The Impact of e-Maturity Models and Framework on Teaching and Learning Practices in the United Arab Emirates Government Schools

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Abstract

This research examines the impact of e-Maturity Models and frameworks on teaching and learning practices in the UAE government schools. Despite significant efforts towards digital transformation in the UAE school education since 2014, there is limited local research exploring how these models and frameworks influence classroom dynamics. This study addresses this gap by focusing on the UAE's K-12 system, specifically targeting Cycle 2 and Cycle 3 schools, where students range from 10 to 18 years old, and staff have substantial experience with the e-Maturity programme.

This study added a valuable contribution to the literature in a local context by re-introducing the wider literature related to e-Maturity Models impact on school education and compared that with the one and only local study of Smart School Transformation Framework, the UAE national framework that was established by MBRSLP in 2016.

Using a multiple case study methodology, data were collected from six government schools, including perspectives from both internal and external e-Maturity evaluators, as well as 129 teachers. The research also incorporates evaluation reports from the schools, along with insights from Ministry of Education officials and professionals.

The findings reveal that adopting e-Maturity Models and digital transformation frameworks in UAE government schools have shifted teaching and learning practices towards a more learner-centered approach. However, there remains a need to refine evaluation tools to more accurately capture their impact on pedagogical practices. The impact of e-Maturity Models and frameworks on teaching and learning practices depends on the seamless integration of these tools, continuous professional development, robust evaluation standards, and active stakeholder engagement. Drawing from these insights, the study provides recommendations for decision makers, researchers and practitioners to enhance the programme's impact, promoting further advancement of e-Maturity in UAE school education.

Key words*:* e-Maturity Models - e-Maturity Framework – Digital Transformation - Smart School – ICT – Self-Review – School Evaluation

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DEDICATION

To my beloved family, my parents, my husband and my children. You all always believed in me to accomplish successful milestones in my life which resulted in obtaining my PhD degree from Lancaster University in the UK. At this stage I am honoured and grateful for all the opportunities, challenges and blessings I have received from Allah that guides me to live and witness this awesome moment.

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The last but not the least, I owe great appreciation to all my family members and friends for being supportive throughout this journey.

Author's declaration

I declare that this thesis is my own work and has not been submitted in substantially the same form for the award of a higher degree elsewhere and neither any sections of this thesis have been published, nor submitted for a higher degree elsewhere.

Signature: *Majdah Dagher Alblooshi*

List of Abbreviations

Abbreviation	Definition
4IR	4th Industrial Revolution
AI	Artificial Intelligence
Becta	British Educational Computing and Technology Agency
BPR	Business Process Reengineering
CMM	Capability Maturity Model
COL	Curriculum Online Programme
DM	Digital Maturity
DT	Digital Transformation
E-MMs	E-Maturity Models
ESE	Emirates School Establishment
HE	Higher Education
ICT	Information Communication Technology
IS	Information System
IoT	Internet of Things
IT	Information Technology
LMS	Learning Management System
LSEN	Learners with Special Needs
MoE	Ministry of Education
MBRSLP	Mohamed Bin Rashid Smart Learning Programme
OD	Organisational Development
OT	Organisational Transformation
SIEF	School Inspection and Evaluation Framework
SRF	Self-Review Framework
SSTF	Smart School Transformation Framework
TA	Thematic Analysis
TAM	Technology Acceptance Model
TPACK	Technological Pedagogical Content Knowledge
VLE	Virtual Learning Environment

Chapter 1

Introduction

1.1 Chapter 1 Overview

Chapter one provides an introduction to this thesis, discussing the background and what motivated the researcher to conduct this study. In the statement of the problem, there is a presentation of the gaps and main limitations concerning the investigation of e-Maturity Models (e-MMs) and frameworks in relation to school education that are supported by relevant literature. Then, the aim and objectives of this study are discussed, and the guided research questions are listed. The importance of the study is highlighted in the rationale, which is followed by the structure of the thesis.

1.2 Background and Motivation to Study

In the year 2014, H.H. Sheikh Mohamed bin Rashid Al Maktoum, the ruler of Dubai, announced the initiative of the Mohamed Bin Rashid Smart Learning Program (MBRSLP), which targeted the transformation of education in government schools from traditional practices to integration of technology to transform to ‘Smart’ schools. For the United Arab Emirates (UAE) government, the transformation towards smart government by adoption of cutting-edge technology was recognised to sustain development efforts and ensure excellence in all governmental services. Following the launching of the smart learning programme, the Ministry of Education (MoE) in the UAE developed several strategic and operational plans to ensure that the infrastructure of government schools and the staff capabilities were up-to-date to cope with the promising smart national agenda of the UAE. During that period of time, in 2014, I was an English language teacher in secondary school pursuing my master’s degree in Hamdan bin Mohamed Smart University (HBMSU). The master’s programme back then followed the hybrid method and, as a learner majoring in Leadership and Management of Online Education, I attended lectures only 20% face-to-face, 10% was dedicated to self-paced study and 70% attendance was through online sessions. My belief in the benefits of online learning and

integration of Information Communication Technology (ICT) in teaching and learning practices were promoted and supported by the positive experience I had been through in saving the time and efforts of travelling to pursue my education. The adoption of the hybrid learning model highlighted to me the significant role of ICT in supporting independent learning, research and collaboration with colleagues and instructors, which impacted me to become a life-long learner and have curiosity to study the implications of ICT in the school environment context.

My interest to conduct a study related to smart education was raised after conducting my thesis in my master's programme about 'Teachers Perceptions of the Smart Learning Program in the UAE Government Schools'. Both my professional experience, from being in the UAE government schools as a teacher to head of academic affairs to vice principal to principal and then to become head of digital learning implementation at Alef Education, and my academic studies, encouraged me to search a field of study that was connected to the national agenda of digital transformation of government schools in the UAE. In one of the courses in my PhD programme, I reviewed literature in relation to e-MMs in relation to evaluation of school Digital Transformation (DT) and Digital Maturity (DM), which guided me to select this particular topic to pursue as a PhD thesis. Furthermore, what backed up my decision was the absence of local literature and the scarcity of educational technology research worldwide targeting e-MMs in school education as a research topic. This gap in the literature led me to study e-MMs' history and to present that in the first sections of this study in order to gain an overall picture of purposes and usages of such tools and approaches for the development and enhancement of any given work environment.

1.3 Statement of the Problem

There is a globally shared notion by educational practitioners and researchers that teaching and learning practices through usage of technology should change to be more effective, to develop learners' skills and behaviours (Msafiri et al., 2023), and to fit the 4th Industrial Revolution (4IR) and knowledge-based economy (Oke & Fernandes, 2020). Educational sector growth and development is not only dependent on the quality of classroom teaching and learning practices

but also dependent on other factors related to the investment of educational technologies, i.e., the digital infrastructure, the digital educational resources, the digital capabilities of stakeholders and the advancement in educational strategies and polices in relation to digital transformation (Timotheus et al., 2022; Ristić, 2017). As a result, several investigations have been initiated to study the impact of technology intervention and utilisation in educational settings at national and international levels but mainly by developed countries (Norman, 2023). The evidence of educational technology integration effectiveness is particularly limited in developing countries (Castillo, 2017; Hill et al., 2016; Piper et al., 2016). One example in this regard is the 30 years and over investigation missions that have been led by the United Kingdom (UK) and the European countries to highlight the changes and impacts of so called 'Learning Technologies' on teaching and learning in advanced e-Maturity schools (Ristić, 2017; Crawley, 2009).

On the other hand, in the UAE, like in some other Arab countries, there is a national initiative in place to turn the education system into a smart system with the integration of technology inside and outside the classroom learning experience, but there is an absence of literature that captures and shows the integration implications to date. Acknowledgement of the absence of literature that explains and explores the impact of e-MMs and frameworks on teaching and learning practices in the UAE government schools is the problem statement of this study; the dedicated work of this research study plans to address this gap through a robust study investigation.

1.4 Aim and Objectives

The aim of this study is to investigate the implications of adopting the selected e-MMs and frameworks on teaching and learning practices by teachers and learners in UAE government schools. Are these implications positive or are some areas in need of enhancements are the core targeted questions. What I am aiming to investigate and highlight are the actual teaching and learning practices adopted currently with the integration of technology, to check the role of e-MMs and frameworks, if any, in shaping and building these approaches. Another

objective is to check the current usage of e-MMs and frameworks as evaluation tools and the effectiveness of the provided tools and criteria within the process of evaluating UAE school e-Maturity. The following research questions are designed to guide the focus of this research by using an appropriate methodology, which is a mixed methods approach involving multiple-case studies.

1.5 Research Questions

There are 4 main questions with additional sub-questions, addressing the related topics of the subject of this research. These questions are:

Q1. What are the available digital and educational technology resources in the UAE government schools?

a. Are these tools considered effective for digital transformation? How are they considered effective?

Q2. What are the adopted e-MMs and frameworks in the UAE government schools?

a. What criteria or standards do they contain and why are these used?
b. How do school staff participate in the digital transformation to advance e-Maturity levels?
c. How do school staff perceive their roles in the development of e-Maturity in teaching and learning practices?

Q3. What are the impacts of adoption of such e-MMs and frameworks on teaching and learning practices?

a. How are these impacts being measured?
b. Are e-Maturity evaluation processes in schools effective?

Q4. Are the adopted e-MMs and frameworks considered effective for digital transformation or do they require enhancements?

a. If they require enhancements, how can this be achieved?

1.6 Rationale for the Study

There is an annual evaluation of all UAE schools' e-Maturity levels that was stated in the agenda of the MoE from 2017 to 2021, and lately it is in the agenda of the Emirates School Establishment (ESE), the governmental entity that was established in 2021 to govern schools and in the mid-year 2024 ESE merged back to the MoE. The annual evaluation is dependent on an e-Maturity framework that is designed by MBRSLP for tracking e-Maturity transformation in the UAE government schools. The MBRSLP is recognised and honoured nationally and internationally for the mission of ICT integration in school education (Ganguly, 2014). The Smart School Transformation Framework (SSTF) was designed in 2016 and adopted by schools from 2017 onwards. However, the e-Maturity Model that is adopted for raising the e-Maturity levels of ICT integration in teaching, learning and pedagogical practices consists of the 5Es e-Maturity levels and these are: Exchange, Enrich, Enhance, Extend and Empower. Though the SSTF as an e-Maturity framework and the 5Es as a description model of e-Maturity levels are used, referred to and adopted by UAE government schools for some years, these tools' implications and effectiveness have not been investigated. The rationale of conducting this study is to clarify the status of adoption of e-MMs and the SSTF in the UAE government schools and to find if there are implications and developments resulting from this adoption, mainly in teaching and learning practices, as this topic is rarely discussed in local literature, which will make this study and thesis the starting point and reference for other developing research in the field of e-MMs and frameworks implications on school education.

1.7 Structure of the Thesis

This thesis contains 6 major chapters: Introduction, Literature Review, Methodology, Findings, Discussion, and Conclusion. In each chapter, there are subsections that start with an overview and end with a summing-up section. The literature review describes the literature selection for this study and addresses the related findings and discussions in several literatures on the topic of this study. Due to the history of the development of e-MMs in other sectors prior to education, such as business and Information Technology (IT), the literature

review section is designed to address the development of e-MMs as evaluation and e-Maturity development tools for promoting the performance of institutions towards advancing their Digital Transformation (DT) mission. Then the literature review chapter highlights those research studies and their discussions and arguments for using e-MMs and frameworks in school education contexts through to reaching the more precise discussions and arguments in relation to the e-MMs' and frameworks' impacts on teaching and learning practices. The end of the literature review chapter addresses the SSTF and the 5Es e-MMs in more detail.

The Methodology chapter describes the methodology and methods adopted to gather data, considering the guided questions and ethical aspects. The numbers and the nature of the samples, participants and targeted community are discussed in the chapter, besides the justification of the selection of a multiple-case study as the main adopted approach for this thesis.

The following chapter is the Findings chapter, which presents figures and tables that resulted from synthesising data and organising all gathered information whether from participants or from reports and documents collected from the selected samples as study cases. The classification of data to address them as findings has arisen through thematic classifications of findings which were then transformed to either qualitative findings or quantitative and numerical figures.

The Discussion chapter extracts the important and vivid outcomes from the Findings chapter to discuss them for the purpose of answering the research questions and supporting with evidence that aligns with the main objectives of this study. The discussion followed a staged approach, from generic to core aspects, in relation to implications of the e-MMs and frameworks on teaching and learning practices in the UAE government schools. The discussion involves presentation of the multiple case studies that are the 6 cases that represent the status of e-Maturity as reported in the 6 selected schools and by the targeted evaluators, the external and internal e-Maturity evaluators.

Finally, the Conclusion chapter summarises the outcomes of this research project with recommendations that I believe will benefit two groups. The first group contains the decision makers and the educators in the field of school education that need to be up-to-date with related literature focusing on adoption of e-MMs and frameworks for ensuring the quality of teaching and learning practices. The other group is the future researchers that are interested in pursuing studies in the field of e-MMs and frameworks usage and implications in school education and, more specifically, in UAE school contexts. The gaps and challenges that were highlighted by this study will be highlighted, for targeting those future researchers and for exploring further questions and solutions for them in future studies.

The upcoming chapter is the Literature Review, which presents previous research in investigating the e-MMs, DT and e-Maturity frameworks, in the contexts of applied theories and practices. Since e-MMs were introduced earlier in other fields than in education, the presentation of the concept, its usages, its benefits and its challenges will be addressed in these earlier contexts and will be followed by its introduction and usages in educational contexts, mainly in school contexts.

Chapter 2

Literature Review

2.1 Chapter 2 Overview

Chapter two covers the literature that has been selected, reviewed and presented to support the investigation into the area of Maturity Models (MMs) or e-MMs and frameworks in school education, their usage and their implications for teaching and learning practices. The lack of local literature related to the e-Maturity of the UAE government schools that was the focus of the study is supported in this chapter by reviewing literature related to e-MMs and frameworks from wider, international and earlier perspectives such as studies related to business and Information System (IS) fields, through to more specific and nation-wide investments in ICT in schools, i.e., Becta studies in the UK and other European studies. The purpose of capturing gradually the development of e-MMs in various fields is to have an overall knowledge of why it is important for organisations of varied disciplines to evaluate their e-Maturity progression against designed levels for the purpose of achievement of advanced DT in the work context. The literature related to establishing and using school e-MMs is discussed, and used to compare that later with the findings of this study.

2.2 Structure of the Literature Review

An extensive review of international literature related to school e-MMs and DT frameworks is considered an integral stage for this study due to lack of local literature which supports the establishment of discussions and comparisons of findings in the later sections. Since e-MMs and frameworks are connected to the context and culture of adoption in certain communities described in the literature as developing and developed countries, the selection of literature followed these criteria:

- Focusing on an overall picture: by highlighting literature that is related to the history of the development of e-MMs and organisation of DT in cross sectors, mainly IT and business fields.

- Focusing on nation-wide initiatives of e-Maturity progression in school education: by highlighting literature related to international studies of e-Maturity in schools and the Becta 2003-2010 studies that were conducted in the UK and found to be the richest resources that are aligned to this study.
- Focusing on e-MMs and frameworks developed for school education: this was by highlighting literature that was mainly conducted in European countries that proposed or adopted e-MMs and frameworks in school contexts.
- Focusing on the impact of e-MMs and frameworks on teaching and learning practices: this was by highlighting literature in relation to the implications of e-MMs, DT frameworks and ICT programmes on teaching and learning practices. The researcher focused on both dated literature and current literature to capture the progression in this area.
- Excluding: studies that were in relation to the Higher Education (HE) sectors, not in the English language and not relevant to school education for students in the age group 10 to 18 years.

2.3 Conceptual Analysis

Since this paper is addressing several concepts tied to the e-MMs and frameworks in school education, this section is intended to analyse those various underlying concepts through presentations of definitions proposed by scholars and experts for the rationale of understanding what exactly those concepts mean and their relationship to this and future studies on similar topics.

Organisation Maturity

Organisation Maturity (OM) is defined by Güell (2021) as *'a measure of organization ability to adapt to the environment, to learn, to improve results and economic and/or social performance, all that with superior results, in the top decile with respect to the concurrent organizations in their activity'*. In early studies, OM was related to the processes and management of technologies and software as IS in organisations. Later on, the concept of OM diversified to all divisions related to organisation growth, i.e., project management maturity and capability maturity. OM is defined as 'A *measure of an organization's readiness*

and capability expressed through its people, processes, data and technologies and the consistent measurement practices that are in place' (Torresc, 2014). In that definition, the technological aspect in relation to OM is seen as part of the progression process towards a more developed and mature workplace that is equipped with advanced technologies and surrounded by effective policies, processes and capable employees. Another recent definition states that OM *'is the measure of the quality of a company's operations. A company with a high maturity level is able to face challenges and seize on opportunities. Improving organizational maturity is a gradual process that emphasizes self-improvement'* (Eby, 2022). Most of the definitions of OM are connected to measurement and description of various conditions, criteria and standards to gain acknowledgement that a company is of a high performance and is highly mature. Similarly, schools of high maturity level should be of high performance, according to the e-MMs and DT standards, but what makes it different from OM in business and the IS field is that schools are foremost focused on empowering students with the right knowledge, skills and positive behaviours following a designed curriculum and national policies which have impact on how ICT is situated by educators in schools.

Maturity and e-Maturity Models

Jugdev and Thomas (2002) defined Maturity Models as tools to identify project or organisational strengths and weaknesses and benchmarking information. According to Cook-Davis (2004), *'the definition of maturity in the capability-maturity family of models leads to the clear conclusion that more mature organizations measure different things than immature ones, and can also expect the measures to show improving results as the organization increases in maturity'.* Maturity Models (MMs) or e-Maturity Models (e-MMs) are a structured collection of elements that describe the characteristics of effective processes or products and they are based on the premise that improving business processes and staff capability will improve the organisations' productivity (Khoshgoftar & Osman, 2009).

For school organisations, e-MMs consist of standards and elements that assess the level of school e-Maturity, mainly the utilisation of ICT for advancement of the learning environment, and that is related to other different fields related to child education which is not the case for business organisations who are mainly focused on profits and valuable returns on investment.

Digital Transformation

Before the introduction of Digital Transformation (DT) to the world economy, historically, there were other terminologies that were developed before we reached DT in the 2010s. The term ‘digitisation’ was used in the 1960s and then ‘digitalisation’ in the 1990s (Kim et al., 2021). Digital transformation is defined as a change of paradigm and sometimes labelled as a technological revolution (Perez, 2010). Later in the literature, digital transformation is mostly connected to other aspects related to organisation growth, i.e., organisation behaviour and the cultural change that has to happen inside organisations. However, to date, literature has not provided many details on how to orchestrate this transformational change. For instance, in a study conducted by El-Telbany et al. (2020) the researchers identified 4 main distributors of DT that cause challenges in emerging economies more than the developed economies and these are namely: the power of technology; the power of digital trust; the power of human digital talent; and the power of information and data. Implementing DT in developing nations confront more challenges than the developed nations with consideration of the nature of complications that evolve with the processes of DT. Thus, the creation of e-MMs as metrics and instruments to push DT was necessary, yet these models are still perceived to be of a high level and for the most part theoretical and lacking the aspect of in what ways this could be achieved in practice (El-Telbany et al., 2020). When it comes to the public sector expectations of governments’ efforts towards digital transformation, it expects the increase in the ability to deliver high value digital services by investments in innovative technologies (Mergel et al., 2019).

Aligning with a similar notion, governments' investments in supporting the DT of schools are for the purposes of delivering high quality services and empowering stakeholders with digital skills. Despite the efforts towards DT in school organisations, there is a lack of understanding about how this will impact the quality of educational services.

2.4 Introduction to the Literature Review

In a recently issued report about Digital Maturity (DM), an interesting argument was proposed by this question: *'Are we surprised that technology is the most digitally mature dimension?'* (digitopia, 2022). As mentioned in that report, when digitopia asked executives about DT they were usually directed to the 'Tech Team'. Are DM and DT all about digital technologies? The argument that was presented in digitopia's 2021 'Digital Maturity Report' was addressing issues related to the advancement of digital maturity mainly in the business sector.

Looking at literature to review for this study, the researcher recognised attempts that were presented in different research papers and reports to approach concepts like e-MMs, DM and DT, adopting mainly a holistic approach and cross reviewing different business sectors. In this study, the method of reviewing literature has taken into consideration the previous literature efforts in connecting dots that are related to the processes of DM and DT, prioritising the objective of this study.

The adopted approach to include and exclude literature was to select literature that was related to these 4 main categories:

- Organisational Maturity, E-Maturity and DT
- E-MMs and DT in School Education
- E-MMs and DT Impact on Teaching and Learning Practices
- UAE School e-MMs and Evaluation Frameworks

As DM and DT were mostly addressed in literature related to IS and business development, this chapter intends to review the history and progression of these related phenomena before their introduction to K-12 (4-18-year-old) educational

settings. For that purpose, the previously mentioned main categories were used as codes, together with other sub-themes, for the purpose of comprehending both the concepts and their functionalities. The process of reviewing literature and extracting the related information for this topic of research was conducted with ATLAS.ti, using the categories, the sub-themes, and a coloured-coding approach. The researcher also used a Microsoft (MS) Excel Sheet Workbook to classify the literature inside and outside selection criteria. The researcher used two research engine tools: Google Scholar and the online library of Lancaster University 'OneSearch'.

It is important to mention that this study only concentrates on literature that is in the English language. It is found that there is a lack of local research literature that describes or discusses the implementation and impact of e-MMs and frameworks that are applied in the context of either the K-12 government school system or the Higher Education (HE) sector in the UAE. The only local data related to the topic of this study are mainly related to the description of progression of the smart learning initiative and applied models and frameworks. These local literatures were collected personally by the researcher from the Ministry of Education (MoE) website, previously known and used documents in the government schools and from collaboration of an official in the MoE in the division of the Smart Learning Program after gaining approval to access the related data to this study from the MoE. These local literatures were mainly about the following:

- The progression related to the Smart Learning initiative under the patronage of the Mohamed bin Rashid Smart Learning Program (MBRSLP).
- A survey commissioned by MBRSLP with the cooperation of different researchers in the HE sector of UAE universities.
- Documents of the Smart School Transformation Framework (SSTF) and the 5Es e-Maturity Stages adopted in UAE government schools.
- The School Inspection and Evaluation Framework (SIEF) that was issued in the academic year 2015-2016.

Results of reviewing both the external and internal literature are presented as follows, from a general perspective towards a more specific presentation of information according to the categories that were selected, ideally to present different aspects related to this study.

2.5 Organisational Maturity, E-Maturity and DT

The rapid development of information technology (IT) has been adopted in many companies and has become crucial for survival of business organisations (Peña-Vinceset al., 2010; Cha, Hwang & Gregor, 2015). However, Scott Morton, in his 1991 book, argued that organisations should undergo fundamental transformations for successful IT implementation. Since then, there has been a noticeable shift in IS research from technical to managerial and organisational issues (Doherty & King, 2005). Technology by itself is no longer perceived to be a magic bullet (Markus & Benjamin, 1997). The literature that related to the history of adopting technology in school organisations, particularly in developed countries, revealed the endless efforts of bringing innovation to education through introduction of cutting-edge technologies at the time to the classroom environment. For instance, in the mid-20th century, schools in developed countries introduced televisions into classrooms and continued from this date to introduce varied digital resources to enhance quality of educational services (Ackerman, 2019). Though schools' adaptation of ICT is well-known in practice in the field, to cope with digital advancement in surrounding social communities, it was rarely linked in the literature to the DT and e-Maturity of a school as an organisation. For past decades, the literature of ICT adaptation in school education was focused on sophisticated and major topics of practice in schools, e.g., teaching, learning, principalship and professional development rather than schools as educational organisations that are targeted by developed governments for advanced DT levels. What is missing in school organisational literature is linkage of ICT implementation to school organisation maturity. It is mentioned in some literature, DT is a multidisciplinary field which needs to be studied and grasped through both holistic and sophisticated approaches. Reviewing literature related to DT in work contexts and from different research

papers targeting Organisation Development (OD) is highly important for this study, to build up at first a crystal-clear notion of 'what are the basic requirements of effective DT for any organisation?'. Research studies have discussed the integration of IT in organisations from different perspectives and levels. In early studies, the term 'IT-enabled Organisation Development' was introduced before the discussion of DM in Organisations. In the following sub-sections, this chapter will discuss OM, e-Maturity and DT from different perspectives, as presented in earlier studies.

2.5.1 Early Stage

The literature related to organisational design and growth has discussed the importance of the integration of technologies for DT of companies and the obstacles they faced (Mettler & Rohner, 2009; Pereira, Durao, Moreira & Veloso, 2022). As mentioned in literature over the last few decades, the concept of IT-enabled organisational transformation (OT) was introduced prior to DT and has attracted considerable attention of researchers in the IS field (Lucas et al., 2013; Ranganathan et al., 2004). Such attention in developing long-term research was only given to schools at that time in countries like the UK, which was a limitation for this study to be able to compare the historical advancement of schools' DT in the UAE. For successful IT-enabled OT, organisations should consider a variety of non-technical elements such as structure, leadership, and culture (Markus, 2004). However, according to Besson and Rowe (2012), who conducted an extensive review of the literature on IT-enabled OT, there is a lack of theoretical clarity and guidance in this research field, which also impacts on the adaptation of IT-enabled OT for schools as organisations in that sense. A possible explanation for this underuse is that the OT phenomenon is inherently complex and uncertain, and hence, no one theory is sufficient (Cha, Hwang & Gregor, 2015). Research related to the concept 'IT-enabled Organisation Development' has highlighted three major positive impacts of IT integration which are: Transformation Resources, Transformation Capabilities, and Strategic Outcomes. For schools seeking positive impacts in these three areas, there is need to consider the core mission of educational services, i.e., building skills, knowledge and positive behaviours for learners of all ages.

2.5.2 MMs and DT

MMs or e-MMs are concepts increasingly adopted and applied in the field of IT and IS, either to assist in OD (Ahern, Clouse & Turner, 2004; Chrissis, Konrad & Shrum, 2008; Mettler & Rohner; 2009; Paulk, Curtis, Chrissis & Weber, 1993) or are used as means of organisational assessment (Mettler & Rohner, 2009; Fraser, Moultrie & Gregory, 2002; Hakes, 1996). These standards can be applied to schools as organisations, to define the stages of e-Maturity in relation to processes, whilst these are not applicable to assess the maturity progression of educational services. MMs became popular after the introduction of a Capability Maturity Model (CMM) in the early 1990s which also led to the development of other models (see Figure 1).

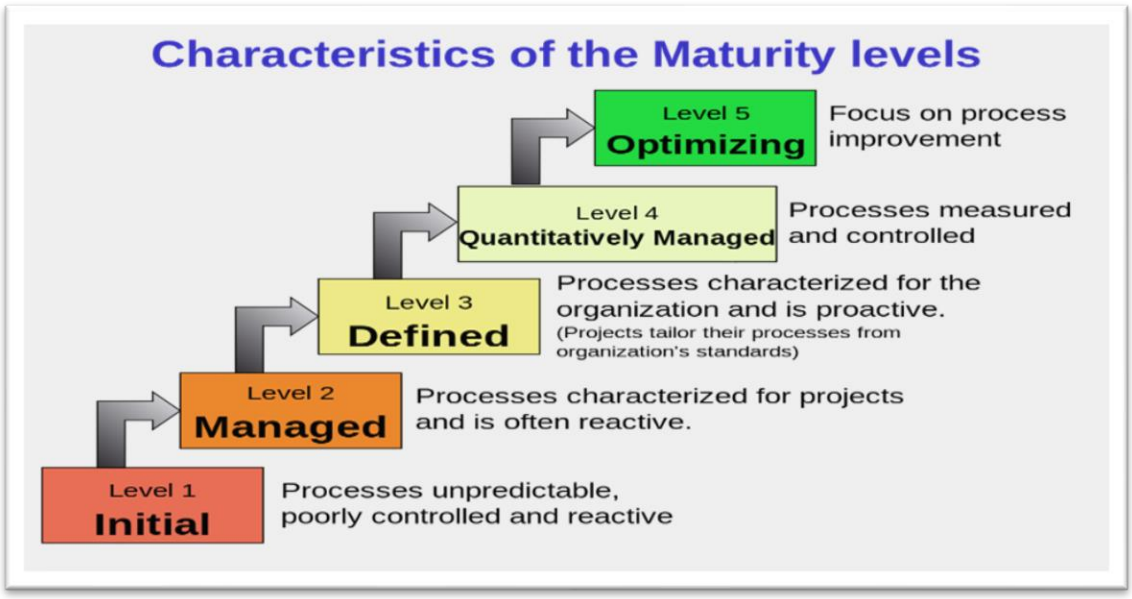

Figure 1. Capability Maturity Model (Godfrey, 2008)

The core mission of MMs is to identify the gap between the actual and intended organisational design which then can be closed by succeeding development activities. However, these models do not necessarily describe how effectively to perform these development actions (Mettler & Rohner, 2009). Therefore, CMM has been criticised because of its overemphasis on the process perspective and its disregard of people's capabilities. The other mentioned challenge for achieving effective development by usage of MMs, such as CMM, is that the

formalisation of improvement activities in combination with extensive bureaucracy can hinder people in organisations from being innovative (Herbsleb & Goldenson, 1996).

According to Pfeffer and Sutton (1999), knowing “what” to do is not enough; it is necessary to turn knowledge into action. On the other hand, the continuous growth in the future for more MMs is dependent on its ability as a comprehensive instrument to balance the divergent business objectives and guide decision makers to make better decisions with regards to organisational design. For that, different MMs were designed and proposed as instrumental artefacts for closing the gaps of the earlier models. The Situational Maturity Model is an example of a proposed maturity model (see Figure 2) that targeted the integration of a model for IT-enabled OT. The model includes specific transformation resources, capabilities and outcomes pertaining to the success of IT-enabled OT. This model can be applied to schools as organisations, but it does not necessarily lead to specific guidelines of how to transform the quality of education.

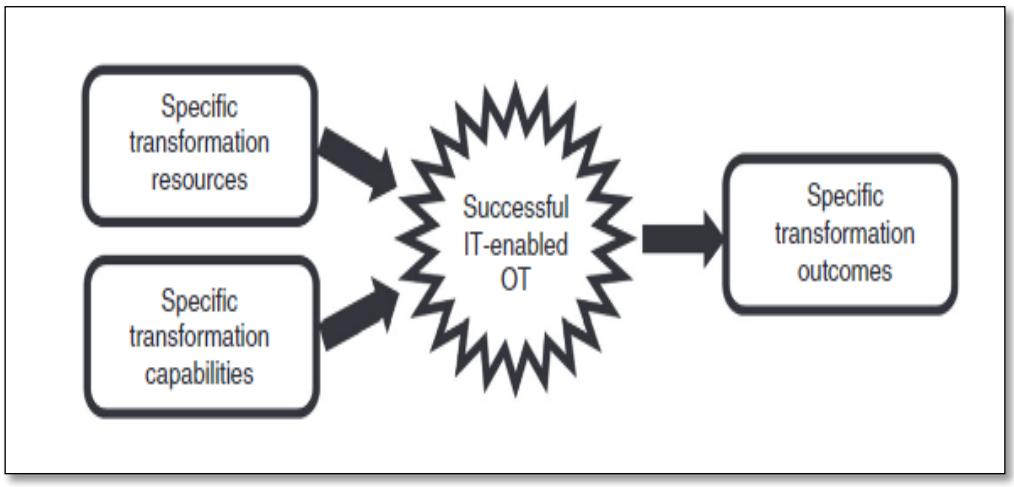

Figure 2. A conceptual of IT-enabled OT (Cha et al., 2015)

Another concept related to the model was organisation learning theory, which refers to the practice of taking intentional actions for better knowledge and understanding (Tippins & Sohi, 2003). IT-enabled OT means the perceptions that firms have of how successful they are in transforming themselves with IT. Organisation learning theory is related to schools’ advancement in integration of

ICT in teaching and learning practices, yet the limitation is that it is still not linked in the literature to the e-Maturity of schools as organisations. There were three important findings in Cha et al.'s (2015) multiple case study paper. The first finding was that flexible IT and policies were found to be key transformation resources. Second, training, teamwork, leadership, and project ownership were identified as key transformation capabilities. Third, strategic outcomes such as responsiveness, customer satisfaction, and business scope were suggested as key transformation outcomes. The findings provide evidence that strategic benefits from the success of IT-enabled OT can be obtained by combining specific transformation resources and capabilities to achieve the desired outcomes.

Addressing the first concept in Figure 2, the *Transformation Resources,* the main argument is that IT resources do not create value in isolation (Melville et al., 2004). IT resources, including IT infrastructure, applications, and IT personnel, should be a part of a value creating process with complementary resources in a synergistic manner (Nevo & Wade, 2011). In other words, IT resources are most valuable when bundled with complementary resources such as organisational structure, work policies, and culture for all organisations, even schools.

The second concept in Figure 2, *Transformation Capabilities,* can be defined as a set of business practices that facilitates the reconfiguration of transformation resources (Francis et al., 2003; Herrmann et al., 2007). With *Transformation Capabilities*, the focus is on organisational learning theory and Business Process Reengineering (BPR) to identify possible factors of *Transformation Capabilities*. Organisational learning refers to the practice of taking intentional actions for better knowledge and understanding (Tippins & Sohi, 2003). Because an organisation moves from its current state to a more desired future state through a series of learning activities, organisational learning is closely linked to OT (Uhlenbruck et al., 2003). Organisational learning has been identified as an important dimension that explains how and why change occurs in the context of IT-enabled OT (Roge et al., 2011). Common learning practices linked to the success of IT-enabled OT include training (Jasperson et al., 2005), teamwork

(Sambamurthy & Zmud, 2000), continuous experimentations (Robey & Bourdreau, 1999), workshops for sharing experiences (Caron et al., 1994), and knowledge sources (Mann et al., 1998). BPR has been widely hailed as a means for leveraging the power of IT (Attaran, 2004). However, it has been criticised for failing to consider the emergent and often contradictory socio-technical interactions (Grover & Kettinger, 2000). Despite such concerns, it should be noted that BPR still has a role to play in the context of IT-enabled OT (Luftman & Derkson, 2012). BPR suggests a wide range of change management strategies such as leadership (Sutanto et al., 2009), employee commitment (Al-Mashari, 2003), and satisfactory rewards (Ahmad et al., 2007). Therefore, it is arguable that organisations that are successful in IT-enabled OT are leveraging specific transformation capabilities based on both the organisational learning and BPR. Such input was not discussed specifically about school contexts in the literature, but given the fact that schools also encounter changes, such an assumption could be true and related.

Addressing the third concept in Figure 2, *Transformation Outcomes*, IT-enabled OT penetrates broadly and deeply into an organisation generating a wide range of outcomes (Hammer, 2004). Drawing on a previous Resource Based View (RBV) and IS studies linking IT resources to various outcomes, it focuses on operational and strategic outcomes (Nevo & Wade, 2011). Operational outcomes represent specific efficiency measures, including operating costs, workload, product, and service quality. On the other hand, strategic outcomes are concerned with customer and market-related measures, including responsiveness, flexibility, business scope, customer satisfaction, and market leadership. Therefore, it is expected that firms that are successful in their IT-enabled OT differentiate themselves by achieving unique operational and strategic outcomes. These arguments suggest that organisations that achieve successful IT-enabled OT are more likely than less successful organisations to obtain unique transformation outcomes. This is partially related to schools that target digital transformation in their strategic agenda and operational tasks for the sake of raising digital literacy, yet the unique transformation that every

educational system seeks is learners' progression in skills and attainments which are still not connected in the literature with IT-enabled OT.

2.5.3 Implications of Rising Technologies

Other studies have been concerned about the implications of rising technologies on Organisational Behaviour (OB) (Ulrike, Katrin, Nina, Andreas & Christian, 2018), mainly reviewing the effects of digital technologies on leadership and employees. DuBrin (2002) describes Organisational Behaviour as the systematic approach to understanding the behaviour of individuals within organisations. It is important to understand the interrelations of human behaviour with other variables such as technology which together cover the whole organisation (Mullins, 1990). In the literature, three major factors can be found that affect OB (Appendix 1), these are people, structure and technology, which constantly interact with the environment that surrounds them within and outside an organisation (Richards, 2017). The way technology is implemented or used within a company may affect the company's inner culture as well as their behaviour towards stakeholders. Furthermore, the implementation of modern technology may bring a gradual change in the composition of the workforce. For example, younger, better educated, more mobile as well as more technologically versed generations will enter companies in greater numbers as in the past, resulting in a changeover within organisations that may well bring along a new set of values, attitudes and concerns that affect the OB within companies (DuBrin, 2002). Adaptation of educational technology in schools might have changed the OB of school stakeholders, i.e., to be more dependent on ICT in the execution of different tasks and the delivery of instructions to learners. DT has developed the digital skills and the culture of work in smart schools, but on the other hand there are variations of digital literacy, abilities and skills across teachers and learners that are still in need of regular tracking and support through professional development programmes.

The recent developing modern technologies, solutions, and systems such as Artificial Intelligence (AI), ChatGPT, the Internet of Things (IoT), Big Data and Robotics have a growing and powerful effect on economy, environment, and

society. They provide new functionalities, increase productivity and efficiency, give higher flexibility and diversity and allow more reusability, parallelism and duplication which could double the annual global economic growth rates by 2035 (Szczepanski, 2019). In addition, they may well change business models, production processes, ways of working and collaborating, but will also permit more mobility, enable faster decision-making and delivery, and support higher standardisation, customisation and prosperity. On the other hand, they can also be related to negative impacts such as unemployment, pressure, ever-increasing exhaustion, despair, higher complexity and social isolation. Therefore, it is important to be aware of these impacts, whether they are positive or negative and to deal with them from the very first beginning. These impacts of modern technologies have affected schools' functionalities as organisation in positive ways. They have provided effective systems for processes like students' registration, employees' records, tracking performance and delivering new educational systems for both learners and teachers. On the other hand, there are challenges involved in implementing technologies in learning environments which are related to maturity levels in multiple areas, such as pedagogical practices, stakeholders' abilities and the educational technology implementation strategies of school leadership.

To support DT companies who need to shift from their traditional, hierarchical structure to a flexible, decentralised organisation, they work with a team/project-oriented leadership to keep pace with the complex and fast-changing environment (digital-centric business) and the increasing customer requirements (customer-led market) (Ulrike, Katrin, Nina, Andreas & Christian, 2018). Additionally, the generation change from the baby boomer to digital natives (Gaston, 2006; Prensky, 2001; 2010) which have unique characteristics and capabilities in comparison to past generations, will require new working structures and leadership (Ulrike, Katrin, Nina, Andreas & Christian, 2018).

2.5.4 Towards Organisational DT

In 2019, Peter C. Verhoef and his colleagues discussed three stages towards accomplishing DT that are: Digitisation, Digitalisation, and DT. The study mentioned the lack of multidisciplinary discussion on DT which should define the change in how a firm employs digital technologies and develops a new digital business model that helps to create and appropriate more value for the firm. According to their study, DT requires specific organisational structures and bears consequences for the metrics used to calibrate performance. For that, the identification of growth strategies is required for firms to transform digitally, beside assets and capabilities. This notion could be applied to schools, putting both teachers' and students' growth in the centre of e-Maturity progression. In terms of the purpose of contributing to the existing discussions on DT, the study adopted a multidisciplinary focus because the emergence of DT requires the building of a scientific knowledge base and development of a research agenda to stimulate the cumulativeness of future research in the multiple domains on this important topic. Three major external factors driving the need for DT were identified:

- The World Wide Web worldwide adoption, with an increasing number of accompanying technologies.
- Due to these new digital technologies, competition is changing dramatically.
- Consumer behaviour is changing as a response to the digital revolution (see Figure 3).

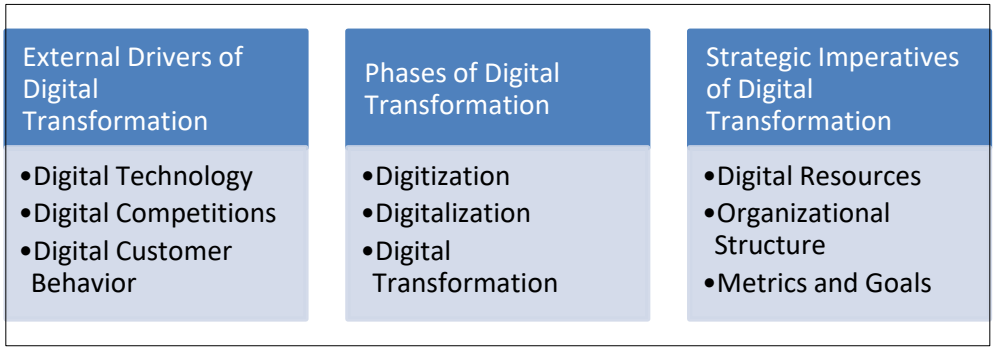

Figure 3. Flow Model for Discussion on Digital Transformation (Verhoef et al., 2019)

A cross-discipline exchange of knowledge helps to better grasp the strategic imperatives of DT, as it involves multiple functional areas, including marketing, information systems, innovations, strategic and operations management. Treating DT, as existent research has done, in functional silos, would potentially lead to ignoring relevant aspects or not optimising cross-fertilisation opportunities. For scholars, understanding the different research streams helps to stimulate the cumulativeness of research (Foss & Saebi, 2017). For practitioners, it is necessary to bring together the insights from IS, marketing, strategic management, innovation, and operations management in order to make sound organisation-wide decisions about how to respond to digital technologies and implement digital organisational changes, and the phases of DT: digitisation, digitalisation, and digital transformation. Most of the literature subscribes that the first two more incremental phases, the digitisation and digitalisation, are needed to attain the most pervasive phase of DT (Loebbecke & Picot, 2015; Matt, Hess, & Benlian, 2015; Parviainen, Tihinen, Kääriäinen, & Teppola, 2017). The journey of schools' development towards digital transformation has involved the first two phases, digitisation and digitalisation, giving the notion that developed countries continuously adopt over the time newly introduced technologies in their educational systems. Yet managing DT to have impact on the quality of educational outcomes and learners' attainment is still a complicated mission for schools, since these are complex environments.

Starting with the first phase and concept 'Digitisation', this is the encoding of analog information into a digital format (i.e., into zeros and ones) such that computers can store, process, and transmit such information (Dougherty & Dunne, 2012; Loebbecke & Picot, 2015; Tan & Pan, 2003; Yoo, Henfridsson, & Lyytinen, 2010). 'Digitalisation' describes how IT or digital technologies can be used to alter existing business processes (Li et al., 2016); for example, the creation of new online or mobile communication channels that allow all customers to easily connect with firms, and which change traditional firm-customer interactions (Ramaswamy & Ozcan, 2016). Coming to the third concept, 'Digital transformation', the most pervasive phase, it describes a company-wide change that leads to the development of new business models (Inanity & Lakhani, 2014;

Kane et al., 2015; Pagane & Pardo, 2017), which may be new to the focal firm or industry. Firms compete and can attain a competitive advantage through their business models (e.g., Casadesus-Masanell & Ricart, 2010), which is defined to represent “how the enterprise creates and delivers value to customers, and then converts payment received to profits” (Teece, 2010: 173). Digital transformation introduces a new business model by implementing a new business logic to create and capture value (e.g., Pagani & Pardo, 2017; Zott & Amit, 2008), which affects the whole company and its ways of doing business (Amit & Zott, 2001) and goes beyond digitalisation — the changing of simple organisational processes and tasks. The challenge that will face schools in taking forward the process of DT is the complex and varied services that will have to be included for achieving valuable transformation to smart educational systems. For that, DT for schools should target different areas that need to meet specific standards over time. Since people, structure, technology, internal and external environments are targets of change and transformation in organisations, schools as organisations will be challenged to derive efficiency in DT, especially in educational services.

On the other hand, studies that have highlighted the notion that “DT is not about technology” have discussed this main question: “Why do some DT efforts succeed and others fail?”. Fundamentally, it is because most digital technologies provide possibilities for efficiency gains and customer intimacy; however, if people lack the positive mind-set to change and the current organisational practices are flawed, then the undertaken process towards DT will simply magnify those flaws (Peter, Thijs, Yakov, Abhi, John, Nicolai & Michael, 2019).

In summary, the literature on business organisations emphasises the importance of IT adoption and e-MMs in driving DT by enhancing capabilities in key areas. These include developing leadership and employee skills through organisational learning, creating appropriate structures, fostering innovation and growth in organisational culture, and achieving positive outcomes by focusing on value creation to build customer loyalty and satisfaction. Future research should consider the impact of DT on work-life balance and explore how to help

employees adapt to new work norms in high-tech, competitive business environments.

All in all, studying literature related to e-MMs and DT for the purpose of OD is of importance for this study. The structures of both the profitable and non-profitable organisations, including schools, are in many ways similar when it comes to people and their capabilities, strategic objectives supported by structure and policies, and the need of qualitative resources to have solid processes, infrastructure, and outcomes. The literature that was highlighted in this section has been driven from business and IT stances to know what are the focus areas that need to be considered in a progression agenda towards e-Maturity in general in any organisation. Linking that knowledge to school e-Maturity and DT for the purpose of impacting the teaching and learning practices to be more effective is what will be discussed and discovered through other related literature in the coming sections. In a non-profitable and governmental organisation such as a school context, e-MMs and DT are highly recommended with consideration of other key factors that ensure the quality of educational services in a school community.

2.6 E-MMs and DT in School Education

Literature that is related to this section mainly comes from European countries, mostly the United Kingdom (UK). The British Educational Computing and Technology Agency (Becta) in the UK, before its demise in 2010, funded, conducted, and commissioned some earlier empirical research studies targeting the integration of technology and the impact of Information and Communication Technologies (ICT) in UK school education (Morris, 2012). The rationale behind highlighting selected literature for this study is that they provide a richer picture of the ‘what’, ‘how’ and ‘why’ aspects when going through the processes of adoption and evaluation of school e-Maturity.

In the UAE, as in other Arab regions, there is an absence of educational studies that explore or discuss the school e-MMs or DT, despite the national UAE mission to transform towards smart schools. For this study, I have reviewed literature

related to international initiatives for developing school e-Maturity, such as those in the UK, in order to understand how national-scale research projects have targeted an investigation of a complex topic of e-Maturity, especially in the school context.

The following sub-sections will highlight the discussion and results coming from several studies about school e-Maturity and DT followed by discussion of arguments, challenges and recommendations.

2.6.1 Nature of Literature related to School e-Maturity and DT

Worldwide, there is a paucity of studies about e-MMs and DT in school education. The UK Becta ICT impact studies have influenced other countries, mainly European, and researchers to continue investigation and exploration of ICT integration, e-MMs and DT evaluation frameworks in school contexts. The selected literature of these regions and researchers has either targeted the development of suitable e-MMs or the investigation of the e-MMs in school education. The few international studies come from Austria, Italy, Denmark, Croatia, Chile and South Africa (Alblooshi, 2021).

In a literature review study I conducted in 2021 (Alblooshi, 2021), I identified the percentages related to the main purposes behind conducting studies about e-MMs in school contexts concentrating on the years 2006 to 2021 with the focus on publications that were in the English language and only targeting school e-Maturity (see Figure 4).

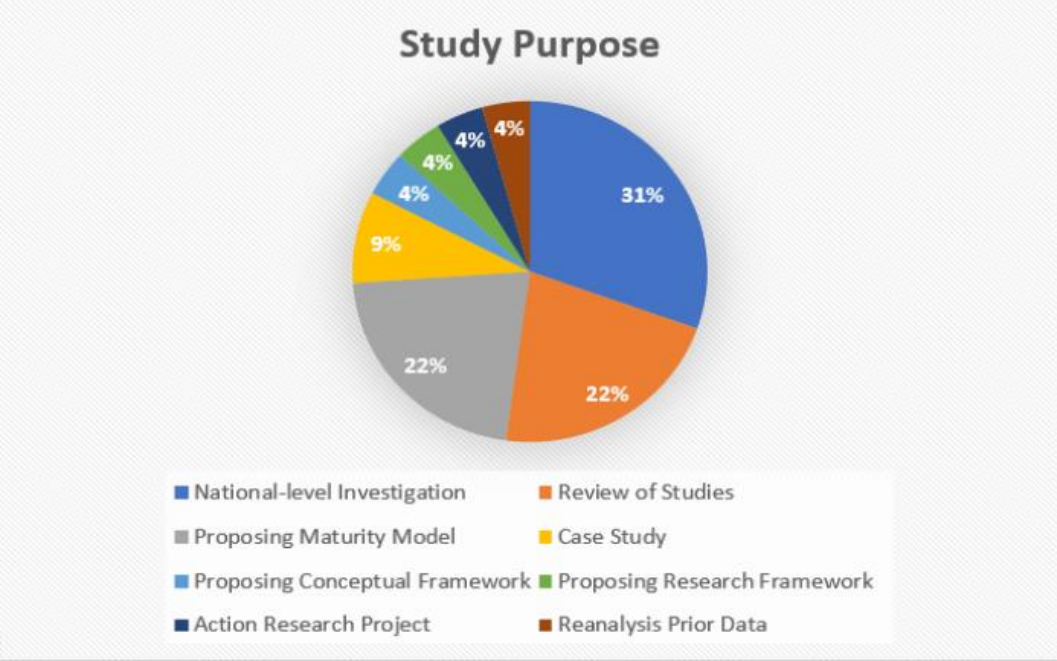

Figure 4. Study purpose of reviewed literature (Alblooshi, 2021)

After reviewing those 23 research papers, the results indicated that most of these studies were conducted as national-level investigations for the purpose of informing the government and policy makers about the degree and quality of ICT integration in school systems (Butt & Cebulla, 2006; Henriksen, Andersen & Medaglia, 2011; Igor, Begicevic & Klacmer, 2018; Sabrina P. & Panagiotis K., 2020; Sofoklis et al., 2016; Underwood et al., 2007; Underwood et al., 2010). These national-level investigations can help individual schools to guide their operational plans to meet the national standards related to school e-Maturity. Individual schools might develop internal case studies to discover the strengths and weaknesses of the ICT integration in their teaching and learning practices and then decide how to implement programmes that progress the e-Maturity level.

In the same study, I thematically categorised the major discussed topics in those 23 papers which resulted in 7 main areas of discussion (see Figure 5). The most frequently discussed themes were “Development of new MMs/e-MMs/Digital Maturity Framework” at 24% and the “Impact on School Performance + e-MMs/MMs/DT Framework” at 21%. The least discussed themes amongst the 7 identified discussion topics were “Technology Enhanced Learning Environments

(TELEs)/Technology Enhanced Learning (TEL)" at 8%, "Challenges and benefits of using e-MMs/MMs/DT Framework" at 10% and "Teachers' Perceptions or Teaching Practices + e-MMs/MMs/DT Framework" at 10% (Alblooshi, 2021). I needed to know more through the literature about the impact of e-MMs and framework on teaching and learning practices in those countries after creation and adoption of e-MMs, which I did not find through my review. This gap is intended to be covered in this thesis.

