# An investigation of implementation, adoption and use of technology for enhancing students' CoreLife Skills in a vocational institute: A Case Study informed by Actor-Network Theory

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This thesis was completed as part of the PhD Doctoral Programme in E-Research & Technology Enhanced Learning.

This thesis results entirely from my own work and has not been offered previously for any other degree or diploma.

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## Abstract

With the increasing emphasis on developing graduate employability skills, termed as CoreLife Skills in the United Arab Emirates (UAE), and growing use of technology in education; this research investigates the assemblage of CoreLife Skills through technological innovation in a vocational education and training (VET) institute in the UAE. Further, the research explores the influence of teachers and students' technology adoption on the technological innovation.

Using a case study research strategy, the project draws on the concepts of the sociology of translation from Actor-Network Theory as both a methodological and analytical tool to inform multiple data collection methods: interviews, observation, review of documents and technological artefact. The research unfolds the socio-material assemblages using existing frameworks: Levels of Teaching Innovation (LoTi), HEAT (higher order thinking, engaged learning, authentic learning and technology use), and the unified theory of acceptance and use of technology (UTAUT).

The research stirred the development of technology enhanced learning and CoreLife Skills development (TEL-CSD) framework for effective integration of technology to enhance students' CoreLife Skills. Cases of technological innovation underpinned by the TEL-CSD framework suggest that technology integration at LoTi Level 3 or above resulting in the generation of HEAT at the corresponding level, did enhance

students' CoreLife Skills. Based on the findings, two conclusions were drawn: CoreLife Skills cannot be developed independently of general learning and cognitive skills, and technology alone cannot promote CoreLife Skills.

The findings suggest that teachers and students' technology adoption influenced mobilisation of allies and sustainability of the actor-network. This also provides tools for critiquing the proposed universality of the UTAUT as a technology adoption model, since influences such as power dynamics, personal characteristics, technical limitations and glitches are absent in the UTAUT. This research thereby demonstrates the usefulness of actor-network approaches in reconsidering and revising existing models in the field of education.

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## List of abbreviations

| | |
|---|---|
| ANT | Actor-network theory |
| AFLF | Australian Flexible Learning Framework |
| HEAT | Higher-order thinking, engagement of students, authenticity of instruction, and technology |
| ICT | Information and communication technology |
| IT | Information technology |
| LMS | Learning management system |
| LoTi | Levels of Teaching Innovation |
| NOSS | National Occupational Skills Standards |
| NQA | National Qualifications Authority |
| OPP | Obligatory passage point |
| RNDC | Recognised National Development Committee |
| TEL-CSD | Technology enabled learning and CoreLife Skills development framework |
| TVET | Technical vocational education and training |
| VETAC | Vocational Education and Training Awards Council |
| VET | Vocational education and training |
| VLE | Virtual learning environment |
| UAE | United Arab Emirates |
| UTAUT | Unified theory of acceptance and use of technology |

## Glossary of terms

| | |
|---|---|
| Actors | Human or non-human entities, also known as actants, which only act in combination with other actors, in which inanimate things (e.g. technology) can also have agency along with human actors (Cresswell, Worth, & Sheikh, 2010). |
| Actor-network | A collection of human and non-human actors who jointly participate in some organised collective activity by translating and aligning their interests. It is also known as a heterogeneous network (Law, 1987). |
| ANT | A material-semiotic approach used to study scientific and technical innovations (Cressman, 2009). |
| Assemblage | A "mode of ordering heterogeneous entities so that they work together for a certain time" (Müller, 2015, p. 28). |
| Betrayal | A situation where actors do not abide by the agreements arising from the enrolment of their representatives, thus resulting in controversy and destabilisation of a network (Callon, 1986a). |
| Durable materials | Materials that last longer, hence used to embody a set of relations that emerge as a result of aligned interest of human and non-human actors (Law, 1992). |
| Focal actor | The central actor within the network who attempts to translate the interests of other actors within the network to their own (Tudor, 2011). |
| Enrolment | The third moment of translation wherein actors enrol in the actor-network by accepting the roles defined for them by the |

| | |
|---|---|
| | focal actors, resulting in successful outcomes of problematisation (Sarosa, 2012). |
| Immutable mobile | Objects created through inscription which can be transported over a long distance and still convey unchanging information, since they are not affected by local uncertainties (Latour, 1987), for example Law's (1986) Portuguese ship. |
| Inscription | The creation of technical objects which ensure an actor's interests are protected, e.g., a particular piece of software or regulations to meet organisational objectives (Latour, 1992). |
| Intéressemment | The second moment of translation in which various actions are performed by focal actors in an attempt to impose the identities and roles defined for each actor during problematisation. |
| Mobilisation | The fourth moment of translation wherein focal actors aim to retain the actor-network by persuading actors to maintain their commitment to the problematised cause of action and ensure the continued position of the obligatory passage point (OPP) (Rhodes, 2009). |
| OPP | When all actors join in solving the problems through formation of an alliance with the focal actor to achieve their interests (Atkinson, 2002). |
| Problematisation | The first moment of translation wherein an actor or actors define the problem, which other actors recognise as their own. |
| Translation | A process by which "the identity of actors, the possibility of interaction and the margins of manoeuvre are negotiated and delimited" (Callon, 1986, p.203). |

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# PART I: RESEARCH BACKGROUND

The first part of the thesis provides a detailed understanding of the phenomenon under investigation through the conceptual framework of the research outlined in Chapter 1 and review of relevant literature in Chapter 2. This part aims to give the reader an account of the research topic, underpinning theoretical framework and literature that influenced the research.

# Chapter 1: Introduction

The research study explores socio-material assemblages shaped by integrating technology with the aim of enhancing students' CoreLife Skills in a VET institute in the UAE. "CoreLife Skills" is the brand name used in the UAE for generic or employability skills (NQA, 2012b, p. 74) that constitute information management, communication skills, teamwork skills, numerical literacy, problem-solving, application of technology and participation in social and civil life (NQA, 2016). The research also investigates factors influencing the assemblage and its sustainability with special emphasis on factors influencing technology adoption by teachers and students. In this chapter, I introduce how I conceptualised my thesis and what readers can expect from it.

## 1.1 Research context

In recent years, the UAE has prioritised the development of a highly skilled workforce to meet the country's socio-economic needs through VET institutions. The National Qualifications Authority (NQA) was established in August 2010, following the path of many other countries with the belief that the crucial step in development of a highly skilled and productive workforce is through a national qualification framework named 'QF*Emirates*' that encompasses all forms of learning (NQA, 2012a). One of the prime responsibilities of the NQA is to ensure that the VET sector is aligned with industry, workplace requirements and the diversification vision of the UAE (NQA, 2015). To accomplish this, the Vocational Education and Training Awards Council (VETAC) under the auspices of the NQA was set up with the aim of developing a system of vocationally related and occupationally oriented qualifications for the

UAE's VET sector using the National Occupational Skills Standards (NOSS) architecture. To develop such qualifications, NQA (2014) outlined the VETAC Q+NOSS System Guidelines for curriculum development in which the NQA approved qualifications are required to integrate CoreLife Skills.

In addition to the structural changes in the education system in the UAE, the Mohammed bin Rashid Smart Learning Programme (MBRSLP) was initiated in 2012 with the aim of providing smart learning to students in universities, colleges and schools through optimum use of technology (Wam, 2012). Consequently, many universities and educational institutions in the UAE have embraced technology to enhance teaching and learning. The study aims to investigate technological innovation undertaken in one such VET institute in the UAE, exploring the potential influence of adoption and use of technology by teachers and learners on the development and acquisition of CoreLife Skills.

## 1.2 Conceptual framework

I conceptualised the research based on my experience, beliefs and assumptions (Ravitch & Riggan, 2011), which steered the exploration of theories and concepts that support and inform the research (Robson, 2011) and the series of sequential and logical propositions to convince the reader of the study's importance and rigour (Ravitch & Riggan, 2011). Antonenko (2014) states that generally, educational technology-based empirical studies lack conceptual frameworks that explicitly link "the relevant concepts or theory-based propositions from the literature review to demonstrate how these theories, concepts, and empirical evidence informed the

formulation of research questions or the choice of the methods" (p. 54). The need to explicitly state the conceptual framework of the research has been recognised "for organizing inquiry and creating a compelling theory-based and data-driven argument for the importance of the problem, rigor of the method, and implications for further development of theory and enhancement of practice" (p. 53). Miles and Huberman (1994) propose that a conceptual framework can be represented either graphically or in narrative form to explain the main things to be studied and the presumed relationships among them. For effective exemplification of a conceptual framework, I chose to first represent it graphically as illustrated in Figure 1.1, followed by an explanation of its different elements.

I adopted Ravitch and Riggan's (2011) approach for presenting my conceptual frameworks that includes three components: researcher's personal interest; topical research, which outlines the key concepts and trends germane to the field of study; and theoretical frameworks that underpin it.

### 1.2.1 Personal interest

Over the last fifteen years, I have worked as an information technology educator in both higher education institutions (HEIs) and VET institutions in the UAE, the last nine years of which I have been employed in the ABC Institute. I have also been interested and involved in technological innovation projects initiated by the institutions I worked for. In 2010, a Moodle based virtual learning environment (VLE) was implemented in the ABC Institute, and upgraded in September 2014, from version 1.9 to 2.7, primarily because the support for serious security issues with Moodle 1.9 was available only until December 2013 (PRWEB, 2012).

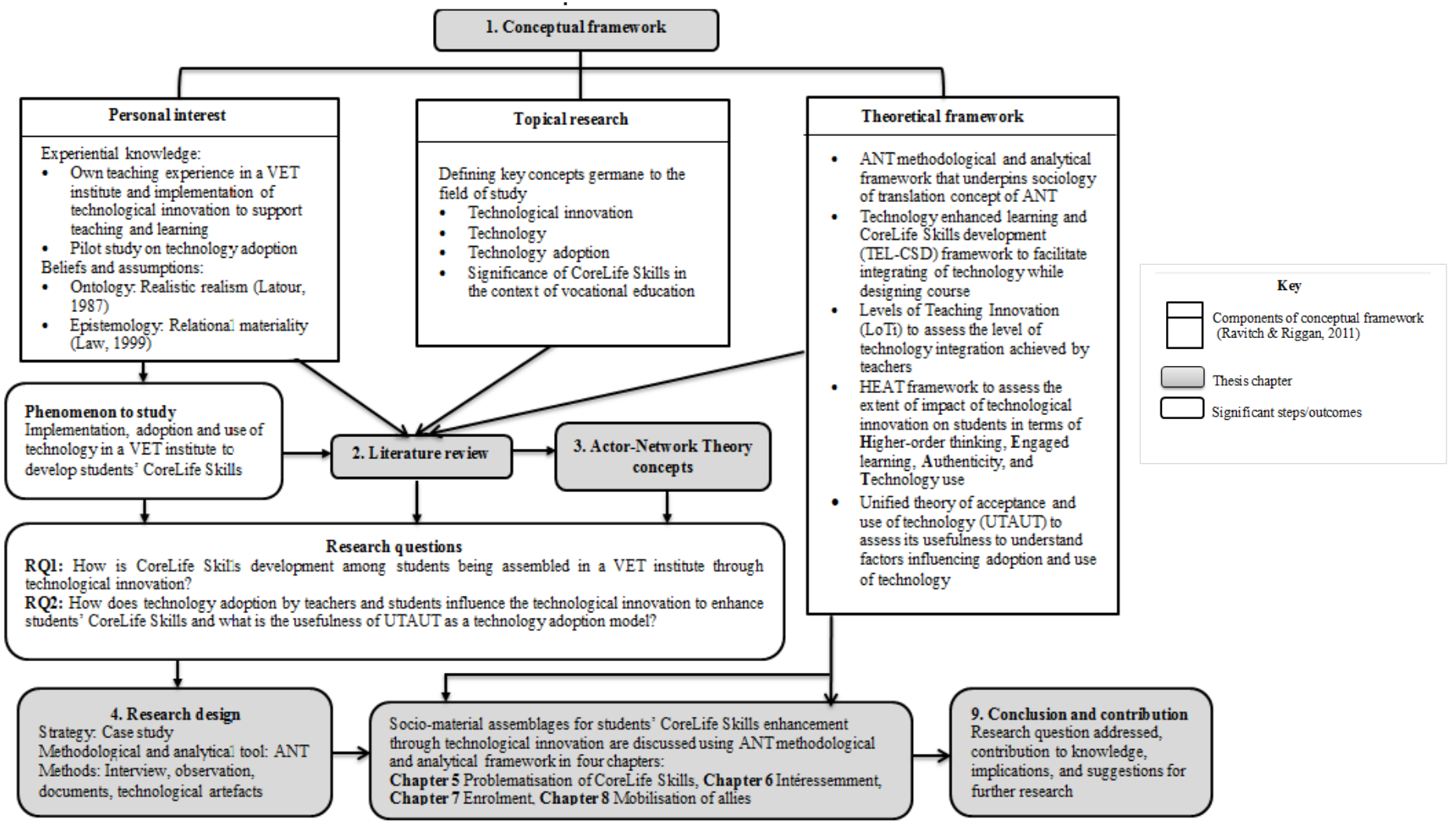



*Figure 1.1Conceptual framework*

I have been providing support to teachers and students to effectively use the VLE as a member of an e-learning team for the past five years. I conducted a pilot study between October and November 2014 to understand the teachers' perspective towards adoption of the VLE as part of my Module 4[1] research.

Thus, selection of the research topic was driven by my interest, experience and results of the pilot study on technology adoption, followed by a literature review on the identified areas of research. This supports Maxwell's (2012) notion that the conceptual framework should not be developed by simply reviewing and summarising some body of theoretical or empirical publications, ignoring the researcher's own experience, speculative thinking, and any pilot and exploratory research they may have conducted.

Four key factors influenced my decision to select the ABC Institute for conducting this empirical study.

- Being employed in the institute for the last nine years as a teacher and holding the additional role of E-learning Developer gave me first hand opportunity to conduct research in the same institute. Costley, Gibbs, and Elliott (2010) propose that a researcher's insider knowledge will be an advantage when researching complex work situations. Besides, gaining access to participants and information is made

[1] Researching Technology Enhanced & Networked Learning Communities is the Module 4 title in Part One of the E-Research and Technology Enhanced Learning Doctoral Programme

easier. However, there are other ethical concerns, which are elaborated in section 4.6 of the thesis.

- Secondly, the pilot study conducted on teachers' adoption of the VLE as part of my Module 4 research identified a need for further research to understand both teachers' and learners' perspectives about technology adoption in the institute. Also, lack of an appropriate course design framework was identified as one of the many factors for low integration of technology by teachers, which demanded further research.
- Thirdly, the institutional philosophy is to provide quality education through a client-oriented programme that requires learners to develop essential key skills, which employers consider to be highly important in the workplace. Thus, the institutional philosophy and strategy align with the NQA's requirements.
- In addition, the institute is inclined towards technological innovation, for example, through the implementation of Mahara ePortfolio in the third term of the academic year, 2014-2015.

Therefore, the institutional setting provides a tremendous opportunity to conduct the proposed research and feed into further research.

The intent of the study is to seek an understanding of the world where I live and work (Creswell, 2009). However, neither do I believe that reality exists independently 'out there' and it can be known objectively, nor do I think it can be constructed by interpreting the world around me using a subjective social constructivist approach. Latour (1999b) calls this 'realistic realism', in which the researcher views reality as an *emergent phenomenon* that is constructed through the interplay between the actors, both human and non-human with equal constitutive characteristics (Cordella & Shaikh, 2006). The epistemology underlying such ontology is that of 'relational

materiality' (Law, 1999) in which actors achieve their form or attributes as a result of interaction with other actors (Cordella & Shaikh, 2006). My ontological and epistemological stance is discussed further in section 4.1.

### 1.2.2 Topical research

VET has been identified to play a pivotal role in upgrading the skills of the workforce and enhancing productivity in the short and medium term (The Government of Abu Dhabi, 2008). The Abu Dhabi Education Council (2015) propose that in an effort towards skills development, the role of educational establishments is to foster and develop students' basic creative skills in areas such as research, problem-solving and critical thinking. Additionally, the government has been investing in new technologies to improve student outcomes (Vision 2021 News, 2013). However, unlike other developed countries, the use of technology for development of CoreLife Skills is yet to be explored in the UAE.

As the term 'technology' is used differently in different contexts, I clarify how I propose to use it in my research. I draw the definition from science and technology studies (STS) wherein it is emphasised that "technology comprises much more than just machines" (Grint & Woolgar, 1997, p. 13).

Winner (1977) explains this further by classifying technology as:

- Apparatus: the "tools, instruments, machines, appliances, weapons, gadgets which are used in accomplishing a wide variety of tasks" (p. 11)
- Technique: "methods, procedures, routines - that people engage in to accomplish tasks" (p. 12)

- Organisation: “some (but not all) varieties of social organization- factories, workshops, bureaucracies” (p12)
- Network: “large-scale systems that combine people and apparatus linked across great distances” (p12)

I am interested in technology as a ‘technique’ that creates a technology enhanced learning environment to promote development of CoreLife Skills by analysing the instructional problem, designing and developing a solution that uses appropriate technology and reflective practices for evaluating and revising decisions made at each step, and then implementing a solution (Association for Educational Communications and Technology, 2004). I also examine technology as an ‘apparatus’ and a ‘network’, since the implementation of a solution involves technological processes that not only include hardware and software resources entailed in teaching, such as VLEs, ePortfolios, smart devices (e.g. mobile, iPad, tablets, etc.), but also its link with people, such as management personnel who make decisions related to technological implementation; e-learning developers who facilitate technology implementation; and teachers and students who are end users of technological innovation.

Innovations are often not adopted in their entirety by their users but technologies have to undergo ‘innovation translation’ (Latour, 1986, 1996a; Law & Callon, 1988) to transform to a form that is most appropriate for use by the potential adopter (Tatnall & Davey, 2007). Adoption is a decision by an individual (teacher, student) to make use of the technological innovation implemented in the institute (Hardaker & Singh, 2011). Hence, implementation of technology cannot necessarily guarantee widespread

adoption by users to achieve a specific goal as there could be a range of factors that influence the decision to adopt a technology.

Having provided a prelude to the research topic, I propose to conduct an extensive review of relevant literature in Chapter 2.

### 1.2.3 Research problem

Crotty (1998) claims that most researchers start with a real-life issue that needs to be addressed or a question that needs to be answered. My starting point was similar. It is my ever-clearer realisation that graduates from the VET institute where I teach, were increasingly ill-equipped with the CoreLife skills to meet the industry requirement to be easily employable. The Emirates Foundation for Philanthropy (2012) also admits that "education is currently seen as inadequate in producing employable graduates [due to] lack of soft skills, such as conflict solving skills" (p. 2). My background in information technology encouraged me to look for solutions to the problem, not solely from a social perspective but also from a technological one.

### 1.2.4 Research questions

I use actor-network theory (ANT), a socio-technical approach, to understand the complex interplay between humans and technology; hence the research questions are influenced by ANT vocabulary, defined in the glossary:

*RQ1: How is CoreLife Skills development among students being assembled in a VET institute through technological innovation?*

Sub-questions:

RQ 1.1: How can a technology implementation framework be developed that facilitates CoreLife Skills development among learners?

RQ1.2: How do human and non-human actors engage in translation to achieve the goal of developing CoreLife Skills among learners through technological innovation?

RQ1.3: What enables and inhibits actions to shape technology and the network for developing CoreLife Skills?

*RQ2: How does technology adoption by teachers and students influence the technological innovation to enhance students' CoreLife Skills and what is the usefulness of UTAUT as a technology adoption model?*

### 1.2.5 Theoretical framework

Antonenko (2014) states that 'conceptual framework' and 'theoretical framework' are often used interchangeably and some research design scholars caution against conflating the two terms (Maxwell, 2012; Shields & Tajalli, 2006). Despite this indistinctness, some scholars such as Miles and Huberman (1994) posit that theories are an integral part of conceptual frameworks. Thus, the theoretical framework refers to the existing theories, which are established and empirically validated sets of propositions, whereas conceptual framework integrates the relevant concepts and propositions from the existing theories; hence both underpin an empirical study (Antonenko, 2014). I have integrated a number of theoretical frameworks to create my conceptual framework for the study, which will both stimulate further research and help in the extension of knowledge.

This research adopts ANT as a philosophical, methodological and analytical approach to investigate the complex interplay between human and non-human actors without privileging any (Tatnall & Gilding, 1999). Fenwick and Edwards (2011) indicate that "ANT is not 'applied' like a theoretical technology, but is more like a sensibility, a way to sense and draw (nearer to) a phenomenon" (p. 10). This ANT sensibility is discussed further in section 3.2.3.

Using an ANT sensibility helped to unfold how a heterogeneous network was assembled in the ABC Institute with the aim of developing students' CoreLife Skills through technological innovation. Further to initial exploration of a range of models and frameworks, I identified the employability skills model of the Australian Flexible Learning Framework (AFLF) (Bowman & Kearns, 2009) as useful to the learning technologist and teachers for integrating technology with the intent of developing a range of employability skills. Using an ANT approach, I opened the 'black box'[2] of the employability skills model and adapted it to meet the needs of the UAE education system, leading to the development of a Technology Enhanced Learning and CoreLife Skills Development (TEL-CSD) framework, which will be discussed in section 6.2.

My interest in understanding the impact of technological innovation on the achievement of students' CoreLife Skills encouraged me to embrace the level of Teaching Innovation (LoTi) framework[3] and HEAT framework. LoTi assesses how technology is implemented by teachers in the classroom by defining seven discrete

[2] A black box represents an irreversible, opaque actor-network that behaves like a single actor when a stable network of relationship is established between actors.