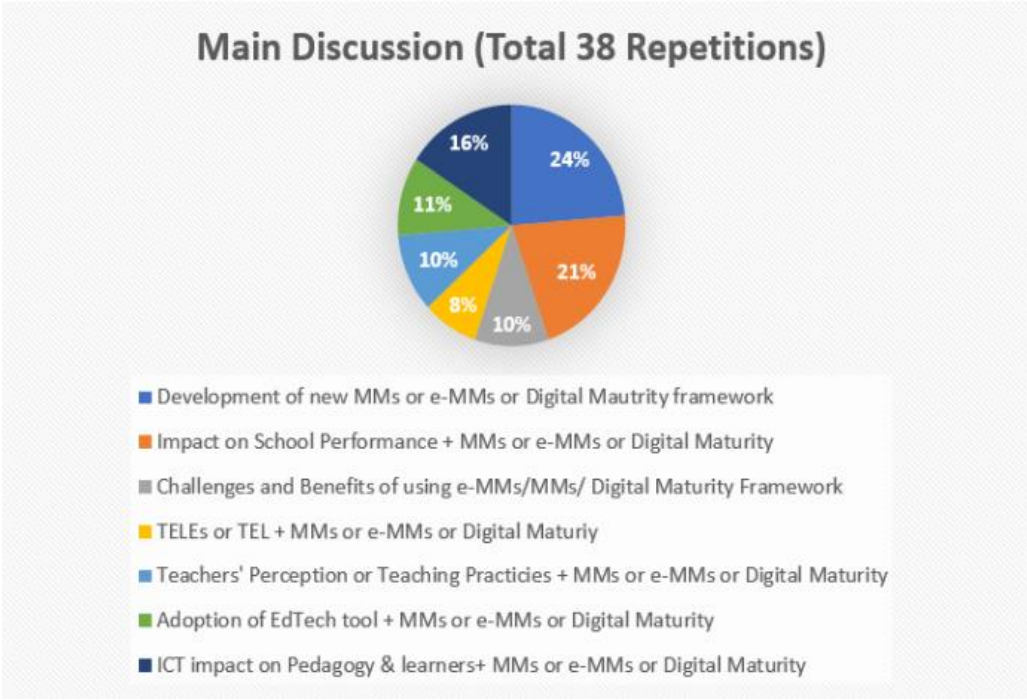

Figure 5. Main Discussion of e-MMs literature (Alblooshi, 2021)

The development of e-learning MMs and evaluation frameworks were basically dependent on one of three major approaches:

- The integration of the Capability Maturity Models Integration (CMMI) family that was developed at Carnegie Mellon University (CMMI Project Team, 2006).
- Thorough empirical research and data gathering from the school field.
- Building these models and frameworks in alignment with international standards such as: ISTE Standards for Educators (Crompton, 2017), UNESCO ICT Competency Framework for Teachers (UNESCO, 2018) and

the Technology Standards for School Administrators Collaborative 2001 TSSA (Yu & Durrington, 2006).

The following sections present Becta ICT impact research, the resulted MMs from Becta studies and other selected e-MMs and frameworks (see Appendix 2). The presentation of Becta results and other European e-MMs is to check the commonalities and differences these different e-MMs proposed for supporting and evaluating school e-Maturity levels and DT progression.

2.6.2 Becta - UK (2003 – 2010)

Becta and some UK educational researchers conducted research studies that targeted different areas related to ICT usage and impact in the British school context. Some of these studies reviewed the usage of certain technologies by teachers and learners and other studies were a series of 'Impact' studies that targeted the notion of ICT impact on teaching, learning and school e-maturity. Becta also conducted studies related to the investigation of ICT effectiveness in the context of pedagogical practices, i.e., personalising learning and using educational games.

My literature review in 2023 identified 16 Becta research studies that were funded and conducted on behalf of what was then the Department for Education and Skills (DfES) from the year 2003 till 2010 (see Appendix 3) and other UK educational researchers' studies that targeted school e-MMs and frameworks. I provide a brief summary of the history of Becta studies, the findings, and the developed e-MMs and frameworks at that time in the UK and other European countries. What will be presented are the related arguments, findings and methodologies that relate to the main objectives of this thesis and not the detailed findings of each reviewed paper.

2.6.3 E-MMs and Frameworks in the UK and other European Countries

Becta commissioned and provided literature that targeted different aspects related to e-Maturity, ICT pedagogy and school performance in the context of British schools. In the early stages before 2006, Becta conducted studies about

the usage of certain technologies in school education, for instance Personal Digital Assistants (PDAs) and tablet Personal Computers (PCs), besides investigation studies on ICT pedagogy. The following studies are those that resulted in e-MMs and frameworks that were either established by Becta or inspired by UK research in the field of school e-Maturity and integration of ICT in the K-12 context.

1. 2004 Underwood and Dillon Maturity Modelling

Under the governance of the UK Department of Education and Skills, Becta commissioned Underwood et al. in 2004 to investigate the impact of the UK 'Test Bed' project, that lasted from 2002 to 2006, to understand the educational costs and benefits of new technologies in environments across primary, secondary and tertiary institutions, when 'sufficient' technology is presented (Underwood & Dillon, 2004). Underwood and Dillon addressed the need of a new educational research framework to investigate the impact of ICT on school education. In their article entitled 'Capturing Complexity through Maturity Modelling', they presented the challenge of studying the impact of ICT on school education since it is a complex system of interrelationships (Underwood & Dillon, 2004). They argued that to capture a greater proportion of this complexity there is a need to build a necessary pre-requisite of the development of predictive dynamic models of the impact of ICT on the educational process and then to develop an analytical tool which allows the synthesis of multiple-sourced data. Underwood and Dillon proposed 'Maturity Modelling' drawn from organisational literature to allow a rich description of ICT integration in school education and how it impacted teaching and learning practices rather than relying only on performance measurement data in evaluation of school e-Maturity. The investigation projects of Underwood et al., to serve the Becta mission, resulted in five main dimensions of a research framework to study the impact of ICT integration in educational contexts; these were: Technology, Curriculum, Leadership and Management, School Staff, and Linkage Maturity. The phenomenon of linkage maturity was captured from Underwood et al.'s literature and was referred to later on in other researchers' attempts to propose new e-MMs and e-Maturity evaluation frameworks for school education. The limitation of the Becta research is that it does not relate to the

UAE, but it covers a gap in the literature related to e-MMs' progression in school education.

2. 2006 Becta e-Maturity Metrics

In 2006, Becta started to focus on the creation of e-Maturity evaluation metrics and indicators to investigate through them the relation between e-Maturity and other aspects of school education, i.e., quality of teaching, quality of learning and school e-Maturity. At the beginning was a study about analysing secondary data related to schools and teachers obtained from the evaluation of the Curriculum OnLine programme (COL) that was an online service funded by the DfES and managed by Becta. The information in COL was about the usage of multimedia resources in lessons. The main objectives were to investigate changes in the attitudes and usage of ICT in schools over time to map stages of "E-maturity" and to explore the relationship between these indicators of ICT and school performance (Butt & Cebulla, 2006).

During the 2006 research, the researchers created an e-Maturity index, or what was called an 'e-Maturity score', to evaluate the e-Maturity of selected primary and secondary schools in the UK. The process of the selection of the main three dimensions and then deciding the 12 indicators within these to measure school e-Maturity was done by following respectively these steps:

- Researchers were focused on the COL evaluation questionnaires to draw out the key indicators.
- Researchers organised a workshop that targeted the participants that were experts in ICT in schools.
- Participants were asked to suggest items from the COL survey questionnaire as indicators of e-Maturity (see Appendices 4, 5, 6 and 7).
- The final selected items represented the three major dimensions of the e-Maturity index which contained 4 indicators in each dimension making in total 12 indicators (Butt & Cebulla, 2006).

What was missing in the provided approach is the linkage between existing e-MMs and the DT framework that were introduced in business organisations and

the IS literature. In the context of my study, schools are complex communities in which multiple areas need to be measured to gain a full understanding of the implications of ICT integration, which I missed in the 2006 Becta Maturity Matrix.

As stated in Becta's COL study, "*Becta aims to increase the number of educational organisations making strategic and effective use of ICT in order to improve educational outcomes and achieving that is by creating models of E-maturity and providing a framework against which schools can benchmark themselves, draw up action plans and review their progress*" (Butt & Cebulla, 2006, p.3).

3. 2006 Self-Review Framework (SRF) by Becta

In 2006, a range of professional bodies with Becta collaborated to establish a Self-Review Framework (SRF) for UK schools. This framework contained 8 elements which were discussed in a 2013 study entitled *'A Self-Review Framework: Information and Communication Technology in a School for learners with Special Educational Needs'* (Diseko & Pule, 2013). This qualitative study adopted the Becta Self-Review Framework as an 'Evaluation Lens' to follow up the targeted teachers' practices in supporting Learners with Special Educational Needs (LSEN) with the integration of ICT and provided resources (see Figure 6).

Figure 6. Self-Review Framework 2006 (Gurney, 2006, p.4)

The Becta Self-Review Framework (SRF) 2006 was described as "*a model for self-review and guide towards e-Maturity*" (Gurney, 2006, p.4). The purposes of the Becta SRF were to:

- *Better manage and develop ICT in line with best practice,*
- *Identify effective and ineffective use of valuable resources,*
- *Plan improvements and future development,*
- *Recognise achievement,*
- *Promote better learning.* (Gurney, 2006, p.6)

Most of these standards are still applicable given its date. What might need improvement is the guidance for conducting transparent and valuable self-review practice that should be mastered by the internal leadership of schools.

4. 2008 Model of Personalising of Learning

The extended long-term Becta research studies to understand and report the impact of e-Maturity and ICT pedagogy on learners and school education was mostly led by Underwood and her colleagues from 2007 till 2010. These interrelated research projects that were presented in final reports in 2009 and 2010 were outcomes of revisiting and reanalysis of the series of 'Impact' studies (Crook et al., 2010; Underwood et al., 2007; Underwood et al., 2008). The two major Becta research projects were the "Evaluation of the ICT Test Bed project" and the "Personalising Learning with Technology project". In both of these, the researchers gathered evidence through quantitative and qualitative data collection approaches. The core mission of Becta was to present meaningful data for policy makers and the school community about best e-Maturity modelling and practices for implementing ICT effectively in learning environments. Based on the Impact 2007 "Personalising Learning with Technology" Report, Underwood and her colleagues presented final reports in 2009 and 2010 to address their understanding of the impact of ICT integration on different interrelated factors to develop school e-Maturity. These efforts resulted in the creation of a proposed model that supported and guided, from the perspective of Underwood's research

team, the effective use of digital technologies for the personalising of learning (see Figure 7).

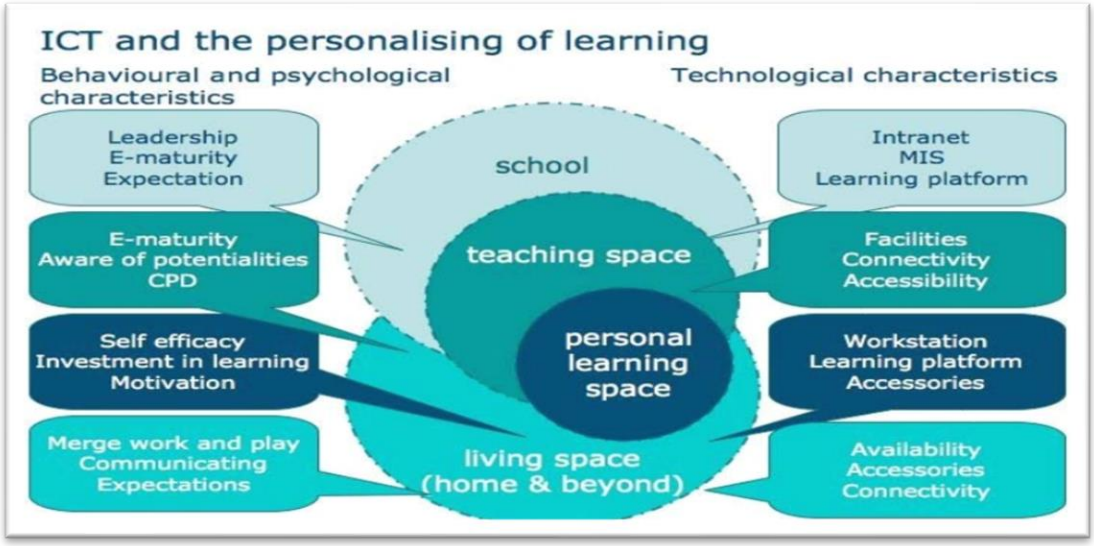

Figure 7. Model of Personalising of Learning 2008 (Underwood et al., 2008)

What is interesting in the 2008 Model of Personalising of Learning is that it highlighted "Behavioural and Psychological Characteristics" which are missing in most other e-MMs, even in the UAE. I believe that adding this criterion in the standards of e-MMs and DT of schools would support internal drivers of students' motivations towards learning.

5. 2013 ICTE-MM in Chile

In 2013 in Chile, Solar et al. proposed an ICT-based and Capability-driven Model that is called ICTE-MM for the purpose of providing a basis for self-assessment and improvement planning for guiding principles in ICT investment. These scholars believed that the degree of success that a school has in implementing ICT will depend, in part, on the quality and maturity of its ICT plan (Solar et al., 2013). The ICTE-MM is basically driven from the CMMI (2006) that focusses on process improvement aspects which guides organisations to develop the quality of the processes and the internationally recognised standards of ICT use in education. The following sources have been considered as inputs in designing the ICTE-MM:

- Models that provide the standard structure of a CMMI (2006).
- ISTE's National Educational Technology Standards (NETS), the NETS for Teachers (NETS-T, 2008), the NETS for Sudents (NETS-S, 2007), and the NETS for Administrators (NETS-A, 2002).
- ICT Competency Standards for Teachers (CST) (UNESCO, 2008).
- Technology Standards for School Administrators (TSSA, 2001).

Solar et al.'s study offers a significant critique of the e-MM proposed by Zhihua and Zhaojun in 2009, particularly highlighting its failure to align with international standards, which are critical benchmarks for evaluating educational environments. While Zhihua and Zhaojun's model provides a structured framework for integrating ICT in schools, particularly in rural Shanghai, the lack of alignment with global standards raises concerns about its broader applicability and scalability beyond this specific context. Zhihua and Zhaojun's e-MM comprises six standards and 63 dimensions covering various aspects of ICT implementation in schools. However, the model's reliance on a Likert scale for evaluation risks oversimplifying the complexities of educational processes and may overlook key qualitative factors crucial to effective ICT integration. Additionally, Solar et al. point out that using this model as a rigid guide for school management could hinder adaptability and responsiveness to local needs and challenges, particularly in diverse educational settings where flexibility is essential (Solar et al., 2013).

6. 2014 The Development of Becta's SRF by Naace

The Education Technology Association (Naace) in the UK adopted the mission of revising and updating the Self-Review Framework (SRF) that was established by Becta, Naace and other bodies in 2008. The process of updating the SRF was ongoing and the last attempt at updating was in the year 2021. The updated version basically combines the previous 8 standards in the SRF 2006 to become the six following standards:

- Leadership and management
- Teaching and learning with technology

- Assessment of digital capability
- Digital safeguarding
- Professional development
- Resources and technology (Naace, 2023)

Most of these standards are included in the UAE SSTF framework and what might need to be added in the UAE framework is “Digital safeguarding”, which concentrates on an important element of digital citizenship.

7. 2017 DigCompOrg Self-Assessment Model of the European Union

DigCompOrg provides a comprehensive and generic conceptual framework (see Figure 8) that reflects all aspects of the process of systematically integrating digital learning in educational organisations from all education sectors. It is adaptable to the particular contexts within which educational organisations, intermediaries or project developers operate (e.g., sector-specific elements, sub-elements or descriptors may be added).

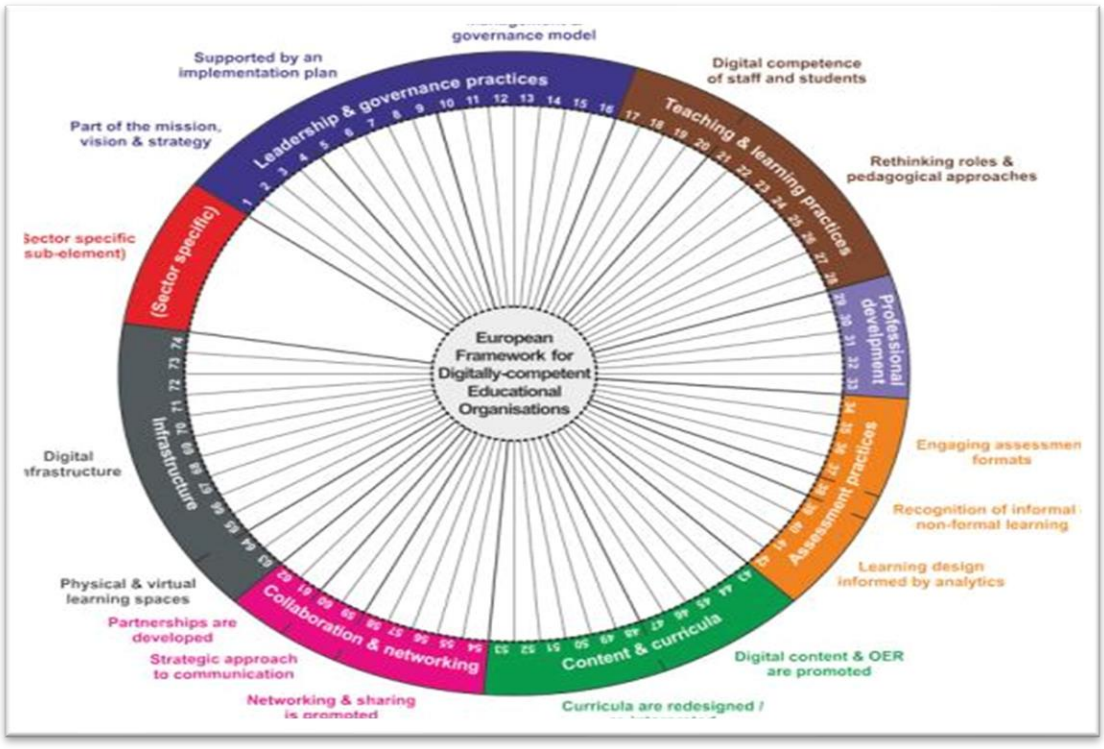

Figure 8. DigCompOrg Framework (European Commission, 2017)

The conceptual framework of DigCompOrg includes important features and elements that the UAE educational system seeks in schools.

8. 2017 Digitally Mature School FDMS in Croatia

The Digitally Mature School (FDMS) is a framework developed in Croatia. The FDMS, together with the accompanying instrument and software was developed as a comprehensive tool set for the assessment of digital maturity of a school. It includes main standards divided into 38 elements that are described on five digital maturity levels in the form of a rubric. It is used as both a self-evaluation instrument and external evaluation of schools, as well as having software supporting FDMS implementation. It is in line with the generic European Framework, the DigCompOrg (Ređep et al., 2017). The FDMS Croatian Framework was developed after investigation of several models and instruments that led to adaptation of 2 main resources for establishment of FDMS and these are the European DigCompOrg and the eLearning Road Map eLEMER (see Figure 9).

Croatian framework	DigCompOrg Thematic Elements	eLearning Roadmap Constructs
Planning, management and leadership	Leadership and governance practices	Leadership and planning
ICT in learning and teaching	Teaching and learning practices Assessment practices Content and curricula	ICT and curriculum
Development of digital competences	Professional development	Professional development
ICT culture	Cooperation and networking	E-learning culture
ICT infrastructure	Infrastructure	ICT infrastructure

Figure 9. Mapping of the FDMS to Existing Framework (Ređep et al., 2017)

The third column is most aligned with the UAE e-Maturity framework which I believe need to be merged with the other two frameworks to have all required standards of school e-Maturity included.

9. 2019 SELFIE The Digital Potential Model of the European Union

SELFIE is a self-assessment tool designed for schools by the European Union and based on the DigCompOrg framework. It contains 8 main criteria:

- Leadership
- Collaboration and Networking
- Infrastructure and Equipment
- Continuing Professional Development
- Pedagogy: Supports and Results
- Pedagogy: Implementation in the Classroom
- Assessment Practices
- Students Digital Competencies

Some of these criteria are covered in the UAE DT framework, i.e., Leadership and Students' Digital Competencies, whilst the Pedagogy standards is missed.

2.6.4 Arguments of Choosing and Using E-MMs for DT in Schools

In the field of school education or public education, e-services and other phenomena, e.g., e-learning, e-content, e-readiness, e-resources, e-confidence and digital competencies, are connected to MMs that are related to educational institutions (Underwood et al., 2007). So, the various connected domains to the mission of evaluating the digital maturity of a school reveals the complexity of the mission. Adding to this is the fact that schools work with stakeholders with variations in attitudes, perspectives, expertise, levels of academia, financial status and digital competencies (Alblooshi, 2021). For that purpose, 'Maturity Modelling', drawn from organisational research, was proposed as a suitable approach for evaluating ICT implications and impacts in school education rather than relying only on performance measurement (Underwood & Dillon, 2004).

The mission of studying and investigating school e-Maturity apparently requires, for the most part, going through these stages in a collective and collaborative manner to map over time the progression of school e-Maturity, which the Becta team worked on in their studies:

- Setting clear definitions of all related terminologies in the topic that researchers are going to investigate, in that case ICT integration in school education and school e-Maturity.
- Developing methods to gather meaningful and reliable sources of data, mainly from experts in the field of education holding different positions, and across educational community stakeholders.
- Using e-MMs to study and benchmark related aspects of school e-Maturity, e.g., e-Pedagogy, e-Resources, e-Learning, ICT skills, e-Safety, etc., for the purpose of understanding the effective and ineffective implications of ICT integration in school education.
- Gathering all these studies to build up a holistic understanding of the impact of ICT in school education to identify the strengths and weaknesses that are related to accomplishing the full potentials of DT of schools as organisations.

The critical issue, from my perspective, occurs when a national initiative that is basically targeting the understanding of the impact of ICT in school, and maps the e-Maturity development, discontinues. In the Morris 2012 report, he critically mentioned the disruption of continuation of the ICT teacher training initiative though the UK government had funded and adopted the ICT in school education initiative for almost 15 years. The discontinuation and the demise of Becta in the year 2010 resulted in pausing the flow of literature related to school e-MMs and ICT impact in the British school context. The introduction of a new agenda, at that time, of including computer science in UK schools and ‘overshadowing’ teachers’ digital literacy that was a demand of the previous governmental initiatives was seen to hinder the ICT skill empowerment of UK school teachers (Morris, 2012). It would have been interesting to know what developments the Becta team would have reached in the area of developing e-MMs for school evaluation. If changing the structure of governmental initiatives is inevitable, at least continuing research and exploration at a national level of what others have reached would serve by adding valuable knowledge to the educational research field in that matter.

At the individual level, the continuation of exploring and reanalysis of the Becta 'Impact' research was fruitful for this thesis. For instance, the UK Becta's Impact 09 report (Crook et al., 2010) was re-analysed in a 2014 study (Harrison, Tomas & Crook, 2014) in which the researchers used Underwood's concept of e-Maturity (Underwood & Dillon, 2004; Underwood et al., 2007) and identified three benefits of the Impact 09 report; these were:

1. At a micro level, it showed not only how ICT could affect student engagement, but also how it impacted the nature of learning.
2. At a meso level, it described the ways in which successful schools were integrating curriculum change using ICT.
3. Finally, at a macro level, it described not only changes in infrastructure, but also suggested some reasons why large-scale change had been successfully embedded (Harrison, Tomas & Crook, 2014).

On the other hand, the findings showed one weakness in Becta's ecosystem analysis of the Impact 09 project and that is that it was teleologically neutral (Harrison, Tomas & Crook, 2014). Though Underwood's Maturity Matrix, from the researchers' perspectives, offered a good record of data on a range and depth of embedding ICT in a school, at learner, teacher, and system levels, it still was missing the strong emphasis on intentionality and studying of intention-behaviour, which motivated Harrison et al. in 2014 to focus on achieving a fuller explanation of the causal factors that promote technology acceptance. The intention-behaviour of teachers, in other words using intentionally the technology for the purpose of effective teaching and learning experiences, affects the technology adoption in an educational setting. For that, the researchers targeted the intentionality and teleology by conducting extensive interviews of teachers and head teachers in schools that were samples in Becta's Impact 09 project. The 2014 study revealed the importance of studying school e-Maturity from both ecological and behaviour-intention perspectives, suggesting avoiding evaluation of school e-Maturity as a complex educational organisation by just using simple models like the Technology Acceptance Model (TAM) created by Davis (1989) (see Figure 10).

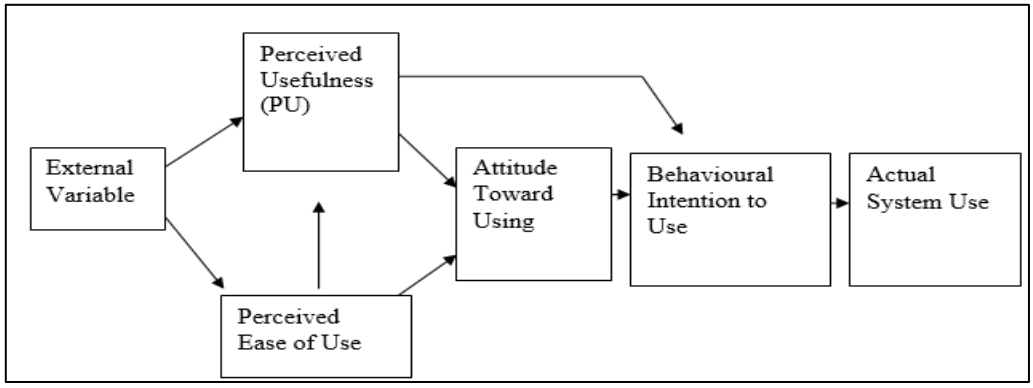

Figure 10. Technology Acceptance Model (TAM) (Davis et al., 1989)

While TAM is a useful tool for assessing technology acceptance at the individual level, researchers find it more effective to evaluate a school's e-Maturity and the success of ICT integration by combining Underwood's 'Linkage Maturity' model with Bagozzi's (2007) socio-contextual perspective. Bagozzi's approach, which emphasises self-regulation as a key individual behaviour, helps to understand how collective behavioural intentions among staff can drive system-level change.

E-MMs and DT frameworks are perceived in the educational literature as helpful tools to measure and indicate the ICT implementation and integration effectiveness in school systems and e-learning environments (Marshall & Mitchell, 2004; Marshall, 2006; Underwood & Dillon, 2004). They provide the strategic leaders and school principals with a self-review framework or guidance to know the status of school e-Maturity. However, the mission of following up and assessing school e-Maturity is complex in its nature and requires several levels of investigations and measurements of different domains. The findings of studies reviewed suggests that e-MMs and DT frameworks are manageable and accessible if the focus is on operational aspects and measuring, for the most part, the obvious and easy-to-measure domains such as infrastructure, resources and numbers of applications used by school stakeholders. When it comes to measuring delivery of instruction, quality of learning with ICT integration or cognitive activities, it will require over time evaluation with appropriate tools and skilful expertise. Usually, the development of a self-assessment framework is based on national or international standards as a result of empirical research conducted by researchers with the collaboration of field experts. It would be

possible to anticipate the discrepancies that may occur in benchmarking school e-Maturity between internal stakeholders who are expected to self-assess their practices towards DT and external educational experts who are focusing on measuring e-Maturity for the purpose of gathering a holistic view of school performance to inform decision makers.

The evaluation of school e-Maturity requires understanding of what it takes to transform a school into smart schools and how to ensure the quality of teaching and learning practices with effective integration of technology. All proposed e-MMs are established by external researchers and governmental bodies who have a theoretical knowledge of ICT pedagogy and an ambitious agenda of transforming schools to be more advanced in usage of technology like other sectors. The notion that the educational sector is falling behind other sectors who are developed more rapidly in usage of ICT and new technologies is common in the educational literature (Serarols, 2020; Sergis, Zervas & Sampson, 2014). For that, the 'external' developers, researchers and evaluators of school e-MMs and frameworks are either commissioned by national educational sectors or have an interest in investigating this field to offer their insights in this critical and complex matter. As a result, all proposed models are serving the school sector as self-guides towards strategic change in usage of ICT in school contexts. Whereas, when it comes to the real world, the actual day-to-day responsible bodies of progression towards effective ICT integration in a school environment are the internal stakeholders and they are the school leaders, teachers, learners, and parents who need to capture a deeper understanding of the 'e-Maturity linkage' and the best practices of ICT pedagogy for achieving the best learning outcomes.

Meeting governmental vision towards transforming schools to more advanced digital practices will require educational researchers and experts to develop several approaches and proposals to review and benchmark schools against certain standards and criteria. The argument in that sense is that policy makers often have unrealistic and overwhelming expectations about the learning improvements that will result from ICT interventions and digital transformation

agendas which still in many research findings are in the stage of 'progressing' rather than 'transforming' (Crawley, 2009; Ristić, 2017; Smith et al., 2008).

This raises a critical question of 'can schools transform effectively and fully towards wise adoption of ICT?'. Related to this, I offer this answer from an Austrian case study led by Micheuz who stated the following:

"I want to point out two different perspectives on innovation diffusion as a framework for further analysis. Two different approaches – digital technologies as a catalyst for reform and that of a lever for reform can be distinguished. The catalyst pattern provokes or instigates far-reaching and sustainable change which exceeds initial intentions. No miracles derive from the mere presence of ICT in a school; it does not, except in unusual circumstances, act as a catalyst for wide scale improvements. Just "throwing technology into the classroom and hoping for good things" is not a good strategy to get a better teacher in the digital age… However, ICT can be a powerful lever for change. In contrast to the catalyst pattern, the lever pattern implies that ICT is not used as an agent but as a tool. An agent, once introduced, can act beyond its immediate goal. A lever can only be applied to achieve an intended goal… These different models are critical for policy which applies for large-scale national investments in IT infrastructure and in-service trainings as well as for the autonomously school administrations when they plan to invest in digital technologies without objectives for pedagogical improvements." (Micheuz, 2009, p.1-2)

The following section considers the literature related to the discussion of ICT in teaching and learning practices and their relationship, if any, with the level of school e-Maturity. Did e-MMs, a DT framework and benchmarking school e-Maturity have impact on teaching and learning practices? If so, what are these impacts? The following section sheds light on the impacts of e-MMs and DT of schools mainly on teaching and learning practices to find out what literature has discussed and been found in this area, which is the main target and objective of this study.

2.7 E-MMs and DT Impact on Teaching and Learning Practices

In this section, it is important to address the Becta literature that targeted ICT pedagogy in relation to school e-Maturity for the purpose of linking these findings with what was presented about Becta's efforts in this field beside the presentation of discussion in the current literature in relation to this study.

2.7.1 Becta Research of ICT Pedagogy in relation to e-MMs and School DT

Although Becta literature intensively targeted school e-Maturity and its impact on teaching and learning practices, the reviewed literature has not provided clear evidence of the relationship between schools' levels of digital maturity and learners' attainment (Butt & Cebulla, 2006; CooperGibson Research, 2022; Cox & Abbott, 2004; Underwood et al., 2010). Despite having technologies omnipresent in UK schools for decades, still the degree to which such technologies are embedded in the fabric of schooling is far less clear and the role of the teacher as change agent, although extensively studied, also lacks clarity (Underwood & Dillon, 2011). On the other hand, there are optimistic findings in the literature that are related to the value-added aspects of ICT integration in teaching and learning practices and these are: it adds joy, variety, individuality, and more tendency to learner-centred approaches (Micheuz, 2009).

Studies that have discussed the concept of "ICT Pedagogy" or "e-Pedagogy" in relation to school e-Maturity and learners' attainment, to figure out if there is any causal positive or negative relationship, have remained at the stage of 'uneven', 'unclear' and 'uncertain'. Becta commissioned studies that mainly targeted the effects of ICT pedagogy on attainment, yet these studies identified only indirect connections between variables in relation to ICT pedagogy and attainment. These findings are still insufficient as direct proofs, which resulted in an inability to establish a clear causal relationship between ICT integration, levels of school e-Maturity and attainment (Butt & Cebulla, 2006; Cox & Abbott, 2004).

In 2007, Becta published a final report on the 'Evaluation of the ICT Test Bed Project', the four-year Becta research project led by Somekh et al. from 2002, in which the research team's findings showed that the impact of ICT on attainment

levels was greater for primary schools than for secondary schools, according to the schools' national test outcomes (Somekh et al., 2007). This final report was an outcome of a long-term study that used Underwood and Dillon's (2004) study as a reference. The schools that were samples in this report were entitled 'Test Bed Schools' and were compared to other schools that were entitled 'Comparator Schools'. In 2004, Underwood and Dillon stated the following interesting outcome from their experience of evaluation of school e-Maturity in relation to learning:

"Perhaps new technologies are delivering new forms of learning for which we have yet to develop adequate assessment techniques. This, the most frequently used defence against the technology sceptics, that current educational assessments are not capable of measuring the value added by technology, has been seen as a 'get out clause' by many but there may be more than a grain of truth in it." (Underwood & Dillon, 2004, p.5)

The argument about measurement of effectiveness of learning practices is that learning is a context-bound practice that will need us to understand all other aspects that add richness to the learning experiences (Underwood & Dillon, 2004).

The reviewed studies that are related to learners were focused on identifying the links between learners' attitudes, school characteristics, learners' technological skills, e-confidence and levels of e-maturity, whilst the studies related to teachers were more concerned with professional development and effective delivery of ICT pedagogy. Underwood and Dillon also targeted teachers' perceptions and responses to ICT usage in classroom contexts and, according to them, changes needed to occur in educational contexts as a "*linear chain of causal steps will not bring the desired changes but a set of complexes interacting influences. In other words, a system model approach which describes a learning ecology which is central to maturity modelling*" (Underwood & Dillon, 2011, p.5).

Three major strategic views were discussed and presented in the Underwood and Dillon 2004 paper about the adoption of technologies in teaching practices in school contexts, which I found interesting and added to my understanding of

the topic. The first one is “A laissez-faire approach” which, according to researchers, is the voice of “naysayers” that supports the cut of funding of ICT in schools and the usage of minimum technologies. The second strategy is to “Bend the technology to the system”, that is, technology should be accepted where it fits current educational structures and practices. The third approach is “Merge and evolve”, where technology is in a constant state of evolution, where we need a merger of ICT and education and not just adding digital technologies to the existing educational structures and practices. The first strategy was unaccepted by the researchers as it suggested inequality of learning opportunities between individuals who possess technological tools and can access educational resources and others who lack these as learning opportunities. The second strategy was described as a status quo, which might play the role of hindering the new ICT educational innovations if continued to exist as a traditional approach. The third strategy, from my perspective, which supports Underwood and Dillon’s insights, will require different mind-sets and new educational trends that are related to the establishment of unfamiliar definitions of new learning ecologies and school systems.

2.7.2 Arguments related to Becta ICT Pedagogy Studies

Becta was an early adopter of the term “e-Maturity” in the context of school systems. Underwood et al. explored the relationship between “personalisation” and e-Maturity in their Impact 07 study, revisiting the topic in their 2010 report, where personalised learning was termed “pLearning”. The findings from Impact 07 revealed a positive correlation between higher levels of e-Maturity and improved school performance. However, personalisation of learning did not consistently lead to better school outcomes, indicating that a school's level of e-Maturity is not directly tied to achieving the most effective approaches for personalising learning.

Underwood et al. (2007) attributed this issue primarily to teachers’ perceptions and understandings of personalised learning, specifically “what it looks like in practice”. Consequently, they emphasised the critical role of teachers in fostering a pLearning culture, which can be enhanced through the use of ICT. This

suggests that teachers are key agents of change in the successful implementation of ICT in learning environments.

Becta studies further highlighted that the role of learners is equally important. Findings showed that students with Low Investment in Learning (LIL) needed to increase their engagement to achieve better outcomes. Educational technology, when used in isolation without effort from learners, does not lead to significant improvements in academic achievement (Underwood et al., 2010).

In all Becta studies, several related terminologies to school e-Maturity and performance were defined and this showed the tendency of Becta researchers to prioritise the understanding of how e-Maturity can best serve school performance and pedagogical aspects of learning rather than only focusing on technological aspects. The DT in the UAE educational system was focused at first on the solidity of digital infrastructure and the empowerment of digital skills of teachers' and learners. What was missed in the UAE context was the long-term research of the DT efforts that took place in the schooling system, which were considered a limitation towards understanding the strengths and weaknesses of the UAE schools' DT programmes.

2.8 Current Studies of ICT Integration Impact on Teaching and Learning Practices

Džigurski et al. (2013) discussed that there is no clear strategic approach to the improvement of the roles of ICT in teaching at all levels; the schools, the local communities, the ministries and the institutions in charge of regulation and development of the respective area. For that, Ristić (2017) argued that the role of ICT is therefore primarily based on the enthusiasm of individuals and local communities which dictate equipping of schools for ICT implementation. From my experience, there is a strategic approach towards developing educational technologies in schools guided by MoE in the UAE. There are also individual efforts from principals and teachers who are skilful and knowledgeable in this area, investing appropriately the technology provided for the sake of developing students' performance. Yet it is not the case for all school stakeholders because

abilities and perceptions towards technologies of principals, teachers, parents and learners are variable.

To gain a comprehensive knowledge of teachers' roles whilst integration of technologies is taking place in their daily classroom practices, several studies have investigated the approaches that best equip teachers and learners with digital skills and the 21st century skills that led to the establishment of educational technology frameworks. In the literature of ICT pedagogy, professional developments of teachers were discussed heavily, as teachers are seen as the key players to empower the learners to use ICT effectively in their learning journey (Ghavifekr et al., 2015; McKnight et al., 2016). The following subsections present aligned frameworks with the mission of empowering eLearning and ICT integration in teaching and learning practices in school education.

2.8.1 Technological Pedagogical Content Knowledge (TPCK or TPACK)

In 2006, the eLearning framework, the 'Technological Pedagogical Content Knowledge' (TPCK), was introduced and coined in educational technology literature, which mainly related to technology integration in educational institutions, educators' digital literacy, and teacher professional development (Moalem, 2018; Shaifie et al., 2019; Solar et al., 2013). Mishra and Koehler in 2006 introduced the TPCK framework, building on Shulman's (1986, 1987) two knowledge bases, the 'Content' and the 'Pedagogy,' on which they added a third knowledge base into the framework, namely, technology. The TPCK framework is most commonly represented using a Venn diagram (see Figure 11) with three overlapping circles, each depicting a distinct form of teacher knowledge.

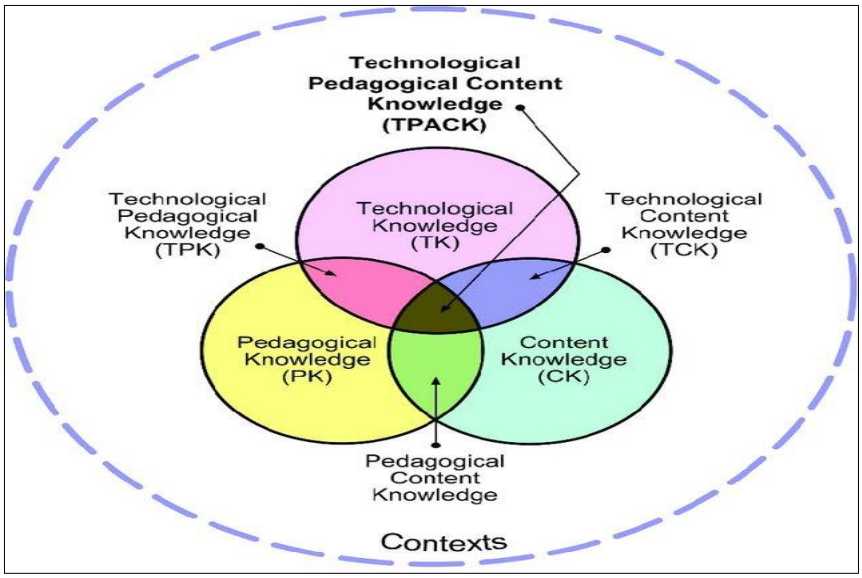

Figure 11. The TPACK Framework and Its Knowledge Components (Koehler & Mishra, 2009)

Koehler and Mishra conceptualised the TPCK framework in terms of seven knowledge domains:

1- Content Knowledge (CK): knowledge about the actual subject matter that is intended to be learned or taught.
2- Pedagogical Knowledge (PK): knowledge about the processes, practices or strategies of teaching and learning.
3- Technological Knowledge (TK): knowledge about operating digital technologies.
4- Pedagogical Content Knowledge (PCK): the interaction of PK and CK.
5- Technological Content Knowledge (TCK): the interaction of TK and CK.
6- Technological Pedagogical Knowledge (TPK): the interaction of TK and PK.
7- Technological Pedagogical Content Knowledge (TPACK): the interaction of PCK, TCK, and TPK.

PCK involves the knowledge of representing content knowledge and adopting pedagogical reasoning to make the specific content more accessible to the learners. TCK refers to the technological representation of content knowledge without any account to teaching (Cox & Graham, 2009). TPK refers to pedagogically sound ways of using technology with no reference towards any specific subject matter. Finally, TPCK is regarded as the contextualised and

situated synthesis of teacher knowledge about teaching specific content through the use of educational technologies that best embody and support it in ways that optimally engage students of diverse needs and preferences in learning (Chai, Chin, Koh, & Tan, 2013; Harris & Hofer, 2011; Koehler, Mishra, & Yahya, 2007; Lin, Tsai, Chai, & Lee, 2013; Mishra & Koehler, 2006).

In 2007, Mishra and Koehler's TPCK changed to TPACK, which was proposed as a term that could be more easily spoken and remembered. According to Thompson and Mishra (2007), TPACK captures the fact that these three knowledge domains should not be taken in isolation, but as an integrated whole, a Total PACKage, as it has been referred to in the literature.

TPACK as a standard connected to e-learning is helpful if added to the process of evaluating school e-Maturity level. It concentrates on pedagogical, content and technological aspects, in combination, which offers a wholistic notion of evaluating school e-Maturity beside utilisation of e-MMs and the DT framework. Adding TPACK from my perspective will prioritise educational aspects into e-MMs and frameworks, which is better than the adaptation of e-MMs that are related to processes such as those in the business sectors discussed in the early literature.

2.8.2 21st Century Skills Frameworks

There is a rich discussion in the literature about the necessity of acquiring 21st century skills during school education to cope with the digital world. It is argued that the 21st century is quite different from the 20th century in the capabilities people need for work, citizenship and self-equalisation, due to the emergence of very sophisticated ICT and the tremendous shift to a knowledge era (Dede, 2009). As a result, some 21st century skills frameworks were developed to offer the roadmap and highlight the skills needed over time amongst learners, teachers and educational stakeholders. This thesis adopts the summarisation of these 21st century skills frameworks (see Appendix 8) that was addressed in Chalkiadaki's study in 2018. In all developed 21st century skills frameworks, though they differ in some components, there are common repetitive components which were

categorised into 4 broad sets of skills. These are namely personal skills, interpersonal and social skills, knowledge and information management, and digital literacy (Chalkiadaki, 2018). Looking at the importance placed for developing learners' 21st century skills, several attempts in the literature have been made to investigate the effective teaching practices to support 21st century learning context and outcomes. In Malaysia, a qualitative study was conducted in 2019 by Ke-Du to identify the criteria of effective teaching in the context of 21st century learning in a Malaysian secondary school. Ke-Du adopted in this study the Partnership for 21st Century Skills (P21 Framework) (2009) (see Figure 12).

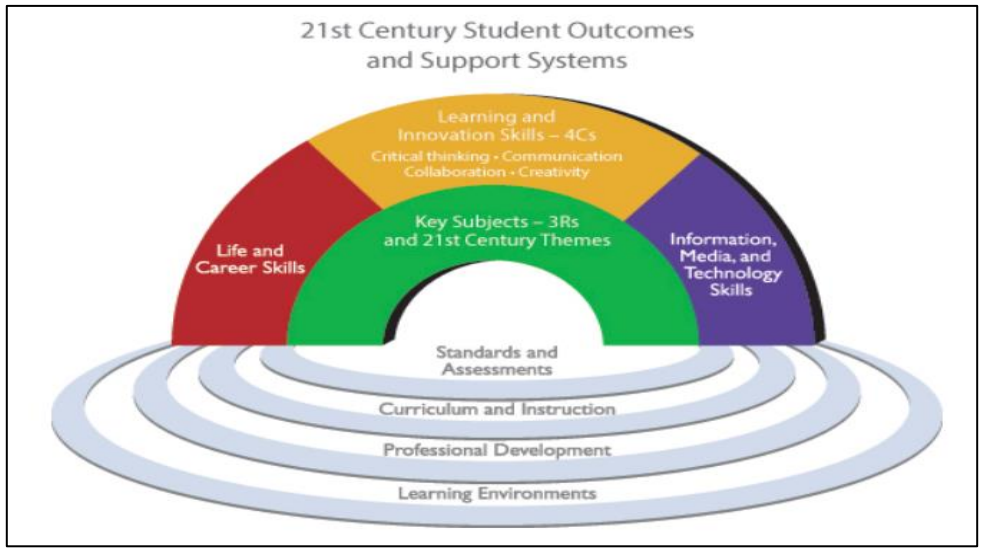

Figure 12. 21st Century Learning Framework (Partnership for 21st Century Skills, 2009)

The P21 Framework emphasised the interconnection of all elements in the process of 21st century teaching and learning, so that students are more prepared for the changing world and global economy (Ke-Du, 2019). This framework would help the UAE school system to guide the instructional delivery with implementation of technologies to achieve high maturity levels, but it requires development and involvement of all connected departments and stakeholders of the school community.

2.8.3 TPACK and 21st Century Skills

A Malaysian study by Shafie et al. (2019) aimed at establishing a relationship between the TPACK framework and the proposed 4C1V framework by the

Malaysian Ministry or Education. The 4C1V framework abbreviation is representing the '4C' or '4Cs' that are amongst the learning and innovation skills in the P21 Framework (2009) - Critical Thinking, Communication, Collaboration, and Creativity - and the '1V' representing Values and Ethics (see Figure 13).

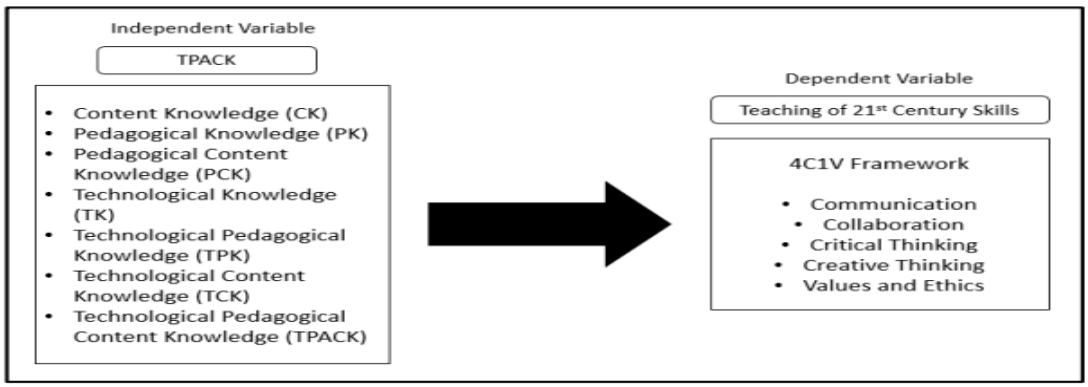

Figure 13. The 21st century skills conceptual framework by (PADU) (Shafie et al, 2019)

The educational literature of Malaysian researchers placed the importance of changing teaching practices to suit learners of the 21st century; these are known as digital natives and millennials (Prensky, 2010). On the other hand, Shafie et al. (2019) discussed the need of investigating teachers' knowledge of soft skills and digital skills in order to reflect that when teaching 21st century skills to their students. Employability skills, hard skills and soft skills are of high demand, which questioned if Malaysian teachers have the comprehension and knowledge of how to teach and adopt 21st century skills. This study looks at the educational literature of Malaysian researchers to check the impact of e-MMs and frameworks' adaptation on teaching and learning practices in other developed nations to compare with the UAE. The focus of developing 21st century skills of learners is a focus for both countries, Malaysia and the UAE, yet there is a lack of local literature to identify specific similarities and differences in both countries' DT agendas for schools.

Overall, the current studies and literature are mainly focused on 21st century skills and TPACK, as described above, as major concepts related to developing teaching and learning practices while considering the integration of technologies.

The following section carries on the arguments that targeted the current studies and the main discussions highlighted in some literature.

2.8.4 Arguments in Relation to the Current Studies

Even though TPACK has become ubiquitous and has been used considerably in the technology integration literature, it has not been adopted by everyone (Voogt et al., 2013). The reasons behind discussing TPACK more in the literature and to gain less focus in teaching practices is due to some major factors that have been mentioned in some studies. The first factor is that most studies that investigated teachers' TPACK levels have targeted pre-service teachers rather than in-service teachers (Shafie at el., 2019). The other factor is that studies that investigated teachers' perspectives towards teaching and learning 21st century skills revealed that teachers have strong support towards teaching those skills, but when it comes to execution and implementation level, the evidence showed little effective practices (Norazlin, 2018; Vail, 2010).

The studies that were conducted to discuss teachers' levels against the TPACK framework were mainly addressing pre-service teachers instead of in-service teachers.

Handal et al. (2013) in their study stated that there are three factors that complicate teachers' efforts to apply TPACK in their teaching, which are:

- instructional factors - teaching and learning issues,
- curricular factors - the issue of ICT use in a school environment,
- and organisational factors – the logistic issue of materialising the integration of ICT in a curriculum. (Shafie et al., 2019).

Whilst the preferable terminology nowadays in the literature that associates ICT with learning is "e-Learning" or "Online-Learning", which highlights the technological aspects in learning environments, still the confusion is which notion is more accurate - the association of learning to technology or technology to learning? This question is of course in need of further investigation and

discussion to help researchers have a mutual understanding of educational technology terminologies. I have drawn a conclusion here that there is no addressing of such concepts that we can for sure say relates to teaching in an e-mature school, thinking of terms like “e-Teaching”, “e-Instruction” or “e-Teaching Maturity Models”. I perceive this unintentional neglected attempt to form terminology related to defining teachers’ roles in instruction delivery in an e-Mature school as unquestioned trust and confidence from both the educational policy and educational researchers’ community for a teacher’s position as ‘knowledge expert’ who inherently should play the role of instructional delivery using different mediums and approaches. On the other hand, to encounter any misunderstanding from the teachers’ side of effective application of several technologies offered in school settings such as a Virtual Learning Environment (VLE), Learning Management System (LMS) or e-Content, a training on usage of these systems and functionalities are perceived to be a governmental or organisational responsibility since this advancement is driven from national agendas. Though teacher education and professional development is of high demand to achieve advanced levels of ICT uses in classroom environments and learning spaces, still this area is absent from discussion in the literature from the perspective of creating suitable e-Maturity Modelling of teaching in e-mature schools or within the proposed e-MMs and DT framework. As stated in a study conducted by researchers from the University of London: *“Although there is an extremely wide literature on CPD in general, and despite the length of time that technology has been used in education, recent literature about ICT CPD contains few large-scale studies or studies of long-term development of pedagogy using technologies*” (Daly, Pachler & Pelletier, 2009, p.14).

The next section is a shift from previously discussed international literature in relation to e-MMs and school DT frameworks to local literature that is related to the UAE national initiatives to track school e-Maturity, the proposed e-MMs and UAE school DT framework.

2.9 UAE School E-MMs and Evaluation Frameworks

2.9.1 School Performance Evaluation in UAE Government Schools

In 2015, different national educational bodies in the UAE cooperated and launched the 'School Inspection and Evaluation Framework' for UAE schools, for both the government and private sectors. These national bodies were:

- The UAE Ministry of Education
- The Department of Education and Knowledge (ADEK in Abu Dhabi)
- The Abu Dhabi Centre for Technical and Vocational Education and Training
- The Knowledge and Human Development Authority (KHDA in Dubai)

The following is the translated version of the introduction section of the 'School Inspection and Evaluation Framework', from the Arabic version of the document:

"The year 2015 witnessed the launch of a unified framework for School Inspection and Evaluation Standards in the United Arab Emirates based on the vision of our wise leadership in building a knowledge-based society, and under the directives of the Prime Minister's Office to be the primary reference for measuring and evaluating the quality of school performance in the public and private sectors in the UAE United Arab Emirates. Thus, this constitutes a major step forward in our joint efforts towards achieving the goals of the National Agenda in building and establishing a world-class education system in the United Arab Emirates.

"The current academic year witnesses the launch of school evaluation processes based on the unified framework for School Inspection and Evaluation Standards, in continuation of the efforts of the Ministry of Education to provide the necessary support to our schools to develop their performance based on accurate and reliable information about quality levels in various aspects of their work, ensuring the provision of high-quality education for all our students.

"Self-evaluation processes are a central part of the school evaluation processes, as it is one of the most important tools that allow the school to measure the impact

of its work in various aspects and allows it to conduct a general assessment of the quality of the educational services it provides. It also provides an important indicator of the quality of school leadership and the extent of its success in leading development processes in the school. Self-evaluation processes help the school to conduct an accurate analysis of its performance in order to identify strengths and areas of improvement, which helps in determining future development directions in the school.

"The self-evaluation document was prepared based on international best practices in school leadership and management in the context of School Inspection and Evaluation Standards in the United Arab Emirates. Each school is required to complete a self-evaluation document as part of its continuous development efforts, which will be one of the main documents that educational inspectors rely on in discussing with school staff about various aspects of the school's work.

"We trust the cooperation of all school leaders and administrations to implement this document and make use of it optimally in the development processes and in establishing a culture of self-evaluation of performance in the various aspects of the school's work in a way that helps the school staff to develop and provide the best quality levels for our students." (School Inspection and Evaluation Framework, 2015, p.3)

The School Inspection and Evaluation Framework (SIEF) is dependent on two major factors to ensure progression towards excellence in UAE school performance. The first factor is the competency of school leadership in adoption of the framework as guidance, and the self-evaluation tool to achieve the UAE Vision 2021. The second factor is the competency of the school inspection team who will follow up the schools and check the level of achieving the unified standards in the SIEF.

Basically, the SIEF consists of 6 main performance standards, which are:

1. The quality of student achievement.
2. The quality of personal and social development and innovation skills.
3. The quality of teaching and assessment processes.
4. The quality of the educational curriculum.
5. The quality of student protection, care, guidance and support.
6. The quality of school leadership and management.

These 6 major performance standards are composed of 17 performance indicators which are designed in descriptive rubric form by which the inspection team will benchmark the school level at 6 levels: Excellent, Very Good, Good, Fair, Weak and Very Weak.

The SIEF-UAE Framework did not mention school e-Maturity and ICT pedagogy as standard in the document, but it encourages the effective integration of best pedagogy to achieve best learning outcomes. The following are the main focus areas in evaluating the quality of standards 1, 3 and 4 that are related to teaching and learning practices:

- Students' attainment and progression of skills in the 6 basic subject matters, namely: Islamic studies, social studies, Arabic language, English language, science and mathematics.
- Quality of learning skills.
- Quality of delivering instruction and implementing of different kinds of assessment in the learning context.
- Quality of designing instruction to enrich and support the curriculum according to learners' needs.

2.9.2 UAE Smart School Transformation Framework - SSTF

In 2016, after nearly 2 years of launching the Mohamed bin Rashid Smart Learning Program (MBRSLP) in the UAE, MBRSLP established the SSTF that targeted the measurement of UAE schools' e-Maturity levels (see Figure 14).

The Ministry of Education, with the cooperation of the MBRSLP, started applying the E-Maturity Programme in all government schools in the UAE in order to set the foundation for the transition to smart education within Emirati schools (MoE Media Centre, 2017). This framework was designed, like other international frameworks, to guide schools in conducting self-evaluation of their progression towards advanced levels of e-Maturity and DT.

The framework consists of 6 standards which are: leadership; curriculum and resourcing learning; learning, teachers and teaching; student and family context; assessment and student progress; and operational provision and management (MBRSLP, 2016). These standards contain 19 elements which have embedded descriptive criteria resulting in 57 items that need to be evaluated at 5 levels: 1 - Weak, 2 - Satisfactory, 3 - Good, 4 - Very Good, and 5 - Outstanding.

In recent years, the external and internal evaluation only requested schools to focus on standards 1, 3 and 5 that are within the scope of schoolwork (see Appendices 9, 10 and 11). There are two other supportive frameworks backing up the SSTF that were established in 2017 for the purpose of raising the digital competencies for teachers and learners, and these are:

- Teachers' Digital Competency Framework.
- Learners' Digital Competency Framework.

These additional frameworks are designed to act as self-evaluation instruments for schools to use to measure the digital competencies and ways to enhance and empower teachers' and learners' digital competencies and skills (see Appendices 12, 13, 14 and 15).

2.9.3 Literature Related to the SSTF

In terms of literature related to the SSTF from the UAE MoE, there is one recently conducted research in 2022 that is entitled “A Survey to explore Teachers’, Parents’ and Students’ experiences from the implementation of Smart Framework in UAE Schools”. This study was commissioned by the UAE MoE and conducted by a research team to explore the effectiveness of implementing the SSTF in UAE schools from professionals’, students’, and families’ perspectives and experiences (Efstratopoulou, Davison, Mathews & Jaffarullah, 2022). The study distributed an online survey to the targeted community and received 5,402 responses that represented all the Emirates in the UAE. The findings showed a strong positive attitude from teachers, students and parents on the effectiveness of the implementation of the SSTF in UAE schools during the last years. However, the reason for conducting the research was that the SSTF was established and used before the pandemic of Covid-19 and school closures, which created an urgent need for revising the existing framework. The main results indicated the difficulty of attaining educational goals, especially for students with determination, in other words learners with special needs, and families from a low social-economic status.

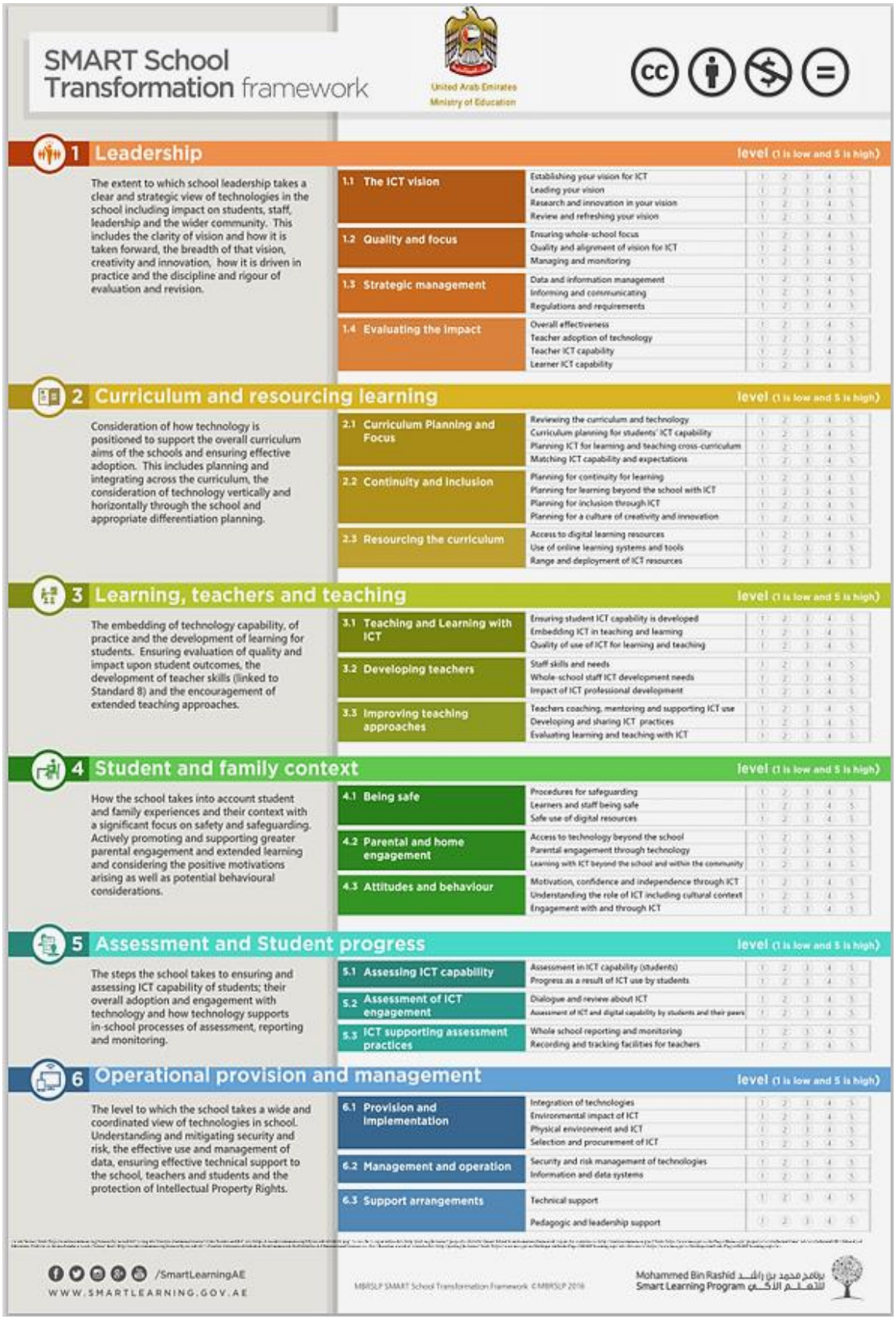

Figure 14. Smart School Transformation Framework SSTF (MBRSLP, 2016)

The study discussed all 6 main standards of the SSTF and provided recommendations and insights from participants' responses. In this section, the results that concern standard 3 are presented, since it is related to the teaching and learning practices in connection to the SSTF. As standard 3 in the SSTF focuses on 'Teachers, Teaching, and Learning', the researchers mainly focused on investigating the Professional Development (PD) aspect, learners' digital skills, and the evaluation of the teaching practices. Almost 1,300 teachers (N=1,298) took part in this survey that consisted of both Likert-scale and open-ended questions. Almost 78% of teachers ensured that the official training plans and programmes were in place in their schools, and they suggested the following, all summarised:

"1. Training should be ongoing and providing opportunities for application rather than being purely theoretical.

"2. Trainings should be updated as new software or programmes are adopted.

"3. There should be formal peer support in schools to allow teachers to provide informal support to each other." (Efstratopoulou, Davison, Mathews & Jaffarullah, 2022, p.15)

Teachers expressed satisfaction with the PD opportunities and offered also the following suggestions:

- *"Develop a rewards system aligned to the completion of PD.*
- *"Ensure PD is succinct and offered at a convenient time.*
- *"Ensure SMARTBOARDS are installed in classes and maintained regularly to ensure functionality.*
- *"Provide all teachers with mobile devices, such as tablets or iPads.*
- *"Provide "release time" to teachers from class to complete PD activities."* (Efstratopoulou, Davison, Mathews & Jaffarullah, 2022, p.15)

When teachers responded to a question related to their perceptions of learners' digital skills development that will serve them to become successful digital learners, the answers positively indicated the raising of ICT skills of learners with some recommendations that basically focused on IT aspects of supporting

learners, and none of these recommendations were related to pedagogical aspects. Examples of some suggestions are:

- *"Ensure that all students have access to devices.*
- *"Make IT skills development gradable.*
- *"Ensure ease of use and minimize number of different tools/platforms."* (Efstratopoulou, Davison, Mathews & Jaffarullah, 2022, p.16)

When respondents were asked about the evaluation of digital teaching practices in their schools and whether these evaluations and follow-up systems were useful, the participants felt that evaluation efforts were taken seriously in their schools. However, they also offered several areas for improvements, including:

"1. Minimize numbers of surveys.

"2. Give opportunity for verbal feedback (focus groups).

"3. Surveys should be in Arabic and English.

"4. Evaluation should be ongoing, not just at the end of the year or term.

"5. Evaluation should be focused not only on outcome, but also on the process.

"6. Evaluation should be holistic.

"7. Improvements should be evident as a result of the evaluation, such as: better networks, more equipment for teachers and students, and better maintenance of equipment. Individuals expressed that seeing improvements based on evaluation data will make teachers more likely to respond to future evaluation efforts." (Efstratopoulou, Davison, Mathews & Jaffarullah, 2022, p.17)

Since the previous results were coming from the one and only study identified that discusses the SSTF implementation in the UAE schools, in the discussion of findings section I will compare and discuss what is related or contradicted within the findings of this study.

2.9.4 The Adopted E-MMs in Teaching and Learning Practices in UAE Schools

The adopted e-MM in UAE classrooms is the 5Es e-Maturity Stages (see Figure 15) that is basically built on the matrix of Blows that includes progressive 'E-Words' scale that has been developed by the National College of School Leadership (NCSL) (Blows, 2009). The target of 'E-Words' scale, back then, is to transform learning and develop children's higher-order thinking skills with the integration of the 1956 Bloom taxonomy. The UAE school educational system has adopted Blows's 5Es and added to it the revised Bloom's Taxonomy (Anderson & Krathwohl, 2001).

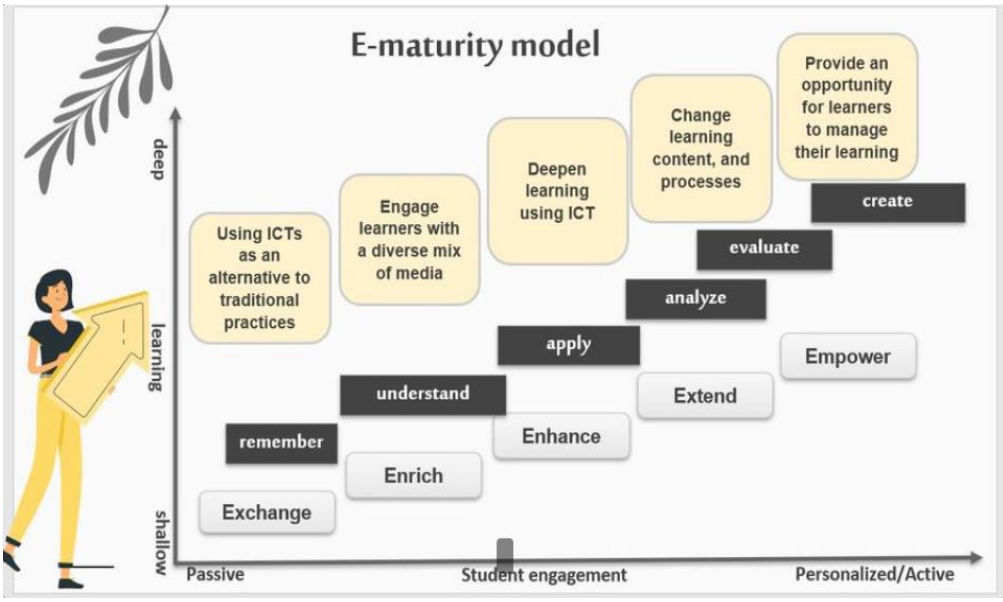

Figure 15: 5Es e-Maturity Model

The 'Exchange level' is considered the lowest stage of either teaching or learning practices. In Figure 15, the Y axis represents 'depth of knowledge' which consists of three stages: shallow, learning and deep. The X axis is related to levels of learners' 'engagement' which also consists of three stages: passive, engagement, personalised or active. There is no literature related to this model, and in real practice, the classroom observation evaluation form is where an inspection team, head of academic affairs or school principal can evaluate teachers' and learners' performance against the 5Es e-Maturity stages.

The form designed for evaluating the classroom observation not only consists of a section related to stages of e-Maturity practiced by teachers and learners but also to other related areas of considered best classroom practices. It is important to mention that these observation forms are updated from time to time by education officials.

2.10 Limitations and Critiques

This chapter has highlighted several limitations and critiques regarding the development and implementation of e-MMs and DT frameworks in organisations and mainly in school education. The critiques emphasise that while e-MMs and frameworks provide valuable guidance, they are often too focused on technology and fail to address the human, pedagogical, and operational challenges of integrating ICT effectively in school settings. The major critiques related to this notion are discussed under these major points:

1. **Lack of clear evidence linking e-Maturity to learning outcomes**: Many studies, including those conducted by Becta, failed to provide clear evidence of a direct relationship between schools' levels of digital maturity and student achievement (Harrison, C. et al., 2003; Somekh, B. et al., 2007). While technologies were integrated in schools, the studies did not conclusively show that higher e-Maturity levels led to enhanced learning outcomes, especially in terms of student performance and attainment (Somekh, et al., 2007; Atkins, 2014).
2. **Overemphasis on technology**: The e-MMs and frameworks tend to focus heavily on the technological aspects of schools, such as infrastructure and resources, while less attention is given to teaching practices, learning quality, and instructional delivery (Selwyn, 2016; Cuban, 2018). This technological bias may overlook the human and pedagogical factors crucial for successful digital integration in schools
3. **Disconnect between policy and classroom practices**: Although there are national and international policies promoting the integration of ICT and the development of digital maturity (Tondeur et al., 2017) there is often a gap between these policies and what is actually implemented in classrooms.

Teachers may support the integration of digital skills and 21st-century competencies, but they often struggle to effectively execute these practices in real-world settings.

4. **Complexity of assessing e-Maturity**: Evaluating school e-Maturity is a complex task that requires multiple levels of investigation, including the analysis of infrastructure, teacher practices, and student engagement. The limitations of current e-MMs include their focus on easily measurable aspects like infrastructure, rather than more complex areas like teaching quality or cognitive skills (Marshall, 2007; Ristić, 2017; Barry, et al., 2023)
5. **Challenges in teacher training and professional development**: The literature highlights the lack of large-scale studies or long-term research on how teachers' professional development in ICT impacts their ability to integrate technology effectively (Tondeur et al., 2016; Atabek, 2019). While teachers are key players in implementing digital transformation, their training is often insufficient or does not address the complexities of using technology for pedagogical purposes.
6. **Inconsistent progress of long-term research of ICT integration**: A limitation noted in some studies, particularly in the UK, is the inconsistent progress in ICT integration after major initiatives like Becta were discontinued. There were concerns that a lack of ongoing support and resources for ICT development in schools hindered the full realisation of digital transformation goals (eSchool News, 2010; Department for Education, 2012).
7. **Over-reliance on simplistic models**: Models like TAM are criticised for being too simplistic when applied to the complex dynamics of school environments (Zaineldeen et al., 2020). Schools need more comprehensive frameworks that account for both ecological and behavioural factors influencing technology adoption.

Though this chapter presented 9 e-MMs and frameworks that aim to advance school educational system to become highly e-Mature, those e-MMs and frameworks have their own strengths and limitations. The proposed e-MMs from Underwood and Dillon (2004), Becta Metrics (2006), and related models, from 1 to 4, target conceptual understanding and qualitative analysis. But they offer

valuable insights into the complex relationships in ICT integration in the process of e-Maturity transformation. In contrast, the European models, from 5 to 9, offer more practical, rubric-based frameworks that are easier to implement in diverse educational contexts, particularly due to their alignment with global standards.

However, the European models tend to be rigid, providing structured evaluations that may not be adaptable to every school's unique circumstances. Meanwhile, the first set of e-MMs offers greater flexibility but lacks concrete metrics for measuring progress. Both sets of models suffer from an over-reliance on self-assessment, which introduces potential bias and inconsistency. Despite these weaknesses, the European models are generally more actionable and suitable for schools aiming to meet global digital standards, while the earlier e-MMs are better suited for in-depth, theoretical exploration of advancement towards e-Mature schools in ICT integration processes.

The limitations stem from a lack of local research, an overemphasis on technology rather than pedagogy, reliance on older studies, and inconsistent evidence connecting e-MMs to improved educational outcomes. These gaps highlight the need for more focused, recent, and localised studies to better understand the implications of digital maturity models in school education mainly in terms of teaching and learning practices.

2.11 Summing up

This chapter has highlighted substantial findings in relation to the history of e-MMs and frameworks development as guidance and evaluation tools of DT advancement in different sectors starting from IS to business organisations and then lately reaching to the educational sector. Thinking of school as an organisation that includes structure, people and technology, the researchers in the UK Becta project adopted the organisation of e-MMs notion to investigate the level of school maturity putting into consideration the common shared standards between school as an organisation and the business sector; mainly this involved leadership and management, and infrastructure and resources as standards. On the other hand, the other standards that are targeting teacher, learner, curriculum

and pedagogy are a core mission to benchmarking school advancement in its functionalities as an educational institution. For that reason, highlighting the connection between e-MMs in different sectors is perceived important for this thesis.

The literature review highlights the value of e-MMs and frameworks as effective tools for self-assessment and institutional evaluation. Internal school leaders are encouraged by national agendas to use these tools regularly for continuous self-review, providing a clear picture of their schools' progress in e-Maturity. At the same time, educational inspection teams or designated research agencies utilise e-MMs and frameworks to assess the impact of nation-wide investments in ICT integration within schools. These evaluations help inform decision-makers about key focus areas to drive the digital transformation of schools and broader educational systems.

The gaps that were discovered while reviewing the literature were mainly the absence of local and international literature related to e-MMs and frameworks implications on teaching and learning practices, and literature that modelled the advance e-Mature schools. It is clearly evident that literature addressing best practices of teaching and learning with consideration of 21st century skills are conducted with no intention placed on how such practices should be modelled in advanced e-Mature schools. Did e-MMs and DT frameworks impact teaching and learning practices in those developing and developed countries in a positive way? Or in a negative way? If so, how is it possible to measure such implications and how to enhance or develop e-MMs and frameworks to contribute to the advancement of effective teaching and learning practices? These are clearly outstanding gaps that are revealed while conducting the literature review in this study.

The following chapter details the methodology and research design adopted to assist the selection of suitable methods and a research approach to guide the efforts in selection of participants, building survey tools to collect data, analysing data, and organising findings, all to answer the main questions of this study.

Chapter 3

Methodology

3.1 Chapter 3 Overview

This chapter explains the methodology that is used for this study. The main focus is to explain the adopted methods and tools to gather data from the selected participants and research community. Due to the lack of local research in the field of UAE school e-Maturity, this study adopted a multiple case study approach, to answer the major research questions with as much clarity as possible.

3.2 Introduction to the Methodology

The main purpose of this chapter is to describe the methodology that has been adopted to overcome the limitations of local educational literature and the gaps related to the field of e-MMs and frameworks and implications for teaching and learning practices in the UAE government schools. The UAE e-Maturity governmental initiative targeted school education in 2017, aiming at total transformation of schools to smart schools. For this study, after 7 years of the UAE e-Maturity initiative, it intends to provide a descriptive analysis of the accumulative experience in transforming schools to smart schools and how that has impacted the pedagogical aspects of progression towards smart schools. The targeted participants are the internal and external UAE government school stakeholders, mainly school principals, the academic officials, teachers and external e-Maturity evaluators who work at UAE MoE and ESE.

This study has adopted a mixed-methods approach gathering both qualitative and quantitative data, relying heavily on a multiple-case study approach. The participants represent the principals, the academic officials, teachers and external evaluators or educational inspectors in the UAE government schools. This study selected 6 government schools' internal stakeholders, 12 school leaders and 129 teachers, and 4 external e-Maturity evaluators to gather qualitative and quantitative data in relation to the main objectives, guided by 4

main research questions. The schools that were selected have learners in the age group between 10 to 18 years old.

3.3 The logic of Inquiry

As stated earlier, there is an absence of local literature that discusses the implications of e-MMs and frameworks on teaching and learning practices in the UAE government schools, which reflects the need to extract data from those who have expertise in the field who witnessed, used and experienced the UAE e-Maturity agenda and its implementations. Did the e-MMs and frameworks help in transforming pedagogy towards effective e-pedagogy? This is the core question of this study investigation, and through the adoption of a multiple-case study, seeks to answer the following major questions and sub questions:

Q1. What are the available digital and educational technology resources in the UAE government schools?

a. Are these tools considered effective for digital transformation? How are they considered effective?

Q2. What are the adopted e-MMs and frameworks in the UAE government schools?

a. What criteria or standards do they contain and why are these used?
b. How do school staff participate in the digital transformation to advance e-Maturity levels?
c. How do school staff perceive their roles in the development of e-Maturity in teaching and learning practices?

Q3. What are the impacts of adoption of such e-MMs and frameworks on teaching and learning practices?

a. How are these impacts being measured?
b. Are e-Maturity evaluation processes in schools effective?

Q4. Are the adopted e-MMs and frameworks considered effective for digital transformation or do they require enhancements?

a. If they require enhancements, how can this be achieved?

3.3.1 Rationale of Adopting a Multiple-Case Study Approach

Following a pragmatist paradigm, this study is adopting a mixed approach for collecting qualitative and quantitative data by conducting a multiple-case study and studying worldwide literature related to the nature and context of this study. The rationale behind the selection of a multiple-case study as a guided approach of investigation and for collection of data in this study is because it is a recommended approach to explore a concept for which few previous studies have been conducted (Sherif et al., 2006). Case studies have been largely used in social sciences and have been found to be especially valuable in practice-oriented fields such as education (Starman, 2013). To extend investigation and gather data from the field experts, the adoption of a multiple-case study is adopted to identify what the commonalities and what the differences are in the teaching and learning practices while adopting the assigned e-MMs and frameworks by educational officials in the UAE government schools. The multiple case-study targeted 6 governmental schools in which the researcher targeted data collection from the internal and external stakeholders as study participants. In addition, this research focused on examining prior-data through studying the school e-Maturity reports that indicates the school e-Maturity status, and local publications in relation to UAE school e-MMs and frameworks.

3.4 Research Setting and Participants

To answer the major questions of this study, the researcher used online platforms to design survey tools, organise and classify data, and convert organised data into meaningful themes to determine findings. The research study targeted 6 government schools as representatives of the UAE government school community and the selection criteria were based on the following:

1- Schools needed to be in cycle 2 (which includes learners from grade 5 to grade 8) or cycle 3 (including learners from grade 9 to grade 12, in which the age group of students is around 10 years old in grade 5 to 18 years old in grade 12).
2- Schools' geographic location, to be nearby the researcher's location, but in different clusters. As UAE schools are divided by operational sector in MoE

and ESE to clusters, i.e., cluster 1 that includes sub clusters such as 1.1, 1.2 …etc., cluster 2 also includes sub clusters 2.1, 2.2 …etc. based on regional aspects and the 7 different Emirates (Abu Dhabi – Dubai – Sharjah – Ajman – Um Al Qiwain – Ras Al Khaimah and Fujairah). The targeted schools for this study belong to 3 different clusters.

3- Schools varied in relation to gender (boys – girls) as UAE is a Muslim country and still schools for cycles 2 and 3 are divided by gender.

The rationale behind including 3 cycle 2 schools and 3 cycle 3 schools, in total 6 schools, is to gather both quantitative and qualitative data from different cycles besides collecting the annual e-Maturity reports in order to check commonalities and differences of data and findings. The other reason is that these schools' communities are geographically located nearby the researcher, which facilitates communication in person and access to data easily, since principals are acquainted and familiar with the researcher as a colleague principal. The schools that were selected for this study were located in northern Emirates in the UAE in Clusters 5.3, 5.4 and 5.5, as each cluster contains an average of 12 to 15 schools.

The targeted numbers of participants and how they participated in this study were as follows:

1- 6 Principals (all answered the online survey and all participated in the semi-structured interview)
2- 6 Academic Officials (5 answered the online survey and 6 conducted the semi-structured interview)
3- 129 Teachers (responded to the online survey)
4- 4 External Evaluators and Experts (participated in the semi-structured interview)

Looking at the length of online survey questions, with 23 questions that carried 9 open ended questions, together with interviewing 16 participants, this resulted in having a large amount of data to be analysed; this guided the decision of selecting 12 school leadership officials, the 6 principals and 6 academic officials,

to ensure obtaining data from a manageable and controlled number of participants as internal school leadership. As for the external evaluators, the researcher managed to reach out to 4 that were nominated to participate as experts from MoE.

Whilst the 129 teachers participated willingly in the online survey from the 6 targeted schools after it was circulated to them officially, this was also considered reasonable, looking at the number of questions in the survey.

3.5 Methods and Procedure of Data Collection

The data collection process for this study involved several stages. First, the researcher sought formal approval from the MoE and the ESE Research Departments by submitting request letters, a Participation Information Sheet, the online survey, interview questions, and personal identification documents. After approval was granted, formal communication was sent to the targeted schools requesting their participation.

The researcher then conducted introductory sessions with school principals, academic officials, and external evaluators via Microsoft Teams to explain the purpose and stages of the study. Consent letters for participation in the semi-structured interviews were sent to the 6 principals, 6 academic officials, and 4 external evaluators. Participants were informed of their right to withdraw from the study within two weeks of signing the consent forms.

The data were collected using three primary tools:

1. **Online Survey** (see Appendices 16 to 21) divided into five sections covering personal information, educational technologies, strategies for integrating technology, e-Maturity, and digital transformation. The survey targeted stakeholders in 6 selected school communities.
2. **Semi-Structured Interviews** (see Appendix 22) conducted with 12 internal stakeholders (principals and academic officials) and 4 external evaluators to gather in-depth insights about e-Maturity and to fill gaps in the literature.

3. **E-Maturity Reports** from 2021 and 2022 for the selected schools, used to analyse the standards and recommendations related to e-Maturity progression.

3.5.1 Strengths and Limitations of the Data Collection Methods

Adopting online surveys has been discussed by studies related to research methods and methodology. The main strengths of using surveys as data gathering tools are ensuring broad reach and efficiency**.** Surveys are effective for collecting data from a large number of respondents in a relatively short period, offering a broad overview of trends and opinions across multiple schools (Bryman, 2016). In this study, the survey allowed the researcher to gather data from diverse stakeholders in six schools, focusing on educational technologies, strategies, e-Maturity, and digital transformation. The other strength is that surveys offer standardised approaches to collect data. Surveys provide a structured format where all participants respond to the same set of questions, facilitating easier comparison and analysis of responses (Creswell & Creswell, 2018). This helped ensure consistent data collection across different schools in key areas relevant to the study's objectives. Also, surveys are effective tools for gathering quantitative data which can be statistically analysed to identify patterns or correlations between e-Maturity and other variables, such as the integration of technology in teaching (Fowler, 2014).

As for limitations, surveys' responses may be limited in depth. While surveys are excellent for capturing broad trends, they often lack the depth needed to fully explore participants' experiences and opinions (Denscombe, 2014). In the context of this study, surveys may not reveal the full complexity of how schools manage their e-Maturity and digital transformation processes. On the other hand, another limitation is that surveys can be perceived to have self-reporting bias because participants self-report their views, which can lead to biases such as over-optimism or social desirability bias, where respondents give answers they believe are expected (Podsakoff et al., 2003). This can affect the accuracy of data related to the actual integration of ICT. Online surveys are also subject to

low response rates which can impact the representativeness of the data and the ability to generalise findings to the broader school community (Bryman, 2016).

The survey's limited depth and potential self-reporting biases were addressed in this study through adoption of semi-structured interviews, which intended to provide richer and more detailed qualitative data from key internal and external evaluators. Semi-structured interviews have major strengths that are mentioned in methods and methodology literature. The first strength is the depth and richness of data collected using this tool. The semi-structured interviews provide detailed, qualitative insights into participants' experiences, opinions, and feelings, allowing for a deeper exploration of complex issues like e-Maturity (Kvale & Brinkmann, 2015). In this study, interviews with school principals, academic officials, and external evaluators yielded rich data that complemented the broader survey results. The other strength aspect is flexibility. The semi-structured format allows the researcher to probe further based on participants' responses, offering the flexibility to explore new themes as they arise (Gill et al., 2008). This adaptability is particularly useful for uncovering specific challenges and successes in schools' digital transformation journeys. One additional positive point to adopting semi-structured interviews is that it offers contextual understanding. Interviews, in general, provide a deeper understanding of the unique context within each school, revealing insights that might be missed in standardised surveys. This method allows the researcher to capture the nuances of how e-Maturity is implemented and experienced by different stakeholders (Creswell & Poth, 2017).

As for limitations of semi-structured interviews, methods and methodology research have indicated that it is time-consuming and resource-intensive. Interviews take significant time to conduct, transcribe, and analyse, especially when involving multiple participants across different schools (Cohen, Manion, & Morrison, 2018). This makes the process more labour-intensive compared to the efficiency of surveys. It also carries the risk of being more subjective and having bias. Interviews are inherently more subjective than surveys, both in how questions are posed and how responses are interpreted (Kvale & Brinkmann,

2015). There is a risk of interviewer bias, where the interviewer's expectations might influence the responses, as well as the possibility that interviewees may tailor their answers to meet perceived expectations. In addition to the previous limitations, semi-structured interviews involve often smaller sample sizes due to time and resources involved, so interviews typically involve fewer participants than do surveys. In this study, 12 internal stakeholders and 4 external evaluators were interviewed, which, while providing in-depth data, represents a smaller pool of insights compared to the broader survey data (Bryman, 2016).

The adoption of the third data collection tool, which was reports of e-Maturity levels, supported the limitations in the previous tools. The first strength is that reports of e-Maturity levels provide access to historical data**.** The collection of e-Maturity level reports from the selected schools (covering the years 2021 and 2022) provided historical data on the schools' digital progression. This type of longitudinal data is valuable for tracking changes in e-Maturity over time and assessing how schools respond to ICT integration recommendations (Yin, 2017). Adding to that, e-Maturity school reports offer standardised evaluation criteria which allow for consistent comparisons across schools. These official reports, produced by external evaluators, lend credibility to the data and provide a reliable basis for analysis (Creswell & Creswell, 2018). Also, these reports offered insights into external evaluators' recommendations**.** The*se recommendations aimed at improving e-Maturity in schools, which align directly with the study's objectives. This allows the researcher to evaluate whether schools have implemented these recommendations and to what extent they have progressed in their digital transformation efforts.

Though obtaining e-Maturity reports was considered valuable for this study, there were some limitations which were covered by the other data collection tools. The first limitation is that reports are limited in contextualisation. While reports offer standardised evaluations, they may not capture the unique challenges and internal processes of individual schools. As Bowen (2009) points out, document analysis often needs to be complemented by other data collection methods to fully understand the context in which the reports were produced. The other

limitation is the dependency on external evaluators' views in these reports, which may not fully align with the internal realities of the schools. This could result in gaps between the evaluation in the reports and the actual implementation or challenges faced by the schools (Bryman, 2016). In addition, reports might potentially lack the implementation details. Although the reports provide valuable recommendations, they may not offer detailed insights into how well the schools have implemented these recommendations or the challenges they face in doing so. This limits the depth of understanding regarding the practical application of the findings (Bowen, 2009).

The combination of online survey**,** semi-structured interviews**,** and e-Maturity level reports provides a more robust and comprehensive approach to data collection in this study. Each method offers unique strengths that compensate for the limitations of the others: surveys provide a broad overview of trends, interviews offer deep insights into stakeholder experiences, and reports provide standardised, objective data on e-Maturity progression. Together, I believe these methods ensure a well-rounded analysis of how schools are advancing in their digital transformation journeys.

3.6 Methods and Procedure of Data Analysis

This study employed Thematic Analysis (TA) as the primary method for identifying, analysing, and interpreting patterns or "themes" within qualitative data (Clarke & Braun, 2016). Thematic Analysis is widely regarded as a flexible and valuable approach for examining qualitative data in social research, particularly for identifying underlying meanings and connections within datasets (Braun & Clarke, 2006). The resulted themes were coded to help tracking and analysing the findings in a systematic manner and some examples of these codes are presented in appendices section (See Appendix 23).

To organise and systematically analyse the data, several platforms and software tools were used as outlined as follows.

3.6.1 Literature Review Analysis using Atlas.ti

The Atlas.ti software was utilised to organise and thematically classify the reviewed literature. The software helped transform the literature into meaningful themes through colour coding, a method that is known for enhancing the process of categorising and analysing large qualitative datasets (Friese, 2019). The major topics highlighted from the literature were:

- **Organisational Maturity, E-Maturity, and Digital Transformation (DT)**: Focused on the development and use of e-Maturity models (e-MMs) and the digital transformation of organisations.
- **E-MMs and DT in School Education**: Targeted research discussing how e-MMs and DT frameworks apply specifically in educational contexts.
- **E-MMs and DT Impact on Teaching and Learning Practices**: Emphasised the influence of e-MMs and DT frameworks on educational practices and outcomes.
- **UAE School e-MMs and Evaluation Frameworks**: Concentrated on local initiatives, frameworks, and evaluations of e-Maturity in UAE schools.

Atlas.ti was pivotal in organising the thematic analysis of the literature by simplifying the categorisation of relevant information, which facilitated subsequent analysis and comparison with empirical data (Smit, 2002).

3.6.2 Online Survey Data Analysis

Responses from the online survey were manually coded and categorised into themes using Microsoft Excel**.** Colour coding was used to classify different categories of responses, which were subsequently transformed into numerical data to assist in quantitative analysis. Manual coding, while labour-intensive, allowed for a deeper engagement with the data, which is particularly beneficial in thematic analysis (Guest, MacQueen, & Namey, 2012).

The identified themes from the survey data were as follows:

- **Educational Technology Availability and Sufficiency**: Addressing the extent of ICT resources available in schools.
- **Teaching and Learning Strategies with Technology Integration**: Highlighting approaches schools adopt for integrating technology into teaching and learning.
- **Perceived Roles and Contributions Towards School E-Maturity and DT**: Participants' views on their contributions to their schools' digital transformation journey.
- **Effectiveness of Selected E-MM and DT Frameworks for UAE Government Schools**: Participants' assessments of how effectively the frameworks guide school transformation.

Using MS Excel enabled effective sorting, comparison, and quantitative analysis of themes, enhancing the interpretability of the findings (Cohen, Manion, & Morrison, 2018).

3.6.3 Semi-Structured Interview Analysis

The semi-structured interviews were conducted using Microsoft Teams, recorded, and then transcribed. Since some participants preferred to answer in Arabic, the transcriptions were translated to English using Google Translate, with subsequent proofreading and editing for accuracy. The process of translating and editing the transcripts ensured that the nuances of the participants' responses were retained, as language translation can sometimes distort meaning if not carefully managed (Temple & Young, 2004).

Thematic coding was again employed using MS Excel, with the following themes emerging from the analysis of the interviews:

- **Participants' Knowledge and Understanding of e-MM and DT Frameworks (5Es and SSTF)**: Examining how well participants understood the criteria and rationale behind the adoption of these frameworks.

- **Implications of e-MM and DT Frameworks on Teaching and Learning**: Assessing the perceived impact of these frameworks on pedagogical practices and how these impacts were measured.
- **Effective Evaluation Methods of e-Maturity Levels and Digital Transformation**: Participants' insights on effective methods for evaluating schools' progress in e-Maturity.
- **Challenges and Discrepancies in e-Maturity Reports**: Investigating any existing inconsistencies between internal and external reports on school e-Maturity.

3.6.4 Analysis of School e-Maturity Reports

The e-Maturity reports from the six selected schools were analysed and categorised into six distinct case studies. This case study approach allowed for in-depth analysis of each school's unique circumstances and performance in relation to the e-Maturity frameworks (Yin, 2017). The reports were thematically coded using MS Excel to identify the following key themes:

- **E-Maturity Score for Each School**: Based on the SSTF used in UAE schools, the scores helped assess each school's level of digital maturity.
- **Strengths and Best Practices for Each School**: Identification of the strongest areas where schools performed well in terms of digital transformation.
- **Areas for Improvement and Enhancement**: Highlighting areas where schools needed further development in their e-Maturity progression.

The use of case studies allowed for a comprehensive understanding of each school's position on the e-Maturity spectrum, combining both qualitative insights from reports and quantitative assessments based on the SSTF criteria (Stake, 1995).

Thematic Analysis, supported by various tools such as Atlas.ti**,** Microsoft Excel**,** and Microsoft Teams, provided a systematic and rigorous approach to analysing both qualitative and quantitative data in this study. By utilising thematic analysis,

the researcher could organise vast amounts of data into coherent themes that directly addressed the research questions. This method enabled a clear comparison between the literature review, survey responses, interview data, and school reports, yielding rich insights into the digital transformation of UAE schools.

3.7 Ethical Considerations

Ethical considerations were central to the design and implementation of this study. In alignment with the ethical guidelines established by Lancaster University and relevant regulatory bodies in the UAE, the researcher took several steps to ensure that the study was conducted with integrity and respect for the participants involved. The process of obtaining ethical approval involved careful examination of potential ethical risks, particularly in relation to participant involvement, privacy, data security, and consent.

Prior to data collection, the researcher submitted an ethics application to the Lancaster University Ethics Committee to ensure the study complied with institutional and international ethical standards. This application included details about the research aims, methods, participant recruitment, and strategies for protecting participants' rights. Only after obtaining formal approval from Lancaster University did the researcher begin the data collection process in UAE government schools.

3.7.1 Participant Consent and Informed Participation

A key ethical consideration in this study was obtaining informed consent from the MoE, its agencies and then from participants. Informed consent ensures that participants fully understand the nature of the research, their role in the study, and their right to withdraw at any stage without facing any negative consequences. To meet this ethical requirement, the researcher provided both MoE and ESE research departments with required documents to obtain approval to conduct this study and gather data from participants. The process began with communication with the MoE and the ESE officials and research departments to

gain consent for conducting this study. This involved multiple stages of interaction with various officials to explain the study's objectives and purpose, supported by official letters and required documents from Lancaster University. After receiving formal approval, which is mandatory for any researcher to obtain before targeting UAE government schools, the researcher proceeded to engage with participants directly. A comprehensive Participation Information Sheet, adapted from a draft prepared by Lancaster University, was provided to each participant. This document clearly outlined the study's purpose, the intended use of the collected data, and the potential benefits and risks associated with participation. Consent was obtained in writing before any data collection commenced. For the semi-structured interviews, consent forms were sent via email to the 6 principals, 6 academic officials, and 4 external evaluators who were invited to participate. These forms also outlined participants' rights, including the right to withdraw from the study within two weeks after signing the consent form. Participants were encouraged to ask questions before providing consent, ensuring they were fully informed and comfortable with their participation.

Furthermore, the consent process adhered to Lancaster University's ethical process, ensuring that the study conformed to best practices in ethical research. This included explaining the voluntary nature of participation and making it clear that participants' involvement would remain confidential and that their personal identities would be protected throughout the study. Ethical approval from both Lancaster University and the relevant MoE and ESE Research Departments ensured that the study followed rigorous ethical protocols, respecting both local and international standards for research involving human subjects.

3.7.2 Participants' Safety, Privacy, and Data Security

Ensuring the safety, privacy, and confidentiality of participants was a top priority in this research. The personal information of all participants—including their names, school names, and other identifying details - was anonymised using a coding system. This ensured that participants felt secure in expressing their honest views and experiences, knowing their identities would not be disclosed.

All data collected from participants were stored on password-protected personal devices and uploaded to a secure personal e-cloud storage. Access to these data was restricted solely to the researcher to safeguard participants' confidentiality and ensure compliance with data protection regulations such as the General Data Protection Regulation (GDPR). The software tools used for data analysis, such as Atlas.ti and MS Excel, were also password-protected, and the researcher ensured that all personal and sensitive data were securely managed in line with ethical standards set by Lancaster University and the UAE Research Departments.

3.7.3 Transparency and Right to Withdraw

Throughout the study, transparency was maintained by clearly communicating participants' rights, including the right to withdraw at any point during the study. All participants were informed that they had two weeks after signing the consent form to withdraw without any need for justification or repercussions. This ensured that participants felt empowered and had full control over their involvement in the research. Any withdrawal requests were respected, and no data from participants who chose to withdraw were included in the analysis.

3.7.4 Validity, Authenticity, and Generalisation

To ensure the validity and authenticity of the research findings, a multiple-case study approach was adopted. This approach enabled the researcher to gather data from a diverse range of participants across different schools, thus providing a comprehensive view of how e-MMs and DT frameworks influence teaching and learning practices in UAE government schools. By involving a variety of stakeholders—including school leaders, academic officials, and external evaluators—the study captured multiple perspectives, adding depth and validity to the findings.

The use of different data collection methods, online surveys, semi-structured interviews, and e-Maturity reports, contributed to data triangulation, which strengthens the credibility and authenticity of the research outcomes (Creswell &

Poth, 2017). This triangulation method ensured that the findings were not reliant on a single source of data, but rather validated through multiple streams of evidence, enhancing the robustness of the conclusions drawn.

To support generalisation of the findings, participants were selected randomly from schools that represented a wide spectrum of e-Maturity stages. This random selection, along with the broad scope of the survey and interviews, facilitated the potential to generalise findings to a wider population of UAE government schools. However, the researcher also acknowledges that the findings are context-specific, and while the results may be applicable to similar educational settings, they should be interpreted with caution when applied to vastly different contexts.

3.8 Summing Up

The methodology presented in this section is designed to fit the investigation and requirements of this study. As there is absence of local literature discussing UAE school e-MMs and e-maturity framework, I have relied heavily on collecting data from participants and available reports.

The following chapter presents the findings in summary, which includes designing some tables and figures to represent and comprehend the various data that have been collected. Following the findings chapter, the discussion chapter will compare and contrast the findings by presenting the multiple-case study through its targeted communities of participants.

Chapter 4

Findings

4.1 Chapter 4 Overview

In this chapter, the collated data from different sources and participants are presented to offer comprehensive answers for the core questions of this study. The upcoming sections are structured according to each targeted group of participants and organised thematically according to the main areas of inquiries. The discussion of the findings and how they relate to the multiple-case of different schools and participants will be presented in the 'Discussion' chapter.

4.2 Analysis of the Online Survey

One hundred and twenty-nine teachers and 11 school leaders (principals and academic officials), which are in total 140 participants, participated in the online survey that aimed at answering questions related to school staff roles and perceptions of e-MMs and frameworks. The targeted research questions and sub-questions that were addressed in the online survey were: Q1, sub-questions b and c in Q2 and Q3 as follows:

Q1. What are the available digital and educational technology resources in the UAE government schools?

a. Are these tools considered effective for digital transformation? How are they considered effective?

Q2. What are the adopted e-MMs and frameworks in the UAE government schools?

b. How do school staff participate in the digital transformation to advance e-Maturity levels?
c. How do school staff perceive their roles in the development of e-Maturity in teaching and learning practices?

Q3. What are the impacts of adoption of such e-MMs and frameworks on teaching and learning practices?

a. How are these impacts being measured?

b. Are e-Maturity evaluation processes in schools effective?

4.2.1 Digital Resources and Educational Technology Availability

The findings present the available technologies and digital resources in the 6 targeted schools (see Appendices 24, 25, 26, 27, 28 and 29). The 6 tables provided in the Appendices section present findings in percentages for the 3 middle schools and the 3 secondary schools, shown in the 3 categories of responses coded as AI = *Available by my Institution*, AM = *Available by Myself* and NA = *Not Available*. The schools are coded as ScM = Middle School, ScS = Secondary School and also coded by colours and numbers, i.e., 01, 02, etc., whereas the participants were coded as T = Teacher, P = Principal, A = Academic Officials and External = External Evaluators. The numerical findings show the percentages of participants' responses for the availability of each digital resource, educational technology, or ICT in their schools. The educational technology systems, digital resources and aids are categorised as follows:

1. Content: e-Content and Content Creator Tools
2. Interaction: Online Broadcast, Interactive Content and Augmented Reality (AR)
3. School data and performance tracker: Learning Management System (LMS), Student Information System (SIS) and e-Assessment
4. Communication and collaboration: Email, Social Media, and e-Channels
5. Enrichment and discovery: e-Library and Multi Media
6. Devices: Personal Computers (PCs), Internet, Smart Board, Interactive Board

The categorisation is based on the nature and use of these technologies in the context of school education, i.e., the technologies that support learners' interaction are collated under 'Interaction' whereas the technologies that assist school stakeholders in obtaining data and track performance are collated under 'School Data and Performance Tracker Systems'.

According to the data, the most prominent technologies in the selected government schools are ‘Devices’, ‘School Data and Performance Follow up Systems’, ‘e-Content’ and ‘Email’. These technologies are mainly provided by the MoE and ESE which shows that 90% and above of those technologies are amongst the basic digital infrastructure of UAE government schools. This indicates that the main goal was to provide schools with basic elements of establishing smart schools in terms of devices, Internet and follow-up systems.

By comparison, technologies that are well-known for promoting communication between the school and parental community, i.e., ‘Social Media’ and ‘e-Channels’ besides those that increase interaction with educational content such as ‘Augmented Reality’, are provided partially by the MoE and ESE and some percentages indicates that they are either provided by internal school stakeholders, school leadership and teachers, or they are not available.

4.2.2 Integration of Technologies in Teaching and Learning Strategies

In the second section of the online survey, the targeted participants were mainly asked about ‘Teaching’ and ‘Learning’ strategies with integration of technologies. The findings related to ‘Teaching Strategies’ (see Table 1), presented according to numbers of responses offered by the total 118 teachers. Regarding ‘Learning Strategies’ (see Table 2), this is presented in a similar way, whilst principals and academic officials’ responses to the similar questions are presented in appendices (see Appendices 30 and 31). Teachers’ answers for ‘Teaching Strategies’ resulted in naming 38 teaching strategies, whilst for ‘Learning Strategies’ a total of 25 strategies were mentioned. The highlighted numbers in yellow showed the highly mentioned strategies that were shared by 15% and above of the participants, as mentioned by 18 participants and above in Table 1 and 17 participants and above in Table 2. The highlighted numbers in silver show the mentioned strategies by 10% to 14% of the participants in both tables.