[3] http://loticonnection.com/index.php/school-improvement/frameworks

implementation levels ranging from Non-use (Level 0) to Refinement (Level 6) (Moersch, 1995). To complement LoTi, Moersch (2010) advanced the HEAT. framework with the proposition that increasing the HEAT - higher-order thinking, engaged learning, authenticity, and technology use - in the classroom can create a remarkable difference by elevating the LoTi level, thus promoting greater rigour and relevance. Thus, during analysis, mapping the outcome of the technology integration in the classroom to LoTi and HEAT helped me to understand the trajectory of changes undergone by the technology, teachers and students as a result of the technological innovation. Thus, the LoTi and HEAT frameworks are enrolled as actors in the network that help to make sense of the technological innovation within the VET institute using ANT sensibility.

As I investigate the assemblage of CoreLife Skills development through technological innovation, I am also interested in understanding possible influences of adoption of technologies by teachers and students on the innovation. Though there are a range of frameworks generally used to investigate technology adoption in quantitative studies, I found the unified theory of acceptance and use of technology (UTAUT) to be particularly interesting as it is assimilated by assembling eight adoption models, discussed in section 2.5 (Venkatesh et al., 2003). In this ANT sensitised study, I use UTAUT as a topic for investigation and ANT as a vehicle for doing so, by following UTAUT as an actor in the network. To accomplish this, the UTAUT questionnaire generally used in a qualitative study to understand the four determinant of technology adoption: performance expectancy, effort expectancy, social influence and facilitating conditions, is customised for this study and used to unfold the heterogeneous network formed by teachers, students, technology and UTAUT.

## 1.3 Thesis outline

The thesis is divided into four main parts and the nine chapters are grouped under these parts as discussed below:

### 1.3.1 Part I: Research background

This part sets the research context.

- Chapter 1 provides an overview of how I conceptualised the thesis and established the research questions.
- Chapter 2 provides an overview of extended research on the topic by reviewing relevant literature, which further elaborates how the research was conceptualised.

### 1.3.2 Part II: Research design

This part outlines the choices I had to make for designing the research.

- Chapter 3 details the core concepts of ANT and how it can be used as a philosophical, methodological and analytical approach.
- Chapter 4 explains the research design with details of my ontological and epistemological stance, the rationale for selecting ANT as a methodological and analytical tool, range of methods used and reasoning for using case study with characteristics of ethnography as my research strategy.

### 1.3.3 Part III: Assembling CoreLife Skills through technological innovation

This part presents the research findings as Callon's (1986) four moments of translation: 'problematisation', 'intéressemment', 'enrolment' and 'mobilisation', and each is discussed separately in the following four chapters.

- Chapter 5 discusses the first moment of translation, problematisation. It discusses how the topic of CoreLife Skills assemblage emerged as the key source of problematisation. The interests of the main actors of the network are outlined to explore how they could be aligned to achieve the goal of developing students' CoreLife Skills through technological innovation.
- Chapter 6 uses ANT sensibility to discuss the intéressemment moment of translation wherein the development of the TEL-CSD framework for technology implementation and its feasibility in implementation of technology is discussed. The process of negotiating the actors' interests and how artefacts are inscribed to facilitate the translation is discussed, based on empirical data.
- In Chapter 7 the enrolment of actors for the assemblage of CoreLife Skills in class by integrating technology for developing students' CoreLife Skills using the TEL-CSD framework is discussed. The level of technological integration achieved by the teachers during each class activity is mapped to an appropriate level of LoTi and its impact on students is mapped to appropriate levels of HEAT to assess the overall impact of CoreLife Skills development among students as a result of technological innovation.
- Chapter 8 discusses the final moment of translation by exploring factors that could mobilise more actors to join and sustain the actor-network created. ANT sensibility unravels additional factors influencing technology adoption and assesses the usefulness of the UTAUT framework in technology adoption studies.

### 1.3.4 Part IV: Research contribution and conclusions

The final part of the thesis summarises my research findings and establishes the notable contributions made by the research.

- Chapter 9 concludes the empirical study by examining the research findings to check if the research questions are answered; establishes the contributions made by the study in light of the existing literature; reflects on the strengths and weaknesses of the research; and identifies opportunities for further research.

# Chapter 2: Literature review

This chapter reviews literature to inform four key aspects of my research: graduate employability skills, technological innovation, technology adoption and a socio-technical approach to the research.

I discuss how educational institutions especially VET institutes are required to work towards development of students' CoreLife Skills, which are recognised by industry. With technology being an integral part of both education and industry in the current scenario, I review the possibility of using it to enhance CoreLife Skills and discuss the suitability of: the AFLF for implementation of technology; Level of Technology Implementation (LoTi) for assessment of technology integration; and HEAT framework to assess impact of technology integration on students. I also explain a range of adoption theories and the rationale for selecting UTAUT as a suitable theoretical framework to investigate the factors influencing the adoption of technology by teachers and students. Unlike traditional quantitative and qualitative approaches used to study implementation, adoption and use of technology in an educational context, I review some of the socio-technical approaches and explain why I consider ANT sensibility for this study.

## 2.1 Panorama of UAE education system - CoreLife Skills and technological innovation

There is an increase in the unemployment of VET graduates in many countries, especially developing countries, which has triggered the need for VET graduates to acquire employability skills suitable for a 21st century workforce (Audu, Kamin, &

Saud, 2013). A survey conducted by Parthenon, experts on education and school systems in the Gulf region, highlights that many employers in the UAE think students have insufficient employability skills (Kapur, 2013). The traditional education system followed in secondary and tertiary education in the UAE mostly emphasises on learning by rote and memorising with little emphasis on developing skills (Munajjed, 2012). As a result, development of critical thinking, problem-solving, decision-making, initiative, creativity, innovation, collaboration, flexibility, leadership and responsibility is restricted (Munajjed, 2012). Hence, in recent years, increasing importance has been given to VET as it offers specific, hands-on training, thereby developing employability skills (Hoteit, Hachem, & Zein, 2014).

To cater to the growing need of employability skills, HEIs and VET institutions worldwide are adopting various approaches to equip graduates with the required skills. Some of the approaches identified in the literature include:

> providing academic staff with relevant support and resources, integrating these skills into curriculum and course design, providing students with work placements and exposure to professional settings and providing advice and guidance through career services,[…] participation in clubs and societies (Precision Consultancy, 2007, p. 3)

In the UAE educational context, there are limited studies that discuss the pedagogical practices and strategies used to develop CoreLife Skills. One of the common approaches identified in literature is provision of workshops and work experience to graduate students for enhancing employability skills. For instance, Zayed University employs a two phase World of Work programme (El-Temtamy, O'Neill, & Midraj, 2016). In phase 1, workshops are conducted to develop students' employability skills via a variety of experiential learning activities and in phase 2, students undertake internships, work placements during summer break. Similarly, Higher College of

Technology features a work experience course of at least four weeks in all the programmes to ensure students develop necessary skills and experience to become significant contributors in building the UAE's workforce (HCT, 2017). Also, Abu Dhabi Centre for Technical and Vocational Education and Training (ACTVET) promotes YES to Work, to reinforce Emirati youth employability in the private sector and create opportunities for lifelong learning (ACTVET, 2017).

Alternative pedagogical approaches discussed in the literature include integration of skills in the curriculum and assessment of skills. Ranginya and McKenzie (2005) studied how integration of critical cognitive skills in the IT curriculum of the first year developmental programme of the UAE University, promoted students' cognitive and technical proficiencies. Students demonstrated how they could acquire and assess information; advance their communication and information management skills; and solve real-world problems by completing scenario based assessment tasks using IT software tools. Schoepp and Danaher (2016) investigated the effectiveness of scenario-based online discussion forum for assessing professional skills otherwise known as generic or employability skills in Zayed University. The study reveals that the open-ended nature of the discussion gave students the opportunity to engage in an intellectually meaningful manner to demonstrate six skills the researchers' investigated: communication, teamwork, understanding ethics and professionalism, understanding global and societal contexts, lifelong learning, and knowledge of contemporary issues. These two studies highlight how CoreLife Skills could be developed in classrooms by integrating IT and cognitive skills in the curriculum. Though there are some other studies, which cast doubt on the assumption that employability skills can be effectively developed within classrooms (Cranmer, 2006).

At the national level, the NQA of the UAE, since its inception, along with its allies, is working to facilitate and monitor the introduction and implementation of CoreLife Skills within the appropriate context across the general education, higher education (HE) and VET sectors (NQA, 2012b). The NQA approved the national qualifications framework (QF*Emirates*) in February 2012, which sets out the policies, structures, standards, systems and procedures for the national qualifications framework for the UAE (NQA, 2012b). The QF*Emirates* recognises the seven key competencies tabulated in Table 2.1 as CoreLife Skills, which are significant for the workplace, learning and daily life.

| **Generic description** | **Detailed description** |
|---|---|
| Information | Collecting, analysing, organising and applying information in a given context |
| Communication | Communicating information, concepts and ideas |
| Organising self | The entrepreneurial spirit, creativity, and discovery, and the ability to self-organize, and the organization of events and activities. |
| Working with others | Working with others in teams, including leadership |
| Mathematical/problem solving | Solving problems including using mathematical ideas and techniques |
| Technology (ICT) | Applying information and communication technologies |
| Societal | Participating in social and civil life including ethical practice |

*Table 2.1CoreLife Skills adapted from NQA (2012b, 2016)*

NQA expects the integration of CoreLife Skills into all qualifications recognised on the QF*Emirates* at every level (i.e. level 1 to level 10); however, NQA does not expect all seven CoreLife Skills to be integrated into small award qualification types.

Though technology is defined as one of the seven CoreLife Skills, its influence on the development of the other six CoreLife Skills needs exploration.

The VETAC Quality Assurance and Endorsement System has devised guidelines named as UAE's Q+NOSS Model for all stakeholders involved in the development of national VET qualifications based on National Occupational Skills Standards (NOSS) in the UAE. The guideline outlines a three-step procedure for development of Q+NOSS-based national vocational qualifications that begins with the development of 'occupational profiles' wherein the knowledge, skills and attributes required to perform a specific occupation is identified; followed by the development of unit standards as per the NOSS, and finally unit standards packaged into 'national qualifications' (NQA, 2014) as illustrated in Figure 2.1.

As per the NOSS, each performance criterion in the unit standard needs to be mapped to relevant CoreLife Skills. This will be significant for teachers as they could link the CoreLife Skills along with the unit content while teaching.

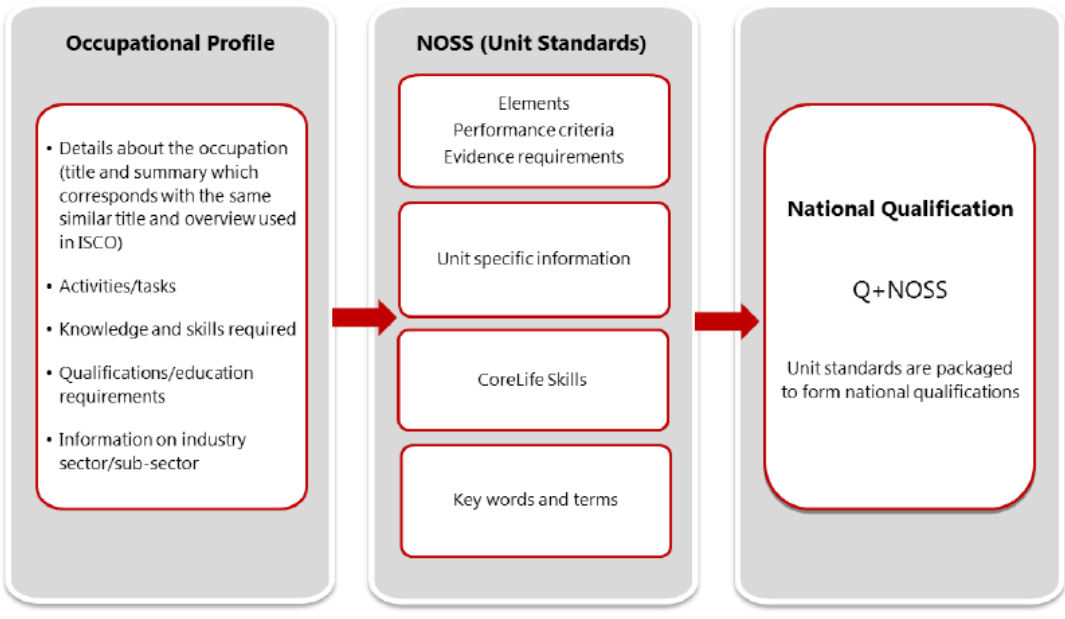



*Figure 2.1Components of Q+NOSS - from NQA (2014, p. 8)*

In another initiative, some of the HE and VET institutions in the UAE have entered into partnership with UK colleges under the British Council's Skills for Employability programme that supports the Middle East governments' efforts to improve the quality of vocational education (Abu Dhabi Press News, 2009). The programme focuses primarily on: policy reforms; strengthening ties between employer, qualification authorities, employment services, and education and training institutions; providing technical support, English language, employability and enterprise skills and supporting employment and entrepreneurship (British Council, 2013). However, these initiatives have also not explored the potential of using technology to enhance CoreLife skills among learners.

There are a growing number of research studies in the UAE that concentrate on the use of technologies in HE but not in the VET sector, which is still in its infancy. Some of the studies focused on understanding female Emirati students' perspectives towards blended learning while using VLEs (Radecki, 2005; Tamim & Senteni, 2011), students' experiences of blended learning from cultural perspectives (Kemp, 2013), use of technology adoption models for assessing e-satisfaction and e-retention (Al-hawari & Mouakket, 2010), use of iPads as assistive devices (Hayhoe, 2012), developing agile portfolios using social media, web repositories and web tools or applications (Apps) (Lampe, 2014) and use of ePortfolio for assessment (Hoven, 2014). Though the need to develop students' CoreLife skills to meet the market demand has been recognised, studies related to uses of technology for enhancing CoreLife skills are under-researched in both HE and VET sectors in the UAE.

## 2.2 Use of technology in education for learning and CoreLife Skills

Use of technology to enhance learning has been discussed extensively in the literature and its use to enhance the CoreLife Skills has been investigated in recent years. The International Labour Organisation review of numerous teaching methodologies and training techniques propose that acquisition of core work skills requires innovative ways of delivering training that combine core skills and technical skills (Brewer, 2013; Brewer & Comyn, 2015). Brewer (2013) states:

> ICT allows learners to learn better, faster, more, differently, on their own, together, inside and outside the classroom, in a greater variety of ways and to be creative. This is a different learning culture, featuring: more independent learning; learners producing knowledge themselves (p. 26).

The statement suggests that ICT facilitates independent and self-directed learning, which could instil self-organisation skills, team work skills and communication skills. Under the broad umbrella of ICT there are many technologies, and choice of relevant ones for the development of specific CoreLife Skills needs to be explored.

Developed countries have made substantial progress in the use of technology for employability skills. In Australia, the VET sector implemented a new policy for employability skills by writing these skills into VET competency standards in training packages with their explicit development made mandatory since July 2008 (Bowman & Kearns, 2009). Drawing from the work of Precision Consultancy (2006) and results of case studies from the Australian VET sector, the AFLF (2009) proposed an employability skills model that integrates e-learning technologies with adult learning principles - responsible learning, cooperative learning, reflective learning and experiential learning - for the development of employability skills. The positive aspect of this framework is that samples of relevant technologies that are suitable to develop

a specific employability skill and the learning skills have been clearly mapped out. Hence, I consider the employability skills model to be suitable to facilitate technology integration for effective delivery with specific focus on employability and learning skills (further explored in section 6.2).

In the UK, the *Technology for Employability* project was initiated by the Joint Information Systems Committee (JISC) in December 2014 to explore the employability opportunities offered by institutions, and how technology can be used to build a digital identity to maximise the effectiveness of employability opportunities. The study revealed that there is wide variation in the practices and understanding about the use of technology to support student employability. For instance, institutions have not used technologies such as e-portfolios or social media anywhere close to their fullest potential (Chatterton & Rebbeck, 2015). As per the project report, different institutions are defining and shaping employability skills; however, there is neither much emphasis on digital literacies, nor much alignment of digital skills with employability skills, which need to be explored.

Of late, developing countries have also recognised the significance of using technology to develop employability skills. In a study conducted by Saba, Igwe, Mogaji, and Mustapha (2013) to understand the impact of e-learning on developing employability of VET pre-service teachers in Nigeria, they clarify that employability skills are not part of the VET curriculum content; hence, they are not formally taught. However, it is identified that "e-learning as innovation in [VET] will provide graduates' opportunities to acquire these employability skills if the lecturers employed this method in teaching" (p. 59).

Ludmila (2008) proposes that educational technologies such as learning management systems (LMS) are being increasingly used today for teaching and learning as a 'bridge tool', to connect teachers for whom technology is an intrusive set of new tasks that infringe on the content learning that is of value to them, to students, who are highly digital literate technophiles. Ludmila (2008) suggest that teachers should realise that currently it is a mode of transient learning and they need to quickly master emerging knowledge. The author has recognised the Modular Object-Oriented Dynamic Learning Environment (Moodle), as a promising LMS from the point of view of innovative teaching and learning because it combines Web 2.0 features with one of the most significant education theories of current time, constructivism, formulated by Papert and Harel (1991). In constructivism, learners are understood to build knowledge through interaction with other learners, teachers, experts, and learning objects by combining existing knowledge, interaction with their environment, and new experiences (Ludmila, 2008). Thus, Moodle was designed to promote independent learning, the personal construction of meaning, effective collaboration and multi-channel communication, which eventually helps in building some of the CoreLife Skills.

## 2.3 Integration of technology in instruction

The Office of Technology Assessment (1995) states that "it is becoming increasingly clear that technology, in and of itself, does not directly change teaching or learning. Rather, the critical element is how technology is incorporated into instruction" (p. 57).

More recently, Summak, Samancioğlu, and Bağlibel (2010) have reiterated that technology in itself does not support learning, since the potential of technology is only utilised when it is well integrated into a learning environment as stated by Voogt and Knezek (2008). Integration of ICT in instruction has the potential to accelerate, enrich, and deepen skills, to motivate and engage students, to help relate experience gained in an academic setting to work practices, create economic viability for tomorrow's workers, as well as to strengthen teaching (Davis & Tearle 1999; Lemke & Coughlin 1998 cited by Yusuf, 2006).

Condie and Munro (2007) advocate that sustained impact of using ICT depends on the ability of the teacher to integrate or embed it into the learning experience of students by ensuring that the potential of the technology is fully realised. It is imperative to consider teachers' roles in integration of technology into instruction because they are directly responsible for teaching and learning and closely associated with learners in the process. Hence, the extent to which they take initiatives to integrate the technology will influence the achievement of desired academic goals, such as enhancement of learning, development of skills and increase in student motivation and engagement.

In this respect, I found the LoTi framework proposed by Moersch (1995) very useful as it helps to map the extent of technological integration accomplished by teachers to seven discrete implementation levels ranging from Non-use (Level 0) to Refinement (Level 6) as tabulated in Figure 2.2.

| LoTi Level | Level Title | Description of the Level of Technology Use |
|---|---|---|
| 0 | Non-Use | Technology use is non-existent; use may be limited to generation of instructional materials that are predominantly text-based |
| 1 | Awareness | Technology used by teachers for administrative, presentation of course materials, or retrieving course materials; used by students as a reward for prior work completed in class |
| 2 | Exploration | Technology used by students for extension activities, enrichment exercises, or information gathering assignments |
| 3 | Infusion | Technology use is based on student use and is motivated by teacher-directed tasks |
| 4 | Integration | Technology use is based on student use and is inherent and motivated by the drive to answer student-generated questions |
| 5 | Expansion | Technology use is now commensurate with diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and the student's level of complex thinking |
| 6 | Refinement | Technology use is directly connected and needed for task completion and students determine which application(s) would best address their needs |

*Figure 2.2 LoTi framework of technology use - from Mosley (2013, p. 2309, Table 1)*

Over the years, Moersch's (1995) LoTi framework has received wider acceptance. The framework aligned with the work of Hall, Loucks, Rutherford, and Newlove (1975), Thomas and Knezek (1991) and Dwyer, Ringstaff and Sandholtz (1992), has evolved to consider the emergence of new standards in the United States (US), such as the National Educational Technology Standards for Teachers (NETS-T) set by the International Society for Technology in Education (ISTE) and Partnership for 21st Century Skills (Moersch, 2010). Thus, the LoTi framework has transformed into a conceptual model to measure teachers' technology implementation in the classroom akin to the digital age literacy norms manifested in ISTE's NETS-T.

> [It] focuses on the delicate balance between instruction, assessment, and the effective use of digital tools and resources to promote higher order thinking, engaged student learning, and authentic assessment practices in all the classroom – all vital characteristics of the 21st Century teaching and learning. (LoTi Connection, 2009)

Each level of the new LoTi framework addresses unique attributes of the pedagogical continuum as teachers enhance the integration of technology from Level 0 to Level 6 in the classroom (Moersch, 2010). I summarise these below:

- Teacher-centric approach to learner centric approach

- Lower levels of student cognition, such as knowledge, comprehension and application, to higher levels, such as synthesis, evaluation, analysis
- Research-based classroom routines, such as providing recognition and giving feedback, to complex classroom routines, such as generating hypotheses and prompting student questions
- Compliant use of digital tools and resources to dynamic, self-directed uses of Web 2.0 tools

Thus, LoTi focuses on how technology is implemented by teachers in the classroom and the HEAT (higher-order thinking, engaged learning, authenticity, and technology use in the classroom) framework, which also has six levels that correspond to the six LoTi levels, measures its impact on learners. Increasing the HEAT can have a positive impact by elevating the LoTi level (Moersch, 2010). The objective of each category of the HEAT framework is briefly described below to understand how it can be measured.

- ***Higher-order thinking (H):*** Higher-order thinking is measured using the revised Bloom's Taxonomy (Bloom, Englehart, Furst, Hill, & Krathwohl, 1956; Krathwohl, 2002) proposed by Anderson, Krathwohl, and Bloom (2001). In addition, Robert Marzano's (2010) work has also been considered in this category of HEAT as it is used in delivering high-quality teaching and learning in the 21st century classroom. According to Maxwell, Stobaugh, and Tassell (2011), using both Bloom's and Marzano's frameworks, the learning target or objective of a lesson can be raised to higher levels of cognitive thinking to meet the minimum

target HEAT level of 3 or above, which is at Bloom's 'analysing' level (Krathwohl, 2002) or higher.

- ***Engaged learning (E):*** uses indicators presented by Jones, Valdez, Nowakowski, and Rasmussen (1993). In an engaged learning classroom, the role of the teacher is that of a *facilitator* to guide students while a student's role is to be an *explorer*. This role helps the student to discover concepts, apply skills, and reflect upon the findings.

- ***Authentic Learning (A):*** is to measure the extent to which objectives, instructional activities, and assessment are situated in the real world. According to Driscoll (2000), authentic learning is one which leads to persistent change in human performance or performance potential as a result of the experience gained by learners through interaction with the world. Thus, the knowledge that learners create as they attempt to understand their experiences is "constructivism" (Driscoll, 2000, p. 376). This type of real-life learning is complex and messy and classrooms that can emulate this environment will be more effective in preparing learners for 'life-long learning' (Siemens, 2004). Herrington and Oliver (2000) suggest that an authentic learning environment can be generated through activities as close to the real world as possible, by simulating processes, enacting multiple roles, and engaging in authentic assessment of learning, which will provide realistic contexts that reflect the ways in which knowledge will be used in real life.
- ***Technology Integration (T):*** is measured on the basis of indicators discussed by Moersch's (2002) LoTi scale. According to Tassell, Stobaugh, and Maxwell

(2013) technology is inseparable from the other aspects of the HEAT framework. The lower-levels of this category define technology as a complementary tool for the classroom while the upper levels view it as an integral part of the learning process (Maxwell et al., 2011).

A more detailed explanation of the extent of HEAT generated at each level of LoTi is illustrated in Appendix One. The LoTi framework has been used in over 100 research studies and dissertations worldwide (LoTi Connection, 2009), see for example Farsaii (2014), Mehta (2011) and Wellmann (2012). I see the potential of using the LoTi and HEAT framework as a yardstick to assess the extent to which technological integration is accomplished by teachers in their classes. There is a clear correlation between HEAT and CoreLife Skills, such as analysis with problem-solving skills; collaboration with others to team work skills, societal and communication skills; evaluation and synthesis to information management. Hence, I propose to investigate whether students who generate HEAT at a higher level also enhance their CoreLife Skills.

## 2.4 Socio-technical approaches

I am interested in adopting a socio-technical approach for investigation. Mlitwa and Van Belle (2010) describe the introduction of technology in an educational system, where teachers and students engage with technologies to achieve their respective goals, as a socio-technical system in which technology is seen within the context of its use in social settings. There are a range of socio-technical approaches, such as institutional theory, structuration theory, activity theory and ANT.

Institutional theory provides a powerful framework for understanding the context of organisational change, where people are seen as rational actors and focus is given on cultural and normative explanations for organisational phenomena (Powell, 1991). However, as the study is not intended to be confined to an investigation of institutional factors, institutional theory is not suitable.

Structuration theory (ST) developed by Giddens (1984) proposes a n integrated meta-theory that recognises both subjective and objective dimensions in viewing social reality, where a structure is understood to be an abstract property of the social systems (Orlikowski & Robey, 1991). However, ST does not help to understand how technology is physically shaped by everyday actions of users and social settings within which it is developed (Orlikowski & Robey, 1991).

Activity Theory (AT) as explained by Vygotsky is "the semiotic process that enables human consciousness development through interaction with artefacts, tools, and social others in an environment and result in individuals to find new meanings in their world" (Yamagata-Lynch, 2010, p. 16). Thus, Vygotsky introduced mediated action as a concept to explain AT in which the context is not out there, but consciously and deliberately created by *subjects* (e.g. people) interacting with *mediating tools* (e.g. technology) through the enactment of an *activity* (e.g. teaching and learning) in an *activity system*, in accordance with their own *objects* (Nardi, 1996). Activity systems are linked to form an activity network that are constituted by, but transcend, the human and nonhumans who participate in them (Spinuzzi, 2008). AT has been used in educational research for investigations of individual and social transformations due to technological innovation. For instance, Kekwaletswe (2007) found AT to be an

effective analytical tool to interpret the phenomenon of ‘mobile learning’ as part of Ph.D. research; and Mlitwa and Van Belle (2010) have used AT to study adoption of LMS within a HEI context. These wide-ranging applications of AT, are close to the nature of the study that I propose to conduct.

ANT was developed by Bruno Latour, Michel Callon, and John Law, three scholars from Science and Technology Studies (STS), to describe a material semiotic approach to scientific and technical innovation (Cressman, 2009). Law (2008) states that

> Actor network theory is a disparate family of material-semiotic tools, sensibilities, and methods of analysis that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located. (p. 141)

ANT does not differentiate between science (knowledge) and technology (artefact), society and nature, truth and falsehood, agency and structure, context and content, human and nonhuman, micro-level and macro-level phenomena, or knowledge and power (Crawford, 2005). Hence, ANT addresses the socio-technical divide by challenging the very notion that purely social or purely technical relationships are possible (Tatnall & Gilding, 1999). These concepts of ANT could be appropriate and useful for the investigation.

My interest in understanding technological innovation and technology adoption in a network of human and non-human assemblages led me to make a difficult choice between AT and ANT, which are similar in many aspects yet different in others. Both study connected networks of actors (humans and nonhumans) without focusing on inter-relationships between macro- and micro-scale phenomena; and both draw on distributed resources of doing and acting, and allow for independent activity of

objects (Miettinen, 1999). Although both are interested in mediation, unlike activity theory where the activity system represents human actions that are mediated by neutral artefacts, the ANT presents a network as a sum of interrelated and causal connectedness of all factors on any sociotechnical account" (Mlitwa & Van Belle, 2010, p. 5). However, activity theorists would not perceive artefacts to be *neutral*. Thus, ANT uses the principle of agnosticism, generalised symmetry and free association to treat both human and non-human actors equally and in the same way (Callon, 1986a; Tatnall & Gilding, 1999) as explained further in section 4.2.2, whereas AT considers artefacts to be subordinate to subjects and their objects. I am in favour of the ANT approach, which gives agency to non-human actors as I am interested in exploring employability skills (CoreLife Skills), technological artefacts, and frameworks, such as the employability skills model, LoTi, HEAT and UTAUT.

Moreover, Tatnall and Gilding (1999) claim that ANT is a useful framework to study implementation of technology. For example, implementation of a B-B Portal for regional small and medium-sized enterprises (SMEs) in Melbourne (Burgess & Tatnall, 2002). The claim is reasonable, because methodologically, ANT approaches "science and technology in the making" as opposed to "readymade science and technology" (Latour, 1987, p. 4). ANT has also been used to study adoption of technology where researchers focus on issues such as network formation, which comprises of human and non-human actors, formation of alliances that influence the decision of acceptance or rejection of IT, and network build up (Sarosa, 2012; Tatnall & Burgess, 2004). For example, adoption of internet technology in banking (Al-Hajri & Tatnall, 2011), and of e-commerce in SMEs (Tatnall & Burgess, 2004).

Fenwick and Edwards (2010) claim that ANT is increasingly attracting the attention of educational researchers and I cite some examples to support the claim. Habib and Johannesen (2007) studied the impact of use of a VLE in a HEI; Hamilton (2011) traced the ways in which the very notion of 'Skills for Life' becomes stabilised as a policy discourse drawing upon the early ANT concept of the moments of translation; Wright and Parchoma (2011) critically evaluated the prevalence and influence of the concept of affordances with mobile technologies in mobile learning; Bhatt (2014) gave a socio-material account of assignment writing in further education classrooms by discussing three cases; O'Keeffe (2015) explored international and local e-assessment practices assembling the adult learner; and Trkman and Trkman (2014) investigated implementation, adoption and later use of a school website. Usually, the implementation of an information system/technology is studied in isolation without considering the interconnection of adoption and later use (Eze, Duan, & Chen, 2013; Rosemann & Vessey, 2008), as a result useful insight into technology innovation is not obtained. However, Trkman and Trkman (2014) used ANT to draw a connection between the implementation of a website in a primary school, its adoption and later use, to understand fully why technology innovation does not bring about expected benefits. So, I propose to investigate the inter-relationship between technology implementation and adoption of technology using ANT sensibility.

## 2.5 Technology adoption theories

Successful implementation of technology in organisations cannot guarantee successful adoption as many are rejected by end-users or not fully used (Sharma & Yetton, 2001; Trkman & Trkman, 2014). In this study, understanding the factors influencing the

adoption of technology by teachers and learners is critical for the success of the technological innovation that aims to develop students' CoreLife Skills.

Many adoption models based on quantitative studies exist that explain the dynamics of technology acceptance by proposing specific predictive factors (Biljon & Renaud, 2008). According to Henneke and Matthee (2012), some influential contemporary models for studying information system adoption are the theory of reasoned action (TRA), theory of planned behaviour (TPB), technology acceptance model (TAM), technology-to-performance chain (TPC), innovation diffusion theory (IDT), UTAUT, ANT and AT. Although there is little consensus with regards to the best model to predict the technology related behaviour, these are among the most popular or relevant models used for studying e-learning adoption (Williams, Dwivedi, Lal, & Schwarz, 2009). AT and ANT adopt socio-technical approaches to conceptualise social life and are used to consider technological changes and acceptance. In this ANT sensitised study, I am interested to use an adoption model as a lens to analyse the factors influencing technology adoption. While reviewing the remaining models mentioned above with this objective, I understood that UTAUT stands apart as it integrates eight theories and models – the TRA (Fishbein & Ajzen, 1977), TPB (Ajzen, 1991), TAM (Davis, 1989) and extended TAM (TAM2) (Venkatesh & Davis, 2000), combined TAM and TPB (C-TAM-TPB) (Taylor & Todd, 1995), social cognitive theory (SCT) (Bandura, 1986), Innovation Diffusion Theory (IDT) (Rogers, 1995), Model of Personal Computing (PC) Utilization (MPCU) (Thompson, Higgins, & Howell, 1991) and Motivational Model (MM) (Davis, Bagozzi, & Warshaw, 1992) to determine intention and usage of information technology by individual users. As these models are basically human-centric and psychological, readers may feel that the

use of such *a priori* explanatory variables by these models is incommensurable with ANT. However, this study aims to use ANT sensibility to explore the usefulness of UTAUT in investigating technology adoption by users. Thus, UTAUT will be enrolled as an actor in the network and a topic of investigation in the ANT-based study.

### 2.5.1 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh, Morris, Davis, and Davis (2003) synthesised UTAUT, a unified theory of individual acceptance of technology, by comparing the core constructs of eight models and theories to develop the core constructs for the UTAUT model as tabulated below in Figure 2.3:

| Core constructs | Constructs and theories | References |
|---|---|---|
| Performance expectancy | Perceived usefulness (TAM/TAM2 and C-TAM-TPB) | Davis (1989) |
| | Extrinsic motivation (MM) | Davis, Bagozzi, and Warshaw (1992) |
| | Job-fit (MPCU) | Thompson, Higgins, and Howell (1991) |
| | Relative advantage (IDT) | Moore and Benbasat (1991) |
| | Outcome expectations (SCT) | Compeau and Higgins (1995) |
| Effort expectancy | Perceived ease of use (TAM/TAM2) | Davis (1989) |
| | Complexity (MPCU) | Thompson et al. (1991) |
| | Ease of use (IDT) | Moore and Benbasat (1991) |
| Social influence | Subjective norm (TRA, TAM2, TPB and C-TAM-TPB) | Ajzen (1991), Fishbein and Ajzen (1975), Taylor and Todd (1995) |
| | Social factors (MPCU) | Thompson et al. (1991) |
| | Image (IDT) | Moore and Benbasat (1991) |
| Facilitating conditions | Perceived behavioral control (TPB and C-TAM-TPB) | Ajzen (1991), Taylor and Todd (1995) |
| | Facilitating conditions (MPCU) | (Thompson et al., 1991) |
| | Compatibility (IDT) | Moore and Benbasat (1991) |

*Note.* IDT = innovation diffusion theory; TRA = theory of reasoned action; TAM = technology acceptance model; TPB = theory of planned behavior; C-TAM-TPB = model combining the technology acceptance model and theory of planned behavior; MPCU = model of PC utilization; MM = motivational model; SCT = social cognitive theory; TAM2 = extended technology acceptance model.

*Figure 2.3 The core constructs of TRA, TPB, TAM, C-TAM-TPB, SCT, IDT, MPCU and MM – from Tan (2013, p. 9, Table 12)*

The UTAUT model includes four core determinants of intentions and usage (performance expectancy, effort expectancy, social influence and facilitating conditions) out of 32 determinants across the eight models, and four moderators of key relationships (gender, age, experience and voluntariness of use) as illustrated in Figure 2.4.

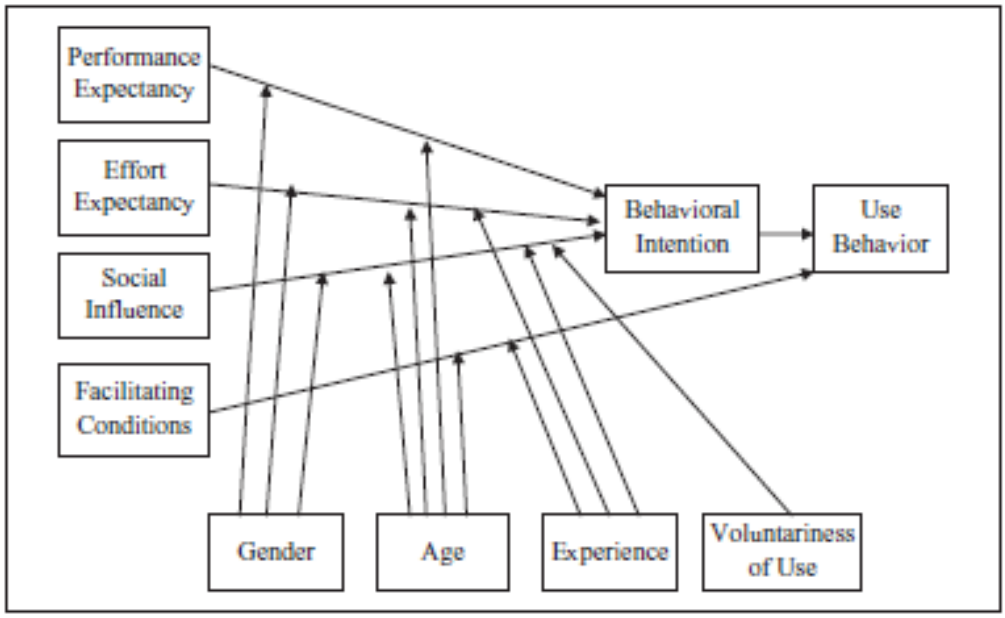



*Figure 2.4 UTAUT – from Venkatesh et al. (2003, p. 447, Figure 3)*

The explanation of the core determinants of users' acceptance and usage behaviour of UTAUT has been tabulated in Table 2.2.

| **Core determinants** | **Description** |
|---|---|
| **Performance expectancy** | "The degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003, p. 447). |
| **Effort expectancy** | "The degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). |
| **Social influence** | "The degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). |
| **Facilitating conditions** | "The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 453). |

*Table 2.2UTAUT core determinants and its description*

Venkatesh et al. (2003) state that

> UTAUT provides a useful tool for managers needing to assess the likelihood of success for new technology introductions and helps them understand the drivers of acceptance in order to proactively design interventions (including training, marketing, etc.) targeted at populations of users that may be less inclined to adopt and use new systems. (p.426)

The statement gives the impression that UTAUT is meant to assess only the users adopting new technology which will definitely restrict its application as implementation of new technology in organisations is not a regular phenomenon. However, authors have used UTAUT in a longitudinal empirical study spanning six months to "capture perceptions as user's experience with technology increased" (p. 437). Thus, it is clear that UTAUT can be used not only to assess initial adoption of a new technology but to capture the transition in perception of users with increased use of technology.

Alzahrani and Goodwin (2012) acknowledge that although UTAUT is new, it has gained popularity as its viability, validity and stability in technology adoption research studies within several contexts have already been confirmed. Straub (2009) also acknowledges that it is frequently used to specifically study technology adoption in formal organisations as it captures much valuable information about intentions and use of a given technology, but admits that it is still new and additional research is required to understand how it may be applied in educational institutions and informal learning situations. Hence, I am also interested in exploring the usefulness of UTAUT in studying technology adoption in general and its application in educational research using ANT sensibility.

## 2.6 Technology implementation and adoption enablers and barriers

Though UTAUT will be used as a tool to identify factors influencing adoption of technology by teachers and students in the institute, I review several factors identified in the literature which act as enablers or barriers to implementation and adoption of

technology. I begin by listing a useful summary of barriers and enablers to ICT integration in pre-service teacher education programmes consolidated by Goktas, Gedik, and Baydas (2013), as tabulated in Figure 2.5 and Figure 2.6 respectively.

| | Beggs (2000) | Brush, Glazewski, Rutowski, Berg, Stromfors, Van-Nest, Stock, & Sutton (2003) | Bullock (2004) | Mehlinger & Powers (2002) | Moursund & Bielefeldt (1999) | Mumtaz (2000) | Nantz & Lundgren (1998) | Schoep (2004) | SchoolNetAfrica (2004) | Williams, Wilson, Richardson, Tuson, & Coles (1998) |
|---|---|---|---|---|---|---|---|---|---|---|
| Lack of in-service training | √ | – | – | √ | – | – | – | √ | – | – |
| Lack of appropriate software/materials | – | √ | √ | – | √ | √ | √ | – | – | √ |
| Lack of basic knowledge/skills for ICTs | – | √ | – | √ | √ | √ | – | √ | √ | √ |
| Lack of hardware | √ | √ | √ | √ | √ | √ | – | √ | √ | √ |
| Lack of knowledge/skills for ICT integration | – | √ | – | √ | √ | √ | – | √ | √ | √ |
| Lack of technical support | – | √ | √ | √ | – | – | √ | √ | – | – |
| Lack of appropriate course content and instructional programs | – | – | – | √ | – | – | – | √ | – | – |
| Lack of time | √ | √ | – | – | – | √ | – | √ | – | – |
| Lack of appropriate administrative support | – | – | – | – | √ | – | √ | √ | √ | – |

*Figure 2.5 A summary list of the barriers affecting ICTs integration in pre-service teacher education programmes – from Goktas (2009, p. 194, Table 1)*

| | Bullock (2004) | Collis & Jung (2003) | Fabry & Higgs (1997) | ISTE (2000) | Jung (2005) | Moursund & Bielefeldt (1999) | Picciano (2001) | Ronnkvist, Dexter, & Anderson (2000) | Strudler & Wetzel (1999) | UNESCO (2002) |
|---|---|---|---|---|---|---|---|---|---|---|
| Having technology plans | – | √ | – | √ | √ | √ | √ | – | √ | √ |
| Offering in-service training | √ | √ | – | √ | √ | √ | – | – | √ | √ |
| Allocation of more budget | √ | √ | √ | √ | – | √ | – | – | – | √ |
| Allocation of specific units and personnel for peer support | √ | – | – | √ | – | – | – | √ | √ | √ |
| Supporting teacher educators (i.e., incentive payment) | – | √ | – | √ | √ | √ | √ | – | √ | √ |
| Decreasing course load of teacher educators | – | – | – | – | √ | – | – | √ | – | – |
| Designing appropriate course content and instructional programs | – | √ | – | √ | – | – | – | – | – | √ |

*Figure 2.6 A summary list of the enablers affecting ICTs integration in pre-service teacher education programmes – from Goktas (2009, p. 195, Table 2)*

Since the research is conducted in the UAE, the barriers to technology experienced by faculty while integrating technology in the UAE are summarised by Schoepp (2005), and illustrated in Figure 2.7.

| Item | Mean | Standard Deviation | Dichotomy | Dichotomy % |
|---|---|---|---|---|
| Faculty unsure as to how to effectively integrate technology. | 4.04 | .812 | 58 | 84.1% |
| The current reward structure does not adequately recognize those utilizing technology. | 3.88 | .993 | 45 | 65.2% ** |
| There are no program standards as to what is expected for teaching with technology. | 3.84 | .993 | 47 | 68.1%* |
| There is a lack of sufficient technology training. | 3.67 | 1.159 | 47 | 68.1% |
| There is a lack of technical support regarding the technology. | 3.61 | 1.191 | 44 | 63.8% |
| Faculty do not have sufficient time to integrate technology. | 3.61 | 1.297 | 42 | 60.1% |
| There is a lack of support from administration. | 3.52 | 1.119 | 39 | 56.5% |
| There is inadequate financial support to develop technology-based activities. | 3.39 | 1.166 | 33 | 47.8% ** |
| Faculty lack basic technology skills. | 3.36 | 1.029 | 36 | 52.2 * |
| Technology training is offered at inconvenient times. | 3.35 | 1.122 | 33 | 47.8 |
| Generic technology training is irrelevant to teacher needs. | 3.26 | 1.171 | 31 | 44.9 |
| The curriculum does not allow enough time to integrate technology. | 3.09 | 1.257 | 30 | 43.5 |
| Faculty is not interested in integrating technology. | 2.90 | 1.002 | 24 | 34.8 |
| There is not enough evidence that using technology will enhance learning. | 2.81 | 1.047 | 18 | 26.1 ** |
| Technology is unreliable. | 2.81 | .974 | 19 | 27.5 * |
| Classroom management is more difficult when using technology. | 2.54 | 1.119 | 18 | 26.1 |
| Software is not adaptable for meeting student needs. | 2.41 | .828 | 7 | 10.1 ** |
| Technology does not fit well for the course I teach. | 2.30 | 1.142 | 13 | 18.8 * |
| There is a scarcity of technology for faculty. | 1.97 | .891 | 6 | 8.7 |
| There is a scarcity of technology for the students. | 1.88 | .883 | 5 | 7.2 |

* The dichotomous rank is higher than the mean rank
** The dichotomous rank is lower than the mean rank

*Figure 2.7 Rank of barriers to integrating technology – from Schoepp (2005, p. 8, Table 1)*

The following subsections summarise the factors influencing technology adoption by teachers and students separately.