Table 1. The Adoptive Teaching Strategies with Technology Integration in the UAE Government Schools

No.	Schools Codes	ScM01	ScM02	ScM03	ScS01	ScS02	ScS03	total (118)
	No. Participants (Teachers)	27 P	19 P	18 P	21 P	19 P	14 P	
1	Flipped Classroom (FC)	5	5	1	2	3	2	18
2	Differentiated Learning (DL)	3	5	2	0	3	3	16
3	Cooperative Learning (CL)	7	7	6	7	4	4	35
4	Collaborative Learning	1	0	0	0	1	0	2
5	Group Work (GW)	1	2	3	3	0	5	14
6	KWL	3	1	0	0	0	1	5
7	Six Hats (SH)	1	0	0	0	0	0	1
8	Brain Storming (BS)	6	1	2	4	2	2	17
9	Critical Thinking (CT)	3	0	0	0	1	0	4
10	Project Based Learning (PBL)	1	0	1	0	1	3	6
11	Active Learning (AL)	4	3	7	4	1	3	22
12	Problem Solving (PS)	6	1	2	0	3	3	15
13	Independent Learning (IL)	3	2	1	2	0	5	13
14	Discovery Learning (DL)	4	0	3	0	0	1	8
15	Research Based Learning (RBL) & Inquiry Based Learning (IBL)	2	1	0	2	2	1	8
16	Create Mind Maps (CMMs)	1	0	1	0	1	0	3
17	Create Concept Maps (CCMs)	2	1	1	0	0	0	4
18	Discussion (D)	3	0	1	1	0	0	5
19	Guided Reading (GR)	2	0	0	0	1	0	3
20	Think Pair Share (TPS)	2	0	0	1	1	0	4
21	Blended Learning (BL)	0	0	0	1	0	0	1
22	Gamification (G)	7	3	7	3	6	3	29
23	21st Centurty Skills	0	1	0	0	0	0	1
24	Direct Instruction/Lecturing	2	0	1	1	1	0	5
25	Learner Acts as Teacher	6	2	1	1	0	2	12
26	Usage of Educational Platforms (UEPs)	3	7	0	0	5	2	17
27	Usage of Multi Media (UMM)	1	0	0	0	0	0	1
28	Record Notes	1	2	0	0	1	0	4
29	Graphic Organizers	2	0	0	1	0	0	3
30	Power Point (Microsoft Office)	1	0	0	0	1	0	2
31	Simulation and imitation	1	0	0	0	1	0	2
32	Peer Learning	0	0	1	3	2	1	7
33	Smart Learning	0	1	2	1	1	1	6
34	Interactive Learning	0	0	0	1	0	0	1
35	Experimentation	0	0	0	1	1	1	3
36	Technology Integration	0	0	0	3	0	0	3

No.	Schools Codes	ScM01	ScM02	ScM03	ScS01	ScS02	ScS03	total (118)
	No. Participants (Teachers)	27 P	19 P	18 P	21 P	19 P	14 P	
37	Synchronous & Asynchronous Teaching	0	0	0	1	1	0	2
38	Activity Based Learning	0	0	0	1	1	0	2

Table 2. The Adoptive Learning Strategies with Technology Integration in the UAE Government Schools

No.	Schools Codes	ScM01	ScM02	ScM03	ScS01	ScS02	ScS03	total (115)
	No. Participants	27 P	19 P	17 P	19 P	18 P	15 P	
1	Cooperative Learning	7	2	3	3	1	3	19
2	Gamification	7	0	5	1	2	2	17
3	Discussion	2	1	2	2	0	1	8
4	Discovery Learning	2	0	1	0	2	0	5
5	Task Achievement	2	0	0	0	0	0	2
6	Research & Inquiry Based Learning (RBL)	3	1	3	2	4	1	14
7	Individual Learning	2	0	1	4	2	3	12
8	Peer Work	1	1	3	0	1	2	8
9	Group Work	1	1	0	1	5	5	13
10	Multi Media	3	0	1	0	0	0	4
11	Use LMS	1	0	0	0	0	0	1
12	Learner Acts as Teacher	0	6	1	0	0	3	10
13	Differentiated Learning	0	4	2	0	1	2	9
14	Use Educational Platforms	1	1	0	1	2	2	7
15	Problem Solving	0	2	0	0	1	2	5
16	Experimentation	0	0	0	1	2	0	3
17	Activity Based Learning	2	0	1		1	3	7
18	Project Based Learning	0	0	0	0	0	1	1
19	Active Learning	0	1	5	1	0	0	7
20	Learning Through Analysis (Texts - Graphics)	0	0	1	1	0	0	2
21	Learning Through Flipped Classroom Strategy	1	4	2	3	3	3	16
22	Linkage to Reality and Surroundings	0	1	0	0	0	1	2
23	Stimulate Thinking	2	1	1	2	1	2	9
24	Mind Maps	0	1	1	0	1	0	3
25	Target Interaction	0	0	1	0	1	1	3

The data show teachers' tendencies to select the 'new trends' of teaching and learning. The most mentioned approaches for teaching strategies while integrating technologies are coloured in Table 1 in gold and they were 'Cooperative Learning', 'Gamification', 'Active Learning' and 'Flipped Classroom'. The other commonly mentioned strategies that are coloured in grey were 'Brain

Storming', 'Usage of Educational Platforms', 'Differentiated Learning', 'Problem Solving', 'Group Work', 'Independent Learning' and 'Learner Acts as Teacher'.

The most mentioned approaches for adopting learning strategies while integrating technologies are coloured in Table 2 in gold and they were 'Cooperative Learning' and 'Gamification'. The other commonly mentioned learning strategies are coloured in the same table in grey and they were 'Learning Through Flipped Classroom Strategy', 'Research and Inquiry Based Learning', 'Group Work' and 'Individual Learning'.

Teachers revealed in their answers their tendency to adopt teaching and learning strategies that are basically supporting the notion of 'Student Centeredness' in the approaches they adopt. In addition, there are two main focus areas in the most mentioned adopted strategies. The first focus is activating the role of learners as individuals and group members in the learning journey and the second focus is to increase interaction of learners by stimulating higher order thinking and adoption of gamification to drive engagement in teaching and learning practices.

Teachers provided data that indicated what they preferred as pedagogical approaches to suit the integration of available technologies while delivering instruction and guiding the learning experience in school education. Selection of the 'Flipped Classroom' approach in both tables showed that teachers' perceptions of their role in delivery of instruction is for the most part as facilitators and designers of strategies that shift them from being the only source of knowledge as subject matter experts.

Studying the impact of technology integration in teaching and learning strategies, I have summarised the participants' responses into short statements and classified them according to school level, middle school or secondary school, and participants' roles where T = Teachers, P = Principals, and A = Academic Officials. The common responses are in bold (see Appendices 32, 33, 34and 35).

The findings showed that technology integration has impacted teaching practices in both cycle 2 and cycle 3 schools. These impacts were:

- Usage of educational platforms, i.e., Alef and LMS to support teaching practices
- Increase motivation towards participation and interaction as main objectives while teaching
- Supporting digital skills and literacy while teaching

The data also showed teachers' attachment to the notion of 'Student Centeredness' in pedagogical practices while planning teaching strategies. According to the findings, the major impacts of technology integration on learning strategies and learners were the following:

- Increased level of learners' engagement, motivation, participation and interaction
- Raised the level of academic achievements
- Enhanced independent learning and usage of educational platforms for learning
- Developed learners' digital skills

4.2.3 E-Maturity and Digital Transformation

The findings (see Appendices 36 and 37) indicate that school leadership unanimously agreed that the available technologies in their schools were sufficient for school DT, whereas teachers' responses varied. Around 82% of teachers in cycle 2 agreed that the available technologies in their schools were sufficient for school DT, but on the other hand 18% partially agreed. Looking at responses of teachers in cycle 3 schools, about 80% of these teachers perceived the available technologies to be sufficient for school DT whilst 20% of them believed that it was 'sometimes' sufficient. None of the respondents on the level of school leadership or teaching staff stated that the technologies that were in schools were not useful for school DT.

Table 3 shows the effective approaches to utilising and implementing technology for the purpose of achieving DT of school education.

Table 3. Effective Utilisation and Implementation of Technology for Digital Transformation of School Education.

ScM01	ScM02	ScM03
Providing device for each student to help them integrate technology in learning **Usage of LMS and Alef Platform by learners** Usage of search engines in classes	**e-Assessments** **Usage of Smart Boards** **Usage of LMS and Alef Platform** **Easiness of Communication**	**Majority of Learners have PCs** **Availability of Educational Platforms** **Having Smart boards**
ScS01	**ScS02**	**ScS03**
Availability of tools to create content for lessons **Usage of Smart board and LMS** **Interactive Platforms** **Easiness of Communication**	**Internet Access and availability of devices enable usage of Educational Platforms** **e-Assessments** Equipment up to date	**Availability of diverse programs and platforms for daily usage at classes** **Internet Access and availability of devices enable usage of Educational Platforms**

According to Table 3, participants were asked about effective approaches of integrating technology that if utilised or implemented would ensure school DT. The participants concentrated on the following key approaches:

- Ensure all schools and learners have devices, i.e., PCs and Smart Boards
- Ensure all schools have Internet access
- Continuous usage of educational platforms, i.e., Alef and LMS Platform
- Adopt e-Assessment
- Ensure easiness of communication

Tables 4 and 5 demonstrate participants' perceptions of their roles to achieve DT in their schools. The aim is to examine participants' understandings of both concepts and what roles they should play to achieve both concepts in real practices.

Table 4. Internal Stakeholders' Perceptions of their Roles towards DT (Cycle 2)

P	ScM01	ScM02	ScM03
T	**Professional development & sharing best practices** usage and integration of technology **Encourage learners** towards digital transformation achieve tasks on LMS **Continuous usage of educational platforms** Target High Levels of e-Maturity	Usage of different digital resources and **educational platform** **Follow up learners' performance** on educational platforms & provide feedback Varied strategies of technology integration Support independent learning, problem solving and cooperative learning **Encourage Innovation** and critical thinking **Professional development** continuous application to raise e-Maturity Rewarding best practices	**Professional development** Personal development on new technology **Applying technology in classrooms effectively and usage of simulation tools** **Encourage learners** to engage effectively **Use platforms** and new educational tools
P	Support Teachers' **Professional Development** (Workshops - Exchange visits - Strategies)	Provide effective digital environment in School Building	Total transform to **e-Tests - e-Activities - interactive activities**
A	**Provide trainings for e-Maturity -** Exchange visits - Usage of e-Maturity Evaluation Form - **Provide feedback**	Discuss teachers' e-Maturity Level and their performance	Survey teachers' needs of **professional development** and work on these needs through internal and external development

Table 5. Internal Stakeholders' Perceptions of their Roles towards DT (Cycle 3)

P	ScS01	ScS02	ScS03
T	**Step away from traditional ways and encourage adaptation of technology** ensure effective integration of technology in teaching and learning interactive tasks - e-assessments - e-surveys increase of interactive content **Attending training** **Encourage learners** to use LMS and Alef for projects and submitting homework Being up to date regarding the implementation of technology in classrooms	**Exchanging experience** between teachers search out new trends and practices **share knowledge related to this field** effective usage of technology **continuous follow up** **Use variety of platforms** that are available	deliver courses for students preparation for digital lessons Independent learning **attending conferences and training** raising digital awareness amongst learners Integrate technology in teaching and learning practices
P	**Continuous Follow up and giving feedback** for teachers	**Support and motivate teachers** towards digital transformation in classrooms	Enhance problem solving and evaluation skills
A	-	**Encourage Excellent Teachers** to share knowledge of adopting high e-Maturity	**Distribute knowledge and awareness** of how to develop e-Maturity

Findings show that participants have shared the following as their main roles in the mission of school DT:

- Ensure continuous professional development through sharing the best practices, exchange experiences, attending training and conferences, and distribution of knowledge and awareness
- Motivate and encourage both teachers and learners to achieve higher levels of e-Maturity through usage of educational platforms and technologies available in the classrooms
- Continuous follow-up and regular feedback for both teachers and learners
- Continuous usage of educational platforms and total transfer to online activities and assessments

Table 6. Internal Stakeholders' Perceptions of their Roles towards e-Maturity Levels (Cycle 2)

P	ScM01	ScM02	ScM03
T	**Professional Development** Continuous **usage of educational platforms** Increase online activities Encourage learners to search information	**Self-development - Classroom observations - Training - sharing practices** **Encourage and motivate learners to use technology** Application of suitable teaching strategies Engage learners in educational tasks	**Usage of Educational and interactive platforms (tasks - homework)** **Exchange expertise and knowledge between colleagues** Train learners continuously on **usage of platforms**
P	**Create Community of Practice** to have learning community	**Continuous follow up for teachers** performance in classroom for development purposes	Give **feedback** and setup development and enhancement plans
A	**Provide educational workshops, feedback** to develop and follow up performance	**Provide brochures and guidance for teachers - provide needed support**	development plans beside conducting individual and group sessions to discuss **professional development** needs

Table 7. Internal Stakeholders' Perceptions of their Roles towards e-Maturity Levels (Cycle 3)

P	ScS01	ScS02	ScS03
T	Active **usage of technology and educational platforms** **Encourage and motivate** learners to use technology that are available	Lesson Planning **Empower and enable learners to use digital educational resources** Assigning learners tasks on **educational platforms**	Active usage of technologies in classrooms **Encourage learners** to **use different technologies, software and programs** Adopt problem solving and target higher order thinking
P	deepen the essential digital skills in school community to build up on	provide suitable learning environment	**motivate both teachers and learners** towards better achievement
A	-	Nominate high performance teachers to share experience to other teachers	prepare workshops and inter-visitation schedule

Studying responses that are shown in Tables 6 and 7 that are related to participants' roles towards gaining higher e-Maturity levels, surprisingly most answers are identical to their roles of achieving school DT. This linkage in answers is related to the complex nature of DT processes, e-Maturity stages and the interconnected nature of school stakeholders' roles when it comes to achieving national objectives of transferring schools to smart schools. For most, teachers perceive their roles in advancement of e-Maturity is to ensure learners' engagement and usage of digital resources, available technology and educational platforms to raise higher order thinking and 21st century skills. Professional development and sharing best practices were the most shared roles amongst participants.

4.2.4 E-Maturity Evaluation

The following bar charts are representations of the effective evaluation tools for measurement of e-Maturity levels in both cycle 2 and cycle 3 schools from the perspectives of school internal stakeholders, the 129 teachers and 11 school leadership, where 1st represents the most effective tool through to the 6th, the least effective tool. The heights in the chart represent the number of participants who selected the effectiveness level for each provided tool (see Figures 16, 17 and 18). The data were gathered from the online survey form in different tables (see Appendices 38, 39, 40 and 41), then analysed and presented in the following

figures. The purpose of this question is to check the preferable and effective evaluation method of e-Maturity level of schools.

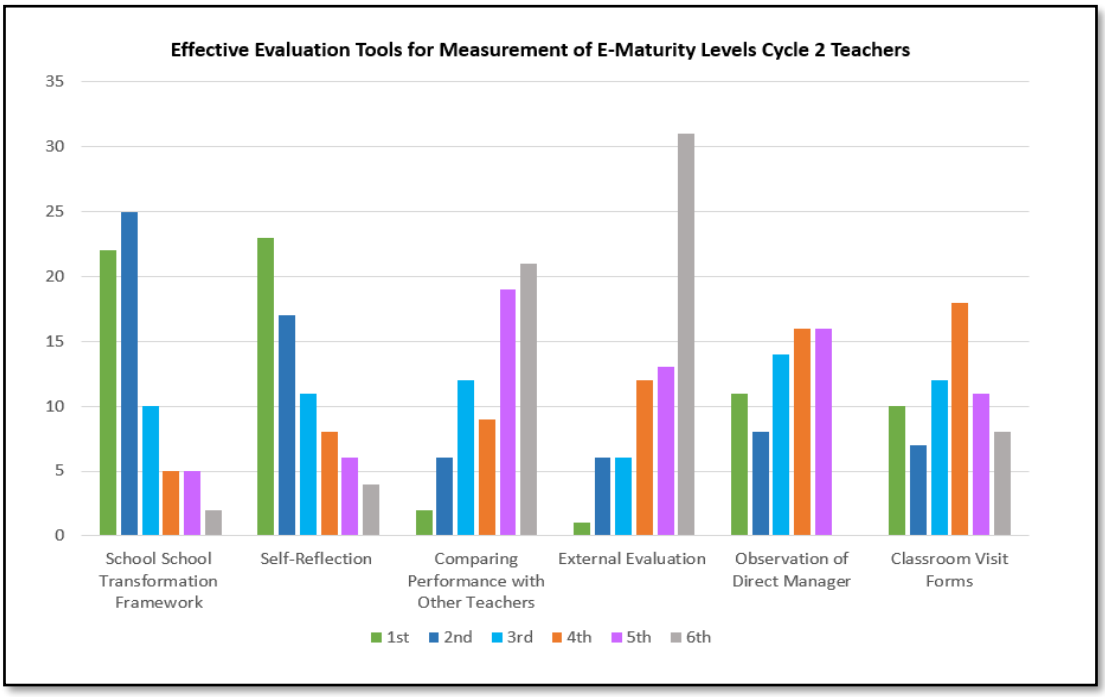

Figure 16. Effective Evaluation Tools for Measurement of e-Maturity Levels in Cycle 2

The finding related to cycle 2 teachers showed that 'Self-Reflection' is perceived as the 1st effective evaluation tool for measuring e-Maturity levels followed in 2nd place by the 'SSTF'. The least effective evaluation tool selected is 'External Evaluation'.

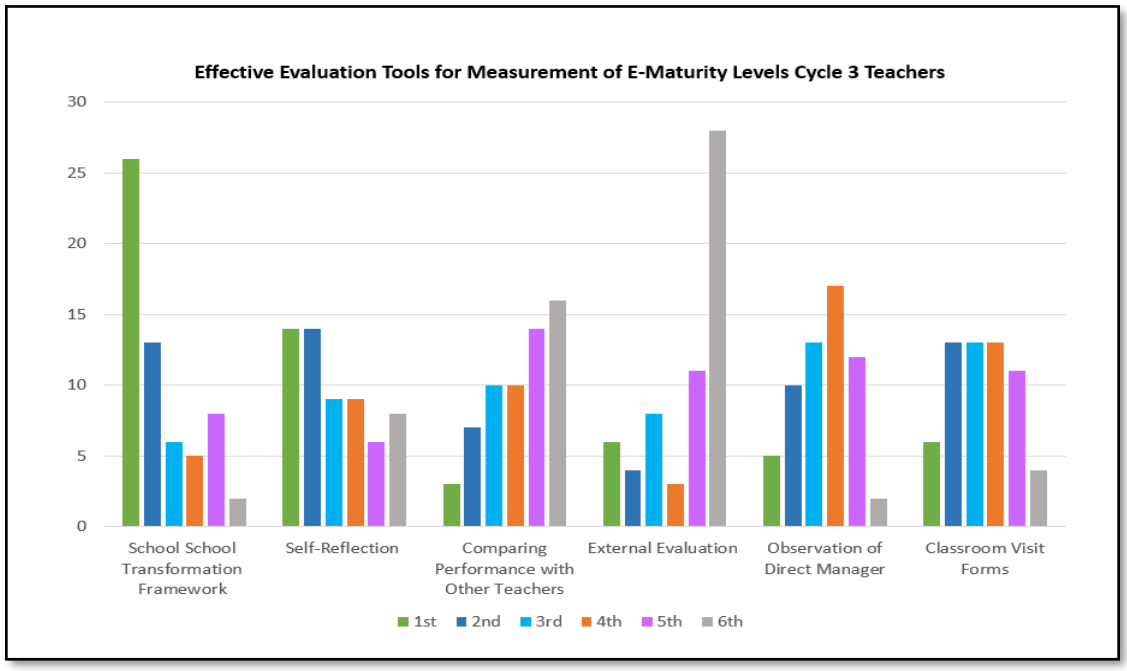

Figure 17. Effective Evaluation Tools for Measurement of e-Maturity Levels in Cycle 3

The findings related to cycle 3 teachers showed that 'SSTF' is perceived as the 1st most effective tool for measurement of e-Maturity levels followed in 2nd place by the 'Self-Reflection' method. Surprisingly, like cycle 2 teachers, cycle 3 teachers selected 'External Evaluation' as the least effective method for measurement of e-Maturity levels. In both the previous figures, the major selected approach as least effective is 'External Evaluation' and 'Comparing Performance with Other Teachers'. Considering perceived tools and methods as effective measurement means for e-Maturity levels, the methods selected by the majority of teachers in both cycles were: 'SSTF', 'Self-Reflection', 'Observation of Direct Manager' and 'Classroom Visit Forms'.

The findings in the bar chart (Figure 18) shows internal evaluators' (school leadership) perceptions of the effective evaluation tools and measurements of the e-Maturity level. The 1st most effective tool is aligned with cycle 3 teachers' selection, which is 'SSTF'.

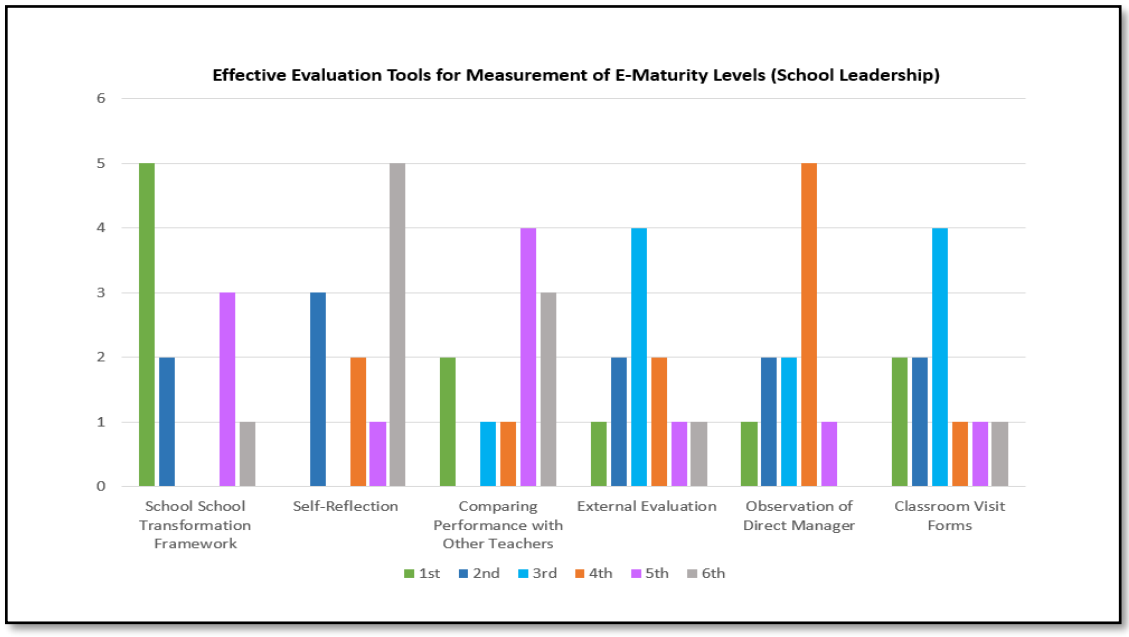

Figure 18. Effective Evaluation Tools for Measurement of e-Maturity Levels – Internal School Leadership

The school leadership contradicts teachers' selections of 'Self-Reflection' as a method of evaluation. Some school leadership considered it as the 2nd preferred tool for measuring e-Maturity levels and others as the least effective measurement method. The other contradiction is the selection of 'External Evaluation' as the 3rd most effective tool for evaluating an e-Maturity level, which is not the case with teachers who perceived it as the least effective measurement approach.

Participants were asked about the clarity of the criteria that are related to effective teaching and learning practices in the SSTF; the e-Maturity framework adopted by the UAE government schools. The participants' answers for this question were limited to 'Yes', 'Sometimes' and 'No' (see Figure 19). The findings showed that amongst the 129 teacher participants, 69 teachers from cycle 2 and 60 teachers from cycle 3, almost 75% from the total number of teachers in cycle 2, identified that effective teaching and learning practices in the SSTF criteria were clear. Whilst 21.7% answered 'Sometimes' it is clear, 2.8% answered the criteria are not clear in this respect. For cycle 3 teachers, 60 in total (76.6%) of them answered 'Yes' the criteria are clear. Whilst 20% responded with 'Sometimes', the remainder answered 'No' the criteria are not clear. Almost 20.9% of teacher

participants from both cycles partially believe that SSTF is providing clear criteria of effective teaching and learning practices.

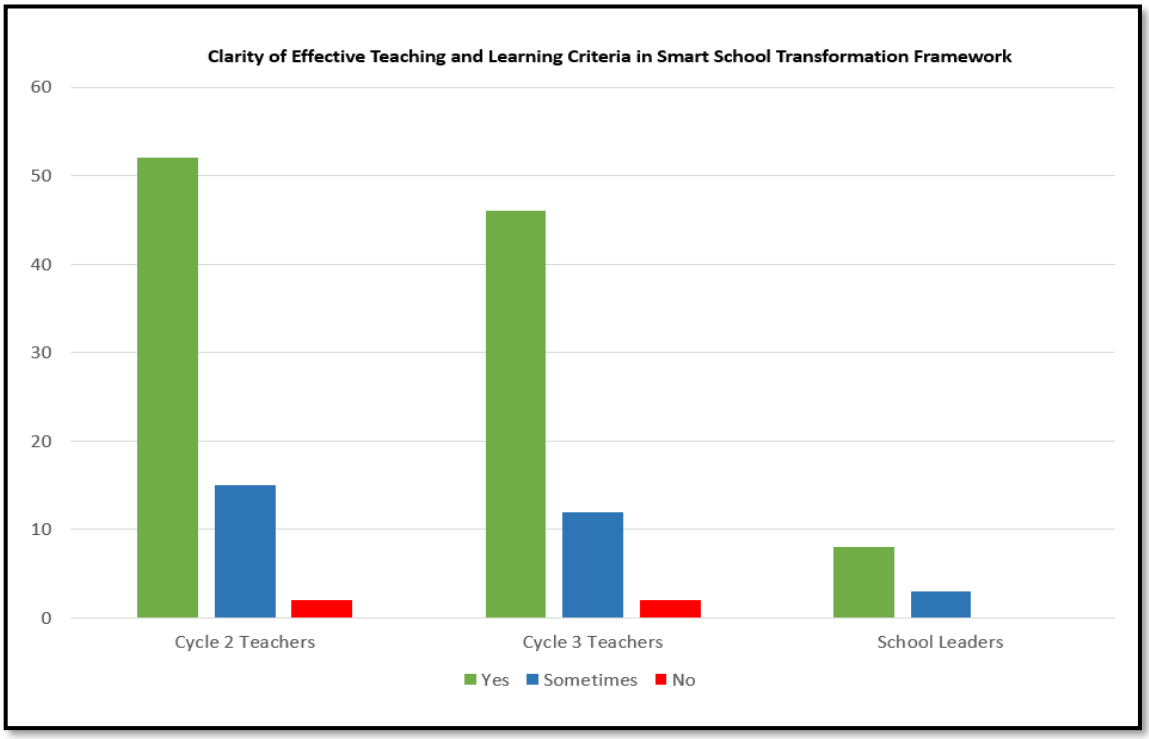

Figure 19. Clarity of Effective Teaching and Learning Criteria in Smart School Transformation Framework

From the school leadership of, in total, 11 participants, 72.7% answered 'Yes' the criteria are clear in the SSTF, whilst the remaining 27.2% answered 'Sometimes' the criteria are clear.

Figure 20 represents discrepancies that school stakeholders acknowledged, if any, between self-evaluation of the school e-Maturity level that were conducted internally in schools and the results of e-Maturity levels that were received from external evaluators (see Appendix 42).

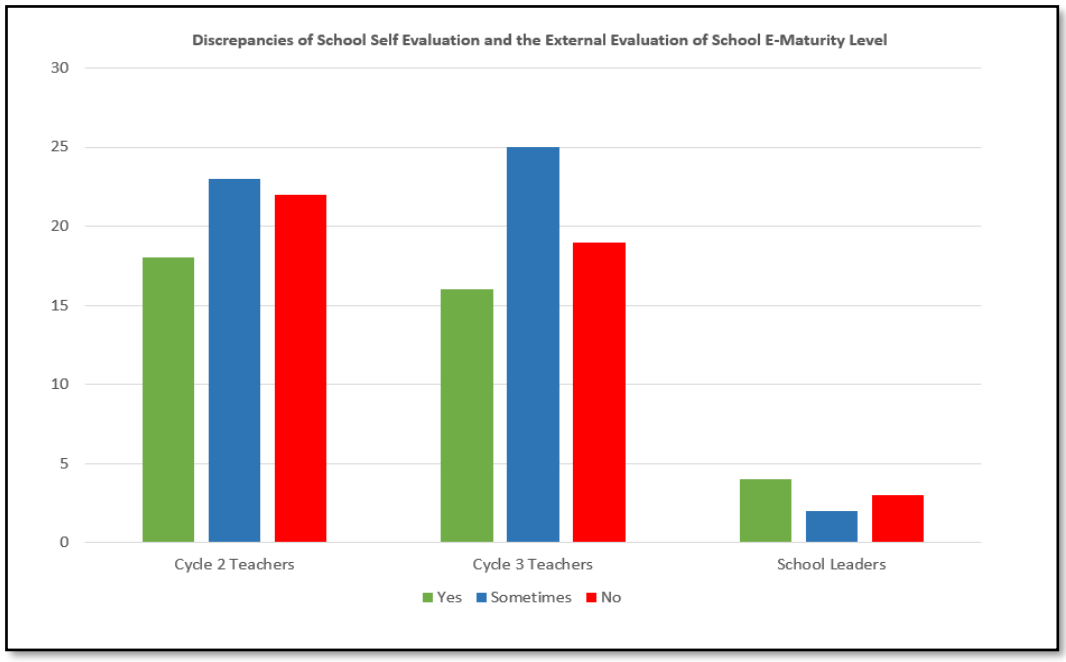

Figure 20. Discrepancies of School Self Evaluation and the External Evaluation of School e-Maturity Level

The figure shows that the majority of participants selected 'Yes' or 'Sometimes' to acknowledging discrepancies between self-evaluation and external evaluation of the school e-Maturity level. In cycle 2, 26% of teachers selected 'Yes' there are discrepancies and the other 33% selected 'Sometimes', leaving 31.8% teachers that answered 'No' they did not acknowledge discrepancies. In the case of cycle 3 teachers, 26.6% selected 'Yes' there are discrepancies and 41.6% answered 'Sometimes', leaving 31.6% with 'No', there are no discrepancies as an answer. The school leadership also offered varied answers to a similar question, with 36% of them selecting 'Yes' there are discrepancies and 18% selecting 'Sometimes', whilst 27% selected 'No'. The findings showed how varied the participants are in their level of having clarity towards the criteria of SSTF leading to discrepancies between the e-Maturity score or level that a school decides for itself based upon the internal self-evaluation process and the score annually received from internal evaluators.

4.3 Analysis of the Semi-Structured Interviews

The semi-structured interviews targeted 4 external evaluators from MoE (currently 2 are employees at ESE after its establishment in 2021), and 12 school leaders (6 principals and 6 academic officials) as internal evaluators to check the commonalities and differences of views, experiences, attitudes and practices of evaluating e-Maturity levels of UAE government schools. The 10 recorded interviews, 4 for each external evaluator and 6 for each school leadership group, were transcribed into Arabic language, as Arabic was the first language of all participants, then the transcripts were translated by myself into English with the assistance of Google Translation for some Arabic concepts. I assured the privacy and safety of participants' identity by going through the process of translating the scripts between English and Arabic language myself. The analysis process of the data related to the semi-structured interviews focused on gathering answers for the following 3 main questions and their sub-questions:

Q2. What are the adopted e-MMs and frameworks in the UAE government schools?

a. What criteria or standards do they contain and why are these used?

Q3. What are the impacts of adoption of such e-MMs and frameworks on teaching and learning practices?

a. How are these impacts being measured?
b. Are e-Maturity evaluation processes in schools effective?

Q.4. Are the adopted e-MMs and frameworks considered effective for digital transformation or do they require enhancements?

a. If they require enhancements, how can this be achieved?

4.3.1 The E-MMs and Frameworks in the UAE Government Schools

The first question in the interview was designed to identify the adopted e-MMs and frameworks in the UAE government schools from the experience and practices of the practitioners in the field. To define the roles of the participants more specifically, the external evaluators are officials who work outside the school environment, in MoE and ESE, who participated in designing the e-MMs and frameworks, and are commissioned to evaluate the schools' e-Maturity levels on an annual basis. The internal evaluators are school leaders who adopted the e-MMs and SSTF to self-evaluate the e-Maturity level of their schools, then present evidence of school progression to the external evaluators to gain the annual score of their achievement level. Three main focuses are presented in question one:

1. First, identifying clearly the e-MMs and frameworks used and adopted in the UAE government schools.
2. Second, the rationale behind selection and development of such e-MMs and frameworks.
3. Third, the depth of understanding the criteria and standards that are in these tools and frameworks.

The findings related to focus one (see Appendices 43, 44 and 45) indicate prominently that 100% of 'External Evaluators' self-report that they have comprehensive understanding of SSTF standards and have provided examples related to the maturity level requirements of each standard in SSTF in detail. Whereas 50% of them mentioned the '5Es' as e-MM that is adopted in school for teaching and learning practices in detail, the other 50% mentioned it in general with no precise or detailed explanation.

Regarding the 'Internal Evaluators', discrepancy appeared between 'Principals' and 'Academic Officials' in providing clear examples of standards in SSTF and 5Es. Sixty-six point six percent of principals clearly explained the SSTF and its standards whereas 33% of them gave comprehensive examples of criteria of the 5Es as e-MM. Opposite responses were given by the academic officials. The

internal evaluators' responses show less clarity towards SSTF and 5Es as an e-MM than the external evaluators. The findings also indicate that 'Academic Officials' have more clarity of the 5Es standards and levels. From my perspective, this is logically related to their role of supporting and following up teaching and learning practices in a school context.

The second focus is the rationale of adopting e-MMs and frameworks from the perspectives of participants to investigate if objectives and purposes amongst evaluators are similar and aligned or whether there are differences. The answers were numbered and deleted from the tables if not mentioned (see Appendices 46, 47 and 48).

The findings reflect the perceptions and attitudes of external and internal evaluators towards the objective of adoption of the e-MM and framework in the UAE government schools. Seventy-five per cent of external evaluators related the rationale of adopting 5Es e-MM and SSTF framework to 'the Best World Practices and Trends in this Field', while 50% of them mentioned 'Considering the best world practices in transferring schools to smart schools. The external evaluators mentioned other adoption drivers that are mainly related to leadership and management of digital education, i.e., leading change management and achieving the required KPIs.

In contrast, the principals and academic officials at schools for the most part related the adoption of the e-MM and framework to 'UAE Vision, Government Vision and Community', while the second most mentioned objective was to 'guide the integration of Technology into Educational system in School to Raise Performance'. The other response of internal evaluators mainly revolved around targeting the quality of teaching and learning practices, raising 21st century skills and thinking skills, and raising academic achievements. Both external and internal evaluators mentioned coping with best world practices and trends as one of the other objectives of adoption of the e-MM and framework in the UAE schools.

The third focus considered investigating the depth of understanding that evaluators had of the 5Es and SSTF standards and criteria (see Appendices 49, 50 and 51). The findings related to external evaluators' understanding of e-Maturity evaluation criteria and standards as a 'road map', 'guidance' and 'direction' towards 'developing school', 'achieving the objective and goals' identified by MoE and ESE. The findings from principals indicated their understanding of e-Maturity criteria as an enabler of raising the learning outcomes and students' performance requiring their support as leadership. The academic officials in their responses believed that e-Maturity standards were intended to support both teachers' and students' skills in order to raise academic and thinking levels.

Commonly, all participants had positive perceptions towards e-MMs and frameworks as methods and tools that develop, raise, support and guide towards advanced levels. The notion of becoming advanced in performance was dominant in the participants' answers and connected with the following aims, to:

- Raise school digital maturity
- Raise school performance
- Achieve educational objectives
- Raise academic achievements
- Raise teacher and student performance
- Develop teaching and learning practices

4.3.2 The Impact of E-MMs and Frameworks on Teaching and Learning Practices

Question number 2 focused on studying the impact of e-MMs and frameworks on teaching and learning practices and how these impacts were measured. The participants' answers to this question were rich and varied, which are presented in tables as a thematic summary (see Tables 8, 9 and 10). The most common answers are in bold whilst the obstacles are in red.

Table 8. The Impact of e-MMs and Frameworks on Teaching and Learning Practices (External Evaluators)

P	Impact	Measurement
External 1	**Increased awareness of Usage of Technology in Educational Practices** (Teachers & Students) **Better investment of learning time through targeting internal motivation and creating suspense** **Students' willingness to learn through apps and communication channels with peers and teachers** Available digital resources for Teachers to support delivery of the content **Evaluation and collaboration between teachers in sharing lesson planning and best practices through PD communities** Change the view teachers have about learners' role and responsibility towards his/her own learning **Increased collaboration between learners, deep learning and independent learning** Usage of different websites and applications (for teachers) to facilitate teaching and learning Building up strong and effective plans **Collaboration and exchange of knowledge between teachers and learners** Build up strong and social personalities that copes with the new world requirements Gives guardian / parents the opportunity to follow up and cooperate with school regarding student's performance	A quantitative measurement, numbers, and percentages Percentage of satisfaction **Observing indicators of teacher and student usage of technology** **Self-Evaluation** National or international tests Level of Learning before and after Reflection on the skills (Teachers, learners, leaders) in usage of technology
External 2	**Allowed students to be more creative, more innovative, more capable of critical thinking, and more capable of research** Student confidence raised and possessed the ability to create **The students' digital skills raised to higher level** UAE ranked second OECD, with regard to the ability of teachers to use pedagogy. In practice, not everyone is able to use the appropriate pedagogy to integrate e-maturity into education.	**Visits to schools to evaluate schools' practices inside classrooms** Using the phrases all, most, and some, so we developed quantitative indicators that determine what level the school is **through observations** **Self-evaluation strategy** and to what extent the individual is transparent and has awareness of what stage the school reaches. **Evidence of school self-evaluation**
External 3	During pandemic phase, there was intense focus on technology and some individual practices have become general to everyone Students have obtained the means (tools) they liked and preferred However, there was no strong focus on the optimal exploitation of technology Now principal from the beginning of the year became more interested in **having awareness regarding e-maturity.** Having school committees that consists of a group of teachers, committee for students which are concerned with electronic maturity, **Workshops that are presented externally outside the school / exchange of experiences** Become a permanent practice in the school community in that they evaluate themselves on an annual basis	Evaluation form was created and used by the principal and the academic specialist to evaluate **teacher performance in the classroom.** **Self-evaluation** that exists in schools to see where they are going, what support they need. **A group of the smart learning team to review schools' evidence** if they are appropriate or inappropriate against the standard.
External 4	**The ability to participate with students using technical tools was high.** **Openness to greater educational resources considering individual differences, as technology helps the student.**	**The self-assessment based on the framework.** **A digital measurement tool** that was built within the LMS and Alef platform.

Table 9. The Impact of e-MMs and Frameworks on Teaching and Learning Practices (Principals)

P	Impact	Measurement
P1	**Increase in the achievement level of our students** **students become more e-mature**, they are able to use the smart learning tools available by the ministry. Become productive rather than being receivers of technology. The teacher's role changed and he/she became facilitator instead of being the instructor Students' participation and wise technology use reduces the pressure on teachers at the same time improves the teaching outcomes Teachers feel more relaxed and comfortable in classes where learners take responsibilities of their learning through technology (when create contents/ games ...etc.)	**Classroom visits** and learning tours **Forms designed** by each teacher to measure the electronic maturity of the student Ensure consistency and follow up.
P2	The smart learning program helps students to be at the heart of the educational process and allows us to develop and improve levels by taking advantage of this technology and smart learning **Reflect positively on academic achievement.** This **program is solid and promotes creativity and innovation.** **Student employ higher order thinking and digital skills** that is the orientation of this generation future	**Questionnaires** **Classroom visits** to observe performance of students
P3	**The effect was transmitted entirely to the student and the students' achievement**. **The students' results for our school were among the best results at the state level** Reached **advanced stages of e-Maturity in the school.**	Noticed among teachers that the quality of education has changed in **their classrooms** **Through educational platforms and the smart portal such** as Alef Platform Have measures in the school, such as **questionnaires** and MS Excel programs, in which we measure the level of each student, where he was and where he has become.
P4	**Raise the levels of achievement for the student** Delve deeper into the subject and the curricula to acquire new skills.	**Students results** based on the learning outcomes Using forms during **classroom visits** **Observing students and teachers performance**
P5	Various workshops contributed to the development of the educational staff and contributed to **the development of students' skills as well.** The student has become dependent on himself and has become emulating the world. Raising awareness and spreading the ethics and rules of digital behaviour and its reflection on identity contributed to strengthening the principle of digital citizenship. Spreading digital safety in the school	The school creates **special forms** for students, parents, and teachers to see **the results** at the beginning and the end of the school year by percentages. **Analyse the data available on portals** to check to which extent the students' levels have risen regarding digital maturity
P6	Acknowledged good effect on **teachers as their level of digital maturity have raised**. Have good effect on **students in enabling the thinking outside the box and encourage innovation.**	**Through evaluation forms for teachers** **Academic achievement,** Participate in the ministerial competitions

Table 10. The Impact of e-MMs and Frameworks on Teaching and Learning Practices (Academic Officials)

P	Impact	Measurement
A1	**The student's level improved, the achievement level also increased** **Student has higher levels of digital maturity,** the student's ability to manage his education process	**Classroom visits** **The created school form** that is sent quarterly which measure the impact of using different teaching strategies, including the digital maturity.
A2	**Students have become aware of the use of technologies.** The teacher has begun to use technologies in an effective, inclusive and participatory way for the student in the learning process. Student become participant as well as a researcher, solves problems that may be within the scope of the school and the emirate. It becomes possible to present solutions for projects in which **a student takes the initiative to innovate.** A connection established between the teacher, the student, the guardian, and the existing environment. Encourage the student to be a researcher and the problem solver	**Classroom visits** Monitoring the **students' grades** **The questionnaires** The **results** obtained by the school at the state level, whether it was competitions.
A3	Yes, there was an effect. We notice that there is **progress in the levels.**	**Excel form** **Classroom visits**
A4	The development of the teacher in having full awareness of digital maturity and its standards. Teacher when masters all the skills necessary to adopt each criterion that **leads to raising the students' levels.** The quality of the learning outcomes and **digital maturity increased** because of applying the skills of the twenty-first century	The **results of the students** The **student's grades** rise and comprehension increases significantly The high scores of students' achievement in the formative and final. **Visit classrooms** and evaluate teachers' performance through a designed form. Knowing the current level of teachers makes the visit conducted for a targeted goal **Submitting periodic reports** of teachers' performance to check their progress and assist the new teachers.
A5	The learning strategies shifted from being traditional to active learning Impacted the achievement, **the academic level and the results of students**	The periodic **classroom visits**
A6	A significant change in teaching strategies A significant change in students' learning A **great impact on the progress of students** **Students became creative and innovative** in the usage of the new programs	**Classroom visits** The satisfaction **measurement forms**

The external evaluators mentioned that they had witnessed several implications of the e-MMs and frameworks on educational practices in schools, and the major impacts were related to:

- Increased awareness towards e-Maturity and usage of technology for educational practices

- Increased collaboration and exchange knowledge activities in the educational community between learners and teachers
- Raising learners' academic achievements, digital skills and 21st century skills, i.e., communication, critical thinking, creativity and collaboration raised to higher levels

The majority of the implications mentioned by external evaluators were positive and mainly showed how e-MMs and frameworks impacted learners' skills and teachers' involvement in Professional Development (PD) communities to obtain effective teaching practices. Yet there were two mentioned obstacles by 2 external evaluators (coloured in Table 29 in red) and these are:

- In real practice still not everyone is able to use the appropriate pedagogy with integration of technology and aiming for e-Maturity in education
- No strong focus on the optimal exploitation of technology

When external evaluators were asked what measurements were used to identify these implications, the majority mentioned the following measurement tools:

- Classroom observation
- Reviewing school evidence of self-evaluation of e-Maturity level based on SSTF standards
- Digital measurement through educational platforms

For internal evaluators, the principals and academic officials, the implications of e-MMs and frameworks on teaching and learning were evident and these were mainly:

- Raising learners' academic achievement and higher order thinking
- Progression in e-Maturity level
- Progression in teachers' and learners' digital skills
- Raised learners' adoption of innovation and creativity

When internal evaluators were asked about the measurement they used, they mainly referred to:

- Classroom visits to observe teacher and learners' performance
- Questionnaires and survey forms created by school
- Data available on educational platforms, i.e., Alef platform
- Trackers and forms to develop periodic reports created by school
- Learners' grades and attainment analysis

The findings show the tendency of external evaluators to rely on school evidence as basic sources to benchmark schools' e-Maturity level. On occasions, these external evaluators conducted school visits and classroom visits to check school stakeholders' performance and levels of e-Maturity and maturity of educational practices. On the other hand, since internal evaluators are in the actual day-to-day school environment, the tendency of creating different trackers and follow-up tools is evident and all-in-all are directed to measure learners' and teachers' performance. The common agreed implications that were witnessed by both external and internal evaluators were the progression of awareness of the benefits of e-MMs and frameworks in supporting technology integration in teaching and learning practices. The positive effects were in favour of students and the development of their digital and educational competencies.

The variation in some responses of the external and internal evaluators indicated the difference of their professional fields and expertise background. Some of them discussed the deeper implications of e-MMs and frameworks from an educational leadership perspective and some others referred to classroom practices and pedagogy in a deeper sense, showing greater understanding of the implications for teaching and learning practices. This difference in viewpoints reflected the selection of the measurement tools and what to focus on when searching e-Maturity implication evidence. This finding highlights the importance of evaluators' perceptions and viewpoints of what e-mature teaching and learning practices should look like and what the appropriate tools of measurement are.

4.3.3 The Effectiveness of the E-MMs and E-Maturity Frameworks

The last question in the semi-structured interview focused on the effectiveness of the existing e-MM, the 5Es and the SSTF in UAE government schools. The

question was mainly to check if these tools were effective or in need of modifications or improvement. The sub-question asked if enhancements were then required (see Appendices 52).

The findings represent the numbers of participants that either believed that the e-MM and framework adopted in UAE schools were effective or they needed enhancement. The participants who perceived these tools as effective with no need of amendments and development were few. Only 3 evaluators, about 18%, stated that these tools were effective guidance towards e-Maturity with no need for any additional work or review, whilst the 13 other participants, about 81%, suggested the need for revision for these tools.

Figure 21 shows rationales for suggesting the need of improvement and enhancement of the current applied e-MMs and frameworks in UAE government schools from the experience and views of the 13 participants stating that these e-MMs and frameworks were in need of revision for development and enhancement.

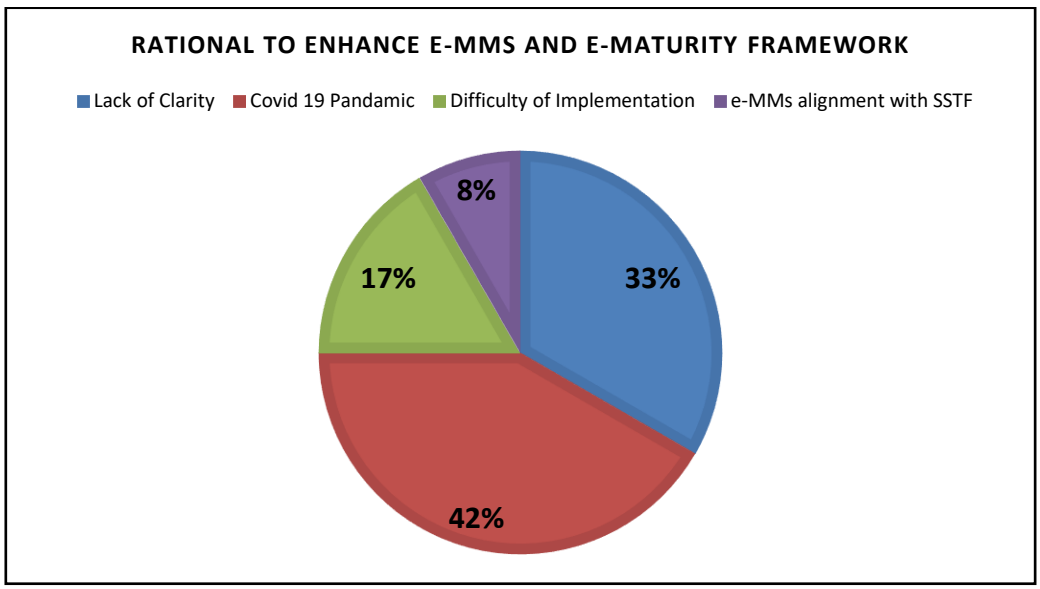

Figure 21. Rational to Enhance e-MMs and Frameworks

Figure 21 shows four main reasons that led participants to suggest the amendments and improvement of the current e-MM and framework adopted in the UAE schools.

The first reason was the experience of the sudden strike of Coronavirus Covid-19. The participants explained how in lockdown periods the online education was implemented for the first time ever in school education, which resulted in questioning the preparation of the educational system for such a crisis and the quality of school DT. This notion encouraged participants to suggest the need to revisit the criteria and standards of evaluating school education and assessing the e-MMs and frameworks that had been adopted prior to the strike of Coronavirus Covid-19 and which were needed to cope with updates that took place post-pandemic period.

The second reason was the lack of clarity in how to reach the standards contained in these models and frameworks. The participants described SSTF as a framework that had 6 major standards that contained 'grey areas'. For 5Es as the e-MM, the internal evaluators were not clear about how to reach the highest levels of e-Maturity in teaching and learning practices, taking into consideration that teachers were evaluated during a classroom visit which lasted for 45 minutes. The obstacle obviously was that while the theoretical and objective stances were that standards were clear, turning these standards and criteria to practice during the daily routine of school education seemed in need of further clarification for school stakeholders and evaluators.