### 2.6.1 Factors influencing teachers' implementation and adoption of technology

According to Buntat, Saud, Dahar, Arifin, and Zaid (2010), teachers are change agents and play a critical role in the success of the teaching and learning in VET programmes. Hence, teacher perceptions are significant in the success or failure of integrating technology into instruction (Can & Cagiltay, 2006).

#### 2.6.1.1 Institutions' technology integration vision, policy and plan

Numerous researchers have highlighted the need for educational institutions to have a clear ICT vision for effective ICT integration (Anderson & Dexter, 2000). Afshari, Bakar, Luan, Samah, and Fooi (2008) recommend that the vision should not be developed by a single person or following a top-down approach but should involve all those who have a stake in the outcome, including teachers, parents, students, and the community, so that they can assist in the creation of the vision by contributing their knowledge and skills. The ICT integration plan needs to be developed based on the school's vision, which will lead to the formation of an ICT integration policy. As teachers play a significant role in drawing up well-articulated school-level ICT policy and implementation processes (Richardson, 2000), these should be articulated to teachers explaining why and how they are expected to integrate technology in their lessons (Strudler & Wetzel, 1999). Thus, a systematic approach towards technology integration involving all stakeholders is vital for its successful implementation.

#### 2.6.1.2 Teachers' training

Glazer, Hannafin, and Song (2005) highlight that providing high quality training to teachers in isolation is not sufficient to accomplish full-scale implementation of technology as teachers need to go beyond simply learning about a new tool. Williamson and Redish (2009) also support the notion that training alone cannot achieve desired results as the professional development training provided to teachers often focuses on technology skills instead of integration of technology; hence teachers do not have many examples of efficient use of technology for learning.

#### 2.6.1.3 Availability of time to experiment, reflect and interact

In numerous studies, (Ertmer, 2004; Goktas, 2009; Goktas et al., 2013; Mumtaz, 2000; Richardson, 2000; Schoepp, 2005) authors have acknowledged that lack of time to explore the potential of a technology, experiment with it and review the possibility of integrating it with the curriculum is a major constraint in achieving maximal benefit.

#### 2.6.1.4 Teachers' characteristics

Some of the characteristics of teachers, such as their educational level, age, gender, educational experience, experience of using computers for educational purposes have been identified as influences on the adoption of an innovation (Rogers, 1995; Schiller, 2003). Richardson (2000) in his study based on the context of Australian schools, found that young teachers generally had advanced ICT skills, while those with slightly more experience were trying to acquire the skills rapidly. However, female teachers over 50 years of age lacked sufficient ICT skills. Further, a creative teacher with a constructivist view of learning, a life-long learner, a social learner, and a decision maker would be likely to use computers in more learner-centric, integrative and transformational ways instead of teacher-centric ways that promote and support traditional classroom practices (Bielaczyc & Collins, 1999; Carvin, 1999).

#### 2.6.1.5 Technological self-efficacy

Olivier and Shapiro (1993) identified self-efficacy as a major predictor of technology adoption. Individuals with a low level of technological self-efficacy often choose a level of innovation that they believe they can handle, which may or may not be the

best or most effective option. On the contrary, individuals with high levels of self-efficacy are in favour of technological changes and inclined towards adopting such options.

#### 2.6.1.6 Availability of technical support

Goktas et al. (2013) highlight how providing effective support to teachers who are using ICT could possibly solve two problems mentioned in the qualitative data: "experienced teachers have adaptation problems using ICT" and "teachers have negative attitudes". Experienced teachers are more used to traditional approaches and motivating them to change their current practice is not easy. Fear of technical failure and not knowing whom to approach in such circumstances could be the reasons for this. Hence, lack of onsite-support for teachers using technology has been identified as one of the major barriers to their technology adoption (Afshari et al., 2008; Goktas et al., 2013; Mumtaz, 2000), and this can be very stressful for them (Tong & Trinidad, 2004).

#### 2.6.1.7 Level of and accessibility to ICT infrastructure

Technological changes are on-going; hence having up-to-date technological infrastructure including hardware and software is a key feature to diffusion of technology (Gülbahar, 2007). Afshari et al. (2008) also emphasise that availability of hardware, software and network infrastructure in the institution plays a vital role in the integration of ICT in education. This in turn would require a forward-looking plan, and appropriate resourcing linked closely to what teachers actually require at any given stage. The findings of Goktas (2009) suggest that providing access to ICT is not enough, as it needs to be complemented with the required level of technological

infrastructure, which is in line with the finding from previous research (Anderson, Varnhagen, & Campbell, 1998; Cuban, 2001; Cuban, Kirkpatrick, & Peck, 2001; Ertmer, 1999; Schoep, 2004; Vaughan, 2002).

### 2.6.2 Factors influencing students' adoption and use of technology

Some of the factors commonly discussed in the literature exploring the adoption and use of technology by students are summarised below.

#### 2.6.2.1 ICT experience

According to Abbad, Morris, and Nahlik (2009), TAM-based studies suggest that an experience of an individual with a specific technology influences the perceptions of ease of use and usefulness of that technology. Based on empirical evidence, Morss (1999) elucidated that older learners with more ICT experience used a LMS (WebCT) more than the younger learners with less ICT experience. However, this contradicts the notion of the Net-generation proposed by Tapscott (2009) who considers that young students prefer to learn using technology. This could be attributed to the increased ICT experience of young students in the current scenario.

#### 2.6.2.2 Attitude

Attitude is a function of personal belief and evaluation of outcome, which influences an individual's decision to adopt a technology (Fishbein & Ajzen, 1977). For instance, a learner who has not been engaged in e-learning before will not be able to perceive the performance of the system and make an evaluation of the outcome. Thus, the learner's intention to adopt e-learning will be influenced by their belief.

#### 2.6.2.3 Perceived usefulness

In the empirical study conducted by Umak, Polancic, and Hericko (2010), students were identified as using e-learning not only because it is easy to use but rather because it is useful for studies.

#### 2.6.2.4 Self-efficacy

As explained in section 2.6.1.5, self-efficacy also influences students' intentions to adopt and use technology. According to Abbad, Morris, and Nahlik (2009), in the e-learning context, students' self-confidence in their ability to perform certain learning tasks using a LMS is construed as self-efficacy. A student will have a more positive perception about ease of use and usefulness of LMS, and may be more willing to accept and use the system, if they have confidence in their capability in dealing with it.

#### 2.6.2.5 System interactivity

A remarkable development in e-learning has been attributed to technologies that promote increased learner interaction either synchronously or asynchronously (Abbad et al., 2009). Thus, it is predictable that system interactivity is one of the factors that may influence students' adoption of e-learning systems. This accords with the claims of Davis, Bagozzi, and Warshaw (1989) that objective system characteristics have a direct impact on perceived usefulness and ease of use; hence they have a substantial impact on usage behaviour.

#### 2.6.2.6 Technical support

As explained in Section 2.6.1.6, the level of technical support available to students was identified to have direct influence on perceived usefulness of a LMS, which indirectly influenced the intention to use the system (Abbad et al., 2009). Ngai, Poon, and Chan (2007) extended the TAM to include technical support to investigate the underlying relationship between technical support, perceived usefulness, perceived ease of use, attitude and the acceptance of the WebCT for higher education. The results from their empirical study indicate the significance of perceived ease of use and perceived usefulness in mediating the relationship of technical support with attitude and WebCT usage.

It is evident from the literature review that each of the factors identified does not in isolation influence adoption and use of technology by its users. Thus, the behaviour and intention of a user to adopt and use a technology is influenced by more than one factor based on their relationship with the user. Hence, a suitable socio-technical approach is suitable to unveil the inter-relationship between the social and technological that influence the users' decision to adopt or use a technology.

## PART II: RESEARCH DESIGN

The second part of the thesis comprising of Chapter 3 and Chapter 4, unfolds the research design I conceptualised for executing the research. I extend the discussion on ANT in Chapter 3, to familiarise readers with its unique concepts and terminologies so that it will be helpful to comprehend the discussion on findings and analysis in Part III. In Chapter 4, I chart the methodological framing of the study and the choices I have made in terms of analytical approach, research strategy, data collection methods, strategies for data analysis, and management.

# Chapter 3: Actor-network theory

Having established my rationale for choosing ANT, in Chapter 2, this chapter provides a detailed account of ANT's unique ontology and epistemology, concepts, and rich vocabulary.

## 3.1 Ontology and epistemology

A 'positivist' asserts that objective reality is untainted by social activity (Stalder, 2000) but an 'interpretivist' researcher asserts that reality and the knowledge are socially constructed, hence 'subjective' (Orlikowski & Baroudi, 1991). As Astley (1985) states, "the world of practice has its own 'objective' reality, but as scientists, our only recourse to that world is through what we see and do, our knowledge is unavoidably subjective in nature" (p. 498). However, Latour (1999b) proposed ANT as an alternative ontology of "realistic realism" (p. 15) that bridges positivism with its ontology of 'realism' and social constructivism/interpretivism with its ontology of 'relativism'. To complement this Law (1999) advanced "relational materiality" (p. 4) as an ANT epistemology where actors achieve their form and attributes as a consequence of other actors (Cordella & Shaikh, 2006). The Figure 3.1 illustrates the beliefs and assumptions underpinning positivism, ANT and social constructivism/interpretivism.

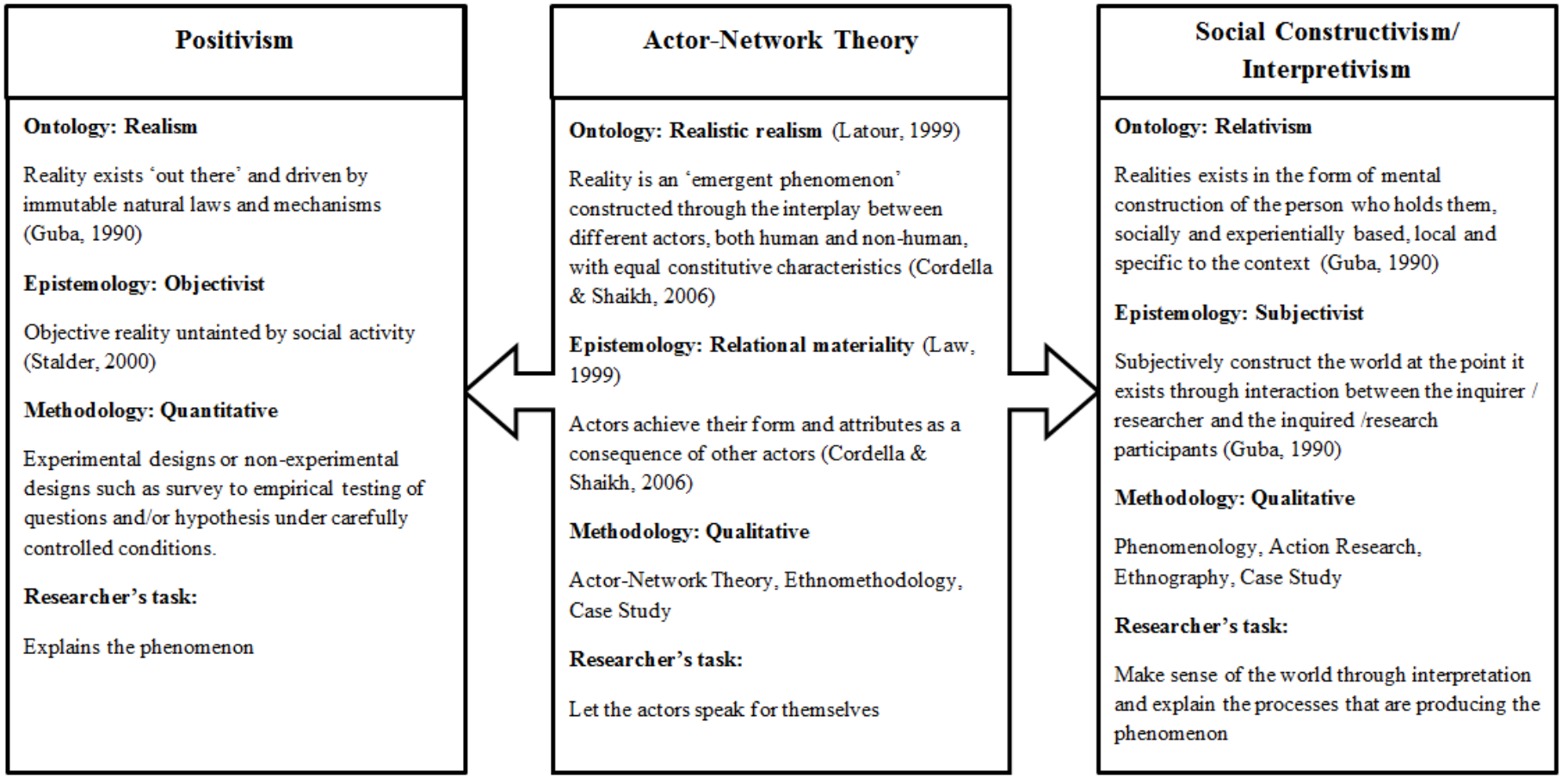



*Figure 3.1 Beliefs and assumptions underpinning positivism, ANT and social constructivism/interpretivism*

Although, ANT is known for its unique formulation of ontology and epistemology, many studies do not follow these. For instance, in information systems research ANT has been used widely with an 'interpretive' epistemology and 'constructivist' ontology (Cordella & Shaikh, 2006). However, Latour (1987, 1999b) has time and again defended against the allegation of using ANT as a constructivist approach. Cordella and Shaikh (2006) support Latour's notion by stating that ANT considers reality as an emergent phenomenon instead of an outcome of the process of people's interpretation, and warns researchers that the *constitutive* assumption of ANT should not be confused with a *constructivist* assumption of interpretivism.

Latour (1999a) also rejects distinctions between objective and subjective reality and converts the dissociation between objective and subjective into one single "circulating entity" (p.17). ANT suggests numerous steps of translation that allow references to travel in many steps where the translators at work are ontological hybrids in the sense that they are simultaneously an object, that is belonging to the world, and a concept, that is belonging to the word (Stalder, 2000). Thus, Nimmo (2011) states that:

> instead of a dualist conception of 'society' and 'nature', or 'subjects' and 'objects', ANT posits *hybrids* of 'societies-natures', heterogeneous assemblages in which humans and nonhumans are inextricably mixed up together. ANT studies therefore trace the complex interrelations between what we tend to think of as the autonomous 'social' and 'natural domains'. (p. 109)

ANT thus offers a unique ontological and epistemological stance.

## 3.2 ANT concepts and vocabularies

When I started exploring ANT, I came across concepts and a range of terms unique to ANT, which I explain in this section as a prelude to this ANT-informed study. One of

my challenges while compiling the vocabularies was that some are canonical terms coined by the three main originators of ANT - Bruno Latour, John Law and Michel Callon; whereas some are seen in the recent work on ANT by authors such as Carroll, Richardson, and Whelan (2012), Cresswell, Worth, and Sheikh (2010), Kaghan and Bowker (2001), Müller (2015), Rhodes (2009) and Tatnall and Gilding (1999). However, I explain all terms and ANT concepts relevant for my study, in the following subsections.

### 3.2.1 Assembling an actor-network

One of the key concepts of ANT is the formation of an actor-network through "assemblage" (p. 28) of heterogeneous entities that work together for a certain time (Müller, 2015). The heterogeneous entities could be "any collection of human, non-human, and 'hybrid' human/non-human actors who jointly participate in some organized (and identifiable) collective activity in some fashion for some period of time" (Kaghan & Bowker, 2001, p. 258). Thus, ANT with its unique epistemological and ontological stance describes the world as consisting of heterogeneous networks formed by actors such as humans, things, ideas, concepts (Cresswell et al., 2010). An actor-network created through the process of translation is described as sociology of translation, which is discussed in section 3.2.7

### 3.2.2 Follow the actor

The terms 'actors' and 'actants', which are interchangeably used, are semiotic and refer to the human or non-human entities that form an actor-network (Rhodes, 2009). Actors are sources of action; however, they only act in combination with other actors in which inanimate things (e.g. technology) can also have agency along with human

actors (Cresswell et al., 2010). Latour (2005) keeps reminding ANT researchers to "follow the actors themselves […]to learn from them what the collective existence has become in their hands, which methods they have elaborated to make it fit together, which accounts could best define the new associations that they have been forced to establish" (p. 12). Thus, ANT researchers follow actors that act and leave traces, which can be described, hence becoming part of the data; but ignore actors that do not act or leave traces (Latour, 2004). Cordella and Shaikh (2006) acknowledge that, as a result, to a great extent a researcher dictates how, when and what s/he sees as data in an ANT study. Thus, the issues of reflexivity are no less problematic in ANT accounts, as network representation is solely produced in the eyes of the researcher, and simultaneously forgetting portrayal of their representation in network translations leaves the entire analysis in the control of the researchers (Fenwick & Edwards, 2011). In this study, where I investigate the implementation and adoption of technology for CoreLife Skills development, my role is not confined to that of a researcher, but as a teacher and a member of the e-learning development team, I gain the status of an actor. Thus, considering Latour's (2005) notion of following actors themselves, wherein I am one of the actors, the issue of reflexivity appears to be less problematic. Additionally, Sheehan (2011) argues that "ANT can be fruitfully applied as a tool that enhances reflexivity regarding relations and relationships in the doing of research, particularly in qualitative research" (p. 336).

### 3.2.3 ANT sensibility

During my initial exploration, I struggled to identify a suitable ANT approach for the study. The question that worried me was - is ANT a framework, a lens, an approach, a theory or something else? However, I was convinced by Law and Singleton's (2013)

statement that "ANT is best treated as sensibility, as a craft or a set of practices that works slowly both on and in the world, as uncertain, as empirically sensitive, as situated, and as passionate because it stays with the trouble" (p. 489). Vicky Singleton postulates ANT to be a set of "care-full" empirical and theoretical sensibility, sensible to materiality, relationality, heterogeneity, and process where the research slowly unfolds uncertainty rather than in a highly programmed manner (cited in Law & Singleton, 2013, p.488). Fenwick and Edwards (2010) suggest that ANT's language and its approaches can support educational researchers to make sense of phenomena in rich ways that discern the difficult uncertainties, messes, multiplicities and contradictions that are embedded in educational issues.

### 3.2.4 Is ANT a 'theory of contingency'?

ANT is seen as a "theory of contingency" (Elbanna, 2012, p. 125) as it depends on collecting and analysing specific case studies without attempting to draw patterns in them. As a result, the possibility of generalising the result is ruled out. However, Law and Callon (1992) have developed a two-dimensional model for the conceptualisation of the local/global mobilisation. They presented their ANT framework as 'a tool' to describe their studied project, which can be useful for the analysis of other projects and technological innovation.

### 3.2.5 Performance of power

ANT offers a distinct view of power, where the artefacts are not considered as means or tools directed by social interests, rather the technical are interwoven with the social (Elbanna, 2012). Thus, power is constructed through the network of humans and non-

humans aligned together. Law and Singleton (2013) clarify that in ANT sensibility two types of power come into play*:*

> the actor-network sensibility starts out by thinking about how the 'power to' do things is achieved by patching practices together. And then it asks about 'power over'. About how all those interwoven practices also distribute power unevenly, in the more usual sociological sense. (p. 494)

Thus, 'power over' refers to power as dominance where there are winners and losers (Law & Singleton, 2013) rather than 'power as possession', that can be measured via the number of entities networked (Crawford, 2005). During different stages of the translation process, power over is achieved by different actors in the network through negotiation, persuasion, seduction, simple bargaining, and violence depending on the particular circumstances (Rhodes, 2009). Thus, power is generated in a relational and distributed manner as a consequence of ordering struggles (Crawford, 2005).

### 3.2.6 The global/local relationship, micro/macro boundaries

"ANT adopts a symmetrical view of sociological dichotomies, such as those between global and local, and macro and micro phenomena" (Elbanna, 2012, p.120). Hence, it does not set boundaries, as a sociotechnical world does not need to have a fixed and unchangeable scale. Latour (1991) emphasises that researchers should not predefine global/local or macro/micro boundaries and should respect the change in scale induced by actors or by displacement of translation. Though my focus of study is the ABC Institute, I do not set any predefined boundaries.

### 3.2.7 Material semiotic

Law (2008) considers ANT to be a disparate family of material semiotic tools as like material semiotics it

> describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects, subjects, human beings, machines, animals, 'nature', ideas, organisations, inequalities, scale and sizes, and geographical arrangements. (p. 2)

Thus, the actor-network created is a socio-material assemblage of humans and non-humans.

### 3.2.8 Sociology of translation

The concept that drew me close to ANT is the sociology of translation termed by Callon (1986a), that is achieved through four moments of translation: problematisation, intéressemment, enrolment and mobilisation by tracing the transformation of heterogeneous networks. The process of translation is useful in examining the implementation of technology in the ABC Institute as the fundamental aim of ANT is to explore how the network is assembled and maintained (Carroll et al., 2012). The utility of Callon's moments of translation is accepted in educational research (Hamilton, 2011; Luck, 2009; Tatnall, 2010). Thus, ANT unfolds the chain of actions that emanate from various actors in a pursuit to deliver a specific action and outcome.

#### 3.2.8.1 Four moments of translation

The four moments of translation - problematisation, intéressemment, enrolment and mobilisation - are non-linear and can in reality overlap with each other. Through the four phases of translation, the respective interests of different human and non-human actors are aligned into a social and technological arrangement (Gao, 2005) to create a heterogeneous actor-network as illustrated in Figure 3.2.

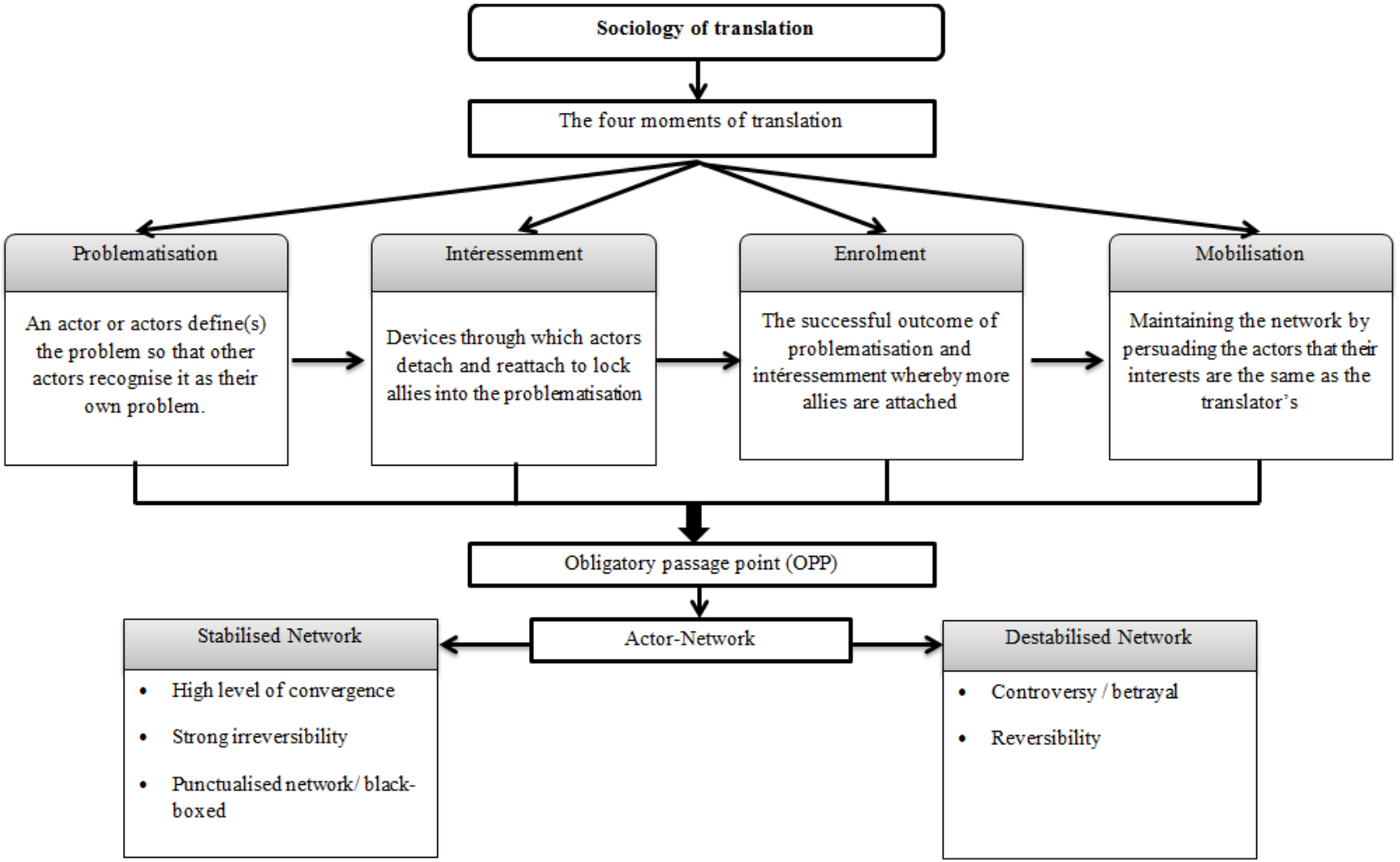



*Figure 3.2 Concepts of sociology of translation - adapted from Rhodes (2009, p. 6, Figure 1)*

The formation of an actor-network is led by an intrinsic goal of the focal actor who attempts to translate the interests of other actors within the network to their own (Tudor, 2011). The functions of the four moments of translation are detailed below:

1. *Problematisation*: Problematisation is the first moment of translation, "in which one or more key actors [also known as focal actors or primary actors] attempt to define the nature of the problem and the roles of the other actors to fit the solution proposed" (Burgess & Tatnall, 2002, p. 185) so that other actors try to recognise the problems defined, as their own.

2. *Intéressemment*: The second moment of translation is intéressemment, in which a group of actions are performed by the translator in an attempt "to impose the identities and roles defined in problematisation on other actors" (Sarosa, 2012, p. 246).

3. *Enrolment*: In this moment, actors enrol in the actor-network by accepting the roles defined for them by the focal actors for the establishment of a stable network of alliances (Sarosa, 2012). The enrolment process may involve coercion, seduction, and voluntary participation (McMaster, Vidgen, & Wastell, 1997).

4. *Mobilisation*: The fourth moment of translation is mobilisation that "maintains commitment to the problematised cause of action and ensures the continued position of the OPP" (Rhodes, 2009, p. 7).

#### 3.2.8.2 Obligatory passage point (OPP)

An OPP must occur for all the actors to achieve their interests when an innovation or change is introduced in a network (Atkinson, 2002; Rhodes, 2009). Therefore, the situation of OPP can be achieved when all actors join in solving the problems through formation of an alliance with the focal actor. The focal actors can use approaches, such as persuasion, cajoling, and even frightening others into believing that they have the solution for the identified problem (Rhodes, 2009). Hence, although the actor-network is dynamic, the focal actor seeks to stabilise and align the interests of the actors (Smith, 2011). However, according to Latour (1986) the power is not inherent to any actor and generated by the costly and risky affair of translation, thus rejecting the traditional idea of power. The translation process is accomplished with the inscription into technical objects to ensure that the aligned interests of actors are preserved, e.g. a particular piece of software or regulations to meet organisational objectives (Latour, 1992). "The technical objects thus simultaneously embody and measure a set of relations between heterogeneous elements" (Akrich, 1992, p. 205). Entities such as documents, reports, academic papers, models, books, and computer programs that form a network are often converted to an inscription or devices (Tatnall & Gilding, 1999). "Immutable mobiles" (Latour, 1987, p. 229) are the objects created through inscription which can be transported over a long distance that still convey unchanging information, since the objects are not affected by the local uncertainties, e.g. Law's (1986) Portuguese ship, which was used throughout the journey while travelling from one destination to the other.

#### 3.2.8.3 States of Actor-Network

An actor-network can predominantly have two states as explained below:

- *Stabilised Network:* A temporarily stable network is created when "aligned interests are created through the enrolment of a sufficient body of allies and where the network is maintained through the translation of interests that bind all actants" (Rhodes, 2009, p. 4). As a consequence of a series of translations, *convergence* occurs, which is measured by the degree of consensus of actants (Rhodes, 2009). When there is a high level of convergence, the network becomes irreversible (Rhodes, 2009). The actor network created as a result of translation behaves like a single actor or a "black box", a phrase used by Callon (1986b, 29), because the relations between actors in the network become irreversible, hence durable. The complex actor-networks are black boxed by a process called 'punctualisation' that converts an entire network into a single actor in another network (Callon, 1991; Cressman, 2009). However, a black box can be re-opened for continuous maintenance or in times of controversies. Thus, the actor-network created achieves stability when a stable alliance is agreed upon by assemblage of uncertain actors (Silvis & Alexander, 2014).

- *Destabilised network:* An actor-network may be destabilised when redistribution of power relations is precipitated due to a change in the belief on which the network was constructed or due to "new information, policy shifts, new technology, or a change in actors; or by certain actors backing out, as they had not been authentically enrolled" (Rhodes, 2009, p. 5). Controversies among the actors may also lead to betrayal leading to destabilisation of the actor-network. Betrayal is a situation where actors do not abide by the agreements arising from the enrolment of their representatives, thus resulting in controversy and destabilisation of the network (Callon, 1986a).

### 3.2.9 Cutting the network

One of the problems with the actor-network conception is the difficulty to decide what and where one should focus while conducting an educational research project. Miettinen (1999) critiques ANT by arguing that network ontology is infinite and therefore impracticable for researchers. To address this issue, Strathern (1996) proposed "cutting networks" (p. 523) as an essential feature in ANT sensitised research where a network would be cut at a point and stopped from further extension. In this study, network assemblage of human and non-human actors extend themselves through the four moments of translation as proposed by Callon (1986a).

## 3.3 Managing controversies related to ANT

Despite the popularity of ANT in the recent past, it has faced some controversies which I outline to understand the possible misconceptions while using ANT.

### 3.3.1 Can ANT be called a theory?

The founders of ANT, Law, Latour and Callon, themselves are not happy with the name and usage of the word 'theory'. ANT is not a theory as theories usually explain how and why things happen (Law, 2008) whereas ANT explains how different actors both human and non-human build the network that creates the reality that we experience (Eidenskog, 2015). However, ANT has been criticised for being too descriptive and described as a toolkit for telling interesting stories about relations assembled or not (Law, 2008). Moreover, it fails to suggest how actors should be seen, and their actions analysed and interpreted (Cresswell et al., 2010). Callon (1999) asserts that ANT is not a theory; hence this gives it both strength and adaptability.

### 3.3.2 Does ANT form an actor network or social network?

The ANT is a heterogeneous network of humans and non-humans in which enough significance needs to be given to non-humans or else it is criticised as being similar to a social network (Cornford, Ciborra, & Shaikh, 2005). Hence, highlighting non-humans is essential in an ANT study, though the extent of significance given to non-humans differs in scale from one researcher to another (Elbanna, 2012). For instance, the ANT pioneer, John Law when focusing on the humans during an analysis, ensures that he mentions other non-human actors could also have been included (Law, 1994; Law & Callon, 1992).

### 3.3.3 Can ANT be presented without translation?

Some reviewers believe that ANT must include moments of translation and are vulnerable if those proposed by Callon (1986) are not part of ANT presentation and case study analysis (Elbanna, 2012). However, Law and Callon (1992) proposed an alternative ANT approach where a local and global networks is mobilised by forming a single locus which shapes, mobilises and controls all transactions between the two networks. Thus, the locus becomes an obligatory point of passage between the two networks. This approach is used as a framework in some ANT researches (c.f. Stanforth 2006; Strong and Letch, 2012).

## 3.4 Summary

This chapter has set the background of the study by giving an overview of the key ANT concepts, terminology and their limitations. The next chapter will set the methodological framework of the study.

# Chapter 4: Methodology

This chapter charts the design strategy underpinning this research, drawing on both the aims and purpose of the study as well as on the wider considerations that helped to guide both practical and theoretical choices. Having set out the research problem and the research question in the introduction chapter that defined the aims and purpose of the study, and the rationale behind choosing ANT's two key concepts sociology of translation and sensibility for conducting the study, in Chapter 2 and 3, in this chapter I explain the factors that governed my decisions related to methodological choices, data collection techniques and data analysis approach. In particular, my role as an 'insider researcher' necessitated some careful thinking about dealing with reliability of data and ethical considerations. The research design strategy I adopted and my aforementioned role gives strength to the research, however, I also acknowledge the inherent limitations and weaknesses of my research design.

## 4.1 Philosophical worldview

It is imperative to clarify a researcher's philosophical perspective initially because the ultimate objective of conducting research is to develop knowledge and the nature of knowledge (Saunders, Lewis, & Thornhill, 2007). Creswell (2009) uses the term "philosophical worldview" (p. 5) to describe a researcher's general orientation about the world and the nature of research and "the basic set of beliefs that guide action" (Guba, 1990, p. 17). As I am convinced that my beliefs would be highly likely to influence my actions and decisions in every stage of the research, I decided to clarify my philosophical worldview in the beginning. According to Creswell (2003), a

philosophical world view is formed on the basis of various assumptions held by an individual.

In this study, I examine the phenomena that emerge as a result of the interplay between humans and non-humans, such as managers, teachers, e-learning developers, students and technologies, towards the development of CoreLife Skills among learners using technology. While describing these inter-relationships, meaning is generated without privileging either the social or the technological. These characteristics underpin the realistic realism viewpoint, wherein reality is perceived to be an emergent phenomenon constructed through the interplay between different actors, both human and non-human, with equal constitutive characteristics (Cordella & Shaikh, 2006).

In an ANT inspired study, actors attain their form and attribute as a consequence of their interaction with other actors, which influence and shape other actors, resulting in relational materiality (Cordella & Shaikh, 2006). As a member of the e-learning development team, I support the implementation and integration of technology in the institute by designing Moodle course pages, making effective use of a range of tools, providing consultancy to teachers on appropriate use of technology to meet a specific requirement, and provide required assistance on a needs basis. So, my regular use of technology for design and implementation and interaction with users of technology, teachers and students, gives me the status of a focal actor within the network, in addition to being a researcher, which helped me to have a better understanding of the phenomena that emerge as a result of the interplay between different entities. Thus, I have undertaken an endogenous research to explore the real-life situation in my

workplace (Maruyama, 1981). I discuss the potential benefit and limitations of these roles in section 4.6.

## 4.2 Methodological and analytical approach

Selection of a suitable research methodology was based on the phenomena under study, research questions set out in Chapter 1, and my philosophical stance, clarified in section 4.1. In this research study, I seek to explore the two phenomena - CoreLife Skills development among students through technology innovation, and adoption and use of technology by teachers and students in the ABC Institute. I am interested in exploratory research using ANT to study the phenomena rather than quantifying them.

Initially, I planned to use ANT as a theoretical lens to understand the socio-technical relationship between the actors, but later I understood that the scope of ANT is much wider and need not be limited to a lens. Law and Singleton (2013) suggest that ANT is a set of "care-full sensibilities [wherein the researchers do not assume too much and let the research unfold itself; thus, it is] [s]ensitive to ethnographic surprises" (p. 488).

At the same time, Hedström, Dhillon, and Karlsson (2010) describe ANT as a "process oriented theory" (p. 46) in which actors are followed to identify the associations that link the different actors together forming a network through the process of translation. This inspired me to use sociology of translation (Callon, 1986a) as a methodological and analytical tool to explore the process of technology implementation and its adoption.

### 4.2.1 ANT as a methodological and analytical tool

ANT is generally known for its methodological dilemmas, as it is vague in terms of how precisely knowledge emerges. Perhaps in response to this methodological vagueness, on the one hand, and fixity of Callon's (1986a) the sociology of translation with four moments of translation, on the other hand, McBride (2000) presented ANT as an analytical tool, and Carroll, Richardson, and Whelan (2012) extending the work of McBride (2000), presented ANT's application as a research methodology for Actor-Network theorists. Though Callon's (1986) four moments of translation are widely used in ANT research (e.g. Burgess & Tatnall, 2002; Rhodes, 2009; Sarosa, 2012; Tatnall, 2010; Uden & Francis, 2011), guidance on the methodological approach a researcher adopts during each of the moments of translation is not clearly explicated. On the other hand, McBride (2000) and Carroll et al. (2012) proposed sequential steps/phases for adopting ANT as an analytical tool and methodological approach but received limited acceptance. Hence, I explored relationships between Carroll et al. (2012) and McBride's (2000) sequential phases/steps with Callon's (1986a) four moments of translation, as illustrated in Figure 4.1, to elucidate the processes involved in each moment of translation. Thus, an ANT methodological and analytical framework, as illustrated in Figure 4.2, was deduced to methodically conduct studies influenced by sociology of translation and analytically present research finding. The processes I carried out during each moment of translation are discussed subsequently.

| Sociology of Translation (Callon, 1986) |
|---|
| **1st Moment of translation: Problematisation**<br>An actant or actants define the problem so that other actants recognise it as their own problem. |
| **2nd Moment of translation: Intéressemment**<br>Devices through which actants detach and reattach to lock allies into the problematisation |
| **3rd Moment of translation: Enrolment**<br>The successful outcome of problematisation and intéressemment whereby more allies are attached |
| **4th Moment of translation: Mobilisation**<br>Maintaining the network by persuading the actants that their interests are the same as the translator |

| Eight phases of adopting ANT (Carroll, Richardson, & Whelan, 2012 adopted from McBride, 2000) |
|---|
| **1. Identify the stakeholders**<br>Comprise of human or non-human actors which influence or becomes influenced by other actors' policies and practices. |
| **2. Investigate the Stakeholders**<br>Understanding the character of the stakeholders through interviews or survey with network representatives, accessing documentation, understanding their attitudes, interactions, interests, etc. |
| **3. Identify stakeholder interactions**<br>Tracing interactions between stakeholders to explore the level of influence between stakeholders (e.g., trust and control). |
| **4. Construct an actor-network model**<br>Construct an actor-network model to determine for example, the network's complexity, cohesion, strength, and influence. |
| **5. Examine Irreversibility**<br>Determine to what degree it is difficult to make a change, e.g., through understanding the culture and the nature of acceptance in the network. |
| **6. Source of inhibitors and enablers**<br>Determine who enables and inhibits actions to shape technology and the network under investigation, e.g., technology, attitudes, resistance, or network infrastructure. |
| **7. Tracing actions**<br>Identify what activities led to the alignment of the actor-network, for example, training |
| **8. Reporting on the actor-network**<br>Report on the overall nature of the network and explain how social actions shape technology and technological innovations shape social action within the network. |

*Figure 4.1 Sociology of translation* (Callon, 1986a) *and phases of adopting ANT (Carroll et al., 2012)*

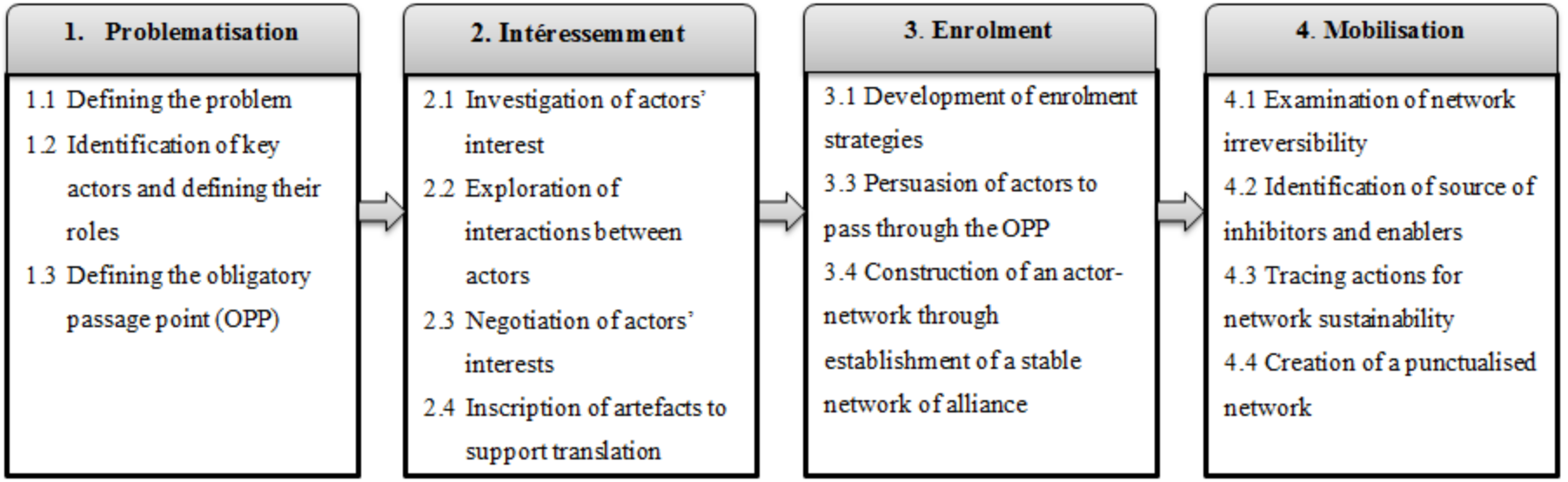



*Figure 4.2 ANT methodological and analytical framework - adapted from Callon (1986), McBride (2000), Uden and Francis (2011)*

The sociology of translation is initiated through problematisation. In this first moment of translation, lack of CoreLife Skills among graduates from VET institutions in the UAE is identified as a problem. So, I identified CoreLife Skills as the first actor to follow and in the process identified other humans and non-human actors that included but were not limited to Moodle, ePortfolio, management staff, teachers and students. As a researcher and more so as an e-learning developer, I emerged as one of the focal actors and in collaboration with other actors, I defined the OPP to fit the solution.

During the second moment of translation, intéressemment, I adopted a range of data collection techniques, which will be discussed in section 4.4, to understand the interests of each actor and the mutual interactions between them to explore the level of influence (e.g. trust, control) between them. This determines the extent of negotiation that may be required to align actors' interests to those of the network as often conflict of interest occurs (Uden & Francis, 2011). Once the focal actors succeed in aligning the interests of actors through negotiation, next through the inscription process, technical objects are created to protect the interests of the actors. The technical objects define the rules, which must be agreed and obeyed by each actor to form an actor-network. In this study, technical objects include the course page in Moodle and the ePortfolio implementation plan, which are critical in the formation of the actor-network.