The third factor was the difficulty of implementation of the higher standards and criteria in the e-MM and framework. The participants explained that the 5Es and SSTF targets had different scopes, which affected the requirements for achieving or reaching each criterion and standard. The scope of the 5Es was the level of learner engagement and depth of learning while integrating technology in alignment with the revised Bloom's taxonomy levels, as stated in the 5Es model. Adopting 5Es, the school expected to concentrate on a teacher's strategies and level of ICT integration to empower learners' engagement and seek deep learning. Such a scope is directly related to teaching and learning practices and not to school DT as a whole. On the other hand, the scope of SSTF was transforming a school to a smart school, taking into consideration all related areas to achieve this mission. The difficulty of implementation occured due to

lack of explanations in both tools of how to reach the advanced levels across these two different scopes and how to capture progression towards higher levels. The other difficulty of implementation mentioned by participants was that not all teachers and learners in a school could implement and achieve those higher standards and, in that case, the continuous professional development and offering solutions to overcome this obstacle was needed from the education authority.

The fourth factor was the necessity of a connection and consistency between the e-MM and the SSTF in order to clarify the loose and general standards as statements in SSTF and the difficulty to achieve high standards in the 5Es.

The last sub-question was offering suggestions about whether the e-MMs and e-Maturity frameworks were perceived as in need of enhancement and improvement, and what could be done to develop better models and frameworks for the educators and school stakeholders (see Figure 22).

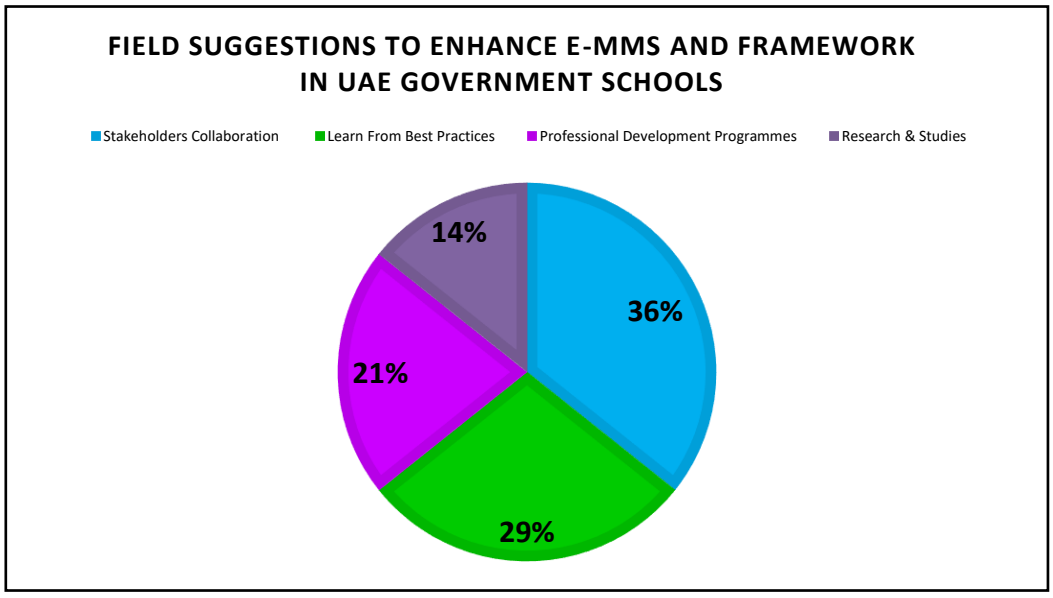

Figure 22. Main Suggestions to Enhance e-MMs and Frameworks in UAE Government Schools

As displayed in Figure 22, the 13 participants out of the 16 shared four specific approaches for enhancing and developing the e-MMs and frameworks in UAE government schools as follows:

- The first suggestion was to ensure stakeholders' collaboration in the processes of revisiting, rethinking and developing these instruments as guidance and an evaluation matrix for school e-Maturity. This suggestion is offered by 36% of the participants).
- The second suggestion was backed up by 29% of participants, which was to learn from the best practices in the field of developing and implementing e-MMs and frameworks which support their development in the UAE school community.
- The third suggestion was gathered from 21% of participants and that was to build sustainable PD programmes that empower schools and stakeholders in the field to implement wisely the e-MMs and DT frameworks in school education.
- The last suggestion represented 11% of the participants' suggestions, who encouraged the conduction of investigation research and studies in the field of e-MMs and DT in UAE school education.

4.4 Analysis of the Annual E-Maturity School Reports

A total of 9 reports were collected from the targeted 6 schools. These reports are delivered annually to schools after the external evaluation team in MoE or ESE review the submitted requirements from schools as documents of evidence of progression towards advanced school e-Maturity level. The schools are required to organise their documentation for mainly three standards in SSTF out of the 6 standards and these are:

1. Leadership (Standard 1).

2. Learning, teachers and teaching (Standard 3).

3. Assessment and students (Standard 5) (see Appendices 22, 23 and 24).

The reports when released to the school show mainly the score of e-Maturity, the strength areas, and the need of improvement areas based on the external evaluation team's analysis of the provided evidence.

The findings related to the e-Maturity reports included the two consecutive school academic years 2021 and 2022 schools' e-Maturity performance and that was prior to the year that this study was conducted (see Appendices 53 and 54)

The most common and shared statements in the reports are in bold for the purpose of discussion of the findings. The reports related to the year 2021 are gathered from 3 schools - 2 middle schools and 1 secondary school. The reports related to the year 2022 are gathered from the 6 targeted schools.

Findings of year 2021 reports included 3 targeted schools out of the 6 targeted schools in this study. The other 3 schools did not provide or obtain the e-Maturity report for the year 2021. On an annual basis, the schools are required to submit the documentations of evidence that involve the e-Maturity self-evaluation report that are usually conducted in schools at an earlier stage of the academic year. The evaluation is based on SSTF standards, and then these schools are expected to submit their action plans and evidence of the processes that targeted the advancement and progression of e-Maturity levels by the end of the academic year. The scores that external evaluators provide for schools after reviewing the documentation are ranged from 1 (the least score) to 5 (the highest score) where 1 = Not satisfactory or poor, 2 = Satisfactory, 3 = Good, 4 = Very good and 5 = Outstanding, and these scores are usually shared the next academic year to restart the cycle of e-Maturity evaluation as shown in Figure 23, illustrating the UAE government school e-Maturity evaluation system.

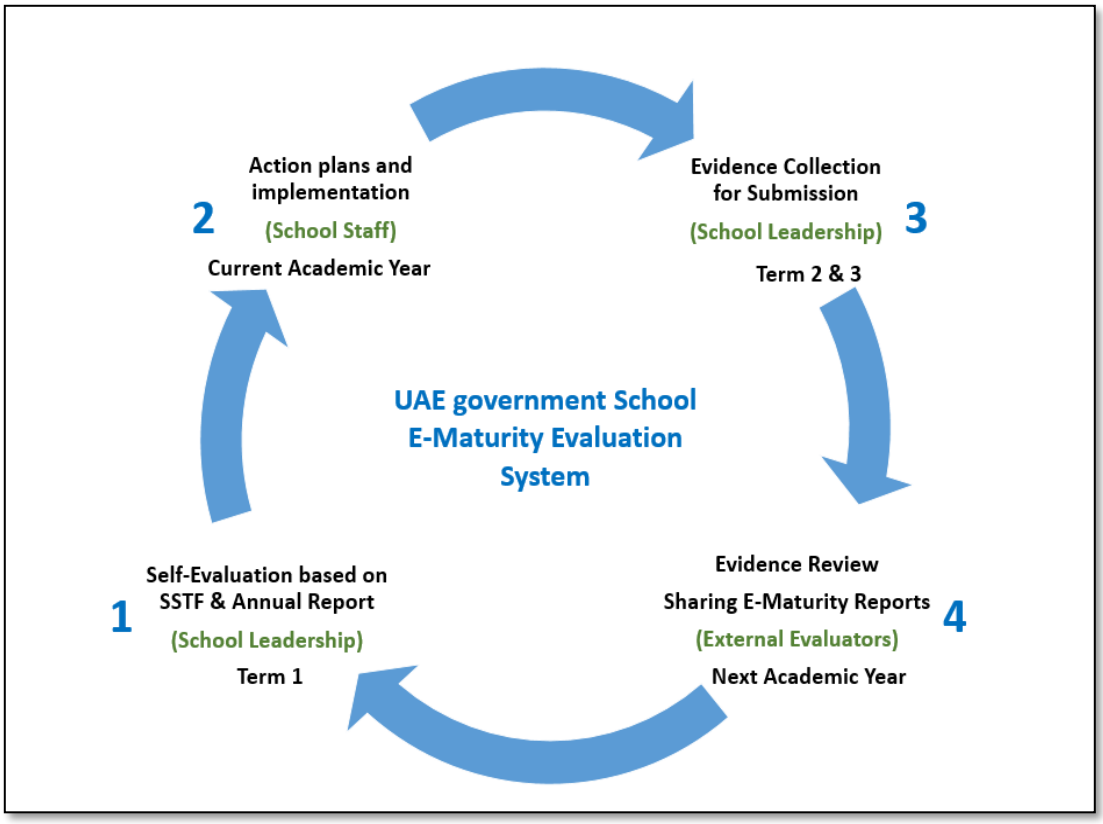

Figure 23. UAE Government School E-Maturity Evaluation System

In 2021, the three scores from schools ranged from 'Good' to 'Very Good'. The reports showed strength areas and weak areas with descriptions of achievement and recommendations of enhancement for each criterion and status. After thorough analysis, the findings related to the most common and shared statements in the reports were divided under 'Strengths' and 'Need Improvement' areas targeting the three standards, coded to (S1) = Leadership, (S2) = Learning, teachers and teaching, and (S3) = Assessment and students. The (G) = General code was assigned if the statement was not related to any standard and it was only indicating the technical error or lack of evidence submission.

1. Strengths in 2021 e-Maturity reports

The schools that received 'Good' in the annual e-Maturity report in 2021 shared their strength areas as were those within the report that received a 'Very Good' level:

- **(S1)** Clarity of school vision for all stakeholders to raise e-Maturity awareness

- **(S1)** Distribution of responsibilities to lead ICT integration effectively
- **(S1)** School having PD plans, strategies and programmes in place
- **(S1)** Distinguished practices and programmes for e-Safety for school community
- **(S2)** Learning development of students' digital capabilities and usage of ICT
- **(S2)** Effective integration of technology in delivering lessons, in teaching and in learning

The only advanced areas that distinguished the 'Very Good' school from the 'Good' schools were:

- **(S1)** Spreading innovation culture amongst teachers and learners
- **(S2)** Evidence of the impact of the PD programmes on teachers' strategies
- **(S3)** Consistency of evaluating learners' digital skills

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2. Need Improvement in 2021 e-Maturity reports

The 'Need Improvement' areas in the 2021 reports were many, as shown in Table 33, but in summary they evolved around these practices:

- **(G)** Lack of clarity in the evidence provided
- **(G)** Lack of evidence to support the self-evaluation reports conducted by internal evaluators
- **(G)** Evidence are not organised comprehensively for each standard
- **(S1)** Lack of evidence of innovation practices towards school DT
- **(S2)** Absence of evidence of monitoring and evaluating the quality of learning and education using ICT inside or outside the school
- **(S3)** Absence of assessment tools and consistency to review learners' ICT capabilities in relation to academic progression

In 2022, the selected 6 schools obtained annual e-Maturity reports, where 3 of these schools had also shared their 2021 reports. The purpose of seeking the reports of 2 consecutive academic years was to compare, to check if the evaluation approach and concentration remained or changed over time. Adding the codes to identify what reports were offered as guidance and

recommendations to the field, the common shared findings and the prominent outcomes of analysis were listed in the focus points following.

3. Strengths in 2022 e-Maturity reports

The annual e-Maturity released reports of the 2022 academic year revealed these areas as common shared strengths in the 6 schools:

- **(G)** Evidence is detailed and descriptive
- **(G)** Evidence of monitoring the good practices, implementation and the progress throughout the academic year
- **(S1)** Availability of e-Maturity school plans, the formation of teams, and the distribution of tasks and responsibilities
- **(S1)** Inclusiveness of the e-Maturity initiative for all school stakeholders
- **(S1)** Develop expertise through planned PD programmes of ICT integration in school education
- **(S1)** Spreading e-Maturity initiative inside and outside school at domain level and local community
- **(S3)** Availability of learners' results analysis and ICT impact measurement

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4. Need Improvement in 2022 e-Maturity reports

For the three schools (ScM01, ScM02 and ScS03) who received e-Maturity reports for the academic year 2021, they received less 'Need Improvement' areas in the 2022 reports. The major common areas of 'Need Improvement' in the year 2022 reports were:

- **(G)** Lack of innovation, excellence and quality aspects in school e-Maturity initiatives
- **(G)** No generalisation or dissemination of the e-Maturity initiatives and their benefits more widely

Regarding low e-Maturity scores in 2022 reports, ScS01 school received a score 2 = Satisfactory. This school, other than the 5 targeted schools, had more 'Need Improvement' areas that evolved around these points:

- **(G)** Lack of clarity in evidence provided for the three standards

- **(S1)** Absence of investment of technologies in communication and cooperating with parents to support learners' achievement
- **(S1)** Lack of PD programmes inside and outside school

The comparison between the 2 years' report, 2021 and 2022, reveals that most targeted schools had major strength areas in leadership and management of e-Maturity progression and advancement which led to them being more advanced in S1 Leadership than shown in the other two standards. The measured obstacle appearing in these reports was the aspect of lacking clarity, innovation and quality in evidence provided for external evaluation.

4.5 Summing Up

The presented findings in this section are rich in detail and are collected from the targeted participants and reports available in the 6 schools. The presentation of findings was organised according to the tools used for the investigation and targeting of the research question that each tool was addressing.

To discuss these findings, Chapter 5, the Discussion chapter, is organised and designed to explore the various collected and organised data from this, the Findings chapter, using a more aligned approach for the purpose of addressing the questions of the study. The discussion approach dives into single cases, which are selected schools and targeted participants of different professional roles in connection to uses of e-MMs and frameworks in the UAE government schools to achieve the annual evaluation and progression of school e-Maturity.

Chapter 5

Discussion

5.1 Chapter 5 Overview

The discussion of the results of this study is presented in sub-sections that provide answers to the main questions and purposes of this study. The approach to the discussion is to showcase the multiple-case study which targeted the 6 UAE government schools and the comparisons of findings in relation to the varied samples and participants. This chapter will target the implications, the challenges and the benefits of the current usage of e-MMs and frameworks in the UAE government schools with a focus on the outcomes delivered by studying the findings of each case and each role in connection with school e-Maturity evaluation and progression. These topics will be presented in different main and sub-sections.

5.2 E-Maturity in the UAE Government Schools

5.2.1 E-Services and Digital Educational Resources

The data in relation to the selected schools as representative cases showed that the digital infrastructure, the digital educational resources and the educational technology programmes are available in the UAE government schools in both cycle 2 and cycle 3 schools. The equipment, the resources and technologies are governed by the national organisations, the MoE and ESE, with collaboration of other contracted private entities. The 100% available e-services at these schools are the Internet, e-mail accounts, the Learning Management System (LMS), the e-content platforms such as the Alef platform, the online assessment system (Swift Assess), smart and interactive boards, and the Student Information System (SIS). Other technological tools that are used as communication channels between the school staff, students and parents are either available through e-mail accounts, online meetings through Microsoft Teams, or through online communication apps that are provided by school staff to bridge the relationship with the parents' communities. Tools like social media, multimedia, Augmented Reality (AR) and content creator tools are sometimes provided by

the government educational entities for some subjects and grade levels whereas for others they are occasionally provided by teachers who are using other personal systems they have preferred or discovered. When it comes to PCs, the majority of students received devices from the educational institutions and for others they used their own devices following the policy of schools. Students receiving devices from the UAE educational entities are dependent on the budget and the availability of devices for distribution, which mostly takes place during the school academic year.

The degree of sufficiency of available technology for the purpose of DT of UAE schools is rated 100% by school leadership and 81% by teachers in the targeted 6 schools (see Tables 13 and 14) which indicates that the available technology is adequate to derive the DT in the government schools in the UAE.

Highlighting the aspects of effective utilisation and implementation of these available technologies for DT of school education, the majority shared highly recommended practices that are:

- The necessity of providing PCs for all students
- The consistency in usage of interactive and content platforms
- Usage of smart boards
- Usage of communication tools amongst school stakeholders

5.2.2 Integration of Technologies in Teaching and Learning Practices

The 15% and above of teachers selecting major strategies when technology is integrated in their teaching practices were: Cooperative Learning, Gamification, Active Learning and Flipped Classroom. The 10% to 14% of teachers selecting the following mostly used strategies in their teaching practices are: Brainstorming, Usage of Educational Platforms, Differentiated Learning, Group Work, Active Learning, Independent Learning and Students taking the Role of Teacher (Learner as Teacher).

The 15% and above of teachers responding to the impact of technology on learning strategies stated mainly two approaches: Cooperative Learning and

Gamification. Whilst the 10–14% of teachers responding to the similar question, identified the following learning strategies used while integrating technologies: Learning through Flipped Classroom, Individual Learning, and Group Work. The 21st century skills, besides thinking skills, are mentioned by some participants, but they represent less than 10% of the targeted sample, which shows that teachers are referring to major trends and styles of learning, whether individually or with groups, as teaching and learning strategies, whilst there are more specific approaches for delivery of instructions mentioned by fewer participants, i.e., research and inquiry-based learning, experimentation and project based learning. Mentioning Gamification, Flipped Classroom and Active Learning indicates the tendency from the teachers to highlight the role of learners in the classroom and their learning journeys, which is driven from the notion of 'the student-centred' approach when delivering instruction.

5.3 E-Maturity Impact on Teaching and Learning Practices

5.3.1 E-MMs and SSTF Impact on Teaching and Learning Practices

This targeted focus in the study was investigated amongst all participants; the teachers, the school leadership as internal evaluators, the external evaluators, and prior e-Maturity reports. Teachers and school leadership shared their responses through the online survey. The internal evaluators, the school leadership, and the external evaluators answered this question in a semi-structured interview.

The internal school stakeholders, teachers and school leadership, stated the following as major impacts on teaching and learning practices while adopting the e-MMs and frameworks:

- Increase students' motivation towards participation and interaction
- Usage of LMS and Alef Education Platforms supporting collaboration
- The technology integration enhanced independent learning
- Advancement of digital skills and literacy amongst learners
- The level of academic achievement raised

In the semi-structured interviews, when asking the internal evaluators again about the impact of the e-MMs and frameworks on teaching and learning practices, the major mentioned impacts were:

- Raising the academic level and the results of the students
- Students obtaining a higher level of digital maturity and usage of technology in learning
- Promoting creativity and innovation amongst learners

On the other hand, the impact that was perceived by external evaluators were stated in a more generic manner, emphasising the impact on school education as whole. The mentioned major impacts were:

- Increased awareness of usage of technology and e-Maturity by learners and teachers
- Learners' eagerness and willingness to learn through technology is evident
- Technology enabled collaboration, exchange of knowledge and expertise amongst teachers and learners

5.3.2 E-MMs and SSTF Effectiveness

In addressing the approaches to measure the impact of the e-MMs and frameworks on teaching and learning practices, my intention was to check the evaluation and follow-up approach that both internal and external evaluators used to come up with conclusions of impacts that were identified. The major evaluation and measurement methods mentioned by external evaluators were:

- School self-evaluation against the SSTF standards
- Classroom visits to observe, record and evaluate teacher and learner performance

Two participants from the 4 external evaluators mentioned the tracking of school self-evaluation evidence as a tool of measurement of implications and only 1 participant referred to the smart learning team as an external body to review school e-Maturity evidence, which indicates that the internal evaluators' roles in

developing and measuring schools' e-Maturity is highly recognised and that these roles are major and need to be undertaken in a consistent manner throughout the school academic year. Additionally, the external evaluators mentioned other tools of measurement of impact which were not shared commonly amongst them, and these were: questionnaires, measurement of technology impact on learning by assessing learners' performance before and after the usage of technology, and usage of an international test as a benchmark.

The internal evaluators, the school leadership, shared the following as the most used tools to evaluate the impact of the e-MMs and frameworks on teaching and learning practices:

- Classroom visits and observation of students' and teachers' performance
- Evaluation forms and periodic performance reports
- Monitoring students' results and learning outcomes
- Monitoring data of progression on educational platforms
- Questionnaires

In a mission to identify the most effective evaluation approach to determine the e-Maturity level of teaching and learning practices, the teachers in the targeted cycle 2 schools stated their preferable evaluation approach in the following ascending answers (1 = most effective tool through to 6 = the least effective tool):

1. Self-Reflection
2. SSTF
3. Observation of Direct Manager
4. Classroom Visit
5. Comparing Performance with Other Teachers
6. External Evaluation

Regarding the teachers in cycle 3, they showed their preferable evaluation approaches in this ascending order (1 = most effective tool through to 6 = the least effective tool):

1. SSTF
2. Self-Reflection
3. Classroom Visit
4. Observation of Direct Manager
5. Comparing Performance with Other Teachers
6. External Evaluation

The school leadership stated their preferable evaluation approach in this ascending order (1 = most effective tool through to 6 = the least effective tool):

1. SSTF
2. Self-Reflection
3. Classroom Visit and External Evaluation
4. Observation of Direct Manager
5. Comparing Performance with Other Teachers
6. Self-Reflection

The above responses showed that teachers are perceiving internal evaluation approaches that are taking place either individually through self-reflection or by school leadership through classroom visits as the most effective e-Maturity evaluation approaches, with the importance of using SSTF. The teachers stated external evaluation as the least preferable approach of evaluating the e-Maturity of their teaching and learning practices, which may indicate the absence of the direct impact of the external evaluation on teaching and learning practices that made teachers sense it as least important. The teachers' notions of the external evaluation having least impact on their practices is backed up when the e-Maturity annual reports were analysed in this study. The annual reports showed rare feedback on e-Maturity levels of teaching and learning practices in a given school, which will be discussed further in section 5.4, when discussing each case.

The school leadership preferences of effective evaluation tools were slightly different from their teachers, by placing the importance of external evaluation amongst the top 3 approaches besides a somewhat confusing outcome of placing the importance of the self-reflection approach in both 2nd and 6th places. Looking at the e-Maturity annual reports provided by the external evaluators to schools, the notion that was carried by the school leadership appears justified, as these reports concentrate mostly on the leadership and management of e-Maturity in the school context, which will be discussed in each case study in the following section (5.4).

5.3.3 The School E-Maturity Annual Evaluation Reports

The e-Maturity reports obtained for this study were 9 in total, 3 reports for 2021 and 6 reports for 2022. Three schools provided 2 consecutive annual reports whilst the 3 others only provided the latest reports. The external evaluators in the smart learning team evaluate annually the evidence related to e-Maturity progression in schools and that is through looking at the submitted evidence after a school leadership conducts self-evaluation and sets up the school e-Maturity plan according to the standards of the SSTF.

The required evidence is only related to 3 out of 6 standards of the SSTF and these are: Leadership; Learning, Teachers and Teaching; and Assessment and Student Progress. The decision of limiting the evidence provided by schools to focus only on these 3 standards was due to a later official decision from the smart learning team to emphasise school efforts towards these core 3 standards whilst other standards were perceived as managed by the MoE and ESE that are outside the school scope. For further clarifications, standard 2 Curriculum and Resourcing Learning in the SSTF is a major task that is a centralised task assigned to the Curriculum Department in the MoE, standard 4 Student and Family Context is perceived as outside the school scope, and standard 6 Operational Provision and Management is a centralised responsibility of the IT and Digital Resources Department in the MoE and ESE.

The assigned department to follow up schools' evidence set up annual workshops to explain the work and offer examples of evidence needed for evaluating school e-Maturity levels. Schools were requested to provide no more than 300 MS PowerPoint slides to show the evidence of e-Maturity advancement in the 3 targeted standards by the end of the current academic year, and the department usually receives the results and e-Maturity reports at the beginning of the next academic year to start the cycle of self-evaluation, developing e-Maturity plans and distribution of tasks of collection of the evidence throughout the academic year.

The discussion of the content of these annual reports, besides the findings related to each case study of the 6 government schools, are presented in the following sub-section.

5.4 The Multiple-Case Study

5.4.1 UAE Cycle 2 Schools

This study targeted 3 cycle 2 schools, middle schools, amongst the total of 6 schools. The investigation showed that all 3 schools received an advanced rate of e-Maturity level by external evaluators (see Figure 24).

School Code	2021	2022
ScM01	Good	Very Good
ScM02	Very Good	Good
ScM03	-	Good

Figure 24. UAE Cycle 2 Schools e-Maturity Evaluation Score – Years 2021 and 2022

The ScM01 school showed advancement in progression towards the advanced e-Maturity level, when looking at the obtained scores of e-Maturity in years 2021 and 2022, from 'Good' to 'Very Good'. The factor that contributed to this progression was school leadership awareness and understanding of the SSTF and 5Es as e-Maturity evaluation tools. Yet both the principal and the academic official were aligned in the notion of a 'Grey area' when describing the SSTF standard. Though ScM01 provided evidence of advanced practices of e-Maturity in school, still there was demand from the school leadership to enhance the SSTF and 5Es for self-evaluation, performance evaluation and guidance purposes. The need of sustainable PD programmes on how to evaluate and implement these tools to impact the quality of teaching and learning practices was expressed as a solution by ScM01 leadership to overcome the 'Grey area' notion. The following quotes by P1 and A1 of ScM01 explain their 'Grey area' perceptions towards the 5Es and SSTF.

P1 said: *'It needs improvement… It is considered a grey area for evaluation, according to my own opinion, and I do not think there was appropriate training for us as school leaders to know exactly the description of each maturity stage, and it is also not clear in the SSTF framework, and they did not clarify it… either it needs a big improvement, or I need more training to understand it. It is either this dilemma or that… I feel that it is outdated, especially after the Corona pandemic'.*

A1 shared a similar view and specified the reason for improving the 5Es e-MM by stating, *'It is a grey area, and there are many similar things… If teacher shifted from Exchange level to Extend and Empowerment, we see it, but there is no exact measures or criterion that determines where this teacher exactly reached and where this student has reached… in which stage, so it needs improvement'.*

The discrepancy in findings related to this school was evident in the e-Maturity report for 2021 in which one statement mentioned that the e-Maturity vision in this school was a strength point and then in another statement it was stated as a need of improvement area which also presented as an unclear statement for

school leadership. The following year, 2022, the annual e-Maturity report for ScM01 only provided 2 recommendations which this school needed to support innovation, excellence and quality of e-Maturity programmes, and consider special needs learners without setting practical examples of how to implement such recommendations.

ScM01 school leadership suggested the need of improvement and alignment of both the 5Es e-MM and the SSTF due to the aspect of discrepancy occurring, besides the 'Grey area' rationale, that was noticed by school leadership and some teachers. Aside from the annual e-Maturity recommendations and need improvement areas for ScM01, the school leadership and teachers perceived the following as their core missions and roles to achieve a high level of e-Maturity:

- sharing practice and continuous professional development programme,
- providing feedback and follow up performance,
- continuous usage of the educational platforms,
- increase of online activities, and
- encourage learners to adopt independent learning skills.

The ScM02 showed reversed performance from 'Very Good' in 2021 to 'Good' in 2022 in e-Maturity annual reports. Though the 2021 report showed strengths in school leadership and e-Maturity initiatives and programmes, in the 2022 report ScM02 was criticised mainly because of the nature of evidence submission, i.e., 'not arranged' and 'not organised properly'. Similarly, as mentioned in the ScM01 2022 report, 'lack' of innovation and exceptionalism' in the school e-Maturity initiatives was a need of improvement area. Added to that there was a recommendation from external evaluators for ScM02 to raise collaboration and sharing of e-Maturity practices to extend outside the school community to reach a cluster level.

The ScM02 school leadership when asked about their perceptions of the 5Es and SSTF effectiveness surprisingly answered they were effective despite the fact that their e-Maturity score declined due to 'Un Clarity' of evidence submitted.

P2 in ScM02 said: *'It has an impact, and we noticed a difference in the level of performance of teachers and students.*

A2 stated: *'We noticed that the existing frameworks have enhanced the students' skills which is because of the teacher efforts… I see that the e-MMs and framework served us in working to reach the highest levels of maturity… we have reached the Enrichment level… we need to reach higher level… there is a clear difference for everyone'.*

Though ScM02 school leadership perceived the 5Es and SSTF as effective, still they could see the discrepancy between their internal self-evaluation and the external evaluation annual reports. Teachers stated 'yes there is discrepancy' by 20% and 'sometimes' there by 35%, whilst the other 45% of teachers selected there was no discrepancy. The school principal's answer was 'yes' whilst the academic official's answer was 'sometimes'. This showed the split status of the school community towards the e-Maturity annual result of their school.

The ScM02 schoolteachers and leadership shared the following as their roles towards advancement of e-Maturity level in their school:

- exchange and share the best practices to support professional development,
- usage of different educational platforms and digital resources,
- follow up performance through observation of classroom practices for development purposes,
- continuous encouragement and motivation of learners to use technology,
- continuous follow up to discuss teachers' e-Maturity level, and
- provide needed support and effective digital environment.

The ScM03 only received the 2022 report in which they gained 'Good' as their e-Maturity level. In the report, the discrepancy between statements in the report was evident when 'school implemented initiatives were shared inside and outside the school community' was mentioned as a strength area and then it was suggested later as the only area of improvement.

When ScM03 school leadership was asked about the effectiveness of the 5Es as the e-MM and SSTF as a maturity framework, both members agreed that these tools were in need of improvement.

P3 said: *'the frameworks and standards that were set in advance are effective, but we need to improve and develop these models and the framework to suit the current situation… after the Corona pandemic ended, the situation changed completely, whether for the student or for the teacher, so it needs some adjustments'.*

A3 said: *'certainly it is effective for digital transformation, but it is subject to change… we transformed remotely, and it had frameworks and had its methods, but now we are returning to reality, so we need to develop some mechanisms and develop some items in line with the current time'.*

Surprisingly, ScM03 school leadership did not perceive discrepancy between school e-Maturity self-evaluation and the external evaluation. In ScM03, the majority of teachers believed that there was discrepancy by 25% of teachers who stated 'yes' and nearly 40% of them stated 'sometimes', leaving 35% of teachers who believed there was no discrepancy. These different percentages amongst teachers that were opposite to the affirmation of school leadership (that there was no discrepancy between internal e-Maturity evaluation and the external annual report) reveals the different stances towards external evaluation between school stakeholders.

ScM03 leadership and teachers shared the following practices as their roles towards raising the e-Maturity levels of their school:

- continuous professional development programmes,
- usage of educational platforms and technology to accomplish activities, and
- encourage the learners to engage effectively.

5.4.2 UAE Cycle 3 Schools

This study targeted 3 cycle 3 secondary schools which showed slightly lower performance than the selected cycle 2 schools (see Figure 25). One school scored 'Satisfactory' in an e-Maturity level. Only one school gained 2 consecutive annual reports which provided a comparison of the nature of 2 annual reports but relying only on one school.

School Code	2021	2022
ScS01	-	Satisfactory
ScS02	-	Good
ScS03	Good	Very Good

Figure 25. UAE Cycle 3 Schools e-Maturity Evaluation Score – Years 2021 and 2022

The ScS01 school received one e-Maturity evaluation report in 2022. The received score was 'Satisfactory' and that was the lowest e-Maturity scored report obtained for this study. The major strengths were mostly related to standard one 'Leadership', i.e., monitoring through regular development reports, the organisation of historical data of e-Maturity progression over years, the encouragement of parents' communication, and the support of professional development of staff. The need of improvement points linked to almost all 3 standards in the SSTF besides the statement of 'Lack clarity' was dominant in the report. Interviewing the school leadership and analysing the data collected from school stakeholders made two assumptions as possible explanations for achieving such a low e-Maturity score. The first assumption is that ScS01 did not present their evidence in more detail or in an organised approach due to internal

circumstances, i.e., vacancies in school leadership, which I noticed when introduced to this school, with associated lack of documentation skills. The second assumption is that the school might have lacked awareness of what to implement to progress in an e-Maturity level. The ScS01 e-Maturity report pointed out the areas that required future attention to be improved, yet the report was descriptive in nature and lacking the practical guidance that might assist in developing processes and planned initiatives for developing e-Maturity levels.

When ScS01 school leadership was asked about the effectiveness of the 5Es and SSTF for e-Maturity evaluation, the answer was they both 'Need Improvement'. P4 said: *'yes it has an impact and things in it are clear and excellent, but there are aspects that need to be clarified, reformulated and in need of new additions… because these tools are used for two to three years… we must clarify more and go deeper… or rather filtering of some items in order to be clearer… for the student for the teacher or even for the guardian so that they are with us'.* A4 only referred to the SSTF by saying: '*In general the DT framework is well established with all standards, but some criteria enable or hinder the other criteria for example the digital infrastructure'.*

When ScS01 participants were asked about the discrepancy between the internal self-evaluation and the external annual evaluation, 41.6% of teachers confirmed 'Yes' there is discrepancy which aligned with their school principal perception, whilst 37.5% stated that 'sometimes there is discrepancy', leaving 20.8% of teachers with 'No' discrepancy. Responses reflected the status of confusion towards the internal and external evaluations which might hinder the clarity of ScS01's actual e-Maturity level.

The ScS01 shared perceived roles of school leadership and teachers towards e-Maturity advancement, which were mainly evolved around these practices:

- active usage of educational platforms,
- encouragement and motivation of learners to use technology, and
- the raising of digital skills in the school community.

The ScS02 school received one e-Maturity report in 2022 and gained the score 'Good' in an e-Maturity level. Based on the evidence provided, the report mentioned a few strength points that for the most part were related to leadership practices, i.e., the inclusiveness of the e-Maturity initiatives, distribution of responsibilities amongst the team, and measurement of the impact through results analysis. The need of improvement areas where mainly related to three repetitive statements in the 2022 report that were the lack of clarity of the procedures leading to e-Maturity advancement, absence of innovation and excellence in the culture of school e-Maturity initiatives, and the lack of participation and dissemination of initiatives outside the school community.

When ScS02 school leadership was asked about the effectiveness of the 5Es e-MM and SSTF for DT of school education, P5 said: *'may need improvement in some elements'* whereas A5 provided an irrelevant answer, even though the question was clarified.

The ScS02 school leadership and 25% of teachers confirmed that there was discrepancy between internal and external e-Maturity evaluation results. The majority of teachers, around 50%, stated that sometimes there was discrepancy, leaving 35% of the teacher community with 'No' discrepancy as an answer.

The ScS02 internal stakeholders' perceptions of their roles to achieve an advanced level of e-Maturity towards achieving DT were:

- continuous professional development through sharing practices and exchange of experience,
- search for new trends and practices, and
- continuous follow-up and regular usage of educational platforms.

The ScS03 school was the only secondary school that shared the 2 consecutive e-Maturity reports of the years 2021 and 2022. There was progress in the e-Maturity score from 'Good' in 2021 to 'Very Good' in 2022. The ScS03 strength areas were mostly related to learners' digital capabilities and adoption of technology to innovate and conduct research. School leadership also showed

strong practices in areas related to stakeholders' engagement in online communities and the execution of effective professional development programmes. The need of improvement areas, like ScS02, was mainly related to the repetitive recommendations of the 2022 e-Maturity report; the adoption of innovation in e-Maturity initiatives, and dissemination of school best e-Maturity practices.

Regarding the 5Es and SSTF effectiveness, ScS03 leadership suggested the modification of these instruments and shared the following responses:

P6's response was concentrated on the 5Es, saying that: '*from my point of view, it needs to be modified… how does a teacher reach with his students to digital maturity? The idea was very difficult for teachers… how can we reach empowerment stage with our students while we know that the curricula do not help and that time does not help us… we directed the teachers that the stage of empowerment basically cannot be achieved in every class… for me if the teacher during one semester can deliver one class that empower students this in itself is considered an achievement because the standards of empowerment is very high… it is difficult to achieve empowerment stage in one class as it needs number of classes… we attend part of each class and evaluate until we reach the highest level, which is empowerment'.*

A6's response concentrated on SSTF, saying: *'sometimes we notice that the criteria are repeated, we notice that they do not measure the real situation, if the criteria were more clear will be better… the focus of documentations was more on the initiatives. If the focus was on the clarity of these initiatives'.* Participant A6 had a different view from P6 in the description of 5Es' clarity by saying: *'for e-Maturity model: Clear, as the levels of substitution to empowerment are very clear'.*

ScS03 had various stances regarding the notion of discrepancy between the internal and external e-Maturity evaluation results. Surprisingly, the principal and academic official shared different perceptions in this aspect. The academic official and the majority of teachers, about 43.7%, perceived 'No' discrepancy in

the result of both e-Maturity evaluation methods, whereas the school principal and 37.5% of teachers stated that sometimes there was discrepancy, and that left 18.7% of teachers stating 'yes' there was discrepancy.

ScS03 participants' perceptions of their roles towards achievement of an advanced e-Maturity level and DT were as follows:

- increase awareness about digital maturity,
- concentrate on professional development programmes,
- promoting the individual learning skills,
- usage of educational platforms, and
- emphasising problem solving and thinking skills.

There are several similarities between the targeted schools in the perceptions of their roles towards e-Maturity advancement and DT (see Table 35).

Table 11. Perceptions of School Staff Roles Towards e-Maturity Advancement and DT

Roles	ScM01	ScM02	ScM03	ScS01	ScS02	ScS03
Usage Educational Platforms	X	X	X	X	x	x
PD	X	X	X	-	x	x
Learner Engagement & Encouragement	X	X	X	X	-	x
Follow up Performance	X	X	-	-	x	-
Promote learners' skills	X	-	-	X	-	x

Looking at perceptions of roles in the Table 35, the 'Usage of Educational Platforms' was perceived as a highly pertinent role from participants in all targeted schools. After that, 'PD' and 'Learner Engagement and Encouragement' were considered the second most pertinent roles from participants' perceptions.

The third role was to ensure progression through 'Follow up Performance' and 'Promote Learners' Skills'. Table 35 shows that ScM01, ScM02 and ScS03 selected almost all perceptions of roles, and at the same time ScM01 and ScS03 received the advanced score for schools in their e-Maturity annual reports of 2022 as they gained 'Very Good' that year. This conclusion leads us to consider a link between perceptions of roles and the progression in e-Maturity level. If school stakeholders' perceptions of their roles match the expected practices in each e-Maturity standard stated in the e-MM or in the DT framework, it appears that the school may more likely progress in e-Maturity practices and DT mission.

5.4.3 The External Evaluation Versus the Internal Evaluation

Comparing the responses of both the external and internal evaluators, 100% of the external evaluators explained the SSTF and its 6 standards in details, with examples to clarify them. Of the internal evaluators, 66.6% of principals described the SSTF and its 6 standards with examples in more detail and with a more comprehensive approach than the academic officials, while only 33.3% of them gave comprehensive descriptions of SSTF standards. Regarding the e-MM and the 5Es, 50% of external evaluators described them with examples, whilst the remaining external evaluators only mentioned them within their description of the SSTF in general. For the school principals, like the external evaluators, only 33.3% of them explained the 5Es, whilst much clearer and detailed knowledge about 5Es was given by 66.6% of academic officials. This showed a generic perspective and approach of detecting the e-Maturity level of a school at a whole that is shared mostly by external evaluators and principals, whereas the academic officials were more focused on e-MMs and evaluation of teaching and learning practices with guidance of the 5Es model. This notion was also backed up when studying the e-Maturity reports, which emphasised mostly on standard one - the leadership.

All the external evaluators agreed on developing mainly the SSTF, and only one external evaluator stated the need to add to the stages of 5Es. In addressing the perceptions of the effectiveness of the SSTF and E5s, External 1 stated: *'I think the model should be modified in accordance with the general framework'.* On the

other hand, External 2 shared the following view: *'I believe that it needs development and improvement, especially in the field of technology after Corona… certainly, we need to reconsider all the tools that we developed previously, because the world is changing in the field of technology'.* The External 3 said: '*Yes the framework needs to be improved… the period of the pandemic focused on important points and supports that showed the weaknesses in the framework itself… there are new things that can be added to it so that the framework itself is appropriate for the existing era, especially after the pandemic… SSTF created in 2017 and not yet widely understood by educational community and by the time school get grasp of it the Corona Virus invasion changed the situation'.* External 4 stated the following view: *'there is no doubt that the tools always need improvement, especially after Corona, which hastened the application of the electronic system… what I think needs to be improved is the skills of the people who apply these frameworks, whether in terms of evaluators or users'.*

5.5 Discussion of Major Results

5.5.1 Effectiveness of SSTF and 5Es

STF and the 5Es e-MMs are recognised as effective instruments for guiding schools toward digital transformation however, significant challenges are encountered in self-review and performance evaluation. These challenges arise primarily due to the lack of clarity in applying certain standards of the 5Es model. The stages of e-Maturity, from Exchange (basic use of technology) to Empower (high-level innovation), were found difficult to measure uniformly, making it hard for schools to achieve higher levels consistently.

In relation to the local literature, Efstratopoulou et al.'s (2022) study found that teachers, while generally positive about the SSTF, highlighted a need for ongoing and practical professional development to help align practices with the framework. They also noted that some students, particularly those from disadvantaged backgrounds, struggled with achieving the educational goals outlined by the SSTF due to resource limitations and digital competencies.

5.5.2 Difficulty of Implementation

The major results reveal that achieving higher e-Maturity levels, such as “Extend” or “Empower”, is difficult, when there are varied levels of digital competency among teachers and learners. Evaluating e-Maturity based on formal observations alone was found to be insufficient, because it did not capture features of continuous progress required for moving towards digital transformation. To address this, regular follow-ups, informal tracking, and self-reflection were suggested as more effective methods of evaluation. This connects with Efstratopoulou et al. (2022) who also noted that evaluation systems need to be ongoing and using varied approaches, with input from teachers about the practicality of current evaluation methods.

5.5.3 Post-Covid-19 Pandemic Expectations

The pandemic highlighted the importance of flexible, technology-driven learning environments. The major results suggest that practices in the Covid-19 pandemic period forced schools to rethink their approaches to education, underscoring the need for learners to develop independent learning skills and for teachers to adopt innovative instructional methods. The Ministry of Education in the UAE responded by expanding the use of platforms like Alef and introducing additional digital resources to support online education. This is in line with Efstratopoulou et al. (2022), who also identified the pandemic as a turning point that accelerated the need for independent, self-regulated learning. Their study noted that both teachers and students had to adapt quickly to these new demands, and that there was a push for more creative, effective use of technology in teaching.

5.5.4 Long-Term Studies of e-MMs and Frameworks

Over time, studies of e-MMs and frameworks show that they are beneficial for guiding schools towards digital transformation. However, research in this area is still limited. Long-term investigations should focus on gathering feedback from school stakeholders, studying the effectiveness of teaching practices, and exploring the impact of professional development programmes.

The local literature supports this, as Efstratopoulou et al. (2022) also emphasised the need for continuous feedback and professional development, suggesting that peer support systems could help sustain long-term improvements in teaching and learning. Additionally, both the local and major results in this study call for case study investigations to better understand the practical applications of these frameworks in diverse school settings.

5.5.5 Measurement of e-MMs and Frameworks Impact

The impact of e-MMs and frameworks is more evident in schools with higher levels of digital infrastructure. The major results state that there is a clear progression in digital skills in schools that invest in technology, but when it comes to e-pedagogy and personalised learning, the evidence is less clear. The emphasis on achieving high e-Maturity often shifts the school's focus on supporting individual teaching practices to reviewing the school's overall performance.

This discrepancy between objectives and outcomes is also noted in the local literature, where Efstratopoulou et al. (2022) discuss the need for clearer guidelines and actionable plans to bridge the gap between the strategic objectives of the SSTF and actual classroom practices.

5.5.6 Strategic Objectives and Applications

The SSTF and 5Es models are designed to provide strategic guidance for schools, but there is a discrepancy between the strategic level and practical application in daily teaching. External evaluators often find a "grey area" when interpreting how these frameworks should be applied, and internal evaluators have highlighted the importance of aligning the SSTF with real-world classroom scenarios.

In Efstratopoulou et al. (2022), teachers also expressed frustration with the lack of detailed guidance on how to implement the SSTF in a way that directly impacts their teaching practices. They recommended more peer collaboration and sharing of best practices to help bridge this gap.

5.5.7 Connection with Wider Literature

The challenges identified in both the major results and local literature are consistent with findings from wider educational research. Anderson and Krathwohl's (2001) revised taxonomy, which underpins the 5Es e-MM, emphasises the importance of higher-order thinking skills, but similar challenges of measuring and applying these competencies in diverse classroom settings have been reported globally. Additionally, studies like those by Becta (2004) in the UK have also highlighted the need for clear implementation guidelines when using digital frameworks in education, reinforcing the need for ongoing professional development and equitable resource distribution.

The shift towards independent learning and self-regulation post-Covid is aligned with global educational trends emphasising 21st-century skills such as critical thinking, collaboration, and digital literacy (OECD, 2019). These skills are now viewed as essential for preparing students for future challenges, further supporting the findings in both the major results and Efstratopoulou et al. (2022) that educational practices must evolve to meet these new demands.

The discussion of the major results of this study in alignment of other studies has highlighted the frameworks' effectiveness in guiding digital transformation in schools, while also identifying key challenges related to clarity, professional development, resource availability, and evaluation methods. The recommendations mentioned have emphasised a need for continuous PD, equitable resource distribution, and more practical, detailed guidance on how to achieve higher levels of e-Maturity within the UAE's diverse educational landscape.

The following section provides answers for the targeted research questions for this study, to guide the reader and researchers to the outcomes of this study's investigation that aim at contributing to local and global literature that are concerned with e-MMs and DT frameworks implications and applications in school education, mainly in teaching and learning practices.

5.6 Answers to Research Questions

This section addresses the research questions in relation to the availability and effectiveness of e-MMs and DT frameworks in UAE government schools, how school staff participate in digital transformation, and the impacts of these frameworks on teaching and learning practices. By investigating the adoption and implementation of e-MMs and frameworks in UAE schools, we can better understand the role of digital technologies in transforming education and advancing e-Maturity levels.

Q1. What are the available digital and educational technology resources in the UAE government schools?

a. Are these tools considered effective for digital transformation? How are they considered effective?

UAE government schools have access to a wide range of digital and educational technology resources that support the transformation toward smart schools. These resources are categorised as follows:

Resources provided by the MoE and ESE:

- **Devices**: Personal computers (PCs), internet access, smart boards, and interactive boards are provided to facilitate digital learning.
- **Systems**: Learning Management Systems (LMS), Student Information Systems (SIS), and e-Assessment tools are available for tracking school performance and data.
- **Content**: Platforms like the Alef educational platform offer e-Content for student learning.
- **Interaction Tools**: Online broadcast systems and interactive content support engagement between teachers and students.
- **Communication**: Email accounts for formal communication among teachers, students, and school stakeholders.

Resources provided by school stakeholders:

- **Content Creation**: Tools that allow for the creation of digital learning content.
- **Interaction**: Augmented Reality (AR) tools are available at the teacher's discretion for enhancing lessons.
- **Collaboration**: Social media and other e-channels are used for communication and collaboration.
- **Enrichment**: e-Libraries and multimedia resources allow for expanded learning and discovery opportunities.

Teachers and learners use these digital technologies in alignment with lesson objectives. Schools are equipped with essential infrastructure, providing almost all teachers and learners with PCs and internet access within school buildings. Key platforms such as the Alef Platform and LMS are regularly used for educational purposes, with teachers leveraging ICT tools to enhance engagement and meet curriculum goals. Learners use these tools to acquire knowledge, complete assignments, and develop digital skills, fostering both academic performance and digital fluency.

According to the research, 100% of school leaders and over 81% of teachers agreed that the available technologies were sufficient for DT. These tools were seen as effective when schools ensured access to necessary devices, internet connectivity, and educational platforms. They promoted e-Assessment and used ICT to improve communication among stakeholders. However, about 20% of teachers expressed occasional concerns, indicating that improvements in access and integration could further enhance effectiveness.

Q2. What are the adopted e-MMs and frameworks in the UAE government schools?

a. **What criteria or standards do they contain and why are these used?**
b. **How do school staff participate in the digital transformation to advance e-Maturity levels?**
c. **How do school staff perceive their roles in the development of e-Maturity in teaching and learning practices?**

Government schools in the UAE have adopted two frameworks to guide their DT efforts: the 5Es e-MM and the SSTF DT framework. The 5Es e-MM, based on Blows's (2009) e-Maturity metrics and the revised Bloom's Taxonomy, comprises five stages: Exchange, Enrich, Enhance, Expand, and Empower. This model focuses on deepening learning and boosting student engagement through technology integration. On the other hand, the SSTF as an e-Maturity transformation framework consists of six key standards that focus on: Leadership, Curriculum and resourcing learning, Learning, teachers and teaching, Student and family context, Assessment and student progress, and Operational provision and management —further divided into 19 sub-elements and 57 operational focal points. It aims to improve leadership, teaching practices, and school operations while advancing digital maturity.

The UAE MoE selected these models to align with global DT trends, modernize its educational system, and enhance learner outcomes. The launch of the MBRSLP in 2014 laid the foundation for implementing these frameworks, tailored to support national goals of educational excellence. The 5Es e-MM emphasizes practices that combine student engagement (Y-axis) with depth of learning (X-axis) across its five stages, aligning with the revised Bloom's taxonomy. Meanwhile, the SSTF provides a roadmap for principals, academic officials, and teachers to achieve advanced digital maturity, improve performance, and empower digital and critical thinking skills.

The selection of these detailed standards, sub-elements and operational focal points is firstly to guide and draw the road map for principals, academic officials and teachers to reach advanced digital maturity levels in implementation and usage of technologies in teaching and learning practices and other school

managerial services. The second purpose is to raise teachers' and learners' performances to gain better academic achievements and empower thinking and digital skills.

School leadership plays a crucial role in guiding the digital transformation process and advancing e-Maturity. Their involvement includes:

1. **Self-Evaluation**: At the start of the academic year, school leaders assess their school's current e-Maturity level based on the **SSTF** standards.
2. **Planning**: Based on self-evaluation results, school leaders develop plans, distribute responsibilities, and initiate professional development (PD) programmes to raise awareness of e-Maturity.
3. **Tracking**: Throughout the year, leadership monitors progress through formal and informal methods, capturing evidence on the implementation of digital maturity programmes and tracking learner performance.
4. **Submission of Evidence**: All evidence is compiled and submitted for external review, resulting in an annual e-Maturity report that helps guide future actions.

School principals focus on creating e-Maturity plans and distributing responsibilities, while academic officials are responsible for evaluating teaching and learning practices using the 5Es e-MM. They acknowledge the complexity of achieving higher levels such as "Extend" and "Empower", with most schools currently operating at the "Enrich" and "Enhance" levels. Teachers perceive that their main role to leverage DT and e-Maturity of school education is through encouraging the use of available technologies to foster individual and cooperative learning, advancing students' digital and academic skills.