During enrolment, the third moment of translation, an enrolment strategy is devised that challenges the current assumptions of the actors. According to Callon (1986a), the device of intéressemment does not necessarily lead to alliances and to actual enrolment. Hence, I investigate the different techniques adopted by focal actors to

persuade other actors to align their interest with the network in an attempt to create a temporarily stable actor-network.

Mobilisation is the fourth moment of translation, wherein I examine irreversibility of the network by determining the level of convergence; what enables or inhibits actions to shape the technology and network. Finally, I report how social actions shape technology and vice-versa within the network.

### 4.2.2 ANT as an analytical tool

Fenwick, Edwards, and Sawchuk (2012, p. 94) describe how "ANT's analyses trace how all things – natural, social, technical or, more accurately, the messy mix of these – become assembled and enacted in networked webs, how they associate and exercise force, and how they persist, decline and mutate". Difficulties may emerge as a result of implicit privilege bestowed on social sciences concerning the manner in which science and technology are explained. To overcome such difficulties, as proposed by Callon (1986), I adhered to the following three methodological principles while interpreting the analysed data.

- *Agnosticism*: I was careful in not privileging any actor's viewpoint and abstaining from censoring any actor's interpretation.
- *Generalised symmetry*: I used an abstract and neutral vocabulary in the best possible way to explain the conflicting viewpoints of different human and non-human actors in the same terms, so that neither the social nor the technical elements in these *heterogeneous networks* (Law, 1987) are given any special

explanatory status (Tatnall & Gilding, 1999). However, in Chapter 8, I had to focus on teachers' and students' adoption of technology, which was inevitable due to the nature of the research.

- *Free association:* I eliminated any definite boundary between social and natural events so that a priori distinctions between the technological or natural and the social are abandoned.

### 4.2.3 LoTi and HEAT as an analytical tool

I used LoTi and HEAT frameworks for analysing the seven cases of technological innovation that I studied. I analysed each case by comparing how technology was integrated by teachers and its impact on students with the attributes defines at each level of LoTi and HEAT, as detailed in Table 10.1 in Appendix 10. The comparison helped to determine at which level of LoTi and HEAT each case could be mapped to. Eventually, I analysed the influence of HEAT generated at each level on the enhancement of students' CoreLife Skills. Thus, analysis and mapping of the seven cases against the six different levels of LoTi and HEAT was the outcome of the interaction between four actors: the researcher, LoTi framework, HEAT framework and the CoreLife Skills. As recommended by Clarke and Montini (1993), during analysis, I observed the silent, collective actors such as LoTi, HEAT and CoreLife Skills even if they did not participate in the action.

## 4.3 Research strategy

To design a suitable research strategy, I investigated various approaches adopted in ANT-influenced research studies. My initial exploration revealed that a corpus of

ANT research is full of ethnographic accounts such as ethnographic investigation of one specific group of scientists (Latour & Woolgar, 1986), ethnography of Daresbury Laboratory (Law, 1994), ethnography of the *Conseil D'Etat* (Latour, 2010) and ethnography of an ordinary disease (Mol, 2002). Thus, ANT's preferred methodology is ethnography (Hamilton, 2011) as it "lets us see the relative messiness of practice" (Law, 2004, p. 18). Perhaps, this could be attributed to the fact that ANT encourages the researcher to focus on the practices and interactions between various actors (humans and non-humans) in assembling networks, which methodologically leans towards ethnography. This gave me an initial impression ANT study would require an ethnographic research design, but soon I learnt that not all ANT research is ethnographic. For example, Latour (1987) conducts no first-hand ethnographic field work in *Science and Action* wherein he followed scientists and engineers, which stands as the invitation to "follow the actors" (Latour, 2005, p. 12); Callon (1986a) did not base the empirical study on domestication of the scallops and the fishermen of St Brieuc Bay on ethnographic methods. Fenwick et al. (2012) suggest that ANT researchers use field observation using an ethnographic approach for data gathering; while Willis (2007) describes ethnography as "an umbrella term for fieldwork, interviewing, and other means of gathering data in authentic (e.g., real-world) environments … [that] puts the researcher in the settings that he or she wants to study" (p. 237). However, Richards (2003) asserts that "[i]n ethnography there is no substitute for extended immersion in the field, and where this is not possible researchers should consider" (p. 16) other approaches. Though I am doing endogenous research, due to my additional responsibilities in the institution, I could actually spend only limited time for participant observation. Consequently, conducting an ethnographic field work study seemed impracticable. Abercrombie,

Hill and Turner (2000) propose that when time is a constraint, researchers almost invariably choose a case study method instead of ethnography.

The significance of case study in an ANT-sensitised study is further established by Law and Singleton's (2013) assertion that "ANT does its theoretical work […] through carefully articulated case studies" (p. 500). Case studies are often adopted in ANT informed research as a research strategy, for example, Callon's (1986a) famous essay on the domestication of scallops at St. Brieuc Bay, Latour's (1988) celebrated account of pasteurisation in France, and others (Beyene, 2010; Bhatt, 2014; Donzello, 2013; Sarosa, 2012), to investigate "a contemporary phenomenon in depth and within its real-life context" (Yin, 2009, p. 18). The phenomena that I investigate in this study are the implementation, adoption and use of technology for enhancement of students' CoreLife Skills in the context of the ABC Institute. The word 'context' is sometimes problematic in ANT as an ANT study does not define any boundary. However, Law and Singleton (2013) state "[i]f you 'follow the actors' they lead us into contexts" (p. 492). The essential part of ANT sensibility is that relations, materials and processes are spread out everywhere; so there is not much distinction between micro and macro context in ANT (Law & Singleton, 2013).

In this study, the case of the ABC Institute is studied, where I focus on understanding the emerging relationships between different actors (human and non-human) in the process of technology implementation and its adoption and uses by teachers and students rather that understanding the context. Thus, this study leans towards Stake's (1995) instrumental case study, which is chosen when:

> [t]he case is of secondary interest; it plays a supportive role, facilitating our understanding of something else. The case is often looked at in depth, its contexts scrutinized, its ordinary activities detailed, but this [is] because it helps [the researcher] pursue the external interest. The case may [or may not] be seen as typical of other cases… The choice of case is made because it is expected to advance our understanding of that other interest. (p. 237)

Thus, the case of the ABC Institute will help to understand how the institutional practices influenced the implementation, adoption and use of technology, which can help in understanding similar situations in other institutions and improve chances of transferability (Lincoln & Guba, 1985) as discussed in section 4.7.

Case study research provides an option of employing a range of data collection methods, such as interview, participant observation, document analysis, survey, questionnaire and others for convergent lines of inquiry (Dooley, 2002; Reilly, 2010; Yin, 2009). Similarly, Fenwick et al. (2012) assert that data collection methods used in ANT research are field observations using ethnographic approach, collection of documents or artefacts, and conversation with participants. Likewise, ethnography also adopts fieldwork, interview and other means of data gathering in real world environments. Thus, participant observation, which is vital in ethnographic research, is also a method used in case study and ANT. Although the traditional hallmark of ethnographic research is considered to be extended periods of observation by a researcher occupying a participant-observer role and documenting observations in highly-detailed field notes that are revisited as research data, "the quality of observation that is represented in the writing of 'cases' is … as important as quantity or duration of observation"(White, Drew, & Hay, 2009). White, Drew and Hay (2009) propose that the act of writing about the case and participants in a case study involves processes that resonate with ethnography.

Willis (2007) suggests that there are more similarities between case study and ethnography and I could trace some similarities in data collection methods and writing style, which is suggestive of the suitability of a case study approach as a possible alternative to an ethnographic approach. Hence, by discussing the similarities and dichotomies of ethnographic and case study approaches, I consider the possibilities of including some characteristics of ethnography in my case study research.

The case study approach seeks to reject or ignore the influence of the researcher to avoid tainting the data or evidence while ethnography is more inclusive of the researcher and considers them to be influential in the process (White et al., 2009). "The inquirer posture of the ethnographic researcher allows [them]… to operate as 'transformative intellectual' who can be advocate or activist or... a 'passionate participant' who facilitates either 'primary voice' (the self-reflexive I) and 'secondary voice' who illuminates through narrative and other forms" (Guba & Lincoln, 2005, p. 196). In this research, my role is not confined to that of a researcher and attains a status of an actor in the network due to my additional role as an e-learning developer and teacher; hence, an ethnographic researcher posture is more practicable.

Ethnographies and case studies often pose unique challenges while writing, as data needs to be assimilated from different sources, as discussed in section 4.4. I presented my research findings as "thick description" (Geertz, 1973, p. 6) of the data as emphasised in ANT studies and suggested by Humphreys and Watson (2009) for ethnographic writing. While giving thick description of ethnographic account, I used evocative language using quotations from interview, anecdotes, descriptions, examples to give a compressive view of the research to readers. Of the four typologies of ethnographic writing proposed by Humphreys and Watson (2009), I adopted semi-

fictionalised ethnography by restructuring events that occurred in one or more ethnographic investigations into a single narrative in order to protect individual identity. Additionally, it also helped to combine information in a single narrative, which minimised repetition.

## 4.4 Methods of data collection

Having identified case study as a suitable research strategy, which supports multiple data collection methods, I adopted four different techniques for gathering data, as discussed in following subsections. However, unlike using the data from multiple sources for data triangulation (Guion, Diehl, & McDonald, 2011; Yin, 2009) as is generally done in a case study; my intention is to explore multiple ontologies that underpin ANT sensibility discussed in section 3.2.3. The data were collected over two academic terms spanning approximately seven months: Term 3 of the academic year 2014-2015, Term 1 of the academic year 2015-2016

A summary of the data collection methods adopted to unfold the two phenomena is shown in Table 4.1.

| Data collection methods | Phenomenon 1: Technology implementation | Phenomenon 2: Technology adoption |
|---|---|---|
| **Observation** | ✓ | ✓ |
| **Interview** | ✓ | ✓ |
| **Documents review** | ✓ | |
| **Technological artefacts** | ✓ | ✓ |

*Table 4.1 Summary matrix of data collection methods used to understand the two phenomena*

### 4.4.1 Interview

Stake (1995) describes how interview technique is adopted by qualitative researchers to discover and portray the multiple views of the case and is the main road to

unveiling multiple realities. In this ANT informed study, both humans and non-humans are interviewed, as discussed in the following subsections.

#### 4.4.1.1 Interviewing humans

The interview was guided by a socio-technical perspective (Hedström et al., 2010) as ANT denies that purely technical or purely social relations are possible (Uden & Francis, 2011). All interviews were conducted in a place suggested by the interviewee. However, students were also asked questions during the class observation to clarify what they did, how and why they did a specific activity while using technology. This is in line with Latour's (1999a) suggestion that information should be gathered from the actors not only to find out what they do, but how and why they do it. Later these students were interviewed to gather further information.

Table 4.2 summarises the participants who contributed towards unfolding two phenomena: technology implementation (phenomenon 1) and its adoption (phenomenon 2) and Table 4.3 provides the details of participants interviewed.

| **Participants** | **Phenomenon 1** | **Phenomenon 2** | **Participant(s)** |
|---|---|---|---|
| **NQA –RNDC member** | 1 | | 1 |
| **TVET curriculum specialist** | 1 | | 1 |
| **Manager from industry** | 1 | | 1 |
| **ABC Institute managers** | 4 | | 4 |
| **e-learning developers*** | 2 | | 2 |
| **Teachers** | 4 | 4 | 3 |
| **Students** | 10 | 10 | 10 |
| **Total number of Interviews** | **23** | **14** | **21** **37** |

*Table 4.2 Summary of participants*

| Serial No. | Participant pseudonym | Participant description | Acronym of participant description |
|---|---|---|---|
| 1 | Sofia | Expert, Research and Studies in NQA, UAE | NQA |
| 2 | Sean | Curriculum Development Specialist in a TVET institution based in the UAE | TVET |
| 3 | Garry | Senior Manager in a local UAE bank | Industry |
| 4 | Norvin | Executive Director, ABC Institute | Manager |
| 5 | Ubert | Teaching and Learning Manager, ABC Institute | Manager |
| 6 | Mohannad | IT Manager/E-learning Team Leader, ABC Institute | Manager |
| 7 | Tony | Quality Manager, ABC Institute | Manager |
| 8 | Shank | Engineering and Business Teacher, ABC Institute | Teacher |
| 9 | Benci | IT Teacher/E-learning Developer, ABC Institute | Teacher |
| 10 | Sana | General Education Teacher, ABC Institute | Teacher |
| 11 | Sara | Business Teacher, ABC Institute | Teacher |
| 12 | Azar | ABC Institute student | Student |
| 13 | Adnan | ABC Institute student | Student |
| 14 | Aaliya | ABC Institute student | Student |
| 15 | Ayeza | ABC Institute student | Student |
| 16 | Emma | ABC Institute student | Student |
| 17 | Markoz | ABC Institute student | Student |
| 18 | Maazin | ABC Institute student | Student |
| 19 | Rabia | ABC Institute student | Student |
| 20 | Zaida | ABC Institute student | Student |
| 21 | Zuhair | ABC Institute student | Student |

*Table 4.3 Interview participant details*

Initially, a semi-structured interview was conducted with experts from NQA, TVET and industry to explore more about students' CoreLife Skills to define the problem. An ethnographic interview approach was used to gather information from the ABC Institute management staff, e-learning team members, teachers, and students to understand their interests behind the implementation of technology; to explore how

teachers integrated technology within their course delivery with the aim of developing CoreLife Skills among learners; and to assess the impact of technology implementation on students, based on the information obtained.

For understanding the factors influencing the adoption of technology by teachers and students, I interviewed them using a UTAUT questionnaire by adapting the survey questionnaire used by Williamson and Parolin (2013) in their quantitative study as discussed in Appendix 11. It includes questions related to the four constructs of the UTAUAT: performance expectancy, effort expectancy, social influence and facilitating conditions, and use behaviour and behavioural intentions. Thus, the questionnaire aimed at unfolding the influence of different technology adoption factors in building the relationship between actors and maintaining the network sustainability. Also, it helped in exploring the usefulness of the UTAUT model to study technology adoption.

I recorded all interviews and subsequently transcribed them myself in order to get closer to the data, which facilitated data analysis**.** I followed the guidance of Loviglio (2012) to assign pseudonyms to each participant to conceal their actual identity. While assigning pseudonyms, I retained the first letter of the actual name and ensured that there was no other person with the same name in the domain to which the participants belonged.

#### 4.4.1.2 Attending to non-humans

Unlike traditional approaches where only humans are interviewed, this ANT study also gives voice to the non-human materials such as Moodle, ePortfolio, mobiles,

UTAUT, TEL-CSD framework, LoTi, HEAT framework. Contrary to presenting human participants' interview data within quotes in qualitative research, Thompson and Adams (2013) propose the use of anecdotes to represent information about/from non-humans. This was accomplished by offering a description of these materials "to produce scripts of what they are making others – humans or non-humans – do" (Latour, 2005, p. 79). Thompson and Adams (2013) state that researchers should look for "invitational quality of the things" (p. 354). To follow the non-human actors, I looked for things that appealed to be heard, viewed or observed. For instance, the video files of the students' presentation in Moodle invited me to watch the video and TEL-CSD framework invited teachers and e-learning developers to make use of it for technology implementation to enhance students' CoreLife Skills. Thus, non-human actors such as video files and the TEL-CSD framework became part of the actor-network. The LoTi and HEAT framework interact with the data I gathered to identify at which level the teachers and students integrated their technology and how far the goal of CoreLife Skills development among learners was achieved. I also observed the UTAUT model to determine its usefulness considering if the framework is comprehensive in assessing adoption of technology or if there are additional factors not accounted for by UTAUT.

### 4.4.2 Observation

Beyond any methodical planning of observations, I used an ethnographic approach by remaining open to discovering elements constructed in the environment observed that included both humans and non-humans and the tools people mobilise during their interaction with others (Baszanger & Dodier, 2004). I took an "observer-as-participant" stance to observe teachers and learners with minimum involvement in the

social settings (Gold, 1958, p. 217). I observed how teachers integrate technology and students experience and react to use of the technology. Additionally, learners introduced their laptops, iPads and smartphones in the learning environment. To follow the non-human actors, I watched out for things that appealed to be observed or used. For instance, the laptops, iPads, mobile devices, Moodle pages, and ePortfolio invited me to observe, and my personal Samsung S3 mobile invited me to video record or take pictures of classroom activities. Thus, having responded to the call of the things, I was caught up in the world that it opened.

I kept a record of my observations by writing field notes as Dewalt, Dewalt, and Wayland (1998) state "observations are not data" (p. 271) and assert that "field notes are the primary method of capturing data from participant observation" (p. 270), which are considered as both data and analysis (Kawulich, 2005).

### 4.4.3 Document review

The document review method was adopted as a secondary data collection method primarily to explore existing employability models that could meet the NQA requirements. For this, I reviewed reports from prominent research related to technology implementation, technology for employability skills, and obtained comprehensive details about a well-established learning design framework, the AFLF that integrates technology with learning theory and employability skills. I also reviewed documents internally maintained by the ABC Institute such as unit standards, policies and handbooks accessible from Moodle for teachers and students, after seeking due permission from the management as a researcher. Google search, One Search of Lancaster University was used to seek external documents related to

CoreLife Skills/ employability skills model using technology. The inclusion and exclusion criteria used to identify the documents are tabulated in Table 4.4.

| Category | Description |
|---|---|
| **Inclusion Criteria** | CoreLife Skills requirement in the UAE. Successful framework/models/learning design that integrate technology for development of CoreLife Skills among learners especially in VET sector |
| **Exclusion Criteria** | Employment skills requirements of other countries. Framework/models/learning design that does not integrate technology and employability skills |
| **Keywords** | "CoreLife Skills in the UAE", "employability skills in the UAE", "employability skills framework using technology for vocational education and training (VET)", "Australian Flexible Learning Framework (AFLF)", "National Qualification Authority (NQA) UAE" |
| **Number of references** | 11 |
| **List of references** | AFLF (2010), Bowman and Kearns (2009), Backroad Connections Pty Ltd (2002), Chatterton and Rebbeck (2015), NQA (2012a, 2012b, 2013, 2014, 2015, 2016), Precision Consultancy (2006, 2007) |

*Table 4.4 Document selection criteria*

### 4.4.4 Technological artefacts

In this ANT study, technological artefacts are an integral part of the network because the study focuses on integration of technology by teachers and its adoption and use by students. Technologies such as Moodle and ePortfolio are sources of rich technological artefacts, such as teaching and learning resources, assignment briefs, students' work, log files and statistical reports. Hence, I sought permission from the ABC Institute management to use teaching and learning resources, assignment briefs and students' work as research data. However, access to log files and statistical reports was denied. Before including video clips or the ePortfolio page of any student, I explained the purpose and anonymisation of data, answered their queries, gave them

opportunity to withdraw and finally invited them to give formal consent through signing a form.

## 4.5 Data analysis and management

Wright and Bhatt (2016) acknowledge that, in practice, ANT projects are very elusive in giving indications of how analysis proceeds, though use of a computer-aided qualitative data analysis software package (CAQDAS) (Lee & Fielding, 1995), such as ATLAS.ti, NVivo and HyperRESEARCH, for the purpose are the focus of competing claims and critiques. Having gathered data from multiple sources, I found it challenging to manage and analyse a wide variety of data in the form of interview transcripts, field notes of observations, samples of online resources, technological artefacts and related documents. Hence, I chose to use ATLAS.ti for effective management of data and to support data analysis. By committing to use ATLAS.ti, I subscribed to the methodological assumptions and design decisions made by its manufacturer. Thompson and Adams (2013) claim that "CAQDAS enhances the agency of [the] qualitative researcher" (p. 353). ATLAS.ti supports a comprehensive overview of the research project (called the Hermeneutic Unit (HU) in ATLAS.ti), facilitating immediate search and retrieval but above all to enhance the quality of data analysis (Smit, 2002). Smit (2002) clarifies that though development of ATLAS.ti is largely influenced by grounded theory, its use is not limited to a grounded theory approach but applicable for other qualitative analysis for interpretation. In my ATLAS.ti project, I reviewed text data to highlight text segments referred to as *quotations,* which could be collected together by tagging them with *codes* in the software. The related codes were then clustered into *code families*. Many *links* were

established using the codes and code families to build *network views*. I found the *network view* feature of ATLAS.ti particularly useful to understand the interactions and inter-relationships between data drawn from different actors. A sample network view is displayed in Figure 4.3.

## 4.6 Ethical consideration

Undertaking an endogenous research approach with an insider-researcher position (Costley et al., 2010), facilitated gaining easier access to participants, such as teachers, students, e-learning team, managers, and technologies, such as Moodle and ePortfolio for the study. I am aware of ethical issues that may emerge by using my insider role such as coercion of participants, and access to privileged information (Smyth & Holian, 2008). However, I clarified to the participants that their participation in the research was voluntary and they had the right to withdraw without any prejudice within two weeks after the interview.

I only included information in my research that I am permitted to use and maintained confidentiality of the data collected. The anonymity of the interview participants was ensured by assigning pseudonyms as discussed in section 4.4.1.1 and consent was secured to include ePortfolio pages, print screens of video recordings, and extracts from assignment briefs; the data were anonymised by hiding certain sections of the details that may be identifiable (discussed in section 4.4.4). The data gathered were secured as per the Lancaster University guidelines.

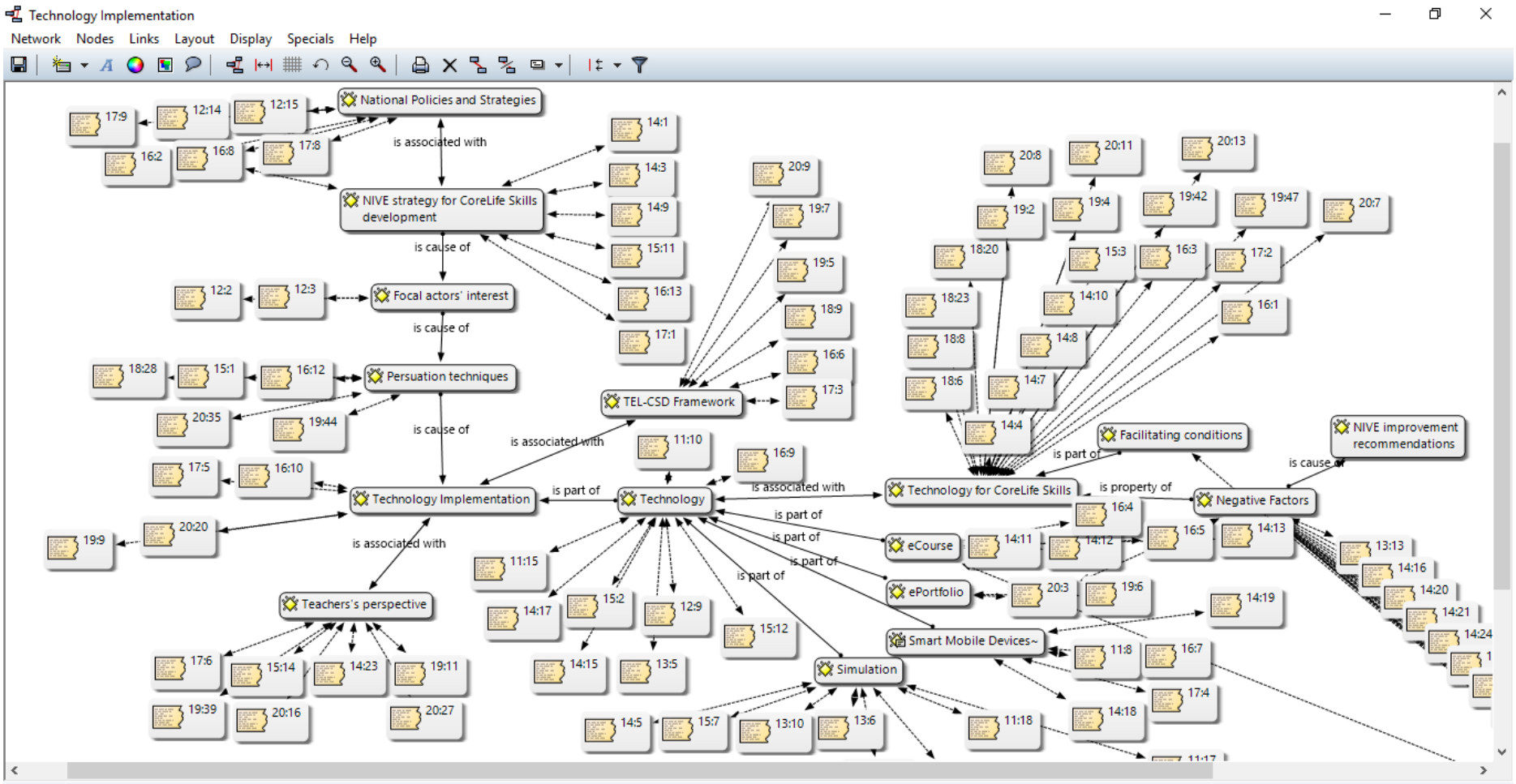



*Figure 4.3 ATLAS.ti network view to analyse technology implementation*

The research was non-funded. So, further to receiving ethical approval from Lancaster University, permission was sought from the ABC Institute to conduct the research. I have complied with the Lancaster University Code of Practice for Research Ethics and Research Governance, British Educational Research Association (BERA, 2011) and the ethics of the ABC Institute to ethically conduct the research.

## 4.7 Reflection on the research design

My research design uses case study as a strategy that includes some characteristics of ethnography, considering the similarities discussed in section 4.3; and is informed by ANT. Both ANT and case study suggests gathering data from multiple sources, which helped to explore multiple ontologies, a unique approach of ANT. However, one of the challenges was the need to have required expertise in a range of data gathering techniques.

Latour (2005) recommends ANT researchers "follow the actors" (p. 12) and look for "mediators making other mediators do things" (p. 217), where mediators are either human or non-human actors. As there can be an infinite number of actors in an actor-network; identifying relevant actors to address the research question was challenging (Cresswell et al., 2010). Therefore, the selection of actors for gathering data was profoundly influenced by my decision on which actors could best address the researcher question. Though this is considered to be a social constructivist approach, as I am doing an endogenous research study, and a focal actor in the network, this approach is justifiable. Another challenge while following the actors was to determine when to stop following them. Strathern (1996) explicates that an analyst must always

cut the network somewhere to determine the scope for analysis by excluding as well as including data. I cut the network when my research questions were answered following the four moments of translation. The size of the network thus produced depended on the number of actors aligned to achieve a particular goal (Stalder, 1997). Hence, any contribution made by an actor to the actor-network is important, contrary to the number of actors representing a network, as an actor becomes strategic for a network through the number of connections it commands and loses its importance when it loses its connections (Latour, 1996b). Hence, questions, which are highly significant for a quantitative study or other qualitative approaches, such as what the total population might be, what proportion is represented by the participants (human actors), how they were sampled, whether they are potentially representative of the entire wider case, are not significant for this ANT informed study.

On the other hand, Lincoln and Guba (1985) suggest describing a phenomenon in sufficient detail, which would help the researcher to evaluate the extent to which the conclusions drawn are transferable to other times, settings, situations, and people. I provided a rich picture of the phenomenon under study using thick description (Geertz, 1973) so that the case study presents qualitative information in sufficient detail to give the reader adequate contextual and environmental descriptions and allow judgements about transferability of the case study based on conceptual applicability (Lawrence, 2010). Thus, the case study approach improves the chances of transferability.

# PART III: SOCIO-MATERIAL ASSEMBLAGES FOR STUDENTS' CORELIFE SKILLS ENHANCEMENT THROUGH TECHNOLOGICAL INNOVATION

This part presents the empirical findings of the ANT sensitised study that I conducted in the ABC Institute to explore transformation in the use of technology, from teaching and learning to enhancement of students' CoreLife Skills. I examine how technology is enacted in the web of relations formed by a socio-material assemblage of human and non-human actors, such as students, teachers, e-learning developers, management, CoreLife Skills and curriculum, creating socio-material assemblages with the aim of facilitating students to develop their CoreLife Skills.

This part narrates ANT stories of socio-material assemblages using the ANT methodological and analytical framework, explained in section 4.2.1. As previously mentioned, the framework is underpinned by the ANT concept of sociology of translation (Callon, 1986a) wherein the socio-material transformation is discussed through the four moments of translation: problematisation, intéressemment, enrolment and mobilisation. Each of these moments of translation is discussed separately in the four separate chapters (5-8) that follow.

## Chapter 5: Problematisation of CoreLife Skills assemblage

This chapter sets out the first moment of translation, problematisation, wherein I define the problem. Beyond my involvement as a researcher in the ABC Institute, my role as an e-learning developer gave me the opportunity to investigate the potential use of technology to enhance student's CoreLife Skills in the ABC Institute. Consequently, I emerged as a focal actor since my objective was to translate the interests of other actors to those of mine so that they engage in the translation process to achieve the goal and form an actor-network. The ABC Institute managers have been working persistently in translating the interests of others to develop students' CoreLife skills; hence, they are also identified as focal actors. There are numerous actors within the institute involved in different processes of translation, each with their own unique characteristics and outcomes. In this research, I focus on the two focal actors, from whose vantage point I wish to see the process of translation.

As an initial step, I identified both human and non-human actors in the ABC Institute who could form the socio-material assemblage of the actor-network with the aim of enhancing students' CoreLife Skills through technological innovation. Subsequently, I define the OPP that the actors in the network have to pass through by aligning their interests to those of the focal actors in order to accomplish the goal. By defining the identities of the actors and establishing themselves as an OPP in the network of relationships they build, they render themselves indispensable in the network, which Callon (1986) calls problematisation.

Unlike a standard chapter under findings and analysis, where one would normally expect extensive excerpts of data and detailed analysis, this short chapter sets out how the study was initiated and is a prelude to further discussion and analysis in subsequent chapters in this part.

## 5.1 Defining the problem

The need for a skilled workforce is on the rise as the UAE Government recognises the importance of a highly skilled, educated and qualified workforce for the country's economic growth and prosperity (NQA, 2012b). Though the term 'skilled workforce' refers to technical skills that a person specialises in, there is enough reference in the literature that suggests the need for employability skills, such as communication skills, teamwork skills and problem-solving for graduate employability (Audu et al., 2013). During my interview with Garry, a senior manager in the banking sector, he stated "we look for graduates who have good communication skills, negotiation skills and [who can be] a team player". Sean, a TVET teacher stated that while interacting with employers to seek feedback about his students undergoing on-the-job training, the employers identified that generally students lack "adaptability skills, their ability to adapt to the working environment. [Secondly,] the students are not independent". Garry also indicated that "students with insufficient employability skills (CoreLife Skills) will face problem[s] while seeking employment. […] The educational institutions need to adopt suitable strategies to enhance students' employability skills".

One of the strategies identified in the literature is the integration of these skills into curriculum and course design. As the country is moving towards a unified national qualification framework named QF*Emirates* framework, Sofia (NQA) states that

> with the national qualifications [framework in place], qualifications need to be industry lead. The [TVET] providers are not really there to develop [qualifications as] NQA works with industry and awarding bodies to develop qualifications. All they need to focus is on the curriculum.

So, the potential benefit of national qualifications is that CoreLife Skills is embedded within the curriculum, as discussed in section 2.1. Hence, institutions offering the national qualifications have to just focus on designing courses and strategies that allow students to enhance their CoreLife Skills.

The ABC Institute has recently started to offer national qualifications accredited by the NQA and benchmarked against the QF*Emirates* framework. The idea of helping students develop their CoreLife Skills is not new to the ABC Institute as its philosophy and strategy outlines that:

> An important aspect of [ABC] programmes is a Key Skills component. In addition to taking academic or vocational courses, students are required to develop essential Key Skills. These skills are integrated into the programmes. (ABC Institute, 2015b)

Here, the term 'Key Skills' refers to CoreLife Skills. The ABC Institute, in line with its philosophical idea, has been offering students on-the-job-training. Norvin (Manager) added, "Early on we had tables and matrices for the various learning outcome indicating when these key skills will be integrated. Unfortunately, the implementation of that was rather short lived. It was a good attempt but not really properly implemented".

However, as an educationalist and an e-learning developer in the ABC Institute, I proposed using some technological aids to facilitate the students to attain their CoreLife Skills. As discussed in the literature review chapter, in countries such as Australia, the UK and the US, the use of technology for enhancement of employability skills is a recent trend, and this idea is still in its infancy in the UAE. After convincing myself that the employability skills model of the AFLF is a useful one to integrate technology to enhance employability skills, I decided to adapt it to suit the needs of the UAE rather than spending time 'reinventing the wheel'. Thus, this study discusses the practical application of technology for the enhancement of a range of CoreLife Skills among students, which could possibly improve graduate employability.

## 5.2 Identification of actors and defining their roles

In ANT, actors can only act in combination with other actors in which inanimate things (e.g. technology) can also have agency along with humans. As one might expect, identification of human actors such as ABC Institute managers, e-learning developers, students and teachers who are an integral part of the translation process was comparatively easy; however, identification of non-human actors was challenging. The ABC Institute offers NQA approved qualifications and the curriculum maps the CoreLife Skills against the performance criteria as discussed in section 2.1. Hence, I identified curriculum and CoreLife Skills as the two non-human actors since both play significant roles while designing course delivery. As I propose to use technology as a mediator to facilitate the enhancement of CoreLife Skills, I identified technology as the third non-human actor. In the following subsection, I

describe the seven actors that I plan to follow initially to explore how they alien their interests to develop an actor-network.

### 5.2.1 ABC Institute managers

One of the managers' goals is to implement the institute's philosophy of integrating key skills or CoreLife Skills while delivering vocational programmes to produce skilled graduates. They plan strategies and take decisions to develop students' CoreLife Skills. Since I am also interested in exploring options to enhance students' CoreLife Skills, both of us emerge as focal actors. My role as a researcher and focal actor is set out in section 5.3 and discussed throughout Part III's chapters. The details of the four managers interviewed are tabulated in Table 4.3 under section 4.4.1.

### 5.2.2 CoreLife Skills

The seven CoreLife Skills as outlined by the NQA (2016) are listed below:

- Collecting, analysing, organising and applying information in a given context
- Communicating information, concepts and ideas
- Initiating and organising self and activities, including motivation, exploration and creativity
- Working with others in teams and leadership skills
- Solving problems including use of mathematical ideas and techniques
- Applying information and communication technology (ICT)
- Participating in social and civic life including ethical practice

These seven skills are identified by the NQA as CoreLife Skills, though different countries may identify different sets of skills as core skills or use any other

terminology to represent the same. However, since the study is conducted in the UAE and CoreLife Skills are embedded in the national qualification curriculum, I decided to focus on them.

### 5.2.3 Curriculum

The ABC Institute has been offering the Pearson BTEC curriculum since its inception in 2006. However, with the national qualification in place, the ABC Institute started to offer dual qualifications approved by both Pearson BTEC and NQA from 2015. Consequently, teaching practices had to be transformed to cater to the needs of both Pearson and NQA. The teachers had to review the unit description for a Pearson course and the unit standard for the corresponding course in the NQA curriculum for element/learning outcomes, unit content, performance criteria, associated CoreLife Skills and guidelines for delivery. Though the unit description/standard includes comprehensive details to facilitate teaching and learning, it is up to the teacher to decide how to deliver the content. Hence, a suitable strategy is required to ensure that technology is integrated to enhance students' CoreLife Skills.

### 5.2.4 E-learning developers

E-learning developers are selected members of the IT department of the institute who are assigned additional responsibility to administer, design and implement technologies such as Moodle, ePortfolio and multimedia for teaching and learning. They are the focal actors who initiate the socio-technical translation with the application of a range of technologies for teaching and learning to achieve the goal. Two members of the e-learning team were interviewed to understand how they

designed courses to integrate technology into teaching and learning and their details tabulated in Table 4.3 under section 4.4.1.

### 5.2.5 Students

The students in the ABC Institute come from a range of cultural and academic backgrounds. Most are from Arab countries and completed their schooling in an Arabic medium of instruction where English is taught as a second language, hence, there is a language barrier. At the same time, there are also students who completed their schooling in an English medium.

### 5.2.6 Teachers

The ABC Institute has teachers who have specialisation in different subjects: business, information technology, engineering and general education. Hence, I am interested in exploring the perspective of teachers coming from different academic backgrounds. The details of the teachers interviewed and observed are tabulated in Table 4.3 under section 4.4.1.

### 5.2.7 Technology

The institute encourages the use of a range of technologies such as eCourse, ePortfolio, MS Office application, YouTube, mobile devices, email, and useful apps such as a dictionary and Google Translate to support teaching and learning. However, identifying and integrating appropriate technology to meet a criterion is challenging. The research aims to explore a suitable framework for effective integration of technology not only to support teaching and learning but also to enhance students' CoreLife Skills.

## 5.3 Defining the obligatory passage point (OPP)

The formation of an actor-network is led by an intrinsic goal of the focal actor who leads the translation process by attempting to translate the interests of other actors within the network to their own (Tudor, 2011). In this study, I work together with ABC managers as focal actors, to accomplish the institutional goal of enhancing students' CoreLife Skills. So, having identified the actors and their roles, I started to explore suitable ways to achieve an OPP so that all actors could join in solving the defined problem through the formation of an alliance with focal actors.

As the ABC Institute promotes the use of technology for teaching and learning, I propose to extend its use further by identifying a suitable framework that could facilitate the design of technology integrated class, which enhances students' CoreLife Skills. I chose to use the LoTi and HEAT framework, discussed in section 2.3, as a lens to assess the correlation between levels of technological innovation achieved in the class and CoreLife Skills development to determine the OPP. The LoTi framework helps to gauge the effectiveness of technological implementation by assessing how the use of digital tools and resources in the classroom produce powerful teaching and learning by mapping the results between Level 0 and Level 6 (Moersch, 2010). At each level of LoTi, the corresponding HEAT level indicates the impact of technology integration on the learner in terms of higher order thinking, engagement, authenticity and technology. By reviewing the characteristics of different LoTi and HEAT levels (as illustrated in Appendix One), as a focal actor I set the OPP at Level 3 of LoTi resulting in the production of HEAT at Level 3, as detailed in Table 5.1.

| LoTi Level | Relation to Content | Relation to Technology | HEAT Intensity |
|---|---|---|---|
| LoTi 3 Infusion | At a Level 3 (Infusion), the instructional focus emphasizes student higher order thinking (i.e., application, analysis, synthesis, evaluation) and engaged learning. Though specific learning activities may or may not be perceived as authentic by the student, instructional emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry). Teacher-centered strategies including the concept attainment, inductive thinking, and scientific inquiry models of teaching are the norm and guide the types of products generated by students using the available digital assets. | Digital tools and resources are used by students to carry out teacher-directed tasks that emphasize higher levels of student cognitive processing relating to the content under investigation. | **Higher-order thinking,**<br>**Engaged learning,**<br>**Authentic learning,**<br>**Technology use.**<br>The H.E.A.T. Framework measures the integration of these four factors in classroom instruction.<br><br>**HEAT Intensity Level 3**<br>H Student learning/questioning at Application or Analysis level of Bloom's Taxonomy<br>E Students given options for projects or to solve a problem<br>A The learning experience provides limited real world relevance, but does not apply the learning to a real world situation<br>T Technology use appears to be an add-on and is not needed for task completion; Technology is used for higher cognitive tasks like analysis and decision-making. Technology provides adaptations or alternatives in activities, assessments, and materials for special populations. |

*Table 5.1 LoTi Framework developed by Dr. Chris Moersch, revised by Dr. Marge Maxwell (Mehta, 2011, Appendix D, p. 94)*

Though at level 3 of LoTi the pedagogical approach is teacher-centric, the instructional focus is on developing higher order thinking skills where technology is used to support analysis and decision making, which will eventually enhance students' CoreLife Skills. As discussed in section 2.3, higher order thinking skills are more likely to promote a range of CoreLife Skills.

Figure 5.1 illustrates the problematisation by describing a system of alliances between main actors, thereby defining their identity and what they want (Callon, 1986a). The figure summarises goals of each actor and the obstacles they face in achieving their goals. By passing through the set OPP, each actor will be able to achieve their respective goal and also enhance students' CoreLife Skills through technological innovation.

The managers have to implement appropriate strategies for technology integration with the aim of developing students' CoreLife Skills to pass through the OPP. The teachers have considered the CoreLife Skills requirements set in the curriculum to integrate technology at LoTi Level 3 and above so that HEAT is generated at Level 3 or above, which demonstrates significant improvement in students' CoreLife Skills, so that teachers, curriculum, CoreLife Skill and technology pass through the OPP. The e-learning developers have to ensure that teachers could integrate technology at least at Level 3 and provide support to students with the use of technology to pass through the OPP. Consequently, managers, teachers, students, e-learning developers, CoreLife Skills, curriculum and technology, by passing through the OPP, build a network of relationships and render themselves indispensable in it.