Q3. What are the impacts of adoption of such e-MMs and frameworks on teaching and learning practices?

a. How are these impacts being measured?
b. Are e-Maturity evaluation processes in schools effective?

The adoption of the 5Es and SSTF has led to significant improvements in teaching and learning practices:

- **Increased awareness** among teachers and learners regarding the use of technology in education.
- **Enhanced learner digital skills** and **academic performance**.
- **Greater teacher involvement** in professional development communities.
- **Encouraged innovation** and creativity among learners.

Challenges include teachers' varying abilities to integrate technology effectively, and a lack of focus on optimising technology use for educational practices.

The impacts are measured through uses of several tools:

- **Classroom visits and evaluation forms** aligned with the 5Es.
- **Self-evaluation** using the SSTF.
- **Data from educational platforms** and internal tracking systems.
- **Learner grades and attainment analysis**.

Teachers favour self-reflection as the preferred method for evaluating their integration of technology, while school leadership prioritises external evaluations.

Q4. Are the adopted e-MMs and frameworks considered effective for digital transformation or do they require enhancements?

a. If they require enhancements, how can this be achieved?

Participants agreed that the frameworks are effective for digital transformation but suggested that enhancements are needed. The reasons include:

- The shift in educational strategies after Covid-19.
- The lack of clarity in day-to-day practices necessary for achieving higher e-Maturity levels.
- The **difficulty of implementing** all standards.
- The need for better alignment between the **SSTF and 5Es**.

Key recommendations for enhancement include:

- **Collaborative review** of the frameworks by stakeholders to refine evaluation instruments.
- **Learning from best practices** in the implementation of digital frameworks.
- **Continuous professional development** to empower stakeholders in understanding and applying the frameworks effectively.
- **Encouragement of research** and case studies for ongoing development and improvement of the frameworks.

5.6 Summing Up

The discussion chapter compares and contrasts the schools as case studies, the participants' roles towards school e-Maturity levels, the information collected from the school stakeholders and the annual reports of their e-Maturity. All in all, this discussion chapter has highlighted the major outcomes and results of this study investigation to answer the main guided questions. The impact of e-MMs and frameworks are evident mainly in those criteria that can be easily measured, such as the technology and users' advancement in using those available digital resources. Another clear implication is the adaptation of educational strategies that focus on learners as the centre of educational processes. Teachers are focused on teaching and learning strategies that were aligned with learner-

centred approaches while using the educational platforms. The 5Es, from a pedagogical perspective, concentrated on the revised Bloom's taxonomy by Anderson and Krathwohl in 2001 and learners' engagement, with less concentration on 21st century skills and explanations of how to evaluate reaching each level within the scope of a classroom environment while classroom visits for formal evaluation are conducted. The SSTF focuses on digital skills of school stakeholders when practicing all related activities to leadership, teaching and learning, with a rubric that describes the status of the standards, whether a school is 'weak', 'satisfactory', 'good', 'very good' and 'outstanding' but lacking the alignment with the 5Es, e-MM and other e-pedagogy frameworks.

The next chapter is the conclusion, in which I summarise the overall investigation results of this study, relating to challenges and gaps that I encountered while investigating and analysing the information, data and documents. I offer also recommendations for future researchers, decision makers and educators who are interested in the field of usage and impact of e-MMs and frameworks on school education, with suggestions for future implementation of such tools in educational institutions.

Chapter 6

Conclusion

6.1 Chapter 6 Overview

This chapter summarises the investigation and outcomes of this study. It includes key findings, contribution to knowledge, gaps and challenges, limitations, and recommendations to guide future practices and research in school e-Maturity and Digital Transformation (DT) frameworks within UAE school education.

6.2 Research Findings

6.2.1 Contribution to Knowledge

This research fills an essential gap in understanding how e-MMs and DT frameworks operate within UAE schools, contributing to educational technology literature in several key ways:

1. **First Examination of e-MMs in UAE School Education**: This study is the first to evaluate the application of e-MMs and DT frameworks specifically within UAE government schools, establishing a foundation for future research in this area.
2. **Stakeholder Insights for e-MMs and Frameworks Development**: The study provides a detailed analysis of how UAE school leaders, teachers, and evaluators perceive e-MMs and DT frameworks, emphasising the need for more practical, operational guidance. This feedback is instrumental in refining these frameworks for greater efficacy in real-world educational settings.
3. **Advancing Digital Competency and Practice**: By documenting the progression of digital competencies among UAE educators and students, this study highlights the potential for these frameworks to positively influence teaching practices. However, it calls for additional, concrete evaluation methods to track and measure this impact comprehensively.
4. **Foundational Work for Long-Term Studies**: The study highlights the absence of long-term data on e-MMs and frameworks applications in schools,

laying a groundwork for longitudinal studies that can capture the full impact of these tools on school e-Maturity.

6.2.2 E-MMs and DT Frameworks in UAE government schools

This study has identified several new findings related to the use and implications of e-MMs and DT frameworks in UAE school education:

1. **Evaluation and Benchmarking Focus**: Literature and practice show that e-MMs and DT frameworks are generally used as evaluation tools to benchmark e-Maturity in schools. However, there is limited focus on assessing these frameworks' long-term implications for teaching and learning. Most participants view these tools as trends, roadmaps, or self-evaluation aids rather than as transformative aids in day-to-day practices.
2. **Need for Comprehensive Frameworks**: Available e-MMs and DT frameworks are often shared through national and governmental bodies (e.g., EU, UK, and UAE) for strategic planning. Yet, there is limited customisation or adaptation at the school level to make these frameworks operational and practical for internal stakeholders. School leaders and evaluators expressed a need for these frameworks to be enhanced, made more comprehensive, and better aligned with daily teaching and learning.
3. **Influence of Technology Investment on Teaching Practices**: Continuous investment in educational technology infrastructure, such as digital resources and educational platforms, has positively impacted teaching and learning practices. Access to these tools allows UAE schools to develop e-Maturity programmes tailored to stakeholder needs, facilitating both teaching preparation and student engagement.
4. **Growth in Digital Competency**: The study found that UAE teachers and learners have shown improved digital competencies, as observed by both internal and external evaluators. The progression in these competencies is apparent, though measurement data are not always documented in detail in annual reports. However, despite the increase in digital skills, some schools continue to report only a 'satisfactory' level in the SSTF.

5. **Shift Towards Learner-Centred Teaching Approaches**: Teachers are increasingly adopting learner-centred methods (e.g., active learning, flipped classrooms, gamification), acknowledging the need to engage students in digital learning activities. This shift aligns with goals for e-Maturity but requires further alignment with framework standards and pedagogical support.

These findings contribute valuable insights into the current state of school e-Maturity and DT in the UAE. They indicate a clear need for framework enhancement and an emphasis on digital competency and learner-centred teaching to support the UAE's educational transformation goals.

6.3 Gaps and Limitations

1. **Lack of Long-Term Studies on e-MMs and Frameworks**:

Current literature lacks comprehensive, long-term studies on the impact of e-MMs and DT frameworks on school education, both locally and internationally. Since Becta's research in the UK (disbanded in 2010), few studies have explored the enduring implications of e-MMs in educational contexts. This gap limits understanding of their long-term benefits or potential areas for improvement.

2. **Complexity in Data Collection and Analysis**:

The multi-layered nature of e-MMs and DT frameworks requires gathering data from diverse sources, from the Ministry of Education (MoE) to individual school stakeholders. This process demanded considerable effort to gain permissions, collect, and synthesise varied data. This challenge could be streamlined with larger collaborative research teams or a dedicated research agency.

3. **Language Barriers in Data Handling**:

All participants responded in Arabic for both the online survey and semi-structured interviews, and the school reports were also in Arabic. Translating and transcribing this information delayed the research process, introducing challenges in maintaining consistency and accuracy across translated

documents. Future studies may consider bilingual research support to mitigate such delays.

4. Limited Sample Size:

Only six schools were targeted due to geographic proximity and the expected volume of data analysis. Expanding the sample size in future research would provide a broader, more representative view of the UAE school community, enhancing the study's generalisability.

5. Limited Access to External Evaluators:

The transition from MoE governance to the Emirates Schools Establishment (ESE) in 2021 created a shift in personnel, limiting access to external evaluators. Only four external evaluators participated, all of whom had expertise in educational leadership and technology. Increasing this number in future research could offer more comprehensive perspectives on e-MMs and frameworks progressions in the UAE.

6.4 Recommendations

The following recommendations target different educational stakeholders that I believe play critical roles in sustaining and developing the UAE smart school education.

1. Decision Makers

The massive investment of the UAE government on educational initiatives such as MBRSLP and mission to transition to smart schools deserves additional investment on long-term studies for the purpose of development and capturing the lessons from current implementations, pitfalls and successful stories.

The recommendations that are discovered from findings of this study are related to ways of successfully investing the e-MMs and frameworks by adopting these practices:

- Overcome the discrepancy and lack of clarity aspects in the 5Es e-MM and SSTF
- Embrace and promote innovation as a culture in school environments to enhance teaching and learning practices with integration of technologies
- Offer continuous PD programmes mainly for school leadership and teachers on how to transfer the standards and elements in the e-MMs and frameworks to real practices
- Consider self-reflection as a tool of evaluating teachers' performance amongst other evaluation tools, since the majority of participant teachers perceived it as the most effective tool

2. UAE Schools and Educational Institutions

The recommendations and suggestions that could assist school leadership and managers of educational institutions in advancing the level of e-Maturity and succeed in their DT mission are:

- Encourage dialogues between school leadership and stakeholders to overcome the challenges of achieving quality and best performance of ICT investment in school education
- Showcase the successful and effective utilisation of the e-MMs and frameworks to promote best educational practices in adoption of educational technologies such as educational platforms for the purposes of raising learners' performance
- Build up communities of practice to exchange knowledge and expertise amongst school stakeholders, educational leaders and evaluators to bridge the gap of lack of awareness and clarity of the roles, responsibilities and effective practices

3. Future Studies

For future studies and for researchers who are interested in investigating e-MMs and frameworks for school education, my recommendation is to focus on these areas:

- Investigate the implications of e-MMs and frameworks on school education as they still lack attention and, for that reason, I encourage targeting various aspects related to that subject, i.e., learners' behaviour, attainment, academic progression, teaching strategies, etc.
- The collection of data for this research scope needs to start from local educational experts who contributed and witnessed the implications of e-MMs and frameworks, paying attention to sample size and data amounts, which were the main challenges I encountered.
- Adoption of long-term studies with a group of researchers is a suitable approach to conduct a study of implications of e-MMs and frameworks on school education. Collected data over time could explain the complexity of measuring the e-Maturity impact on school education and could lead to more detailed findings.

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Appendices

Appendix1: Factors Affecting Organisational Behaviour

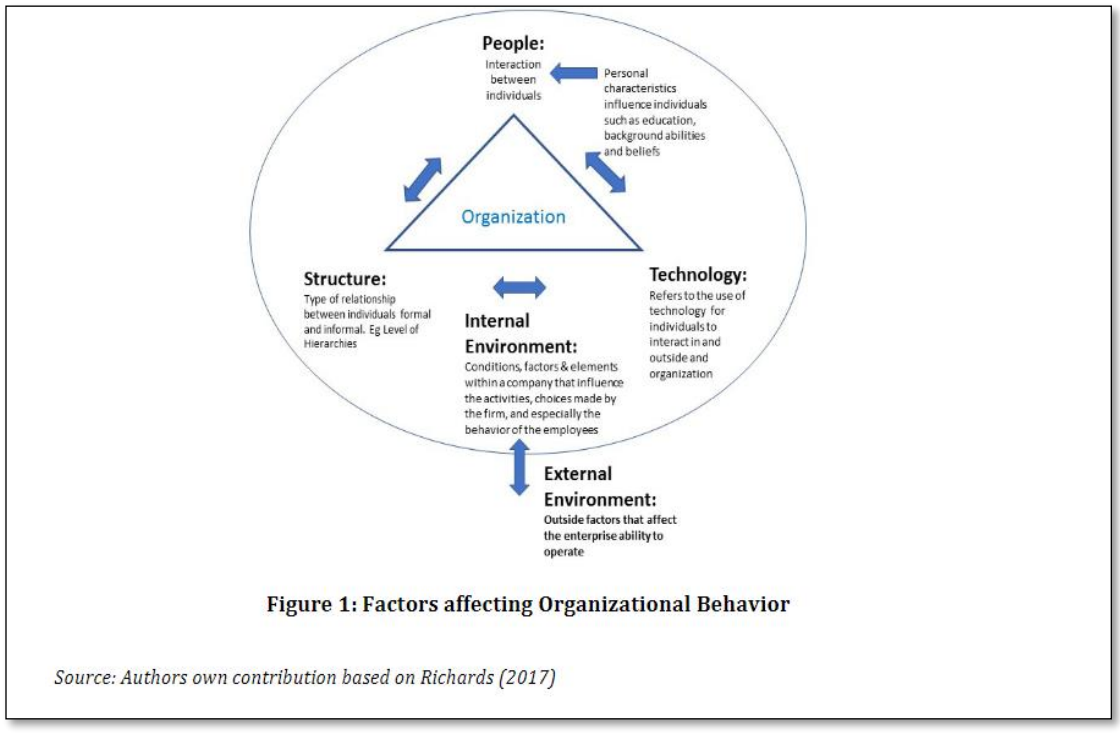


Figure 1: Factors affecting Organizational Behavior

Source: Authors own contribution based on Richards (2017)

Appendix 2: Table 1: Proposed e-MMs and DT Frameworks for School

#	Year	Region	Title or Researchers	Description
1	2004	UK	**Underwood & Dillon 'Maturity Modeling' evaluation framework**	Five dimensions: technology, curriculum, leadership and management, school staff, and linkage maturity. It is evaluated in five levels in the form of a rubric with descriptors.
2	2006	Europe Union	**European Schoolnet**	Compendium of standards and indicators of various education inspections under three dimensions: conditions, use and results. It establishes eight quality areas with their respective indicators. Four levels of achievement are assigned.
3	2006	UK	**Becta Self-Review Framework (SRF)**	Eight elements: leadership and management, curriculum, teaching and learning process, evaluation, teacher training, learning opportunities, resources and results.
4	2008	UK	**Model of Personalising of Learning**	ICT and the Personalising of Learning Model includes two major characteristics with other sub criteria: Behavioural and pshychological characteristics, and Technological characteristics
5	2013	Chile	**ICTE-MM / Solar, Sabattin & Parada**	It is based on several international standards (ISTE, UNESCO and TSSA). It establishes five dimensions: organization, infrastructures, administrators, teachers and students. The dimensions are divided into 25 areas and measured in five levels in a rubric form.
6	2014	UK	**NAACE**	It is a diagnostic tool consists of these six elements: leadership and management, use of ICT, teaching and learning, assessment of digital competence, teacher training and resources.

#	Year	Region	Title or Researchers	Description
7	2017	Croatia	**Digitally Mature School FDMS**	Consists of 5 elements: Planning, Management and Leadership, ICT in learning and teaching, Development of Digital competences, ICT Culture, ICT infrastructure. The model has benefited from 2 European e-Maturity Models: The DigCompOrg and eLearning Roadmap.
8	2017	European Union	**DigComOrg/ Redecker**	It is a school self-assessment model of the European Union. It is divided into 7 thematic elements, 15 sub-elements and 74 descriptors. The elements are leadership and governance, educational practices, professional development, assessment, curriculum, collaboration, and infrastructure.
9	2019	European Commission	**SELFIE**	It is a model of the European Union to know the digital potential of schools. It is based on a questionnaire for students, teachers and management team. A report is generated with the answers from which the school establishes priorities and an action plan.

Appendix 3: Table 2: Reviewed Becta Studies (2003 – 2010)

#	Year	Title
1	2003	Handheld computers (PDAs) in schools
2	2003	What the research says about using ICT in Maths
3	2004	An investigation of the research evidence relating to ICT pedagogy
4	2005	Tablet PCs in schools: Case study report: A report for Becta by the Open University
5	2006	E-maturity and School Performance - A Secondary Analysis of COL Evaluation Data Analysis Report
6	2007	Evaluation of ICT Test Bed Project
7	2007	Impact: Personalising Learning with Technology
8	2008	Emerging trends in serious games and virtual worlds
9	2008	Harnessing Technology Schools Survey
10	2008	Harnessing Technology: Next Generation Learning
11	2009	E_accesse, E_maturity, E_safety report: A learner survey
12	2009	Continuing Professional Development in ICT for Teachers: Literature Review
13	2009	The impact of digital technology
14	2009	Personalising Learning – Final Report
15	2010	Understanding the impact of technology Learner and School Level Factors
16	2010	The Impact of Technology: Value-Added Classroom Practice

Appendix 4: Three Major Dimensions of the e-Maturity Index

Infrastructure and Resources	Organisational Co-ordination and Workforce	Engaging the Learner
School 's pupil/computer ratio and pupil/interactive whiteboard ratio	Availability of subject- dedicated computers and interactive whiteboards for use in lessons	Rating of fitness for purpose of computers and interactive whiteboards
Rating of speed of school Internet connection	School's rating of how important a role ICT plays in teaching for different subjects	Frequency with which computer packages, Internet resources , and subject specific software are used in lessons
Proportion of computers linked to a network	Confidence of teachers in using ICT to deliver curriculum	Teacher rating of importance of ICT in teaching
How well current funding meets school's technical support and training needs	Proportion of lesson planning done using digital resources	Pupil access to ICT resources outside of lessons

Appendix 5: Dimension 1: Infrastructure and Resources

Dimensions **and Survey Questions**	**Scoring**
Infrastructure and Resources	
Pupil: Computer (desktop+laptop) ratio Pupil: interactive whiteboard ratio	For each ratio 1=schools in tertile with highest pupil:resource ratio 2= schools in middle tertile 3= schools in tertile with lowest pupil:resource ratio Final score = averaged score over 2 ratios
How would you rate the school's internet connection in terms of speed? - Fast enough for all or most of our requirements - Fast enough for some of our requirements - Not fast enough for our requirements	1= not fast enough 2 = fast enough for some 3 = fast enough for most/all
How many computers in the school are linked to a network? - All - More than half - Around half - Less than half - None	1= none/less than half 2= around half/more than half 3 = all
How well do current levels of funding meet the school's needs for technical support and training? - More funding than we need - About the right amount of funding - Less funding than we need	1=less than need 2 = about right 3=more than need

Appendix 6: Dimension 2: Organisational Co-Ordination

***Dimensions* and Survey Questions**	**Scoring**
Organisational co-ordination	
How important a role would you say ICT plays in teaching at your school for the following? – Very important - Quite important - Not very important - Not at all important	Each subject in each key stage scored so: 1= not very/at all 2=quite 3=very Final score = averaged scores for maths, English and science at KS2 (primary) and KS4 (secondary)
Question asked of different key stages and subjects Overall, how confident would you say teachers at the school are in the use of ICT in delivering the school curriculum? - Very confident - Quite confident - Not very confident - Not at all confident	1= Not very/at all 2= quite 3= very
In planning the content of lessons for your subject proportionately how much use is made of digital resources (e.g. web-based content, software packages)?	For each teacher scored so: 1=<25% 2=25-49% 3=50% or more Final score = averaged scores for teachers of 3 core subjects
Which of the following resources are available for use in lessons for your subject? Desktop computers, laptops, interactive whiteboards - Dedicated resources available for subject - Only shared resources available for subject - Not available	Each resource scored so: 1= not available 2=shared 3=dedicated for subject Final score= averaged scores across 3 resources

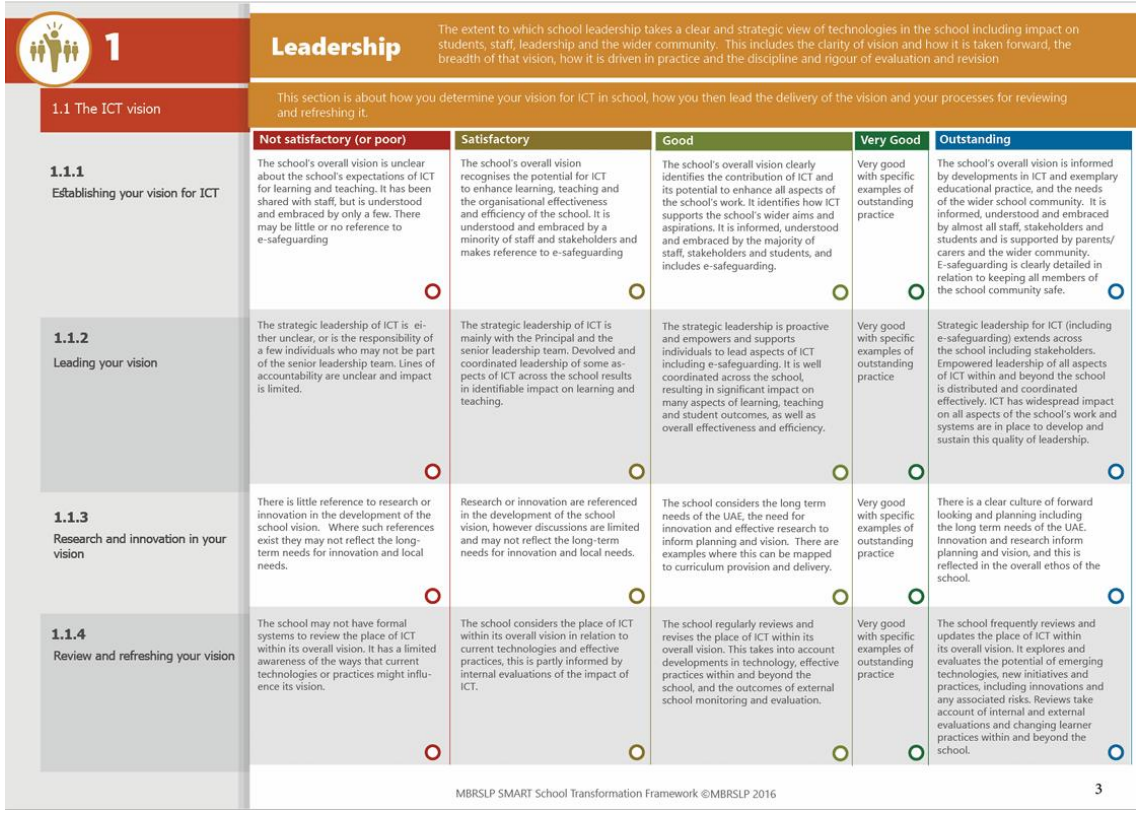
Appendix 7: Dimension 3: Engaging the Learner

***Dimensions* and Survey Questions**	**Scoring**
Engaging the Learner	
For each available please rate the fitness for purpose of resources available Desktops, laptops, interactive whiteboards - Very good - Quite good - Not very good - Not at all good - Not available	Each resource scored so: 1=not good/not available 2= quite good 3=very good Final score = averaged scores across 3 resources
How frequently are the following resources used in lessons for your subject? Computer packages, Internet based resources, subject specific software applications - In all/most lessons - In more than half of lessons - In around half of lessons - In less than half of lessons - Rarely/never - Not available	Each resource scored so: 1= rarely/not available 2= less than half of lessons 3= half or more Final score = averaged scores across 3 resources
How important a role does ICT play in teaching and learning for your subject? - Very important - Quite important - Not very important - Not at all important	1 = not very/ at all 2= quite 3=very Question asked of all Key Stages Look just at KS2 for primary and KS4 for secondary
Are ICT facilities available for pupil use outside lessons in any of the following ways? - Breakfast clubs - Lunchtime clubs - After-school clubs - Informal access before school - Informal access at lunchtimes/breaks - Informal access after school - None of these	Access divided into formal (clubs) and informal. For each score: 1= none 2= at least one 3 = all three Final score = averaged score across 2 types of access.

Appendix 8: Table 3: 21st century Skills Frameworks

21st century skills frameworks	Year	Details
EnGauge 21st century skills	2003	Digital age literacy (basic, scientific, economic, technological, visual, information, multicultural literacy, global awareness), inventive thinking (adaptability, managing complexity, self- direction, curiosity, creativity, risk taking, higher-order thinking and sound reasoning), effective communication (teaming and collaboration, interpersonal skills, personal, social and civic responsibility, interactive communication), high productivity (prioritizing, planning and managing for results, effective use of real world tools, ability to produce relevant high quality products)
OECD (DeSeCo)	2005	Using tools interactively (language, symbols, texts, knowledge, information, technology), interacting in heterogeneous groups (relate well to others, co-operate, work in teams, manage and resolve conflicts), acting autonomously (act within the big picture, form and conduct life plans and personal projects, defend and assert rights, interests, limits and needs)
European Parliament and Council	2006	Communication in the mother tongue, communication in foreign languages, mathematical competence and basic competences in science and technology, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, cultural awareness and expression.
The P21 Framework for 21st Century Learning	2007	Learning and motivation skills: creativity, critical thinking, problem solving, communication, collaboration Information, Media and Technology Skills: information, media, communication and technology literacy Life and Career skills: flexibility, adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility
ATC21S	2012	Ways of thinking (creativity and innovation, critical thinking, problem solving, decision making, metacognition), tools for working (information literacy, ICT literacy), ways of working (communication, collaboration) and ways of living in the world (local and global citizenship, life and career, personal and social responsibility, cultural awareness)
UNESCO (LMTF)	2013	Physical well-being (physical health and hygiene, food and nutrition, physical activity, sexual health), social and emotional skills (social and community values, civic values, mental health and well-being), culture and the arts (creative arts, cultural knowledge, self and community identity), literacy and communication (oral fluency and comprehension, reading fluency and comprehension, receptive and expressive vocabulary, written expression and composition), learning approaches and cognition (persistence and attention, cooperation, autonomy, knowledge, comprehension, application, critical thinking), numeracy and mathematics (number concepts and operations, geometry and patterns, mathematics application), science and technology (scientific inquiry, life science, physical science, earth science, awareness and use of digital technology)

Appendix 9: SSTF Standard 1 Leadership



1 Leadership

The extent to which school leadership takes a clear and strategic view of technologies in the school including impact on students, staff, leadership and the wider community. This includes the clarity of vision and how it is taken forward, the breadth of that vision, how it is driven in practice and the discipline and rigour of evaluation and revision

1.1 The ICT vision

This section is about how you determine your vision for ICT in school, how you then lead the delivery of the vision and your processes for reviewing and refreshing it.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
1.1.1 Establishing your vision for ICT	The school's overall vision is unclear about the school's expectations of ICT for learning and teaching. It has been shared with staff, but is understood and embraced by only a few. There may be little or no reference to e-safeguarding	The school's overall vision recognises the potential for ICT to enhance learning, teaching and the organisational effectiveness and efficiency of the school. It is understood and embraced by a minority of staff and stakeholders and makes reference to e-safeguarding	The school's overall vision clearly identifies the contribution of ICT and its potential to enhance all aspects of the school's work. It identifies how ICT supports the school's wider aims and aspirations. It is informed, understood and embraced by the majority of staff, stakeholders and students, and includes e-safeguarding.	Very good with specific examples of outstanding practice	The school's overall vision is informed by developments in ICT and exemplary educational practice, and the needs of the wider school community. It is informed, understood and embraced by almost all staff, stakeholders and students and is supported by parents/ carers and the wider community. E-safeguarding is clearly detailed in relation to keeping all members of the school community safe.
1.1.2 Leading your vision	The strategic leadership of ICT is either unclear, or is the responsibility of a few individuals who may not be part of the senior leadership team. Lines of accountability are unclear and impact is limited.	The strategic leadership of ICT is mainly with the Principal and the senior leadership team. Devolved and coordinated leadership of some aspects of ICT across the school results in identifiable impact on learning and teaching.	The strategic leadership is proactive and empowers and supports individuals to lead aspects of ICT including e-safeguarding. It is well coordinated across the school, resulting in significant impact on many aspects of learning, teaching and student outcomes, as well as overall effectiveness and efficiency.	Very good with specific examples of outstanding practice	Strategic leadership for ICT (including e-safeguarding) extends across the school including stakeholders. Empowered leadership of all aspects of ICT within and beyond the school is distributed and coordinated effectively. ICT has widespread impact on all aspects of the school's work and systems are in place to develop and sustain this quality of leadership.
1.1.3 Research and innovation in your vision	There is little reference to research or innovation in the development of the school vision. Where such references exist they may not reflect the long-term needs for innovation and local needs.	Research or innovation are referenced in the development of the school vision, however discussions are limited and may not reflect the long-term needs for innovation and local needs.	The school considers the long term needs of the UAE, the need for innovation and effective research to inform planning and vision. There are examples where this can be mapped to curriculum provision and delivery.	Very good with specific examples of outstanding practice	There is a clear culture of forward looking and planning including the long term needs of the UAE. Innovation and research inform planning and vision, and this is reflected in the overall ethos of the school.
1.1.4 Review and refreshing your vision	The school may not have formal systems to review the place of ICT within its overall vision. It has a limited awareness of the ways that current technologies or practices might influence its vision.	The school considers the place of ICT within its overall vision in relation to current technologies and effective practices, this is partly informed by internal evaluations of the impact of ICT.	The school regularly reviews and revises the place of ICT within its overall vision. This takes into account developments in technology, effective practices within and beyond the school, and the outcomes of external school monitoring and evaluation.	Very good with specific examples of outstanding practice	The school frequently reviews and updates the place of ICT within its overall vision. It explores and evaluates the potential of emerging technologies, new initiatives and practices, including innovations and any associated risks. Reviews take account of internal and external evaluations and changing learner practices within and beyond the school.

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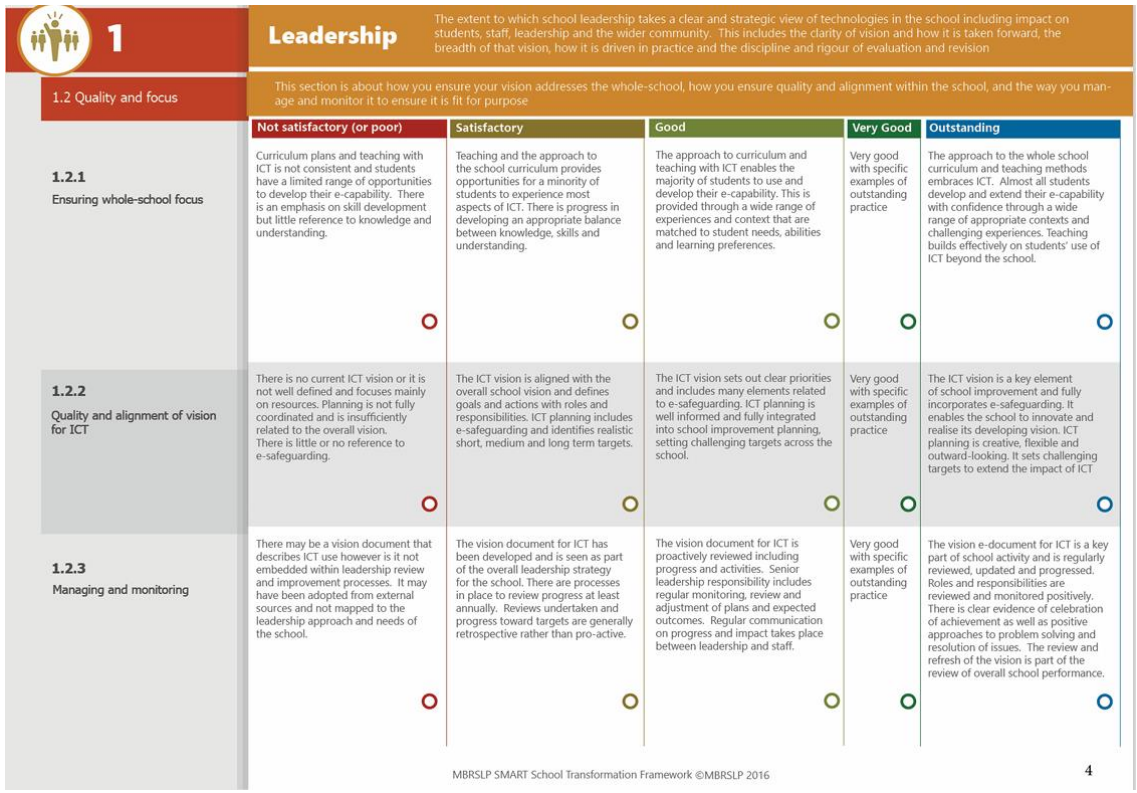

1 Leadership

The extent to which school leadership takes a clear and strategic view of technologies in the school including impact on students, staff, leadership and the wider community. This includes the clarity of vision and how it is taken forward, the breadth of that vision, how it is driven in practice and the discipline and rigour of evaluation and revision

1.2 Quality and focus

This section is about how you ensure your vision addresses the whole-school, how you ensure quality and alignment within the school, and the way you manage and monitor it to ensure it is fit for purpose

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
1.2.1 Ensuring whole-school focus	Curriculum plans and teaching with ICT is not consistent and students have a limited range of opportunities to develop their e-capability. There is an emphasis on skill development but little reference to knowledge and understanding.	Teaching and the approach to the school curriculum provides opportunities for a minority of students to experience most aspects of ICT. There is progress in developing an appropriate balance between knowledge, skills and understanding.	The approach to curriculum and teaching with ICT enables the majority of students to use and develop their e-capability. This is provided through a wide range of experiences and context that are matched to student needs, abilities and learning preferences.	Very good with specific examples of outstanding practice	The approach to the whole school curriculum and teaching methods embraces ICT. Almost all students develop and extend their e-capability with confidence through a wide range of appropriate contexts and challenging experiences. Teaching builds effectively on students' use of ICT beyond the school.
1.2.2 Quality and alignment of vision for ICT	There is no current ICT vision or it is not well defined and focuses mainly on resources. Planning is not fully coordinated and is insufficiently related to the overall vision. There is little or no reference to e-safeguarding.	The ICT vision is aligned with the overall school vision and defines goals and actions with roles and responsibilities. ICT planning includes e-safeguarding and identifies realistic short, medium and long term targets.	The ICT vision sets out clear priorities and includes many elements related to e-safeguarding. ICT planning is well informed and fully integrated into school improvement planning, setting challenging targets across the school.	Very good with specific examples of outstanding practice	The ICT vision is a key element of school improvement and fully incorporates e-safeguarding. It enables the school to innovate and realise its developing vision. ICT planning is creative, flexible and outward-looking. It sets challenging targets to extend the impact of ICT
1.2.3 Managing and monitoring	There may be a vision document that describes ICT use however is it not embedded within leadership review and improvement processes. It may have been adopted from external sources and not mapped to the leadership approach and needs of the school.	The vision document for ICT has been developed and is seen as part of the overall leadership strategy for the school. There are processes in place to review progress at least annually. Reviews undertaken and progress toward targets are generally retrospective rather than pro-active.	The vision document for ICT is proactively reviewed including progress and activities. Senior leadership responsibility includes regular monitoring, review and adjustment of plans and expected outcomes. Regular communication on progress and impact takes place between leadership and staff.	Very good with specific examples of outstanding practice	The vision e-document for ICT is a key part of school activity and is regularly reviewed, updated and progressed. Roles and responsibilities are reviewed and monitored positively. There is clear evidence of celebration of achievement as well as positive approaches to problem solving and resolution of issues. The review and refresh of the vision is part of the review of overall school performance.

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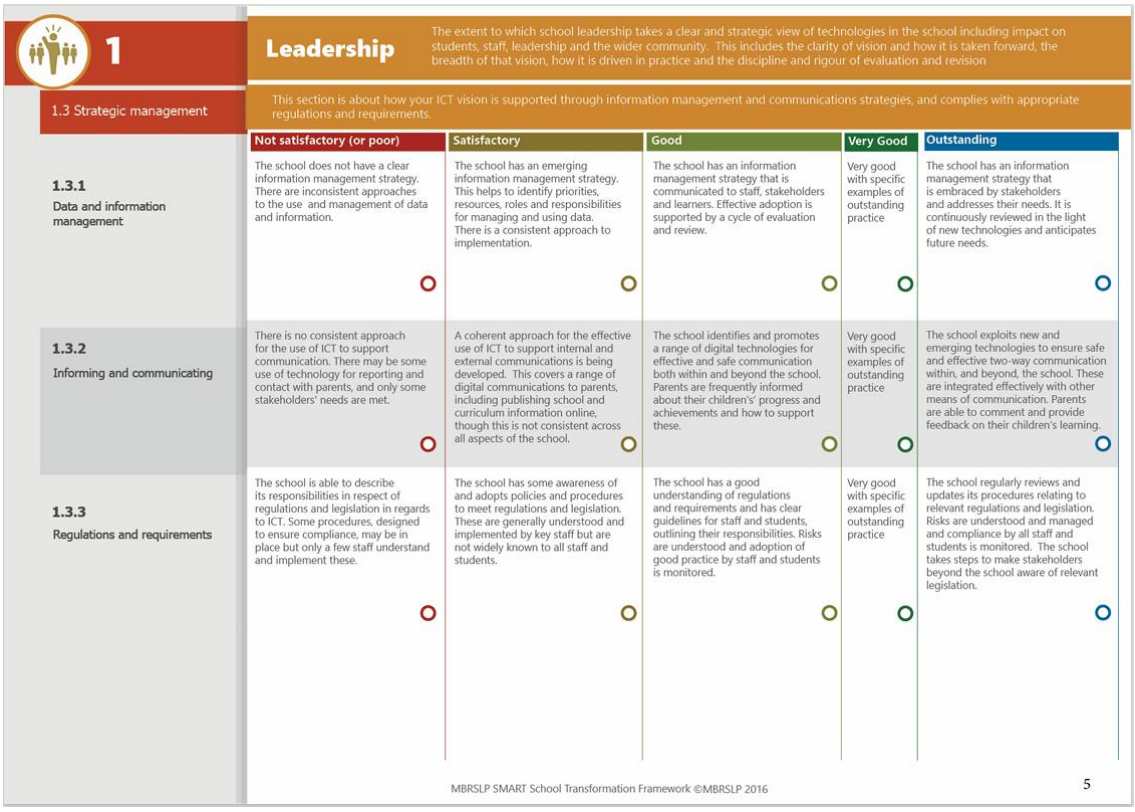

1

Leadership

The extent to which school leadership takes a clear and strategic view of technologies in the school including impact on students, staff, leadership and the wider community. This includes the clarity of vision and how it is taken forward, the breadth of that vision, how it is driven in practice and the discipline and rigour of evaluation and revision

1.3 Strategic management

This section is about how your ICT vision is supported through information management and communications strategies, and complies with appropriate regulations and requirements.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
1.3.1 Data and information management	The school does not have a clear information management strategy. There are inconsistent approaches to the use and management of data and information.	The school has an emerging information management strategy. This helps to identify priorities, resources, roles and responsibilities for managing and using data. There is a consistent approach to implementation.	The school has an information management strategy that is communicated to staff, stakeholders and learners. Effective adoption is supported by a cycle of evaluation and review.	Very good with specific examples of outstanding practice	The school has an information management strategy that is embraced by stakeholders and addresses their needs. It is continuously reviewed in the light of new technologies and anticipates future needs.
1.3.2 Informing and communicating	There is no consistent approach for the use of ICT to support communication. There may be some use of technology for reporting and contact with parents, and only some stakeholders' needs are met.	A coherent approach for the effective use of ICT to support internal and external communications is being developed. This covers a range of digital communications to parents, including publishing school and curriculum information online, though this is not consistent across all aspects of the school.	The school identifies and promotes a range of digital technologies for effective and safe communication both within and beyond the school. Parents are frequently informed about their children's' progress and achievements and how to support these.	Very good with specific examples of outstanding practice	The school exploits new and emerging technologies to ensure safe and effective two-way communication within, and beyond, the school. These are integrated effectively with other means of communication. Parents are able to comment and provide feedback on their children's learning.
1.3.3 Regulations and requirements	The school is able to describe its responsibilities in respect of regulations and legislation in regards to ICT. Some procedures, designed to ensure compliance, may be in place but only a few staff understand and implement these.	The school has some awareness of and adopts policies and procedures to meet regulations and legislation. These are generally understood and implemented by key staff but are not widely known to all staff and students.	The school has a good understanding of regulations and requirements and has clear guidelines for staff and students, outlining their responsibilities. Risks are understood and adoption of good practice by staff and students is monitored.	Very good with specific examples of outstanding practice	The school regularly reviews and updates its procedures relating to relevant regulations and legislation. Risks are understood and managed and compliance by all staff and students is monitored. The school takes steps to make stakeholders beyond the school aware of relevant legislation.

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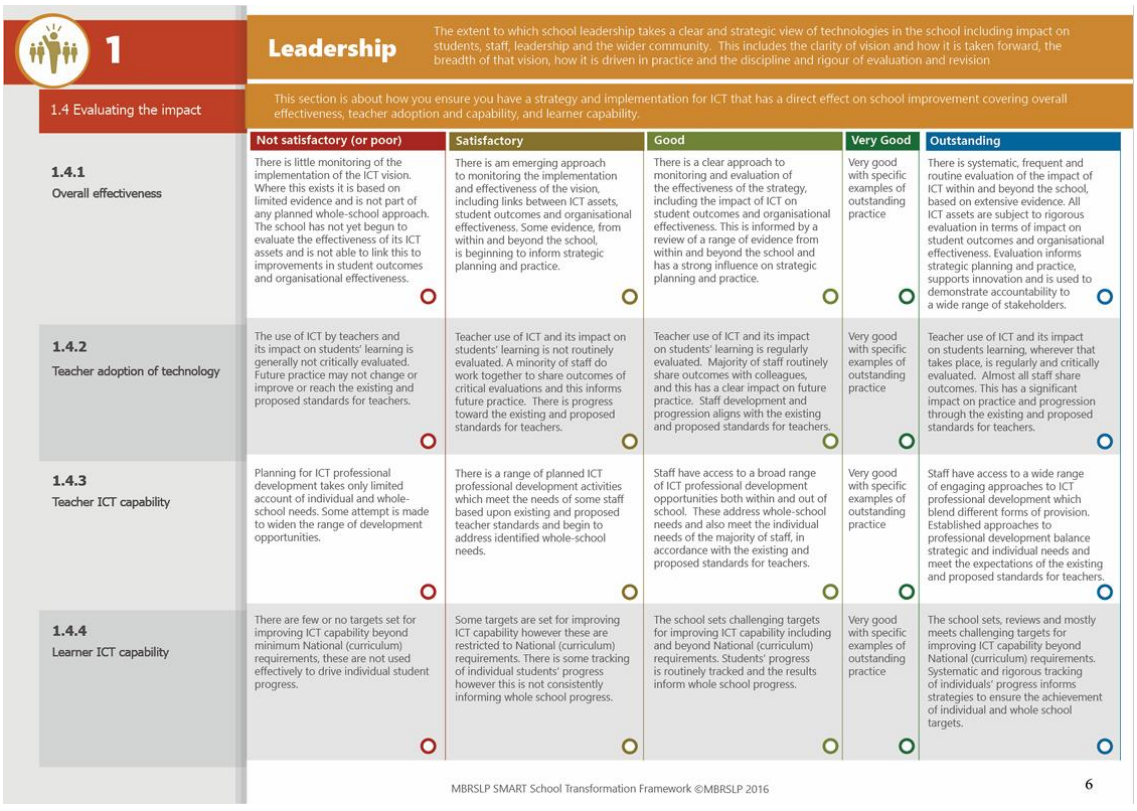

1

Leadership

The extent to which school leadership takes a clear and strategic view of technologies in the school including impact on students, staff, leadership and the wider community. This includes the clarity of vision and how it is taken forward, the breadth of that vision, how it is driven in practice and the discipline and rigour of evaluation and revision

1.4 Evaluating the impact

This section is about how you ensure you have a strategy and implementation for ICT that has a direct effect on school improvement covering overall effectiveness, teacher adoption and capability, and learner capability.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
1.4.1 Overall effectiveness	There is little monitoring of the implementation of the ICT vision. Where this exists it is based on limited evidence and is not part of any planned whole-school approach. The school has not yet begun to evaluate the effectiveness of its ICT assets and is not able to link this to improvements in student outcomes and organisational effectiveness.	There is am emerging approach to monitoring the implementation and effectiveness of the vision, including links between ICT assets, student outcomes and organisational effectiveness. Some evidence, from within and beyond the school, is beginning to inform strategic planning and practice.	There is a clear approach to monitoring and evaluation of the effectiveness of the strategy, including the impact of ICT on student outcomes and organisational effectiveness. This is informed by a review of a range of evidence from within and beyond the school and has a strong influence on strategic planning and practice.	Very good with specific examples of outstanding practice	There is systematic, frequent and routine evaluation of the impact of ICT within and beyond the school, based on extensive evidence. All ICT assets are subject to rigorous evaluation in terms of impact on student outcomes and organisational effectiveness. Evaluation informs strategic planning and practice, supports innovation and is used to demonstrate accountability to a wide range of stakeholders.
1.4.2 Teacher adoption of technology	The use of ICT by teachers and its impact on students' learning is generally not critically evaluated. Future practice may not change or improve or reach the existing and proposed standards for teachers.	Teacher use of ICT and its impact on students' learning is not routinely evaluated. A minority of staff do work together to share outcomes of critical evaluations and this informs future practice. There is progress toward the existing and proposed standards for teachers.	Teacher use of ICT and its impact on students' learning is regularly evaluated. Majority of staff routinely share outcomes with colleagues, and this has a clear impact on future practice. Staff development and progression aligns with the existing and proposed standards for teachers.	Very good with specific examples of outstanding practice	Teacher use of ICT and its impact on students learning, wherever that takes place, is regularly and critically evaluated. Almost all staff share outcomes. This has a significant impact on practice and progression through the existing and proposed standards for teachers.
1.4.3 Teacher ICT capability	Planning for ICT professional development takes only limited account of individual and whole-school needs. Some attempt is made to widen the range of development opportunities.	There is a range of planned ICT professional development activities which meet the needs of some staff based upon existing and proposed teacher standards and begin to address identified whole-school needs.	Staff have access to a broad range of ICT professional development opportunities both within and out of school. These address whole-school needs and also meet the individual needs of the majority of staff, in accordance with the existing and proposed standards for teachers.	Very good with specific examples of outstanding practice	Staff have access to a wide range of engaging approaches to ICT professional development which blend different forms of provision. Established approaches to professional development balance strategic and individual needs and meet the expectations of the existing and proposed standards for teachers.
1.4.4 Learner ICT capability	There are few or no targets set for improving ICT capability beyond minimum National (curriculum) requirements, these are not used effectively to drive individual student progress.	Some targets are set for improving ICT capability however these are restricted to National (curriculum) requirements. There is some tracking of individual students' progress however this is not consistently informing whole school progress.	The school sets challenging targets for improving ICT capability including and beyond National (curriculum) requirements. Students' progress is routinely tracked and the results inform whole school progress.	Very good with specific examples of outstanding practice	The school sets, reviews and mostly meets challenging targets for improving ICT capability beyond National (curriculum) requirements. Systematic and rigorous tracking of individuals' progress informs strategies to ensure the achievement of individual and whole school targets.

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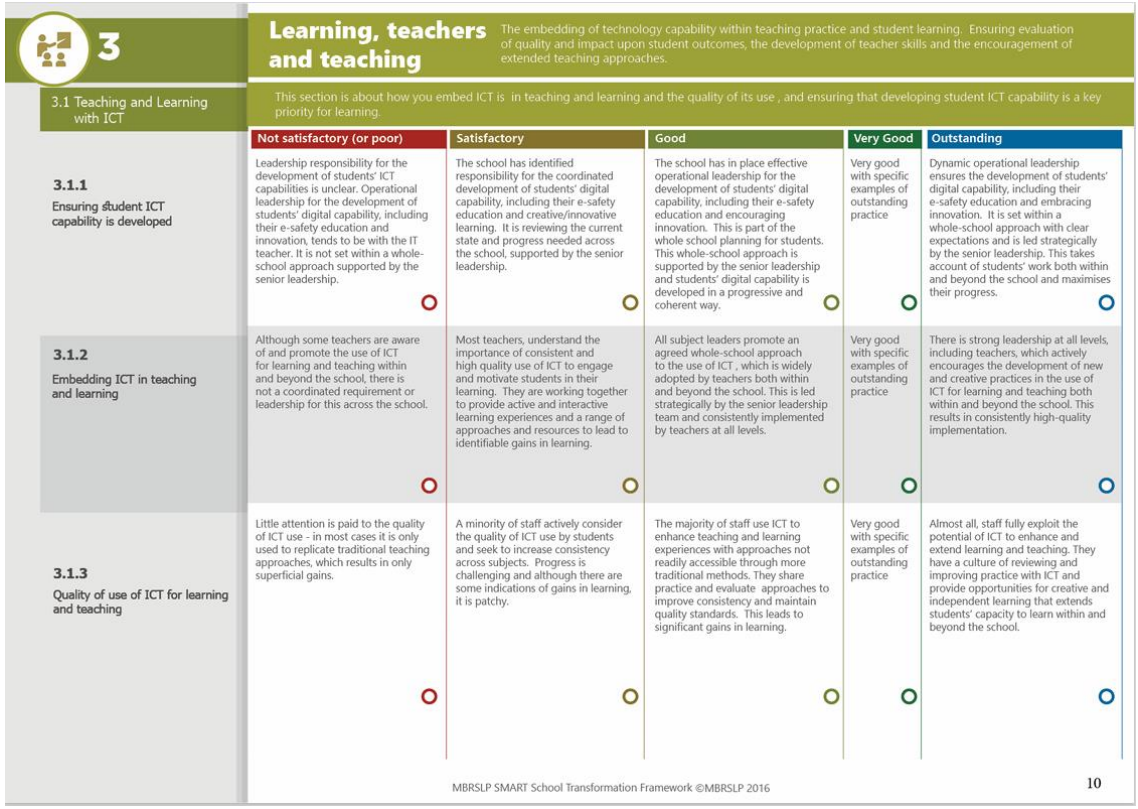
Appendix 10: SSTF Standard 3 Learning, Teachers and Teaching



3 Learning, teachers and teaching

The embedding of technology capability within teaching practice and student learning. Ensuring evaluation of quality and impact upon student outcomes, the development of teacher skills and the encouragement of extended teaching approaches.

3.1 Teaching and Learning with ICT

This section is about how you embed ICT is in teaching and learning and the quality of its use , and ensuring that developing student ICT capability is a key priority for learning.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
3.1.1 Ensuring student ICT capability is developed	Leadership responsibility for the development of students' ICT capabilities is unclear. Operational leadership for the development of students' digital capability, including their e-safety education and innovation, tends to be with the IT teacher. It is not set within a whole-school approach supported by the senior leadership.	The school has identified responsibility for the coordinated development of students' digital capability, including their e-safety education and creative/innovative learning. It is reviewing the current state and progress needed across the school, supported by the senior leadership.	The school has in place effective operational leadership for the development of students' digital capability, including their e-safety education and encouraging innovation. This is part of the whole school planning for students. This whole-school approach is supported by the senior leadership and students' digital capability is developed in a progressive and coherent way.	Very good with specific examples of outstanding practice	Dynamic operational leadership ensures the development of students' digital capability, including their e-safety education and embracing innovation. It is set within a whole-school approach with clear expectations and is led strategically by the senior leadership. This takes account of students' work both within and beyond the school and maximises their progress.
3.1.2 Embedding ICT in teaching and learning	Although some teachers are aware of and promote the use of ICT for learning and teaching within and beyond the school, there is not a coordinated requirement or leadership for this across the school.	Most teachers, understand the importance of consistent and high quality use of ICT to engage and motivate students in their learning. They are working together to provide active and interactive learning experiences and a range of approaches and resources to lead to identifiable gains in learning.	All subject leaders promote an agreed whole-school approach to the use of ICT , which is widely adopted by teachers both within and beyond the school. This is led strategically by the senior leadership team and consistently implemented by teachers at all levels.	Very good with specific examples of outstanding practice	There is strong leadership at all levels, including teachers, which actively encourages the development of new and creative practices in the use of ICT for learning and teaching both within and beyond the school. This results in consistently high-quality implementation.
3.1.3 Quality of use of ICT for learning and teaching	Little attention is paid to the quality of ICT use - in most cases it is only used to replicate traditional teaching approaches, which results in only superficial gains.	A minority of staff actively consider the quality of ICT use by students and seek to increase consistency across subjects. Progress is challenging and although there are some indications of gains in learning, it is patchy.	The majority of staff use ICT to enhance teaching and learning experiences with approaches not readily accessible through more traditional methods. They share practice and evaluate approaches to improve consistency and maintain quality standards. This leads to significant gains in learning.	Very good with specific examples of outstanding practice	Almost all, staff fully exploit the potential of ICT to enhance and extend learning and teaching. They have a culture of reviewing and improving practice with ICT and provide opportunities for creative and independent learning that extends students' capacity to learn within and beyond the school.

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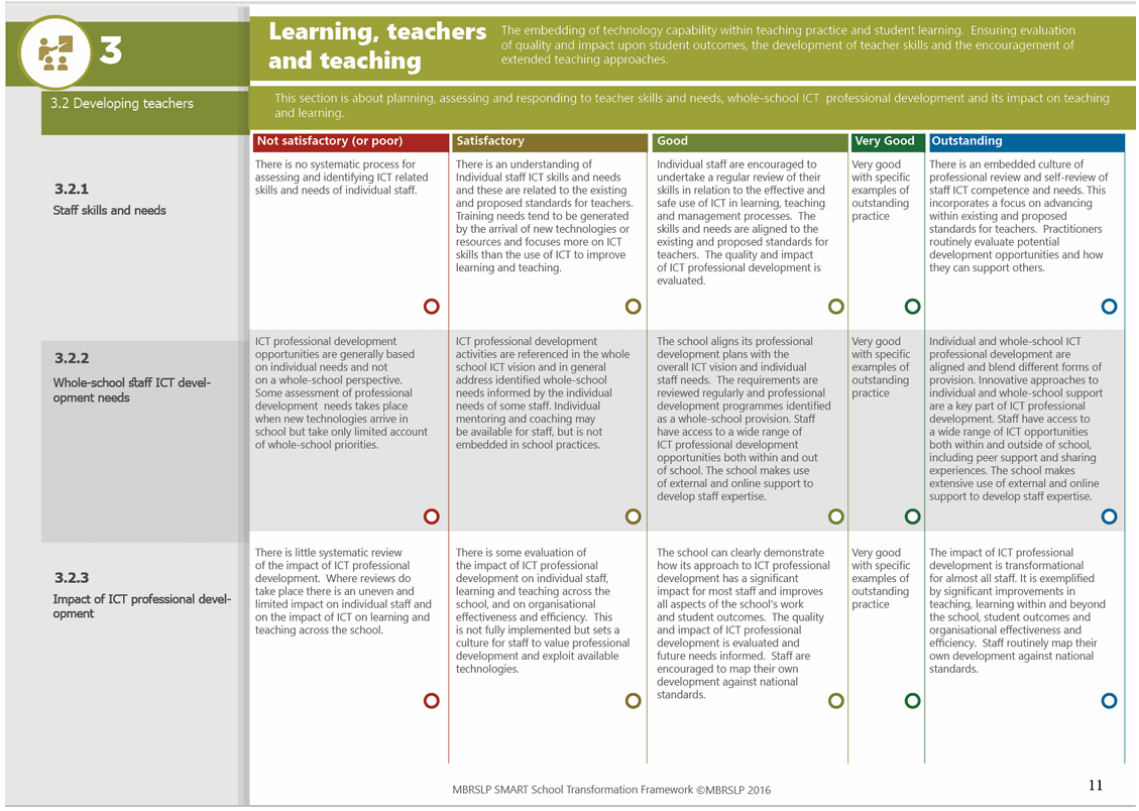

3 Learning, teachers and teaching

The embedding of technology capability within teaching practice and student learning. Ensuring evaluation of quality and impact upon student outcomes, the development of teacher skills and the encouragement of extended teaching approaches.

3.2 Developing teachers

This section is about planning, assessing and responding to teacher skills and needs, whole-school ICT professional development and its impact on teaching and learning.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
3.2.1 Staff skills and needs	There is no systematic process for assessing and identifying ICT related skills and needs of individual staff.	There is an understanding of Individual staff ICT skills and needs and these are related to the existing and proposed standards for teachers. Training needs tend to be generated by the arrival of new technologies or resources and focuses more on ICT skills than the use of ICT to improve learning and teaching.	Individual staff are encouraged to undertake a regular review of their skills in relation to the effective and safe use of ICT in learning, teaching and management processes. The skills and needs are aligned to the existing and proposed standards for teachers. The quality and impact of ICT professional development is evaluated.	Very good with specific examples of outstanding practice	There is an embedded culture of professional review and self-review of staff ICT competence and needs. This incorporates a focus on advancing within existing and proposed standards for teachers. Practitioners routinely evaluate potential development opportunities and how they can support others.
3.2.2 Whole-school staff ICT development needs	ICT professional development opportunities are generally based on individual needs and not on a whole-school perspective. Some assessment of professional development needs takes place when new technologies arrive in school but take only limited account of whole-school priorities.	ICT professional development activities are referenced in the whole school ICT vision and in general address identified whole-school needs informed by the individual needs of some staff. Individual mentoring and coaching may be available for staff, but is not embedded in school practices.	The school aligns its professional development plans with the overall ICT vision and individual staff needs. The requirements are reviewed regularly and professional development programmes identified as a whole-school provision. Staff have access to a wide range of ICT professional development opportunities both within and out of school. The school makes use of external and online support to develop staff expertise.	Very good with specific examples of outstanding practice	Individual and whole-school ICT professional development are aligned and blend different forms of provision. Innovative approaches to individual and whole-school support are a key part of ICT professional development. Staff have access to a wide range of ICT opportunities both within and outside of school, including peer support and sharing experiences. The school makes extensive use of external and online support to develop staff expertise.
3.2.3 Impact of ICT professional development	There is little systematic review of the impact of ICT professional development. Where reviews do take place there is an uneven and limited impact on individual staff and on the impact of ICT on learning and teaching across the school.	There is some evaluation of the impact of ICT professional development on individual staff, learning and teaching across the school, and on organisational effectiveness and efficiency. This is not fully implemented but sets a culture for staff to value professional development and exploit available technologies.	The school can clearly demonstrate how its approach to ICT professional development has a significant impact for most staff and improves all aspects of the school's work and student outcomes. The quality and impact of ICT professional development is evaluated and future needs informed. Staff are encouraged to map their own development against national standards.	Very good with specific examples of outstanding practice	The impact of ICT professional development is transformational for almost all staff. It is exemplified by significant improvements in teaching, learning within and beyond the school, student outcomes and organisational effectiveness and efficiency. Staff routinely map their own development against national standards.

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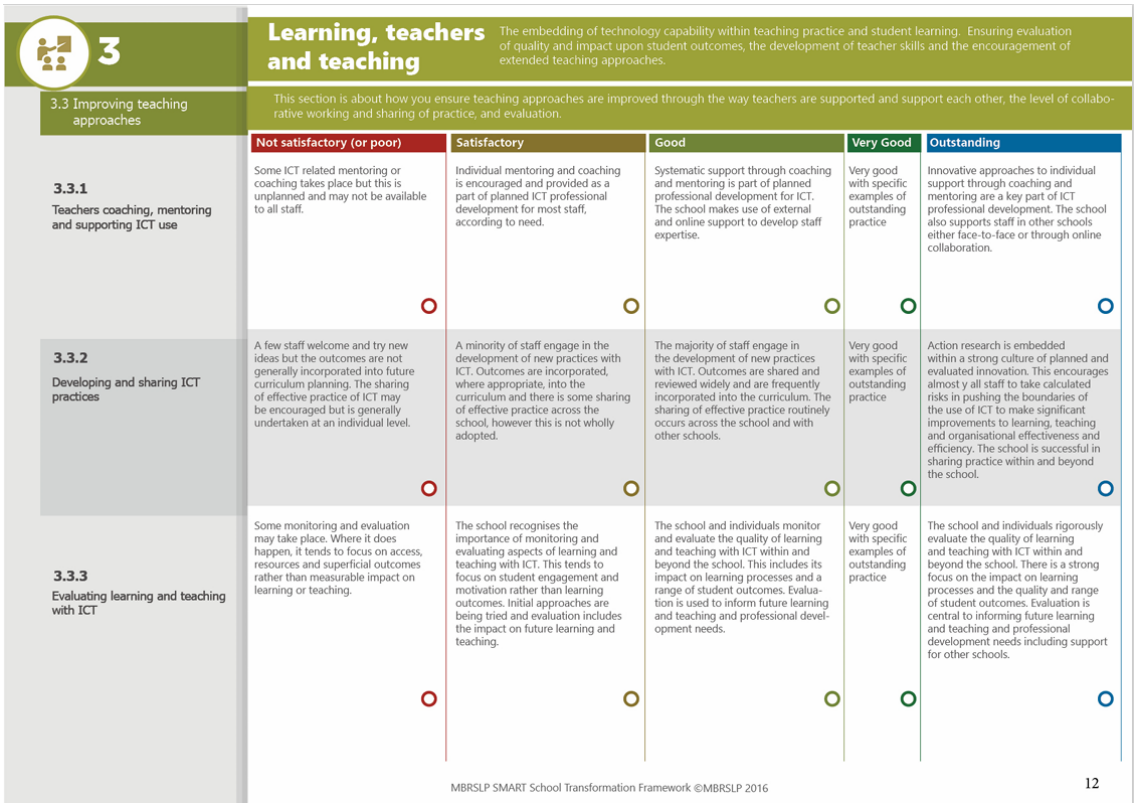

3

Learning, teachers and teaching

The embedding of technology capability within teaching practice and student learning. Ensuring evaluation of quality and impact upon student outcomes, the development of teacher skills and the encouragement of extended teaching approaches.

3.3 Improving teaching approaches

This section is about how you ensure teaching approaches are improved through the way teachers are supported and support each other, the level of collaborative working and sharing of practice, and evaluation.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
3.3.1 Teachers coaching, mentoring and supporting ICT use	Some ICT related mentoring or coaching takes place but this is unplanned and may not be available to all staff.	Individual mentoring and coaching is encouraged and provided as a part of planned ICT professional development for most staff, according to need.	Systematic support through coaching and mentoring is part of planned professional development for ICT. The school makes use of external and online support to develop staff expertise.	Very good with specific examples of outstanding practice	Innovative approaches to individual support through coaching and mentoring are a key part of ICT professional development. The school also supports staff in other schools either face-to-face or through online collaboration.
3.3.2 Developing and sharing ICT practices	A few staff welcome and try new ideas but the outcomes are not generally incorporated into future curriculum planning. The sharing of effective practice of ICT may be encouraged but is generally undertaken at an individual level.	A minority of staff engage in the development of new practices with ICT. Outcomes are incorporated, where appropriate, into the curriculum and there is some sharing of effective practice across the school, however this is not wholly adopted.	The majority of staff engage in the development of new practices with ICT. Outcomes are shared and reviewed widely and are frequently incorporated into the curriculum. The sharing of effective practice routinely occurs across the school and with other schools.	Very good with specific examples of outstanding practice	Action research is embedded within a strong culture of planned and evaluated innovation. This encourages almost y all staff to take calculated risks in pushing the boundaries of the use of ICT to make significant improvements to learning, teaching and organisational effectiveness and efficiency. The school is successful in sharing practice within and beyond the school.
3.3.3 Evaluating learning and teaching with ICT	Some monitoring and evaluation may take place. Where it does happen, it tends to focus on access, resources and superficial outcomes rather than measurable impact on learning or teaching.	The school recognises the importance of monitoring and evaluating aspects of learning and teaching with ICT. This tends to focus on student engagement and motivation rather than learning outcomes. Initial approaches are being tried and evaluation includes the impact on future learning and teaching.	The school and individuals monitor and evaluate the quality of learning and teaching with ICT within and beyond the school. This includes its impact on learning processes and a range of student outcomes. Evaluation is used to inform future learning and teaching and professional development needs.	Very good with specific examples of outstanding practice	The school and individuals rigorously evaluate the quality of learning and teaching with ICT within and beyond the school. There is a strong focus on the impact on learning processes and the quality and range of student outcomes. Evaluation is central to informing future learning and teaching and professional development needs including support for other schools.

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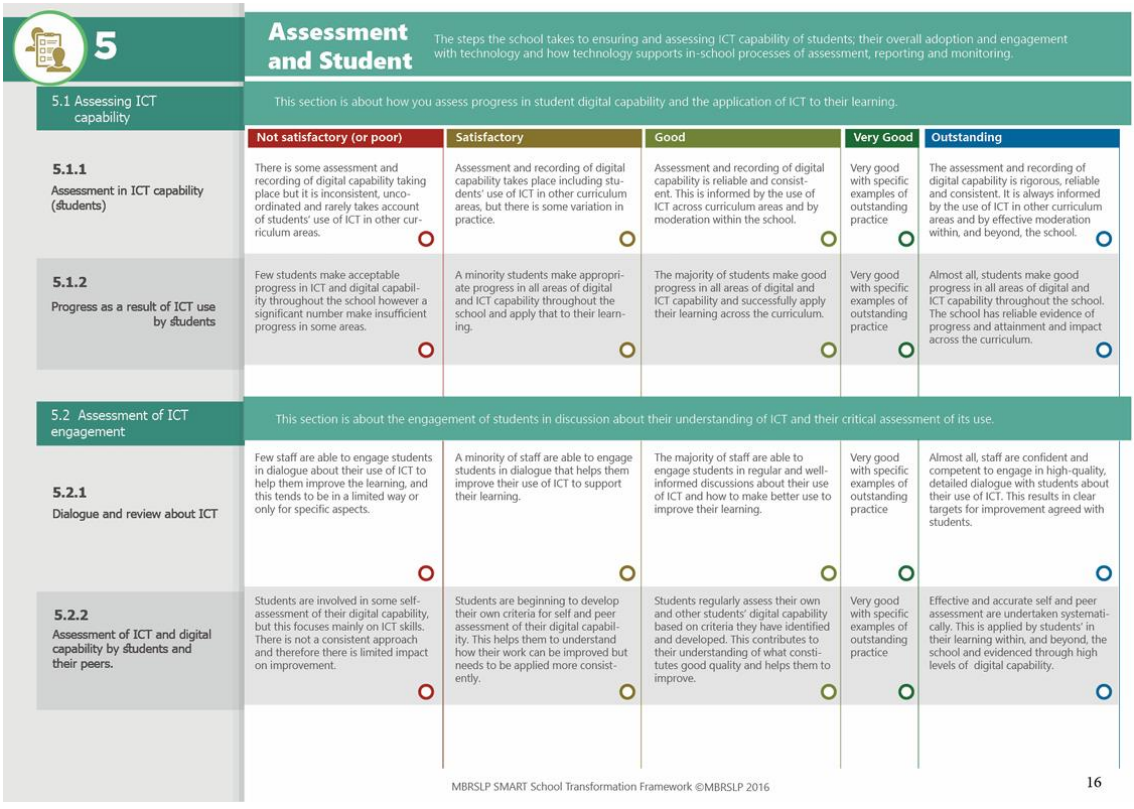
Appendix 11: Standard 5 Assessment and Student



5

Assessment and Student

The steps the school takes to ensuring and assessing ICT capability of students; their overall adoption and engagement with technology and how technology supports in-school processes of assessment, reporting and monitoring.

5.1 Assessing ICT capability

This section is about how you assess progress in student digital capability and the application of ICT to their learning.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
5.1.1 Assessment in ICT capability (students)	There is some assessment and recording of digital capability taking place but it is inconsistent, uncoordinated and rarely takes account of students' use of ICT in other curriculum areas.	Assessment and recording of digital capability takes place including students' use of ICT in other curriculum areas, but there is some variation in practice.	Assessment and recording of digital capability is reliable and consistent. This is informed by the use of ICT across curriculum areas and by moderation within the school.	Very good with specific examples of outstanding practice	The assessment and recording of digital capability is rigorous, reliable and consistent. It is always informed by the use of ICT in other curriculum areas and by effective moderation within, and beyond, the school.
5.1.2 Progress as a result of ICT use by students	Few students make acceptable progress in ICT and digital capability throughout the school however a significant number make insufficient progress in some areas.	A minority students make appropriate progress in all areas of digital and ICT capability throughout the school and apply that to their learning.	The majority of students make good progress in all areas of digital and ICT capability and successfully apply their learning across the curriculum.	Very good with specific examples of outstanding practice	Almost all, students make good progress in all areas of digital and ICT capability throughout the school. The school has reliable evidence of progress and attainment and impact across the curriculum.

5.2 Assessment of ICT engagement

This section is about the engagement of students in discussion about their understanding of ICT and their critical assessment of its use.

5.2.1 Dialogue and review about ICT	Few staff are able to engage students in dialogue about their use of ICT to help them improve the learning, and this tends to be in a limited way or only for specific aspects.	A minority of staff are able to engage students in dialogue that helps them improve their use of ICT to support their learning.	The majority of staff are able to engage students in regular and well-informed discussions about their use of ICT and how to make better use to improve their learning.	Very good with specific examples of outstanding practice	Almost all, staff are confident and competent to engage in high-quality, detailed dialogue with students about their use of ICT. This results in clear targets for improvement agreed with students.
5.2.2 Assessment of ICT and digital capability by students and their peers.	Students are involved in some self-assessment of their digital capability, but this focuses mainly on ICT skills. There is not a consistent approach and therefore there is limited impact on improvement.	Students are beginning to develop their own criteria for self and peer assessment of their digital capability. This helps them to understand how their work can be improved but needs to be applied more consistently.	Students regularly assess their own and other students' digital capability based on criteria they have identified and developed. This contributes to their understanding of what constitutes good quality and helps them to improve.	Very good with specific examples of outstanding practice	Effective and accurate self and peer assessment are undertaken systematically. This is applied by students' in their learning within, and beyond, the school and evidenced through high levels of digital capability.

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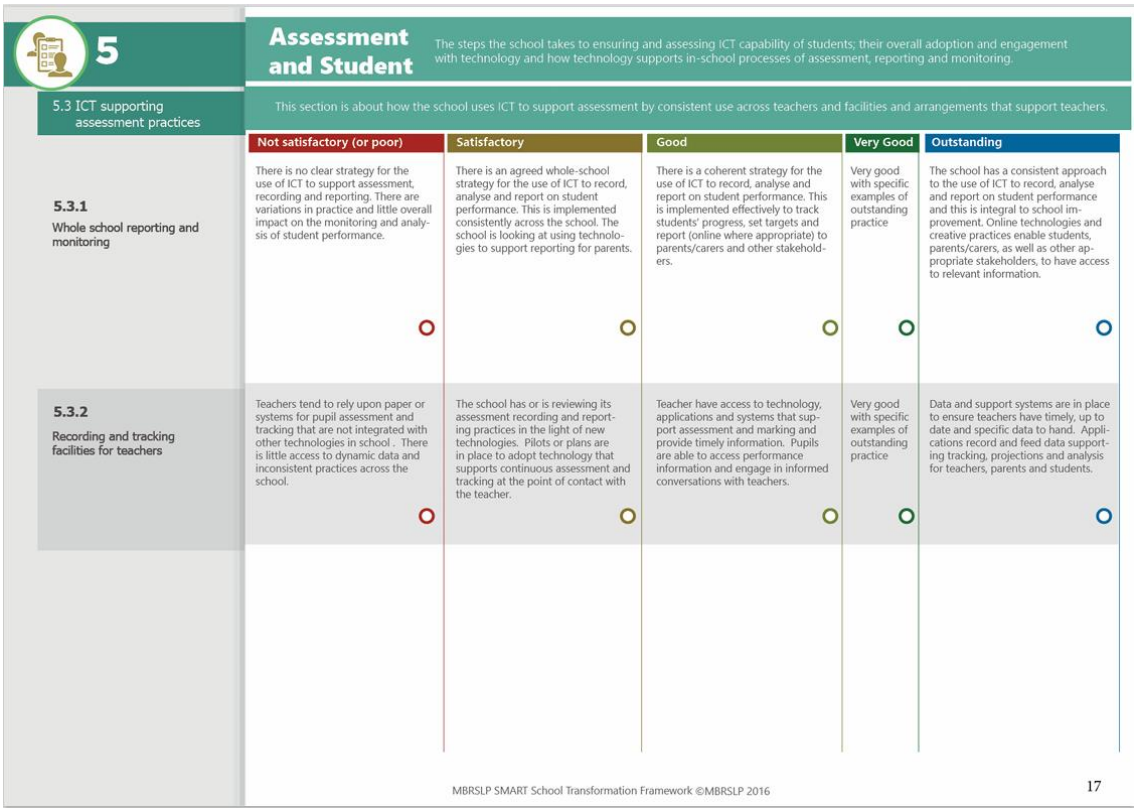

5

Assessment and Student

The steps the school takes to ensuring and assessing ICT capability of students; their overall adoption and engagement with technology and how technology supports in-school processes of assessment, reporting and monitoring.

5.3 ICT supporting assessment practices

This section is about how the school uses ICT to support assessment by consistent use across teachers and facilities and arrangements that support teachers.

	Not satisfactory (or poor)	Satisfactory	Good	Very Good	Outstanding
5.3.1 Whole school reporting and monitoring	There is no clear strategy for the use of ICT to support assessment, recording and reporting. There are variations in practice and little overall impact on the monitoring and analysis of student performance.	There is an agreed whole-school strategy for the use of ICT to record, analyse and report on student performance. This is implemented consistently across the school. The school is looking at using technologies to support reporting for parents.	There is a coherent strategy for the use of ICT to record, analyse and report on student performance. This is implemented effectively to track students' progress, set targets and report (online where appropriate) to parents/carers and other stakeholders.	Very good with specific examples of outstanding practice	The school has a consistent approach to the use of ICT to record, analyse and report on student performance and this is integral to school improvement. Online technologies and creative practices enable students, parents/carers, as well as other appropriate stakeholders, to have access to relevant information.
5.3.2 Recording and tracking facilities for teachers	Teachers tend to rely upon paper or systems for pupil assessment and tracking that are not integrated with other technologies in school . There is little access to dynamic data and inconsistent practices across the school.	The school has or is reviewing its assessment recording and reporting practices in the light of new technologies. Pilots or plans are in place to adopt technology that supports continuous assessment and tracking at the point of contact with the teacher.	Teacher have access to technology, applications and systems that support assessment and marking and provide timely information. Pupils are able to access performance information and engage in informed conversations with teachers.	Very good with specific examples of outstanding practice	Data and support systems are in place to ensure teachers have timely, up to date and specific data to hand. Applications record and feed data supporting tracking, projections and analysis for teachers, parents and students.

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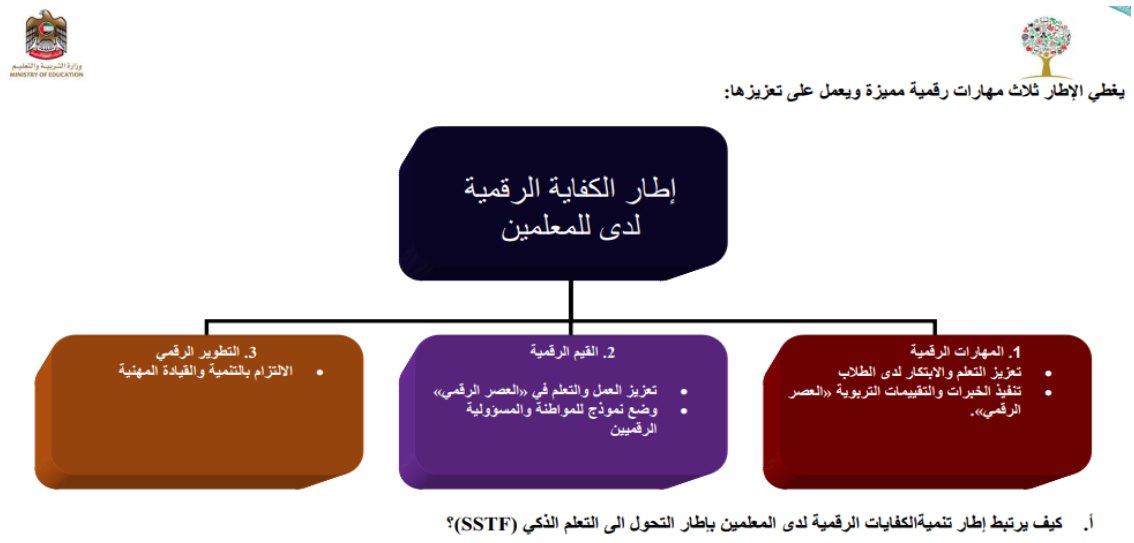
Appendix 12: Teacher Digital Competency Framework in relation to SSTF



يغطي الإطار ثلاث مهارات رقمية مميزة ويعمل على تعزيزها:

إطار الكفاية الرقمية لدى للمعلمين

1. المهارات الرقمية
- تعزيز التعلم والابتكار لدى الطلاب
- تنفيذ الخبرات والتقييمات التربوية «العصر الرقمي».

2. القيم الرقمية
- تعزيز العمل والتعلم في «العصر الرقمي»
- وضع نموذج للمواطنة والمسؤولية الرقميين

3. التطوير الرقمي
- الالتزام بالتنمية والقيادة المهنية

أ. كيف يرتبط إطار تنميةالكفايات الرقمية لدى المعلمين بإطار التحول الى التعلم الذكي (SSTF)؟

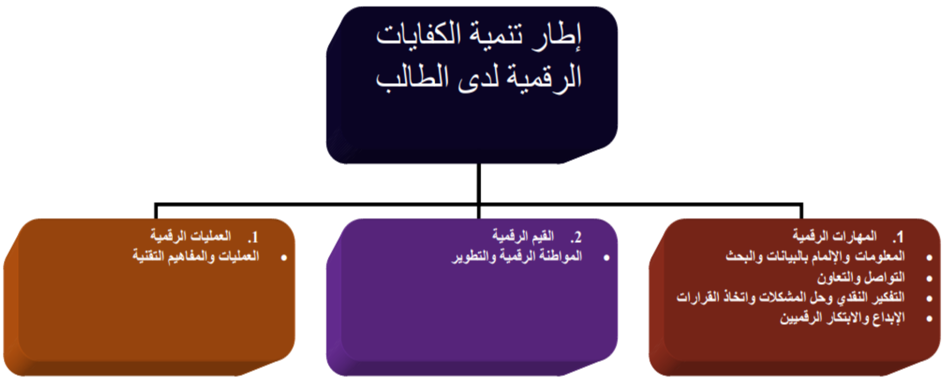
يبرز إطار التحول إلى التعلم الذكي (SSTF) بشكل جلي أهمية تقييم المهارات الرقمية للمعلمين وتطويرها بغية تحسين عملية تعليم الطلاب ولا سيما بالتركيز على (العناصر: (1-4) و (2-3) من إطار التحول إلى التعلم الذكي ، وعليه جاء إطار تنمية الكفايةالرقمية لدى المعلمين للتصدي لهذين العنصرين وتحسين جودة العملية التربوية بشكلٍ عام.

Appendix 13: Criteria of Teacher Digital Competency Framework in relation to SSTF

الكفاءات الرقمية لدى المعلمين	العناصر	مستوى الكفاية				
		واعٍ	مبتدئ	متوسط	متقدم	خبير
1. تعزيز التعليم والابتكار لدى الطلاب يوظف المعلمون معرفتهم بالمواد التي يُدرسونها والممارسات التربوية التي يتمتعون بها وقدرات تقنية المعلومات والاتصالات لديهم لتوفير المزيد من الفرص للطلاب التي تسمح لهم بالتطور والإبداع والابتكار في البيئتين الحقيقية والافتراضية على حد سواء. (1-3-2/ 1-2-2/ 2-2-2/ 3-2-4)	1-1 تشجيع الابتكار					
	1-2 تشجيع استخدام تقنيات المعلومات والاتصالات في حل المشكلات الحياتية الواقعية.					
	1-3 تشجيع الطلاب على التفكير باستخدام الأدوات الرقمية.					
	1-4 المشاركة في المعرفة التعاونية في البيئات الحقيقية والافتراضية.					
2. تطبيق الخبرات والتقييمات التربوية «العصر الرقمي» يمنح المعلمون الفرصة للطلاب لتطوير معارفهم ومهاراتهم ومواقفهم الشخصية وذلك بتقديم وتقييم خبرات وتقييمات تربوية موثوقة باستخدام أحدث الأدوات والمصادر الرقمية التي تدعم المحتوى التعليمي ككل. (1-3-3/2-1-2/ 2-2-3/ 2-3-2/ 3-1-1-/3-1-2/3-1-3/3-2-2/3-3-1/3-3-2)	2-1 تمكين الطلاب من خلال خبرات تعليمية تعزز من التعلم والابتكار لديهم.					
	2-2 تمكين الطلاب من تحديد أهدافهم وتتبع ما يحرزوه من تقدم في بيئات التعلم مختلفة.					
	2-3 تمييز طرق التعلم وتكييفها باستخدام أدوات رقمية					
	2-4 تقييم ممارسات التعلم ذات الصلة بتقنية المعلومات والاتصالات واستخدام النتائج لتحسين طرق التدريس.					
3. تعزيز بيئة العمل والتعلم الخاصة بـ «العصر الرقمي» يطرح المعلمون نموذجًا للاحترافية في المجتمعين العالمي والرقمي ويحاولون تحقيق تشارك وتكامل المعرفة والمهارات وأساليب العمل من خلال تقنية المعلومات والاتصالات. (1-5-1/1-5-2/1-5-3/2-1-1/2-3-2/3-2-4/3-3-3)	3-1 تكامل المعرفة ونقلها من خلال تقنية المعلومات والاتصالات.					
	3-2 التواصل مع أصحاب المصلحة والتعاون معهم باستخدام تقنية المعلومات والاتصالات لتحسين مستوى تحسين الطلاب.					
	3-3 إبراز أهمية تقنية المعلومات والاتصالات في عمليات مشاركة مصادر المعلومات وتحليلها وتقييمها واستخدامها لدعم طرق البحث والتعلم.					
4. وضع نموذج للمواطنة والمسؤولية الرقميين. يعرض المعلمون ثقافة استخدام الانترنت ويضعون نموذجًا سلوكيًا وقانونيًا في بيئة رقمية متطورة. (1-1-1/1-2-2/1-3-1/3-1-1)	4-1 أن يكون مثالا يحتذى به لاستخدام تقنية المعلومات والاتصالات بشكلٍ آمن وسليم.					
	4-2 ضمان المساواة بين جميع الطلاب في إمكانية الوصول إلى تقنيات المعلومات والاتصالات ومصادرها.					
	4-3 أن يكون مثالا يحتذى به لثقافة استخدام الانترنت وآدابه.					
	4-4 أن يكون مثالا يحتذى به للمسؤولية والمشاركة في الوعي الثقافي.					
5. الالتزام بالتنمية والقيادة المهنية. يضع المعلمون الممارسات المهنية لتقنيات المعلومات والاتصالات والقيادة داخل مدارسهم ومجتمعاتهم العملية. (1-2-3/1-5-3/2-3-1/3-2-4/4-1-1/4-1-2/4-1-3/4-2-2/4-3-1/4-3-2/4-1-4)	5-1 استكشاف أداوت تقنية المعلومات والاتصالات.					
	5-ان يكون مثالا للقيادة التشاركية لمهارات تقنية المعلومات والاتصالات وانعكاس ذلك في اتخاذ القرارات وبناء المجتمع.					
	5-3 تقييم موارد تقنية المعلومات والاتصالات والتركيز عليها لدعم تعليم الطلاب.					
	5-4 الالتزام بممارسات التطور المهني التي تؤثر في الأداء وفي المجتمع ككل وتجديد تلك الممارسات.					

Appendix 14: Student Digital Competency Framework in relation to SSTF

يغطي الإطار 3 مهارات رقمية مميزة يعمل على تعزيزها:



ب. كيف يرتبط إطار الكفايات الرقمية الخاص بالطالب بإطار التحول الى المدارس الذكية؟

يبرز إطار التحول للمدارس الذكي أهمية تقييم المستويات الرقمية للطلاب وتطويرها من أجل زيادة قدراتهم على رفع مستوى التحصيل. (العناصر: 1.3 و3.1 من إطار التحول للمدارس الذكي). في المقابل، فإن إطارتنمية الكفايات الرقمية الخاص بالطالب مصمم للعمل على هذين العنصرين بالأخص ومن أجل تحسين جودة التعلم.

Appendix 15: Criteria of Student Digital Competency Framework in relation to SSTF

وزارة التربية والتعليم
MINISTRY OF EDUCATION

ب- إطار تنمية كفايات الطالب الرقمية

كفاءة الطلاب الرقمية	العناصر	مستوى الكفاءة				
		واعي	مبتدئ	متوسط	متقدم	خبير
1. المعلومات والإلمام بالبيانات والبحث يطبق الطلاب الأدوات الرقمية من أجل جمع معلومات جديدة وتقييمها واستخدامها أو إنشاءها من الأساس. يستخدم الطلاب التقنيات الرقمية ليطبقوا ما تعلموه على عملهم واعطاء آرائهم للآخرين عندما يكون ذلك مناسبًا. يستخدم الطلاب الوجهات المناسبة للوصول لمصادر التعلم الرقمي ومشاركتها وإجراء البحوث بطريقة فعالة ومسؤولة.	1-1 البحث عن المعلومات وتصفحها وفرزها.					
	1-2 مشاركة المعلومات والمحتوى					
	1-3 تقييم المعلومات باستخدام تقنية المعلومات والاتصالات					
	1-4 إدارة المحتوى الرقمي					
2. التواصل والتعاون يستخدم الطلاب وسائل الإعلام الرقمية في التواصل والتعبير بإبداع والعمل بتعاون ودعم التعلم الفردي والمساهمة في تعلم الآخرين على المستويين المحلي والعالمي. يستخدم الطلاب الأدوات الرقمية لبناء شبكات رقمية مع متعلمين من خلفيات وثقافات مختلفة والمشاركة معهم بطرق تساعد على زيادة التفاهم والتعلم المتبادلين.	2-1 التفاعل من خلال الأدوات الرقمية					
	2-2 التواصل والمشاركة على الإنترنت					
	2-3 التعاون باستخدام الأدوات الرقمية					
	2-4 آداب الإنترنت					
3. التفكير النقدي وحل المشكلات واتخاذ القرارات يستخدم الطلاب مهارات التفكير النقدي في التخطيط للأبحاث وإجراءها وإدارة المشاريع وحل المشكلات واتخاذ قرارات عن علم باستخدام الأدوات الرقمية والمصادر المناسبة بطرق تنتفع من فائدة الطرق التقنية	3-1 رفع مستوى جودة الدمج					
	3-2 التخطيط والإدارة وحل المشكلات باستخدام الأدوات الرقمية					
	3-3 تحليل البيانات وفحصها					
	3-4 استكشاف المسائل وتحويلها الى مواد مرنة باستخدام أدوات ومحتوى رقميين					
4. الإبداع الرقمي والابتكار يتمكن الطلاب من تصميم و/أو إنشاء أدوات رقمية ومحتوى رقمي جديدين ودمج المحاكات الجديدة. وفي المستويات المتقدمة يتمكن الطلاب من برمجة وتصميم التطبيقات/البرامج والألعاب والبيئات والواجهات الافتراضية. يتمكن الطلاب في هذا المستوى من قيادة الفرق ومجالات الممارسة/الموضوعات في اتجاهات جديدة استجابة للتحديات والفرص الرقمية	4-1 إنشاء محتوى ومنتجات رقمية					
	4-2 دمج المحاكاة					
	4-3 كتابة الرموز/البرمجة					
	4-4 قيادة التغييرات الرقمية					
5. التطور والمواطنة الرقمية يفهم الطلاب الشواغل الإنسانية والثقافية والمجتمعية المرتبطة بتقنية المعلومات والاتصالات ويتصرفون بشكل قانوني وأخلاقي، وبذلك يشكلون ويديرون هويتهم وسمعتهم الرقميتين. للطلاب القدرة على المشاركة فرص التعلم الرقمي والاستفادة منها وعلى دعم الآخرين وتطوير هم في محيط غني رقميًا.	5-1 تنمية هوية رقمية					
	5-2 ان يكون مثالا للسلوك القانوني والأخلاقي					
	5-3 ممارسة التعلم مدى الحياة الرقمي					
	5-4 ان يكون مثالا للقائد الرقمي في المجتمع					
6. العمليات والمفاهيم التقنية يظهر الطلاب فهمًا صحيحًا ومحترمًا للمفاهيم والأنظمة والعمليات التقنية. يشارك الطلاب بسلوك إيجابي وآمن وقانوني وأخلاقي، وبمكنهم فهم المخاطر الإلكترونية وحلها، ويكونون على علم بتقنية جمع المعلومات المستخدمة في تعقب تنقلهم على الإنترنت عند استخدام التقنية، بما في ذلك التفاعلات الاجتماعية على الإنترنت أو عند استخدام أجهزة متصلة بالشبكة.	6-1 استخدام تقنية المعلومات والاتصالات في الأنشطة اليومية					
	6.2 الامتثال لسياسة الاستخدام (AUP) وحقوق التأليف والنشر والتراخيص					
	6.3 حماية البيانات والأجهزة على نحو يتصف بالسلامـــة والامان					
	6.4 تحديد احتياجات الكفاية الرقمية					

Appendix 16: Online Survey (Introduction)

The Impact of e-Maturity Framework and Models on Teaching and Learning Practices - UAE

The survey will take approximately 9 minutes to complete.

هذه الاستبانة تستهدف دراسة أثر نماذج وأطر النضج الإلكتروني على عمليات التعليم والتعلم في المدارس الحكومية في دولة الإمارات

أنا باحثة دكتوراه في جامعة لانكستر في المملكة المتحدة وأجري هذه الدراسة للحصول على درجة الدكتوراه **في برنامج دكتوراه الفلسفة في تخصص البحث الإلكتروني والتكنولوجيا الداعمة للتعلم**

وأود من خلال هذه الدراسة تسليط الضوء على أثر تقييم نماذج النضج الإلكتروني لغايات التحول الرقمي للمدارس على عمليات التعليم والتعلم في المدارس الحكومية في دولة الإمارات ومدى فاعلية أدوات وأطر التقييم المتاحة في هذه النماذج

This is an online survey that targets studying the impact of e-Maturity Models and Frameworks on Teaching and Learning practices in UAE public schools

I am a Ph.D. learner at Lancaster University in the United Kingdom and this topic will be my thesis to obtain the Ph.D. degree in **E-Research & Technology Enhanced Learning - Ph.D. programme**

I am interested in identifying the impact of evaluation processes of e-Maturity 'Models, for the purpose of schools' Digital Transformation, on teaching and learning in government schools in the United Arab Emirates, and how effective these tools and evaluation frameworks are that are available in such models.

المستهدفون لحل الاستبانة هم: مدير المدرسة - المعلم - رئيس وحدة الشؤون الأكاديمية

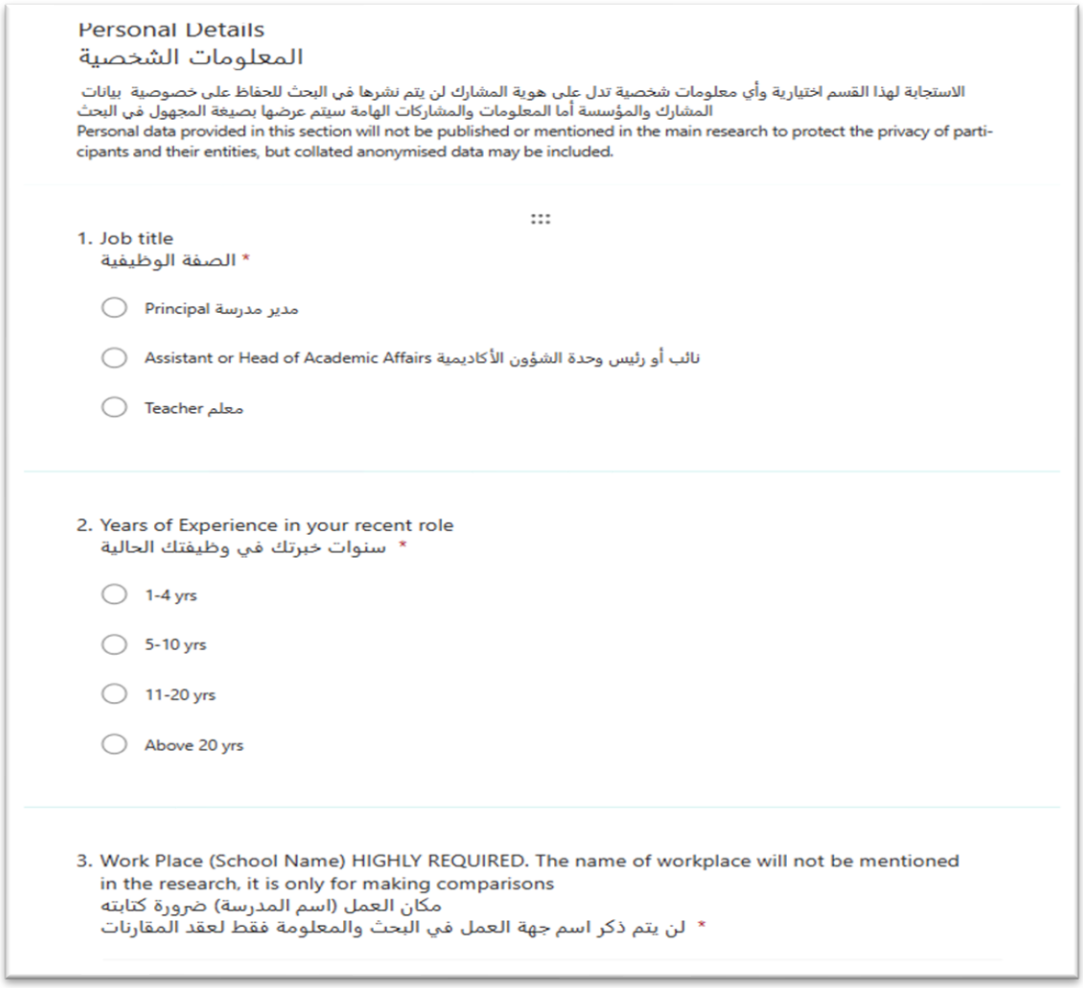
يرجى الاستجابة للإستبانة بعد قراءة التعليمات في كل قسم بشكل دقيق

The targeted participants for this survey are: School Principal - Teacher - Head of Academic Affairs

Please respond after reading the instructions carefully in each section.

ماجده عبدالله داغر البلوشي
Majdah Abdulla Dagher Alblooshi

Appendix 17: Online Survey – Section 1



Personal Details
المعلومات الشخصية

الاستجابة لهذا القسم اختيارية وأي معلومات شخصية تدل على هوية المشارك لن يتم نشرها في البحث للحفاظ على خصوصية بيانات المشارك والمؤسسة أما المعلومات والمشاركات الهامة سيتم عرضها بصيغة المجهول في البحث
Personal data provided in this section will not be published or mentioned in the main research to protect the privacy of participants and their entities, but collated anonymised data may be included.

1. Job title
الصفة الوظيفية *

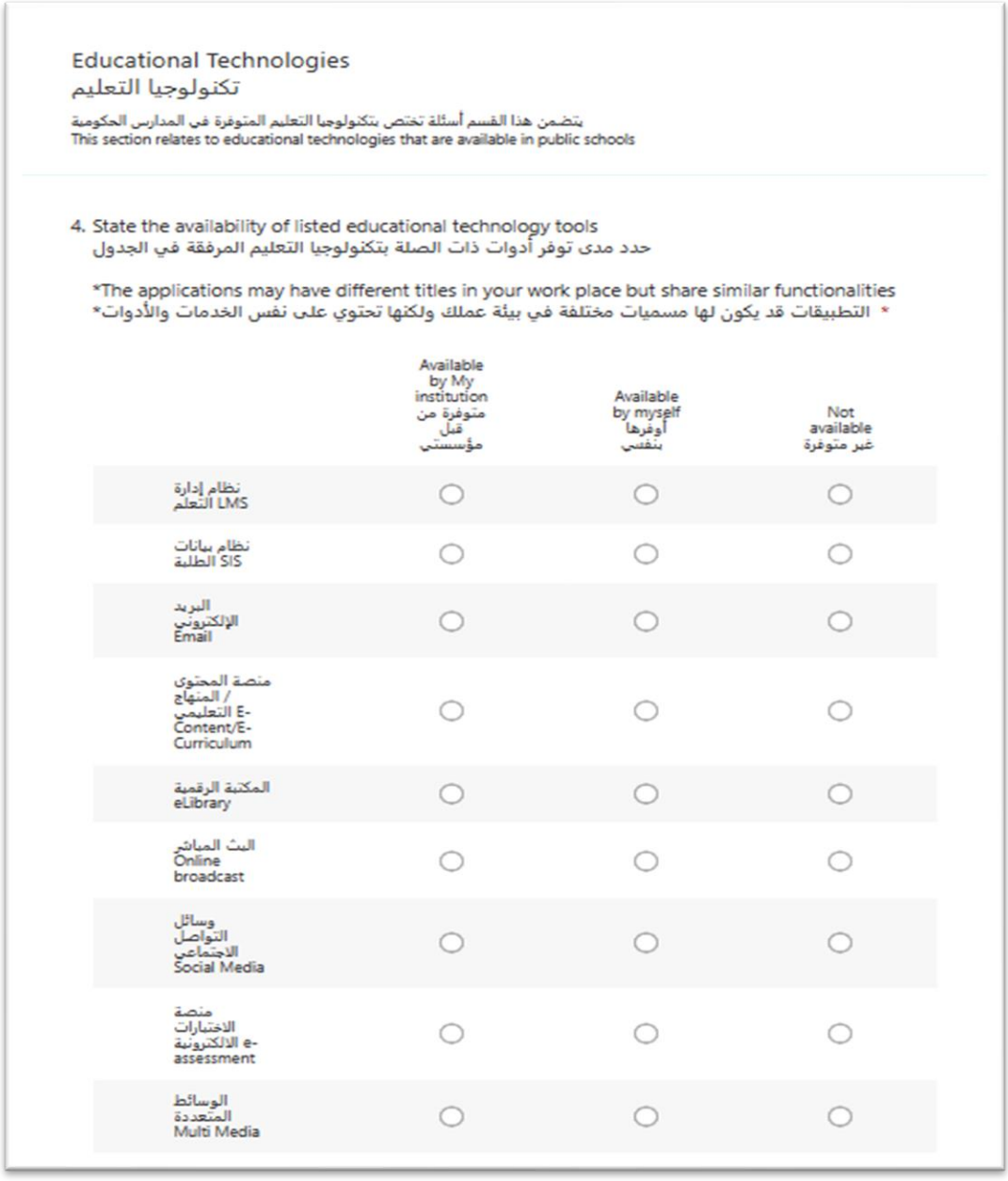
- Principal مدير مدرسة
- Assistant or Head of Academic Affairs نائب أو رئيس وحدة الشؤون الأكاديمية
- Teacher معلم

2. Years of Experience in your recent role
سنوات خبرتك في وظيفتك الحالية *

- 1-4 yrs
- 5-10 yrs
- 11-20 yrs
- Above 20 yrs

3. Work Place (School Name) HIGHLY REQUIRED. The name of workplace will not be mentioned in the research, it is only for making comparisons
مكان العمل (اسم المدرسة) ضرورة كتابته
لن يتم ذكر اسم جهة العمل في البحث والمعلومة فقط لعقد المقارنات *

Appendix 18: Online Survey – Section 2



Educational Technologies
تكنولوجيا التعليم

يتضمن هذا القسم أسئلة تختص بتكنولوجيا التعليم المتوفرة في المدارس الحكومية
This section relates to educational technologies that are available in public schools

4. State the availability of listed educational technology tools
حدد مدى توفر أدوات ذات الصلة بتكنولوجيا التعليم المرفقة في الجدول

*The applications may have different titles in your work place but share similar functionalities
التطبيقات قد يكون لها مسميات مختلفة في بيئة عملك ولكنها تحتوي على نفس الخدمات والأدوات* *

	Available by My institution متوفرة من قبل مؤسستي	Available by myself أوفرها بنفسي	Not available غير متوفرة
نظام إدارة التعلم LMS	○	○	○
نظام بيانات الطلبة SIS	○	○	○
البريد الإلكتروني Email	○	○	○
منصة المحتوى / المنهاج التعليمي E-Content/E-Curriculum	○	○	○
المكتبة الرقمية eLibrary	○	○	○
البث المباشر Online broadcast	○	○	○
وسائل التواصل الاجتماعي Social Media	○	○	○
منصة الاختبارات الالكترونية e-assessment	○	○	○
الوسائط المتعددة Multi Media	○	○	○

المحتوى التفاعلي Interactive content	○	○	○
أدوات إعداد المحتوى Content creator tools	○	○	○
أجهزة المحمول والحاسوب laptops & PCs	○	○	○
شبكة الانترنت Internet	○	○	○
السبورات الذكية Smart Boards	○	○	○
السبورات التفاعلية Interactive Boards	○	○	○
الواقع المعزز Augmented Reality (AR)	○	○	○
القنوات الرقمية e-Channels	○	○	○

5. هل هناك أدوات أخرى متوفرة غير مذكورة في السؤال أعلاه؟
Are there other tools available that are not mentioned? (Not listed above) *

- ○ نعم Yes
- ○ لا No

6. إن كانت اجابتك للسؤال السابق بنعم اذكر هنا ما الأدوات الأخرى المتوفرة
If you answered the previous question by yes, please state the tools that is not listed above

Enter your answer

Appendix 19: Online Survey – Section 3

Strategies to integrate technology in Teaching and Learning
استراتيجيات دمج التكنولوجيا في التعليم و التعلم

7. ما هي الاستراتيجيات التعليمية التي يتم استخدامها في مدرستكم بشكل فاعل في الحصص الدراسية ؟
What are the effective teaching strategies that are adopted in your school inside classrooms? *

Enter your answer

8. هل يتم دمج التكنولوجيا عند تطبيقكم لاستراتيجيات التعليم الفاعلة التي ذكرتموها سابقا ؟
Do you integrate technology with the effective teaching strategies that you mentioned above? *

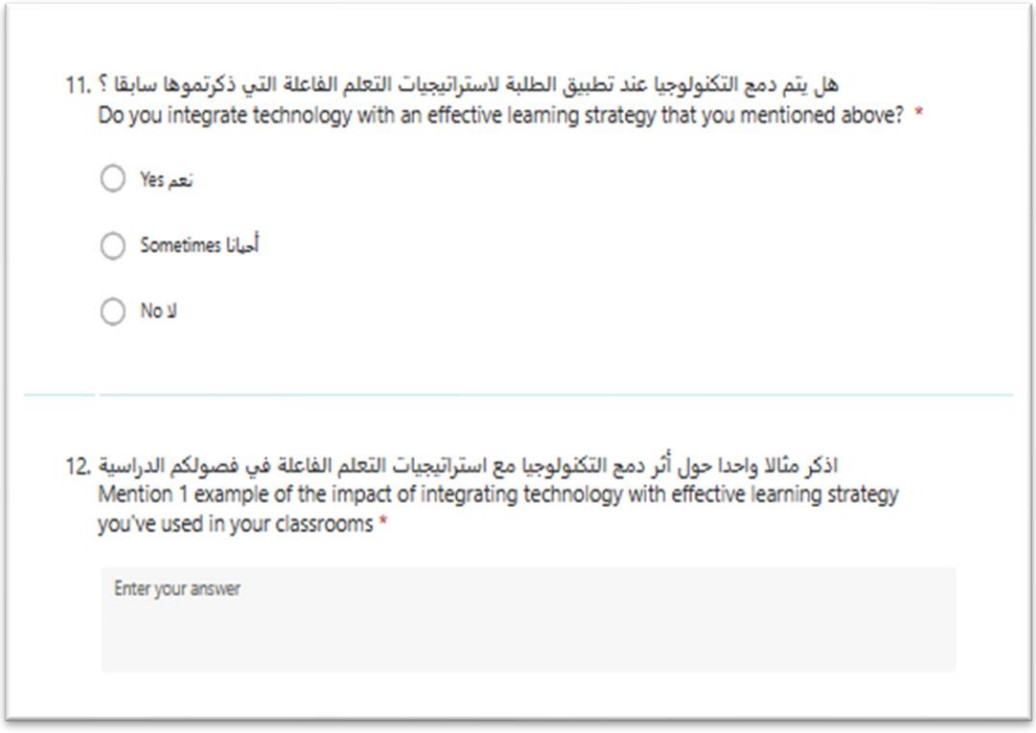
- Yes نعم
- Sometimes أحيانا
- No لا

9. اذكر مثالا واحدا حول أثر دمج تكنولوجيا التعليم مع استراتيجيات التعليم الفاعلة في فصولكم الدراسية
Mention 1 example of the impact of integrating educational technology and the effective teaching strategy you've used in your classrooms *

Enter your answer

10. ما هي استراتيجيات التعلم التي يتيحها المعلم للطلبة ليتبنوها بشكل فاعل لتعميق المعرفة والمهارات والقيم المستهدفة ؟
What are the effective learning strategies that are offered by teachers to their learners to adopt to deepen the targeted knowledge, skills and values ? *

Enter your answer



11. هل يتم دمج التكنولوجيا عند تطبيق الطلبة لاستراتيجيات التعلم الفاعلة التي ذكرتموها سابقا ؟
Do you integrate technology with an effective learning strategy that you mentioned above? *

- Yes نعم
- Sometimes أحيانا
- No لا

12. اذكر مثالا واحدا حول أثر دمج التكنولوجيا مع استراتيجيات التعلم الفاعلة في فصولكم الدراسية
Mention 1 example of the impact of integrating technology with effective learning strategy you've used in your classrooms *

Enter your answer

Appendix 20: Online Survey – Section 4

e-Maturity & Digital Transformation

النضج الإلكتروني و التحول الرقمي

هذا القسم يتناول النضج الإلكتروني والسعي للتحول الرقمي

This section targets e-Maturity and the efforts to achieve digital transformation

13. هل التكنولوجيا المتوفرة لديكم تعتبر فاعلة لغايات التحول الرقمي لمدارس ذكية ؟
Is the available technology considered effective for the purposes of Digital transformation to become smart schools? *

- ◯ Yes نعم
- ◯ Sometimes أحيانا
- ◯ No لا

14. يرجى منكم تفسير اجابتكم السابقة هنا
Please explain your previous response here *

Enter your answer

15. كيف يمكنكم كموظفين في المدرسة (مدير مدرسة - معلم - رئيس وحدة الشؤون الأكاديمية) المساهمة في التحول الرقمي لمدرستكم والتقدم في مستويات النضج الإلكتروني؟
How do school staff participate in the digital transformation to advance e-Maturity levels? *

Enter your answer

16. ما هو دورك في تطوير مستويات النضج الإلكتروني في عمليات التعليم والتعلم الفاعلة في مدرستكم؟
What is your role in development of e-Maturity levels that concentrate on effective Teaching and Learning in your school? *

Enter your answer

Appendix 21: Online Survey – Section 5

e-Maturity Evaluation
تقييم النضج الإلكتروني

هذا القسم يتضمن جوانب تقييم النضج الإلكتروني في المدارس الحكومية
This section includes aspects related to e-Maturity Evaluation in public schools

17. رتب الأدوات التالية وفقا لفاعليتها في تحديد مستويات النضج الإلكتروني لعمليات التعليم والتعلم
Reorganize the following tools according to their effectiveness when used to identify e-Maturity levels of teaching and learning processes
* حيث أعلى القائمة هي الأداة الأكثر فاعلية والأسفل هي الأقل فاعلية
* At the top should be the most effective tool, and the least will be at the bottom *

- استمارة الزيارات الصفية Classroom Visit Form
- إطار التحول للمدارس الذكية School Digital Transformation Framework
- ملاحظات الرئيس المباشر Observation of Direct Leader
- التقييم الخارجي من قبل موجهين أو الادارة العليا في المؤسسة External Evaluation from supervisors or ESE
- التأمل المهني لممارسات دمج التكنولوجيا في التعليم Self reflection on processes to integrate technology in teaching
- مقارنة أدائك مع زملائك المعلمين Compare your performance with other colleagues

18. Other tool / tools to mention than those listed above
أداة أو أدوات أخرى غير المذكوره أعلاه اذكرها هنا *

Enter your answer

19. هل تعتبر اطار التحول للمدارس الذكية فيما يختص بمعايير التعليم والتعلم الفاعلة لغايات تحقيق مستويات متقدمة للنضج الالكتروني واضحة؟
Do you consider the criteria of effective teaching and learning for achieving advanced e-Maturity level are clear in Smart School Transformation Framework? *

- ◯ Yes نعم
- ◯ Sometimes أحيانا
- ◯ No لا

20. فسر اجابتك السابقة
Explain your previous response *

Enter your answer

21. هل هناك تفاوت ما بين نتيجة التقييم الذاتي للنضج الإلكتروني للمدرسة ونتائج المقيمين من الوزارة في التقارير السنوية، بناء على استخدام اطار التحول للمدارس الذكية ؟
Are there discrepancies between e-Maturity self-evaluation in school and the annual report of external evaluators from the ministry, according to the usage of the Smart School Transformation Framework? *

- Yes نعم
- sometimes أحيانا
- No لا

22. في حال وجود تفاوت هل يمكنك التفسير في أي جانب ؟
In case there are discrepancies can you explain in which criteria? *

Enter your answer

23. ما جوانب التحسين أو التطوير التي من الممكن أن تدعم عمليات تقييم النضج الإلكتروني لدعم علميات التعليم والتعلم الفاعلة من وجهة نظرك (إن وجدت)؟
What enhancement or development procedures you think can support the evaluation processes of e-Maturity to support effective teaching and learning procedures (if available)? *

Enter your answer

Appendix 22: Semi-Structured Interview questions

Lancaster University

This interview session may take around 15 to 30 minutes. It contains questions to gather data for studying the impact of e-Maturity Models or frameworks on Teaching and Learning practices in the UAE public schools. Your participation is voluntary and will remain anonymous as the purpose is to gather data to study educational practices related to e-Maturity Models for achievement of digital transformation in school contexts, specifically the impacts on teaching and learning practices, and not to assess individuals' performances.

**You may withdraw after 2 weeks of conducting this interview but not later as I will be working on analyzing all data after 2 weeks of collecting them.*

تحتاج جلسة المقابلة هذه من 15 إلى 30 دقيقة و تحتوي على أسئلة لجمع بيانات لدراسة أثر نماذج وأطر النضج الإلكتروني لغايات التحول الرقمي على عمليات التعليم والتعلم في المدارس الحكومية في دولة الإمارات العربية المتحدة. تعتبر مشاركتك تطوعية ومجهولة الهوية وذلك لغرض جمع البيانات لغايات التعرف على الممارسات ذات الصلة بنماذج النضج الإلكتروني لغايات التحول الرقمي وبالتحديد أثرها على عمليات التعليم والتعلم في المحيط المدرسي حيث أن الدراسة لا تستهدف تقييم الأفراد و مستويات أدائهم.

**يمكنك الإنسحاب من المشاركة في البحث خلال الأسبوعين بعد مشاركتك في هذه المقابلة ولكنك لا تستطيع سحب المشاركة بعد انقضاء فترة الاسبوعين وذلك لأني سأضمن نتائج المقابلة بعد اسبوعين من حصولي على الاستجابات.*

The interview questions relate to both the internal and external evaluators who benchmark schools' e-Maturity levels.

أسئلة المقابلة تستهدف كلا المقيمين الداخليين والخارجيين والذين يقيمون ويصنفون مستوى النضج الإلكتروني للمدارس.

ماجده عبدالله داغر البلوشي
Majdah Abdulla Dagher Alblooshi

Interview Questions

Name of Participant: **Code given:**

The researcher will put tick beside the following:

1. Internal Evaluator ( ) 2. External Evaluator ( )

1. What are the adopted e-MMs or Maturity Frameworks in the UAE government schools?

- Why were they selected?
- What criteria or standards do they contain and why are these used?

2. What are the impacts of adoption of such e-MMs or Maturity Frameworks on teaching and learning practices?

- How are these impacts being measured?

3. Are the adopted e-MMs or Maturity Frameworks considered effective for digital transformation or do they require enhancements?

- If they require enhancements, how can this be achieved?

Thank you very much for your participation in this interview session.

Appendix 23: The Coded Topics and Themes

Topics/Themes	Codes	Description
The 6 targeted schools for this study	**ScM01 – ScM02 – ScM03** **ScS01 – ScS02 – ScS03**	**Sc = School, M= Middle, S = Secondary, to categorize the 6 schools the end symbol of the code included 01, 02, 03 … etc.**
Participants	**P1 – P2 – P3 – P4 – P5 – P6** **A1 – A2 – A3 – A4 – A5 – A6** **External 1 – External 2 – External 3 – External 4** **T**	**P = Principal** **A = Academic Official** **External = External Evaluators** **T = Teacher**
Responses	**Colour Codes = White – Pink – Red** **AI – AM – NV**	**White = Yes** **Pink = Sometimes** **Red = No** **AI = Available by Institution** **AM = Available by Myself** **NV = Not Available**

Appendix 24: Educational Technology Availability in ScM01 school. Total number of participants = 31

SCM01	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Content		Interaction			School Data & Performance Tracker Systems			Communication & Collaboration			Enrichment & Discovery		Devices			
	e-Content	Content Creator Tools	Online Broadcast	Interactive Content	Augmented Reality	LMS	SIS	e-Assessment	Email	Social Media	e-Channels	e-Library	Multi Media	Personal Computers	Internet	Smart Board	Interactive Board
AI	100	70.9	87	83.8	58	96.7	100	90.3	96.7	51.6	90.3	77.4	90.3	96.7	93.5	100	100
AM	-	25.8	6.4	16.1	22.5	3.2	-	9.6	3.2	45.1	3.2	16.1	9.6	3.2	6.4	-	-
NV	-	3.2	6.4	-	19.3	-	-	-	-	3.2	6.4	6.4	-	-	-	-	-

Appendix 25: Educational Technology Availability in ScM02 school. Total number of participants = 22

SCM02	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Content		Interaction			School Data & Performance Tracker Systems			Communication & Collaboration			Enrichment & Discovery		Devices			
	e-Content	Content Creator Tools	Online Broadcast	Interactive Content	Augmented Reality	LMS	SIS	e-Assessment	Email	Social Media	e-Channels	e-Library	Multi Media	Personal Computers	Internet	Smart Board	Interactive Board
AI	95.4	68.1	86.3	72.7	68.1	100	100	90.9	100	65	90.9	90.9	72.7	100	100	100	100
AM	5	31.8	5	22.7	9	-	-	9	-	40.9	5	-	22.7	-	-	-	-
NV	-	-	9	5	40.9	-	-	-	-	-	5	9	5	-	-	-	-

Appendix 26: Educational Technology Availability in ScM03 school. Total number of participants = 22

SCM03	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Content		Interaction			School Data & Performance Tracker Systems			Communication & Collaboration			Enrichment & Discovery		Devices			
	e-Content	Content Creator	Online Broadca	Interactiv e	Augment ed	LMS	SIS	e-Assessm ent	Email	Social Media	e-Channel	e-Library	Multi Media	Personal Compute rs	Internet	Smart Board	Interactiv e Board
AI	100	72.7	77.2	81.8	63.6	100	95.4	100	100	65	86.3	81.8	77.2	90.9	90.9	100	95.4
AM	-	18.1	9	18.1	9	-	5	-	-	31.8	5	9	18.1	9	9	-	5
NV	-	9	13.6	-	27.2	-	-	-	-	5	5	9	5	-	-	-	-

Appendix 27: Educational Technology Availability in ScS01 school. Total number of participants = 25

ScS01	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Content		Interaction			School Data & Performance Tracker Systems			Communication & Collaboration			Enrichment & Discovery		Devices			
	e-Content	Content Creator Tools	Online Broadcast	Interactive Content	Augmented Reality	LMS	SIS	e-Assessment	Email	Social Media	e-Channels	e-Library	Multi Media	Personal Computers	Internet	Smart Board	Interactive Board
AI	92	88	96	76	44	100	96	100	96	76	80	100	76	96	100	100	92
AM	8	12	-	20	8	-	4	-	4	20	4	-	24	4	-	-	-
NV	-	-	8	4	48	-	-	-	-	4	16	-	-	-	-	-	8

Appendix 28: Educational Technology Availability in ScS02 school. Total number of participants = 22

SCS02	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Content		Interaction			School Data & Performance Tracker Systems			Communication & Collaboration			Enrichment & Discovery		Devices			
	e-Content	Content Creator Tools	Online Broadcast	Interactive Content	Augmented Reality	LMS	SIS	e-Assessment	Email	Social Media	e-Channels	e-Library	Multi Media	Personal Computers	Internet	Smart Board	Interactive Board
AI	100	72.7	86.3	77.2	40.9	100	100	100	100	36.3	63.6	86.3	63.6	90.9	90.9	100	90.9
AM	-	27.2	5	22.7	-	-	-	-	-	45.4	13.6	5	31.8	9	9	-	-
NV	-	-	9	-	65	-	-	-	-	18.1	22.7	9	5	-	-	-	9

Appendix 29: Educational Technology Availability in ScS03 school. Total number of participants = 18

SCS03	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Content		Interaction			School Data & Performance Tracker Systems			Communication & Collaboration			Enrichment & Discovery		Devices			
	e-Content	Content Creator Tools	Online Broadcast	Interactive Content	Augmented Reality	LMS	SIS	e-Assessment	Email	Social Media	e-Channels	e-Library	Multi Media	Personal Computers	Internet	Smart Board	Interactive Board
AI	100	61.1	88.8	72.2	61.1	100	94.4	100	100	38.8	100	83.3	55.5	100	100	100	94.4
AM	-	22.2	11.1	22.2	11.1	-	-	-	-	50	-	-	38.8	-	-	-	-
NV	-	11.1	-	5.5	27.7	-	5.5	-	-	11.1	-	16.6	5.5	-	-	-	5.5

Appendix 30: Principal Responses to the Teaching and Learning Strategies

No.	Teaching Strategies	ScM01	ScM02	ScM03	ScS01	ScS02	ScS03	Total (6)
1	Differentiated Learning (DL)			1				1
2	Cooperative Learning (CL)	1	1					2
3	Brain Storming (BS)		1					1
4	Project Based Learning (PBL)	1						1
5	Active Learning (AL)		1				1	2
6	Problem Solving (PS)		1					1
7	Discovery Learning (DL)	1	1					2
8	Research Based Learning (RBL) & Inquiry Based Learning (IBL)	1			1			2
9	Create Mind Maps (CMMs)		1					1
10	Discussion (D)		1					1
11	Gamification (G)	1	1					2
12	Master Learner	1			1			2
13	Usage of Educational Platforms (UEPs)	1	1			1		3
14	Peer Learning		1	1	1			3
15	Experimentation	1						1
No.	Teaching Strategies	ScM01	ScM02	ScM03	ScS01	ScS02	ScS03	Total (6)
1	Gamification					1		1
2	Discussion		1					1
3	Discovery Learning		1			1		2
4	Task Achievement	1						1
5	Research & Inquiry Based Learning (RBL)		1		1	1	1	4
6	Individual Learning		1	1				2
7	Peer Work		1	1				2
8	Group Work		1					1
9	Problem Solving	1						1
10	Learning Through Flipped Classroom Strategy				1			1
11	Stimulate Thinking	1				1		2

Appendix 31: Academic Officials Responses to the Teaching and Learning Strategies

No.	Teaching Strategies	ScM01	ScM02	ScM03	~~ScS01~~	ScS02	ScS03	Total (5)
1	Flipped Classroom (FC)					1	1	2
2	Differentiated Learning (DL)		1	1			1	3
3	Cooperative Learning (CL)	1		1				2
4	Brain Storming (BS)	1						1
5	Critical Thinking (CT)		1					1
6	Active Learning (AL)			1				1
7	Independent Learning (IL)						1	1
8	Discovery Learning (DL)						1	1
9	Research Based Learning (RBL) & Inquiry Based Learning (IBL)			1			1	2
10	Create Mind Maps (CMMs)	1						1
11	Gamification (G)	1		1				2
12	Master Learner		1					1
13	Record Notes		1					1
14	Peer Learning	1		1				2
No.	**Teaching Strategies**	**ScM01**	**ScM02**	**ScM03**	**ScS01**	**ScS02**	**ScS03**	**Total (5)**
1	Cooperative Learning			1				1
2	Gamification			1		1		2
3	Discovery Learning						1	1
4	Research & Inquiry Based Learning (RBL)			1			1	2
5	Peer Work			1				1
6	Group Work		1	1				2
7	Differentiated Learning		1					1
8	Use Educational Platforms					1		1
9	Active Learning			1				1
10	Stimulate Thinking	1		1				2

Appendix 32: Impact of Technology Integration in Teaching Strategies in Middle Schools (Cycle 2)

P.	ScM01	ScM02	ScM03
T	**Increase motivation towards participation & interaction** Facilitate Learning Process Stimulate competitiveness **Usage of LMS for different activities** Usage of Interactive worksheets Usage of Games and Videos Develop Skills & Knowledge	**Increase motivation towards participation & Interaction** **Raising the level of academic achievement** Active Learning **Usage of Alef Education Platform** for Independent Learning, Discussion, Check Understanding & Assessment **Usage of LMS and Alef Education Platform facilitate collaboration and sharing of work**	**Increase motivation towards participation & Interaction** Increase Attention Differentiation Simplify Information **Usage of Educational Platform for achieving tasks**
P	**Increase motivation towards participation & interaction** Facilitate Teachers' duties by: Saving efforts and time in correction processes, preparing assessments and establishing exit tickets.	Support and Enhance Maturity Levels Create Enjoyment while Learning	**Increase motivation towards learning which** enhance **learners' academic achievements**
A	**Increase motivation towards participation & Interaction**	**Increase motivation towards participation & Interaction** Engage Learners with activities and competitions Encourage Learners to search and innovate	New Technology supports learners' digital skills in utilising technology for learning

Appendix 33: Impact of Technology Integration on Teaching Strategies in Secondary Schools (Cycle 3)

P.	ScS01	ScS02	ScS03
T	**Increase motivation towards participation & Interaction** **Enhance Learners' Performance and ability to learn** **Support Digital skills and literacy** around usage of Internet **Usage of Education Platform such as Alef** **Enhance Independent Learning** Usage of virtual laboratories	**Increase motivation towards participation & Interaction** **Raising the level of academic achievement** Differentiation **Usage of Education Platform such as Alef, LMS and simulation websites** Targeting self-learning, independent learning, PBL, Gamification and Problem based Learning	**Increase motivation towards participation & Interaction** **Raising the level of academic achievement** **Support Digital skills and literacy**, and Increase Knowledge **Usage of Educational Platforms such as Alef and LMS** Problem Solving through different applications
P	Technological tools provide teachers with instant follow up system	**Increase motivation towards participation & interaction** **Enhance learners' understanding of content** Create Encouraging Environment towards challenges and innovation	**Technology enhance student learning processes**
A	NA	Application of Flipped Classroom Increase Learners' knowledge and save both time and efforts inside classroom	Flipped classroom enable learners to use **educational platforms inside classrooms**

Appendix 34: Impact of Technology Integration on Learning Strategies in Middle Schools (Cycle 2)

P	ScM01	ScM02	ScM03
T	**Increase motivation towards participation & Interaction** **Stimulate competitiveness** depth of knowledge better retention of knowledge Differentiation Search Information Student Play the role of teacher **Usage of LMS / Discussion** Engage Learners through Gamification **Raising the level of academic achievement**	**Increase motivation towards participation & Interaction** **Usage of LMS for different Activities** Increase Knowledge **Enhance Learning** Engage Learners Student Play the role of teacher Easy to Access information Develop Learners' Character **Develop skills** in building Models and Robots	**Increase motivation towards participation & Interaction** depth of knowledge / Link Knowledge with Practice **Usage of LMS for different Activities** Increase Eagerness to Learn Easiness to access information Help understanding content & curriculum **Stimulate competitiveness** Build confidence Differentiation
P	**Raising the level of academic achievement** Targeting lower achievers with specific practices	Support Independent learning Easy to access information	**Stimulate positive competitiveness** **Raising the level of academic achievement**
A	Enhance Positive Behaviour Enable Digital Transformation	Interactive lessons and distinguish performance Achievement of learning goals	**Develop learners' digital skills and usage of PCs**

Appendix 35. Impact of Technology Integration on Learning Strategies in Secondary Schools (Cycle 3)

P	ScS01	ScS02	ScS03
T	**Engagement /enthusiasm toward learning** Develop research skills **Enhance Independent learning** Build confidence Increase Knowledge / improve skills **Raising the level of academic achievement**	**Increase motivation towards participation & Interaction** depth of knowledge / enable understanding **Raising the level of academic achievement** Engagement /enthusiasm toward learning	Engagement / Fun learning **Increase motivation towards participation & Interaction** **Increase digital skills** Deep Learning Stimulate competitiveness
P	Multiple digital sources Enrichment of the learning goals	**Raising the level of academic achievement**	**Increase motivation towards participation & Interaction**
A	NA	Save efforts and time	**Usage of Educational Platforms in classes**

Appendix 36: Sufficiency of Available Technology for Digital Transformation of UAE Schools (Cycle 2)

P	ScM01			ScM02			ScM03		
	Yes	**Sometimes**	**No**	**Yes**	**Sometimes**	**No**	**Yes**	**Sometimes**	No
T	75.8	24.1	-	70	30	-	100	-	-
P	√			√			√		
A	√			√			√		

Appendix 37: Sufficiency of Available Technology for Digital Transformation of UAE Schools (Cycle 3).

P	ScS01			ScS02			ScS03		
	Yes	**Sometimes**	**No**	**Yes**	**Sometimes**	**No**	**Yes**	**Sometimes**	No
T	87.5	12.5	-	75	15	-	78.5	12.5	-
P	√			√			√		
A				√			√		

Appendix 38: Ordering of Effective Evaluation Tool for Measurement of E-Maturity Levels (Cycle 2 Teachers)

	Teachers	ScM01					
		1	2	3	4	5	6
1	School Digital Transformation Framework	12	10	2	2	3	0
2	Self-reflection on processes to integrate technology in teaching	10	9	6	4	0	0
3	Compare your performance with other colleagues	1	4	3	1	12	8
4	External Evaluation from supervisors or ESE	0	1	1	6	5	16
5	Observation of Direct Leader	3	1	9	9	7	0
6	Classroom Visit Form	3	5	6	8	3	2

Order		
1	1	
2	2	
3	5	6
4	3	4

#		ScM02					
		1	2	3	4	5	6
1	School Digital Transformation Framework	5	7	5	1	0	2
2	Self-reflection on processes to integrate technology in teaching	8	2	3	1	3	3
3	Compare your performance with other colleagues	0	1	6	4	4	5
4	External Evaluation from supervisors or ESE	1	2	2	4	4	7
5	Observation of Direct Leader	5	6	1	0	4	0
6	Classroom Visit Form	1	1	3	7	5	3

1	2	
2	1	
3	3	6
4	5	4

#		ScM03					
		1	2	3	4	5	6
1	School Digital Transformation Framework	5	8	3	2	2	0
2	Self-reflection on processes to integrate technology in teaching	5	6	2	3	3	1
3	Compare your performance with other colleagues	1	1	3	4	3	8
4	External Evaluation from supervisors or ESE	0	3	3	2	4	8
5	Observation of Direct Leader	3	1	4	7	5	0
6	Classroom Visit Form	6	1	3	3	3	3

1	6	
2	1	2
3	5	3
4	4	

Appendix 39: Ordering of Effective Evaluation Tool for Measurement of E-Maturity Levels (Cycle 3 Teachers)

#	Teachers	ScS01					
		1	2	3	4	5	6
1	School Digital Transformation Framework	11	3	2	3	5	0
2	Self-reflection on processes to integrate technology in teaching	3	5	3	4	2	7
3	Compare your performance with other colleagues	3	3	3	3	7	5
4	External Evaluation from supervisors or ESE	4	1	3	2	5	9
5	Observation of Direct Leader	1	4	9	5	5	0
6	Classroom Visit Form	2	8	4	6	1	3

1	1	6	
2	5		
3	3	6	
4	4	2	

#		ScS02					
		1	2	3	4	5	6
1	School Digital Transformation Framework	9	6	2	0	3	0
2	Self-reflection on processes to integrate technology in teaching	6	5	4	4	1	0
3	Compare your performance with other colleagues	0	3	3	5	3	6
4	External Evaluation from supervisors or ESE	0	2	3	1	2	12
5	Observation of Direct Leader	2	4	3	5	4	1
6	Classroom Visit Form	3	2	4	3	7	1

1	1		
2	2	1	
3	3	5	
4	4	6	

#		ScS03					
		1	2	3	4	5	6
1	School Digital Transformation Framework	6	4	2	2	0	2
2	Self-reflection on processes to integrate technology in teaching	5	4	2	1	3	1
3	Compare your performance with other colleagues	0	1	4	2	4	5
4	External Evaluation from supervisors or ESE	2	1	2	0	4	7
5	Observation of Direct Leader	2	2	1	7	3	1
6	Classroom Visit Form	1	3	5	4	3	0

1	1		
2	2		
3	5	6	
4	4	3	

Appendix 40: Ordering of Effective Evaluation Tool for Measurement of E-Maturity Levels (School Leadership) (Cycle 2)

ScM01	**P**	4	1	5	3	2	6
	A	1	2	4	5	6	3
ScM02	**P**	1	4	6	5	3	2
	A	6	5	4	2	3	1
ScM03	**P**	4	1	5	3	2	6
	A	1	2	4	5	6	3

Appendix 41: Ordering of Effective Evaluation Tool for Measurement of E-Maturity Levels (School Leadership) (Cycle 3)

ScS01	**P**	4	1	5	3	2	6
	A	1	2	4	5	6	3
ScS02	**P**	3	1	4	6	5	2
	A						
ScS03	**P**	1	6	5	4	3	2
	A	6	2	3	5	1	4

Appendix 42: Discrepancy between Internal Evaluation and External Evaluation of e-Maturity

ScM01	**Yes**	**Sometimes**	**No**
Teachers Total = 28	10 = 35.7%	12 = 42.8%	6 = 21.4%
P	1		
A		1	
ScM02	**Yes**	**Sometimes**	**No**
Teachers Total = 20	4 = 20%	7 = 35%	9 = 45%
P			1
A		1	
ScM03	**Yes**	**Sometimes**	**No**
Teachers Total = 20	5 = 25%	8 = 40%	7 = 35%
P			1
A			1
ScS01	**Yes**	**Sometimes**	**No**
Teachers Total = 24	10 = 41.6%	9 = 37.5%	5 = 20.8%
P	1		
A			
ScS02	**Yes**	**Sometimes**	**No**
Teachers Total = 20	3 = 15%	10 = 50%	7 = 35%
P	1		
A	1		
ScS03	**Yes**	**Sometimes**	**No**
Teachers Total = 16	3 = 18.7%	6 = 37.5%	7 = 43.7%
P		1	
A			1
Average Percentage	26%	40.6%	33.4%

Appendix 43: Clarity of e-MMs and Frameworks for External Evaluators

Description	External 1	External 2	External 3	External 4	Rates
Mentioned clearly the framework with example					**100%**
Mentioned clearly the e-MM with example					**50%**
Mentioned only the framework without example					**-**
Mentioned only the e-MM without example					**50%**
Not clear description / not sure about the framework					-
Not mentioned or clear description / not sure about the e-MM					-

Appendix 44: Clarity of e-MMs and Frameworks for Principals

Description	P1	P2	P3	P4	P5	P6	Rates
Mentioned clearly the framework with example							**66.6%**
Mentioned clearly the e-MM with example							**50%**
Mentioned only the **f**ramework without example							**33%**
Mentioned only the e-MM without example							**50%**
Not clear description / not sure about the framework							-
Not mentioned or clear description / not sure about the e-MM							**-**

Appendix 45: Clarity of e-MMs and Framework for Academic Officials

Description	A1	A2	A3	A4	A5	A6	Rates
Mentioned clearly the framework with example							**33%**
Mentioned clearly the e-MM with example							**66%**
Mentioned only the **f**ramework without example							**50%**
Mentioned only the e-MM without example							**33%**
Not clear description / not sure about the framework							**16%**
Not mentioned or clear description / not sure about the e-MM							**-**

Appendix 46: Rationale of adopting 5Es e-MM and SSTF from External Evaluators Perspectives

Why adopting SSTF?	**Ex. 1**	**Ex. 2**	**Ex. 3**	**Ex. 4**	**Rates**
1- Based on the Best World Practices and trends in this Field					**75%**
2- Based on UAE Vision, Government Vision, Community					**25%**
3- Based on Research, Studies and World Reports					**25%**
4- To Suit other Framework applied in the School System like School Inspection and Evaluation Framework SEIF 2015-2016					**25%**
5- Considering the best world practices in transferring schools to smart schools					**50%**
6- To Correct or guide the integration of Technology into Educational system in School (Raise Performance)					**25%**
7- To Lead Change Management towards Digital Transformation					**25%**
8- To Suit the required KPIs in the UAE					**25%**
9- To avoid confusion of having several evaluation tools and keep focused on specific frameworks.					**25%**
10- Based on the school development pillars or desired end-results (School Leadership - Competencies)					**25%**
Why Adopting e-MMs (E5s)?					**Rates**
1- Comparing Different e-MMs to Suit Education System in the UAE					**25%**

Appendix 47: Rationale of adopting 5Es e-MM and SSTF from Internal Evaluators Perspectives (Principals)

Why adopting SSTF?	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**Rates**
1- Based on the Best World Practices and trends in this Field							**16.6%**
2- Based on UAE Vision, Government Vision, Community							**50%**
6- To Correct or guide the integration of Technology into Educational system in School (Raise Performance)							**50%**
10- Based on the school development pillars or desired end-results (School Leadership - Competencies)							**16.6%**
11- To Encourage Learners' participation and deepen the educational experience (Target 21st Skills) throughout academic years							**33.3%**
12- To have fixed standards to evaluate school e-Maturity level							**16.6%**

Appendix 48: Rationale of adopting 5Es e-MM and SSTF from Internal Evaluators Perspectives (Academic Officials)

Why adopting SSTF?	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**Rates**
1- Based on the Best World Practices and trends in this Field							**16.6%**
2- Based on UAE Vision, Government Vision, Community							**66.6%**
6- To Correct or guide the integration of Technology into Educational system in School (Raise Performance)							**33.3%**
13- To raise academic achievement							**16.6%**
14- To suit the requirement of modern era							**16.6%**
Why Adopting e-MMs (E5s)?	**A1**	**A2**	**A3**	**A4**	**A5**	**A6**	**Rates**
2- To target quality in teaching and learning (Thinking skills, Knowledge depth)							**16.6%**

Appendix 49: The Explanation of the Standards and Criteria of e-Maturity Evaluation (External Evaluators)

Description	**Ex. 1**	**Ex. 2**	**Ex. 3**	**Ex. 4**
Mentioned Clearly the Framework Standards & Criteria **(100%)**				
Mentioned Clearly the e-MM Criteria **(50%)**				
Mentioned only the e-MM without Example **(50%)**				

Why these criteria are used ?	
Ex. 1	Act as **a road map for principals, teachers and every individual in School** to reach the digital maturity Do self and peer evaluation and get the appropriate feedback of the practices Avoid confusion of having different accreditation and evaluation criteria (working hard to make the alignment) **Ensure reaching the educational objectives** (identified by MOE & ESE)
Ex. 2	Globally, these are the pillars of the school upon which distinguished schools are based **Develop a school** as a whole Investing technology in advancing the school level
Ex. 3	A need for the field itself to **have a correct direction** Act like **a road map for administration and each individual in the school** to know how to **progress with e-maturity**
Ex. 4	the use of digital tools and skills **to achieve the goals of the institution.** At the highest level to serve the results of the students.

Appendix 50: The Explanation of the Standards and Criteria of e-Maturity Evaluation (Principals)

Description	P1	P2	P3	P4	P5	P6
Mentioned Clearly the Framework Standards & Criteria **(66.6%)**						
Mentioned Clearly the e-MM Criteria **(50%)**						
Mentioned only the Framework without Example **(33%)**						
Mentioned only the e-MM without Example **(50%)**						

Why these criteria are used ?	
P1	To implement technology effectively in teaching and learning practices To have **quality in learning outcomes**
P2	leadership, teaching, learning and the student are considered the most important axes of the school community
P3	**Transform normal learning to hybrid learning**, and therefore We need to have an electronic maturity we have a vision and a message that must be clear to all employees, to students, even to parents.
P4	It is an integrated system in its distributions, each standard completes the other i.e. leadership, teachers and students.
P5	Employing tools and strategies that contribute in **raising the level of student achievement.** **Leadership aspect is very important to consider as standard because a vision and a mission embed by leadership.**
P6	We focus on **leadership from bottom up approach** to engage groups, teachers, students and parents.

Appendix 51: The Explanation of the Standards and Criteria of e-Maturity Evaluation (Academic Officials)

Description	A1	A2	A3	A4	A5	A6
Mentioned Clearly the Framework Standards & Criteria **(33%)**						
Mentioned Clearly the e-MM Criteria **(66%)**						
Mentioned only the Framework without Example **(50%)**						
Mentioned only the e-MM without Example **(33%)**						
Not mentioned or not clear description of the framework **(16%)**						

Why these criteria are used ?	
A1	Leaders to follow up and offer feedback regularly about the teaching and learning processes which will assure **continuous improvement** and feedback. This will certainly have an impact on **the teacher**, and therefore it will have an impact on the student.
A2	All these standards are complementary to each other, we integrate with each other and complete the system in order to **bridge the imbalance and see where the weaknesses are, reach higher points, develop and improve**
A3	Standards are there to expand e-Maturity and **develop the performance of the teacher**, whether in the classroom or outside the classroom, to **serve the academic side of the student and develop his performance.**
A4	replace the book with the electronic book. Therefore, this gives the student a skill in using technologies, and this saves large sums of money for the ministry and the state. Focus on **students' usage of media and research skills.**

A5	Create a stage in which we **move from current level to a higher level in the process of teaching and learning,** starting with spreading culture to the teacher, training the teacher and following up the teacher through visits and many other things, until in the end **we get the level of students in terms of achievement** and in terms of education at the end of the school or academic year.
A6	Serve **in raising the thinking level of the students**. We do not want to rely only on book as a knowledge resource. Expanding outside this book and enriching the **student's collection of information and guiding the student to solve problems** we have in the country so that he can serve the country in the future.

Appendix 52: The Effectiveness of the e-MMs and Frameworks

P	Effective		In Need of Improvement		Rationale
	e-MMs (5Es)	**Framework (SSTF)**	**e-MMs**	**SSTF**	
External 1	-	√	√	-	e-MMs to aligned with SSTF
External 2	-	-	√	√	Covid-19
External 3	-	-	-	√	Covid-19
External 4	-	-	√	√	Covid-19
P1	-	-	√	√	Lack of Clarity
P2	√	√	-	-	
P3	-	-	√	√	Covid-19
P4	-	-	√	√	Lack of Clarity
P5	-	-	√	√	
P6	-	-	√	√	Difficulty of Implementation
A1	-	-	√	√	Lack of Clarity
A2	√	√	-	-	
A3	-	-	√	√	Covid-19
A4	-	-	-	√	Difficulty of Implementation
A5	-	-	-	-	
A6	√	-	-	√	Lack of Clarity

Appendix 53: E-Maturity Evaluation Reports for Academic Year 2021

School Info	Strengths – Weaknesses	Description
ScM01 **Result** **Good**	**7 Strength points**	b. **Clarity of School vision for all stakeholders** and its implication is clear c. **Distinguish practices of e-Safety** that targeted all stakeholders d. **Distribution of responsibilities to lead ICT** effectively in school which impacted school work and students' results. **e.** Internal competitions and initiatives targeting **the development of students' digital skills** f. Most **class sessions integrate technology**, educational programs, platforms, Microsoft office and LMS. **The quality of integration** is rated between average level to outstanding level. g. **Students showed awareness of using the smart learning tools** and chances were given to them to search and design in h. **The school has strategy and guidance as part of its professional development plan** which targeted the ICT usage. The school invest on the external support and online platforms to develop its employees.
	9 Need Improvements	1. Establishing your vision for ICT, **leading your vision, Research and Innovation in your vision,** and Reviewing and refreshing your vision: **Not Clear** 2. Learner ICT capability: **No objectives determined** to improve learners' capability to exceed the curriculum standards. **No constant reviewing of learners' progress** in performance. 3. Quality of use for ICT for learning and teaching: **Not Clear** 4. Employees' Skills and Needs: **Not Clear** 5. Developing and Sharing ICT practices: **No Professional development plan** developed for school and no evidence for systematic reviewing of the plan 6. **Not clear evidence** of providing opportunities for gaining extra and external professional development support on the level of cluster. 7. **Not clear evidence** of having analysis of employees' need regarding professional development and the kind of support school provide to encourage teachers' to plan for their own professional development 8. **Not clear evidence** of the impact of professional development on learners' performance 9. Assessment of ICT and digital capabilities of students and their peers: **No assessment available for learners and their peers to evaluate digital capabilities** according to their own standards.
ScM02 **Result** **Very** **Good**	**11 Strength points**	1. **Clarity of vision** for all stakeholders 2. **Distinguish programs for e-safety** covering all targeted parties of school community 3. **Distribution of leadership and responsibilities related to ICT aspects** has major impacts on school work and students' results 4. **Spreading innovation culture** between students and all employees 5. The majority of classes **integrate technology and educational programs effectively** and learners showed knowledge in usage of smart learning tools as opportunities provided to them to search and design in classes. 6. Establishing groups in LMS and on telegram. Parents appreciated the **effective communication** through school channels on telegram 7. School staff capabilities in usage of ICT to enhance the educational practices and sharing of these practices with external staff in other schools 8. **School aligned its PD plans with the needs of its staff** and provide other external supports and digital resources to develop its staff. 9. Clear evidence of the **impact of PD programmes on teachers' strategies** which impacted learners' outcomes

		10. Consistency of **evaluating learners' digital skills** via usage of forms 11. Evidence of **Learners' improvements in using ICT** to progress in their studies and results, using technology in internal and external classroom activities, for instance initiatives, competitions, winning awards, and innovative works.
	7 Need Improvement	1. A clear **culture of forecasting future**, the school takes into account the long-term requirements of research and innovation through **innovative projects** and external competitions. 2. Showing a **culture of self-assessment** for each of the staff members' competence and their needs in ICT, and conducting a routine evaluation of possible development opportunities and how they support others. 3. Include templates of individual **professional development** plans that are subject to regular review. 4. Highlighting the role of the school and individuals in **monitoring and evaluating the quality of learning and education using ICT** inside and outside the school. 5. Evaluation of **students' digital capabilities** and recording them in a consistent manner through follow-up and evaluation forms for students' digital capabilities by the administrative and teaching staff. 6. Highlighting the **impact of technologies on learning processes** as well as assessment processes that enrich students' learning quality and future professional development needs. 7. Attach special **detailed dialogues regarding students' skills** and their use of educational platforms and various programs, while providing them with feedback for improvement.
School Info	**Strengths – Weaknesses**	**Description**
ScS03 **Result** **Good**	**20 Strength points**	1. School has **a clear vision and all stakeholders are aware** of it and its **impact is clear**. 2. **Distinguished practices of e-safety** targeting the school community. 3. **Effective distribution and coordination of leadership responsible** for aspects of which has resulted in significant impacts on school work and student outcomes. 4. Preparing internal competitions and initiatives aimed at developing the **student's digital capabilities.** 5. Spreading the **culture of research and innovation** among students and staff inside and outside the school. 6. Most of the **lessons contain activation of technologies** from Microsoft programs and various educational programs, as well as activation of the smart learning portal, and the quality of employing technologies was from average to excellent. 7. Students show knowledge and know how **to use smart learning tools**, and they have the opportunity to design and research some lessons. 8. Groups were created in the smart learning portal and channels in the WhatsApp program, and parents noted **the effective communication** by the school administration with them, informing them of all developments in the school, assisting them in using technologies, and allowing parents to make comments about their children's learning process. 9. Preparing weekly **reports and routine follow-up**. 10. The school encourages teachers to use ICT inside and outside the school and to develop new **creative practices in learning**. 11. Staff members rely on ICT to improve and expand the scope of learning and teaching, share practices, review and improve them, and provide creative and independent learning opportunities.

		12. The school encourages staff members to review their ICT skills and there is **a culture of professional review and self-assessment and its impact.** 13. The school has **methods of counseling and guidance** as part of the planned **professional development of ICT** 14. The **ability of staff members to develop new practices using ICT for the purpose of making significant improvements to learning and teaching**. Practices are routinely exchanged inside and outside the school. 15. Clarity of **the impact of the professional development** of ICT through models for employing different strategies and educational practices with various technologies after attending workshops which showed impact on students' outputs. 16. **Monitoring and evaluating the quality of learning and teaching** using ICT inside and outside the school. 17. Evaluation of **students' digital capabilities** and recording them in a consistent manner through follow-up and evaluation forms by the administrative and teaching staff. 18. Demonstration of good **progress among students in the use ICT** at the school level as a whole, and what they learned was successfully applied in their curriculum 19. Distinguished practices of **developing students' digital capabilities** and **leadership skills** through creative independent learning inside and outside the school. 20. The **school provides data and support systems** that ensure that teachers and students have easy access to updated and clear data in a timely manner.
	7 Need Improvement	1. **Focus on outstanding practices** in the wide-ranging impacts of technology on the work of the school. 2. **Regular review to improve** showing positive control of responsibilities 3. **Celebration of achievements** during the three semesters. 4. The delivery of the staff to a **wide range of development opportunities** and the **lack of clarity** of the distinguished practices in the methods of preparing for the future. 5. Highlighting the **impact on students' outcomes** and encouraging planning for personal development in accordance with national standards. 6. **Students evaluate their digital abilities** for themselves and their peers based on criteria that help them improve 7. Include **innovative and distinguished practices** around the self-assessment criteria of the digital transformation framework

Appendix 54: E-Maturity Evaluation Reports for Academic Year 2022

School Info	Strengths – Weaknesses	Description
ScM01 **Result** **Very Good**	**6 Strength points**	All uploaded e-Maturity initiatives have targeted all standards. **Plans** for all initiatives were clear and considered **building teamwork** and **distribute responsibilities** The **evidence where detailed and descriptive** 'stated in good way' **Share and collaborate** internal and external initiatives with school and outside school community **Analysis of results and impact evaluation** were done clearly **Accomplishing workshops** and induction programs for all targeted parties
	2 Need Improvement	1. Some **initiatives lack innovation, excellence and quality** as they are similar to other initiatives in other schools 2. It's important to **focus on SN learners and develop distinguished programs** for them
ScM02 **Result** **Good**	**2 strength points**	1. Initiative **plans** are clear and integrated, taking into account **the formation of teams** and the **statement of tasks.** 2. The guides are detailed with the **procedures well explained and descriptive**.
	4 Need Improvement	1. The **files need to be arranged, organized** and worked on as an initiative of the school with its procedures. 2. **Implementing initiatives outside the school and sharing them** more widely at the level of other schools in the area to ensure the effectiveness of the desired results and the dissemination of benefits. 3. Some initiatives **lack the spirit of innovation and the nature of exceptionalism**, as similar practices have been observed in other schools 4. Results analysis and impact measurement have been worked on and it is preferable to attach **development plans**.
ScM03 **Result** **Good**	**7 Strength points**	1. The raised e-Maturity initiatives included all target groups. 2. Initiative **plans** are clear and integrated, taking into account **the formation of teams** and **the statement of tasks** 3. The guides are detailed with the **procedures well explained and descriptive.** 4. **Implementing most of the initiatives inside and outside** the school in partnership with the external community well. 5. **Results analysis and impact measurement** in a clear manner. 6. **Workshops and introductory programs** have been prepared for the target groups. 7. Work to **find solutions to the challenges** facing the school by turning it into an initiative
	1 Need Improvement	1. **Generalizing the initiatives more widely** at the level of other schools in the scale to ensure the effectiveness of the desired results and the generalization of benefits.
School Info	**Strengths – Weaknesses**	**Description**

ScS01 **Result** **Acceptable**	**6 Strength points**	1. **Management and Monitoring**: Preparing weekly reports and routine follow-up during the three semesters. 2. **Data and information management:** Availability of data analysis that shows development over the past three years and preparation of development and improvement forms 3. **Reporting and communication:** Parents are encouraged to communicate effectively by the school administration and inform them of all developments in the school and their children's academic level, the level of their use of technologies, or their achievements. 4. **Regulations and requirements:** Existence of monitoring of good practices and monitoring of the implementation of regulations, identification of staff and students what their responsibilities are, and mention of awareness measures outside the school. 5. **Students' abilities in ICT:** Clarity of the school's goals in improving students' capabilities for information and communication technologies beyond the requirements of the national curriculum, and following up on students' progress in a systematic and rigorous manner. 6. **Guiding, directing and supporting teachers in the use of ICT:** The school has guidance and direction methods as part of the **planned professional development** of information and communication technologies and uses external and electronic support in order to develop the expertise of staff members.
	14 Need **Improvement**	1. **Leadership and vision: Lack of clarity** in the distribution of command to the teams responsible for all aspects of technologies and their coordination effectively inside and outside the school. 2. **Students' ability: Lack of clarity** about developing students' abilities and confidence in using ICT, as well as benefiting from them outside the school. 3. **Quality of vision and regularity of ICT**: **Unclear** goals that involve a kind of challenge to enhance the impact of technologies outside the school boundaries. 4. **Data and information management:** School to provide analysis of development over the past three years, as there is no map of future needs 5. **There are no examples** of the school's **investment in new technologies** in communication, informing parents of their children's progress and achievements, and expressing their opinions and observations about their children's learning process. 6. Lack of good practice **monitoring and control** 7. **Overall effectiveness:** The **lack of clarity** of strategic practices in assessing the impact of technologies on student outcomes and organizational effectiveness. 8. Lack of **development opportunities inside and outside the school** for all staff members 9. The **quality of the use of ICT in learning and teaching**: It **is not clear** that all staff members invest technologies in improving the scope of learning and teaching. 10. The **lack of clarity** of **creative independent learning for students** that develops the ability to learn inside and outside the school. 11. The **lack of clarity** of **the leadership's encouragement** to develop new creative practices in the use of technologies inside and outside the school. 12. **Lack of clarity** of **impact on students' outcomes and encouragement** to plan for personal development in accordance with national standards. 13. **Dialogue and review on ICT**: **Lack of clarity** in the detailed dialogues regarding students' skills and their use of educational platforms and various programs, while providing them with feedback for improvement.

		14. **Lack of clarity** in the assessment regarding the **digital capabilities** of themselves and their peers based on criteria that help them improve.
School Info	**Strengths – Weaknesses**	**Description**
ScS02 **Result** **Good**	**3 Strength points**	1. The **inclusiveness of the e-Maturity initiative** for all, for the three basic elements. 2. The **initiative plan is clear and integrated**, taking into account the formation of the teams and the statement of tasks 3. **Results analysis and impact measurement** have been worked on.
	4 Need Improvement	1. The **procedures and guides are simple and not clear** enough to practice. 2. Demonstrating **the spirit of innovation and the nature of exceptionalism** in the initiatives in a greater way. 3. Raise **developmental plans and procedures** related to the results of the implemented analysis. 4. **Dissemination of the initiative more widely** at the level of domain schools and the external community to ensure the effectiveness of the desired results and the generalization of benefits.
ScS03 **Result** **Very Good**	**5 Strength points**	6 **Inclusiveness of the e-Maturity initiative** for all, the three core elements. 7 **The initiative plan is clear and integrated**, taking into account the formation of teams and the statement of tasks 8 **The manuals are detailed, with procedures clearly and descriptively explained**. 9 **Implementing the initiative inside and outside the school at the domain level**. 10 **Results analysis and impact measurement** have been worked on in a clear manner.
	3 Need Improvement	1. Demonstrate **the spirit of innovation and the exceptional nature** of initiatives in a greater way. 2. Set **plans and procedures for development** related to the results of the implemented analysis. 3. **Dissemination of the initiative more widely at the school level and the external community** to reach desired benefit