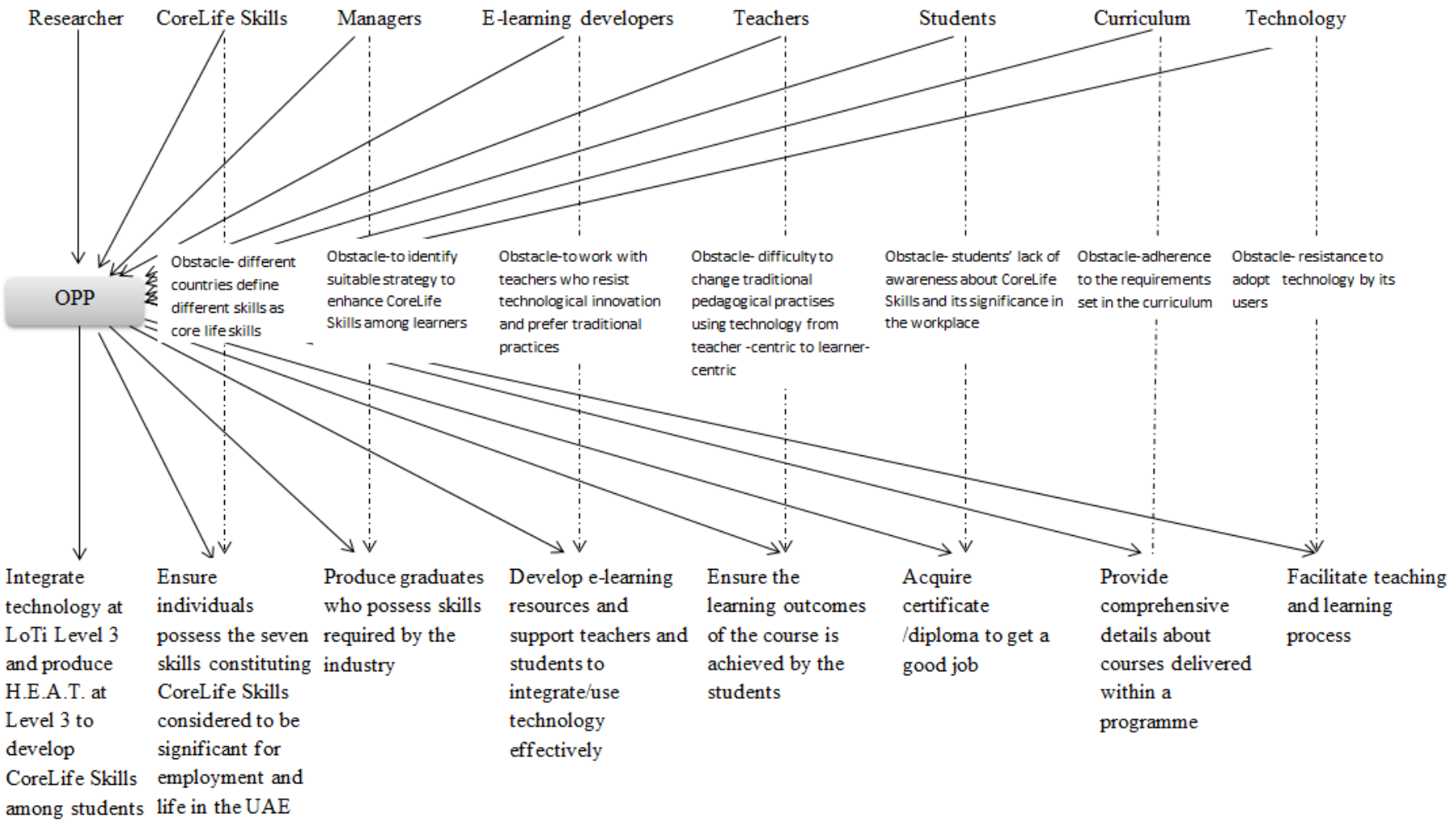



*Figure 5.1 Problematisation of developing students' CoreLife Skills through technological innovation - adapted from Callon (1986a, Figure 2)*

## 5.4 Summary

In this chapter, I defined the problem, identified the main actors of the network and defined their identities and set the OPP. In the next chapter, I will discuss the second moment of translation that unfolds - how focal actors impose identities and roles on other actors.

## Chapter 6: Intéressemment

Having identified the main actors and defined their roles in the first moment of translation, in this chapter I discuss the second moment of translation, intéressemment, wherein focal actors convince other actors to accept the defined identities and roles, and pass through the OPP to form a system of alliance. To accomplish this, as a focal actor, I investigated the interests of the main actors to analyse strategies to negotiate their interests to align with those of focal actors. This chapter also presents the translation of the employability skills model of the AFLF to the TEL-CSD framework suitable for the UAE context, with the aim of facilitating effective integration of technology for enhancement of students' CoreLife Skills. The TEL-CSD framework formed the basis for designing the eCourse course page template and integrating other technologies such as ePortfolio, mobile devices, and Google apps to ensure that the technologies are aligned to accomplish the set goal.

The findings are presented in this chapter based on the responses received from human actors such as ABC Institute managers, e-learning developers, students, and teachers during interview; and data gathered by reviewing artefacts, such as documents, the Moodle site, the ePortfolio site; and observing classes to get an insight into non-human actors such as CoreLife Skills, curriculum, and technologies. For effective data analysis and management of the wide range of data gathered, I used ATLAS.ti software and assigned codes to quotations extracted from the data, created code families and built network views as discussed in section 4.5.

## 6.1 Investigating the actors' interests

In this section, I explore the interests of the seven key actors - ABC Institute managers, CoreLife Skills, curriculum, e-learning developers, students, teachers and technologies identified in section 5.3 of Chapter 5 to explore how their interests could be aligned to pass through the OPP. My investigation of these actors' interests is based on their respective aims identified and illustrated in Figure 5.1. I chose to follow the actor ABC Institute managers first, as they are primarily responsible for implementing the institution's goals by adopting suitable strategies. The selection of the next actor for investigation, curriculum, was based on the response received from ABC Institute managers. The curriculum offered at the ABC Institute maps performance criteria to relevant CoreLife Skills. So, I reviewed curriculum and CoreLife Skills to understand how the interest of these actors could be negotiated if they are not already aligned with the interests of the focal actors. The teachers deliver the curriculum to the students and each has their own interests behind teaching and learning, which I explored next. As this research aims to use technology for enhancement of CoreLife Skills, which is facilitated by e-learning developers, I identified their interests too. The terms 'key skills', 'soft skills' and 'employability skills' are used interchangeably for CoreLife Skills by the interview participants.

### 6.1.1 ABC Institute managers

The institute managers aim to produce graduates who possess skills required by industry, as illustrated in Figure 5.1. While talking to managers, I was interested in exploring the strategies they adopted to develop students' CoreLife Skills. They conveyed that one of the institution's philosophies is to integrate key skills into the curriculum to help students develop essential key skills. So, to accomplish the

institution's philosophy they had to implement various strategies. For instance, Norvin (Manager) stated, "[t]he most important part of that was identifying the way the key skills can be integrated into our curriculum". Ubert (Manager) stated that "teaching soft skills is [an] essential part of [ABC Institute] and its strategy. [ABC Institute] offers as part of the strategy, ICT courses, numeracy courses, offer problem solving courses, study skills". Tony (Manager) also admitted that the curriculum is designed to incorporate "key skills, English, Mathematics and IT" with the focus on developing key skills. However, my concern is to what extent these skills could be taught as it is generally understood that skills could only be developed through practice. This begs the question, how ABC management could ensure that relevant opportunities are provided to students to develop their skills. So, the focal actors that include the managers need to identify a suitable strategy to ensure the development of students' CoreLife Skills.

### 6.1.2 Curriculum

The curriculum provides comprehensive details about units delivered in a programme. So, it is the core for programme delivery and I am interested to know as an e-learning developer and researcher, if the CoreLife Skills are clearly mapped out in individual units and if the need for using any technology is explicitly stated, which will facilitate teachers to integrate these while teaching. After reviewing the unit standards for a business programme, I discovered that the requirement to use specific tools and technologies are explicitly stated in some unit standards. For example, in the *Business Decision Making* unit, learners are required to use a word processor, spreadsheet, presentation and project planning software. In the *Working with and Leading People* unit, learners are required to develop team work and leadership skills. However, there

are some other knowledge-based units where the content is neither linked to any skills nor use of specific technology recognised. So, the units that do not clearly map CoreLife Skills to performance criteria will require more intervention from teachers to explore the possibility of integrating CoreLife Skills and appropriate technology during course delivery.

### 6.1.3 CoreLife Skills

In section 5.2.2, I have defined the seven CoreLife Skills that NQA considers to be significant in the UAE workplace and the NQA approved qualification offered in the ABC Institute includes these in the curriculum. So, I am interested in knowing how teachers use technology to incorporate CoreLife Skills specified in the curriculum.

### 6.1.4 Teachers

The teachers' goal is to ensure that students achieve the learning outcome set out for a course, as illustrated in Figure 5.1. Hence, I am interested in reviewing how teachers make use of the unit standard, which stipulates the learning outcomes, performance criteria, associated CoreLife Skills, and methods of delivery for teaching. At the same time, I am also interested in knowing how teachers make use of technologies for teaching and learning, as the use of technology is pivotal in this research. For investigating teachers' interests, I draw on my personal experience as a teacher in the ABC Institute along with interview data and a review of technological artefacts. I have observed in the past that generally teachers use unit standard of a programme to identify content to be delivered with a focus on learners' achievements in the assessment so that they pass the course. If use of technology or application of any CoreLife skills is a requirement towards achieving a grade, then teachers

accomplished these requirements. Sana (Teacher) acknowledged that "most of the teachers struggle to switch from the traditional practice to the use of technology". So, possibly a framework linking CoreLife Skills, content and technology could help teachers to use appropriate technology to support a learner-centric paradigm that could possibly help students to enhance their CoreLife Skills.

### 6.1.5 Students

The students in the ABC Institute aim to earn their diploma or certificate, which will help them to secure a job as identified and illustrated in Figure 5.1. However, a review of literature and interviews with Sean (TVET) and Garry (Industry) reveal that employers expect employees to possess employability skills, which students are quite aware of. For instance, Markoz (Student) admitted that he is aware that employers look for employability skills but he states "I guess any industry [these] days are looking for hard working people. People who are willing to do the task as required. Most industries have now set a minimum standard for their employees". Unfortunately, hard work and standards for employees are not identified as CoreLife Skills in the UAE. Nevertheless, on providing a little background about CoreLife Skills, Azar (Student) said "They need communications skills, [sense of] responsibility, leadership skills because most of them work in group[s] so they need [a] leader". So, there is a need for creating awareness about CoreLife Skills among students and emphasising the implications of not having these skills in order to motivate them to develop their CoreLife Skills. Hence, I am interested in exploring how these students' interests could be transformed to develop their CoreLife Skills.

### 6.1.6 Technologies

The technology is primarily implemented in the ABC Institute to facilitate teaching and learning as identified in section 5.3, Figure 5.1. However, I am interested in reviewing how the use of technology can be extended further to develop students' CoreLife Skills. Amidst wide ranging technologies used in the ABC Institute, this study focuses on reviewing the current use of three technologies - eCourse, ePortfolio and mobile devices more closely.

#### 6.1.6.1 eCourse

eCourse, the Moodle-based VLE, was implemented in 2010 with certain exceptions, which I explore in this section. According to Ubert (Manager),

> [ABC Institute] understood that a technological system was needed to organise and manage teaching, learning and assessment, and for meeting requirements of integrating technology to enhance and improve technological application for our stakeholders like students, teachers, management, external verifiers, parents and so on.

Mohannad (Manager, E-learning Team Leader) pointed out that eCourse was implemented "to offer e-learning [platform to] students, to make [it] easier [for them] to access the learning resources for all courses developed by different teachers, to automate the process of receiving or submitting assignments". Mohannad mentioned that subsequently eCourse was upgraded in 2014

> from [an] administrative point of view like easy administration and [to improve efficiency], especially when we have more users; features that are needed and not included in the previous [version]; to provide user friendly, easy to access and secured system and responsive design to [easily view eCourse pages] in different devices.

When I reviewed selected course pages created in eCourse in its early days of implementation, the design of the course page explains that the use of eCourse then was more to meet the administrative requirements, such as taking attendance, a source

to disseminate learning resources, upload assignments, grading and providing feedback. So, the eCourse implementation needs to be transformed and redesigned to enhance students' CoreLife Skills.

#### 6.1.6.2 ePortfolio

The Mahara ePortfolio platform was introduced in 2014 and I explore how the institute could benefit from ePortfolio. From the ABC Institute managers' viewpoints, it is essential for students to create their ePortfolio page(s) to demonstrate their knowledge, skills, and accomplishments to assessors and employers. Thus, the main purpose identified for using ePortfolio is to demonstrate students' achievements in one or more areas, which will help them not only in getting grades in assessment but to impress the potential job providers. The interest behind ePortfolio implementation is thus aligned with the interests of the focal actors.

#### 6.1.6.3 Mobile devices

Mobile devices include, but are not limited to, smartphones, tablet PCs and iPads. I am interested to know if the ABC Institute has identified the need to use mobile devices for teaching, learning and CoreLife Skills development.

Ubert (Manager) acknowledged that use of mobile devices in teaching and learning is gaining popularity in many parts of the world including UAE. Santos (2013) cites various research studies (e.g. Bär et al., 2005; Geist, 2011; Milrad & Spikol, 2007; Zurita & Nussbaum, 2004) that acknowledge the use of various types of mobile devices to effectively support classroom activities. Santos encourages the use of students' own mobile devices for teaching and learning, considering that almost every

student in the UAE institute where she conducted the study had their own mobile devices. The situation is similar in the ABC institute, where almost every student has their own smartphones and they can access the internet through the free Wi-Fi connectivity provided by the institute. So, Ubert asserts that there needs to be a "proper strategic plan, implementation plan" for effective utilisation of mobile devices for teaching and learning in the institute. Norvin (Manager) said: "I am in favour of using mobile devices provided teachers have got some way of preventing the distractions. Then let's use it because the students are much more familiar with using the mobile devices".

Thus, the current use of smartphones needs to be transformed to facilitate teaching and learning, and enhancement of CoreLife Skills by using it to access eCourse, ePortfolio, websites or other useful apps.

### 6.1.7 E-learning developers

E-learning developers are involved in researching best practices to ensure effective integration of technology and develop e-learning resources to facilitate teaching and learning. As an e-learning developer, I proposed to the management, the idea of developing students' CoreLife Skills through technological innovation to extend its use beyond facilitating teaching and learning. However, Benci (Teacher, e-Learning Developer) states, "if they (Teachers) are not convinced then automatically they will withdraw from implementation of technology". Thus, the major challenge for e-learning developers is to convince teachers to integrate technology for developing students' CoreLife Skills. Hence, there is a need to develop a suitable framework for technology integration that clearly outlines an inter-link between teaching content,

learning skills, CoreLife Skills and technology, which will help teachers. The next section discusses the advancement of such a framework.

## 6.2 A framework to enhance CoreLife Skills using technology

As a researcher and a member of the e-learning team, I identified a proven framework for enhancing students' CoreLife Skills and transformed it to meet the need of the UAE. I investigated various studies conducted in both developing and developed countries related to use of technology to enhance CoreLife Skills as discussed in section 2.2. During the investigation, the employability skills model of the AFLF emerged as a useful framework that integrates employability skills with relevant learning skills and technologies. Further, the analytical survey report prepared on the basis of the Information and Communication Technologies in Technical and Vocational Education and Training project launched by the UNESCO Institute for Information Technologies in Education in 2002, recognised Australia to be a trendsetter and a world leader for its initiatives in research, innovation and reform in TVET (Chinien, 2003). The report also highlighted Australia's strategic plan for achieving its flexible learning vision in VET through the AFLF for the National Vocational Education and Training System 2000-2005 and its significant benefits. The strong acclamation about Australia and the AFLF provided in the analytical survey report was significant in my decision to use the AFLF as a model for the implementation of technology in the ABC Institute. In the UAE, the VET sector is still in its infancy; hence, I considered adapting the proven AFLF to meet the needs of the UAE. However, as a researcher I am limited on the extent to which the AFLF could be adopted as implemented of its features would require a national level

initiatives, for instance national level policies. Thus, my focus was limited to use of the employability skills model of the AFLF, illustrated in Figure 6.1, to create the learning design that makes effective use of technology to enhance both learning and employability skills among learners.

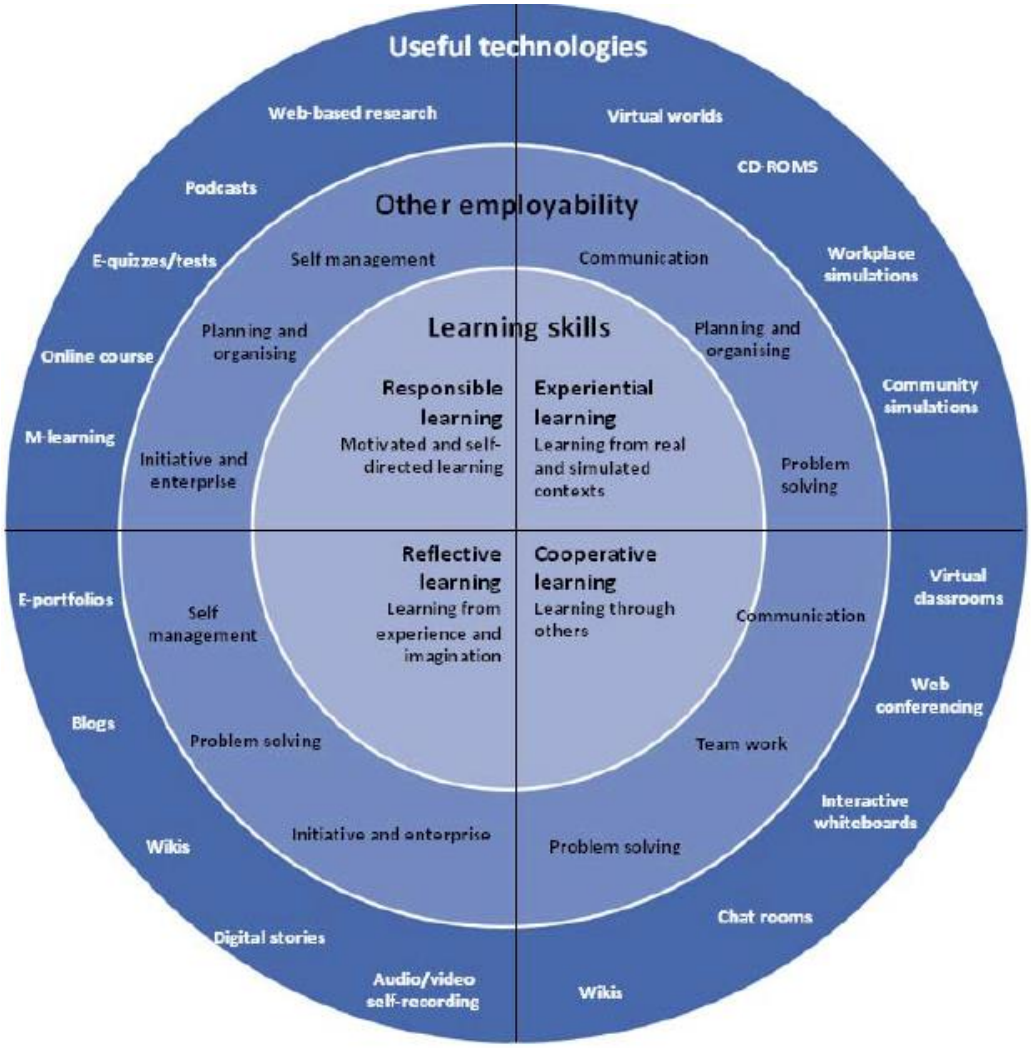



*Figure 6.1Employability skills model – from Bowman and Kearns (2009, p. 29, Figure 5)*

The employability skills model of the AFLF attained material durability after its successful implementation in the Australian TVET sector. Hence, I opened the black box of the employability skills model and through a comparative study between the AFLF and the NQA requirements identified by reviewing documents listed in Table 4.4 in section 4.4.3; I transformed the employability skills model to the TEL-CSD framework for meeting the NQA requirements. The development of the TEL-CSD

framework involved three actors: the researcher, AFLF's employability model and NQA's VETAC-NOSS guidelines. As recommended by Clarke and Montini (1993), I observed the silent, collective actors such as employability model and VETAC-NOSS guidelines for designing the framework. Also, I followed the four professional qualities recommended by Wolf, Rode, Sussman, and Kellogg (2006) as design praxis:

> 1) a non-linear process of intent and discovery, 2) design judgment, which is informed by a combination of knowledge, reflection, practice and action, 3) the making of artifacts, and 4) the design critique ('crit'). […] The design crit is a designer's reflective, evaluative and communicative explanation of her design judgments and the activities in which she has engaged. (p. 524)

To begin with, I draw a comparison between the skills identified in NQA's CoreLife Skills and AFLF's employability skills and tabulated in Table 6.1.

| AFLF-Employability Skills | NQA-CoreLife Skills |
|---|---|
| **Planning and Organising** | **Information**: Collecting, analysing, organising and applying information in a given context |
| **Communication Skills** | **Communication**: Communicating information, concepts and ideas |
| **Initiative and enterprise**<br>**Self-Management** | **Organising self**: Initiating and organising self-activities including motivation, exploration and creativity |
| **Team Work** | **Working in a team**: Working with others in teams including leadership |
| **Problem Solving** | **Problem solving**: Solving problems including using mathematical ideas and techniques |
| **Technology** | **Technology**: Applying information and communication technology (ICT) |
| - | **Societal**: Participating in social and civic life including ethical practice |

*Table 6.1Mapping related AFLF employability skills to NQA CoreLife Skills*

Though all six skills identified in the AFLF could be mapped to its corresponding CoreLife skills, there is no corresponding skill for societal CoreLife Skill in the AFLF employability skills model.

As discussed in section 2.1, the NQA and VETAC are responsible for the development of curriculum as per the QF*Emirates* framework, the national qualification framework for the UAE. The VETAC Q+NOSS System Guidelines for curriculum development outlined by the NQA (2014) require unit standards to include specific CoreLife Skills that will be addressed while delivering a learning outcome. The VETAC Q+NOSS System guidelines are in accordance with the Precision Consultancy (2006) recommendation on AFLF as explained below:

> Employability Skills must be well defined and written into units of competency to ensure that they are apparent, clear and can be delivered and assessed as an essential component of the workplace competency. This means that Employability Skills will be:
> - contained in the units as part of the other performance requirements that make up the competency as a whole;
> - explicitly described within units to enable users of Training Packages to accurately identify the performance requirements of each unit with regard to Employability Skills. (p. 32)

The VETAC Q+NOSS System Guidelines explain that while designing the curriculum, in each unit of a programme, most of the descriptors used for learning outcomes and action verbs of the performance criteria are aligned to Bloom's Taxonomy (Bloom et al., 1956). For instance, the action verb 'explain' corresponds to the lower level of Bloom's Taxonomy and simpler tasks, whereas the action verb 'evaluate' relates to higher order thinking skills and requires complex reasoning.

Hence, I realised that to develop a comprehensive framework to enhance students' CoreLife Skills, along with CoreLife Skills, Learning Skills and technology, Bloom's

Taxonomy also needed to be integrated into the proposed model, which is currently not included in the employability skills model of the AFLF. I renamed the adapted AFLF employability skills model as the TEL-CSD Framework, as illustrated in Figure 6.2 that integrates four essential components: Technology, CoreLife Skills, Bloom's Taxonomy and Learning Skills represented as four concentric circles.

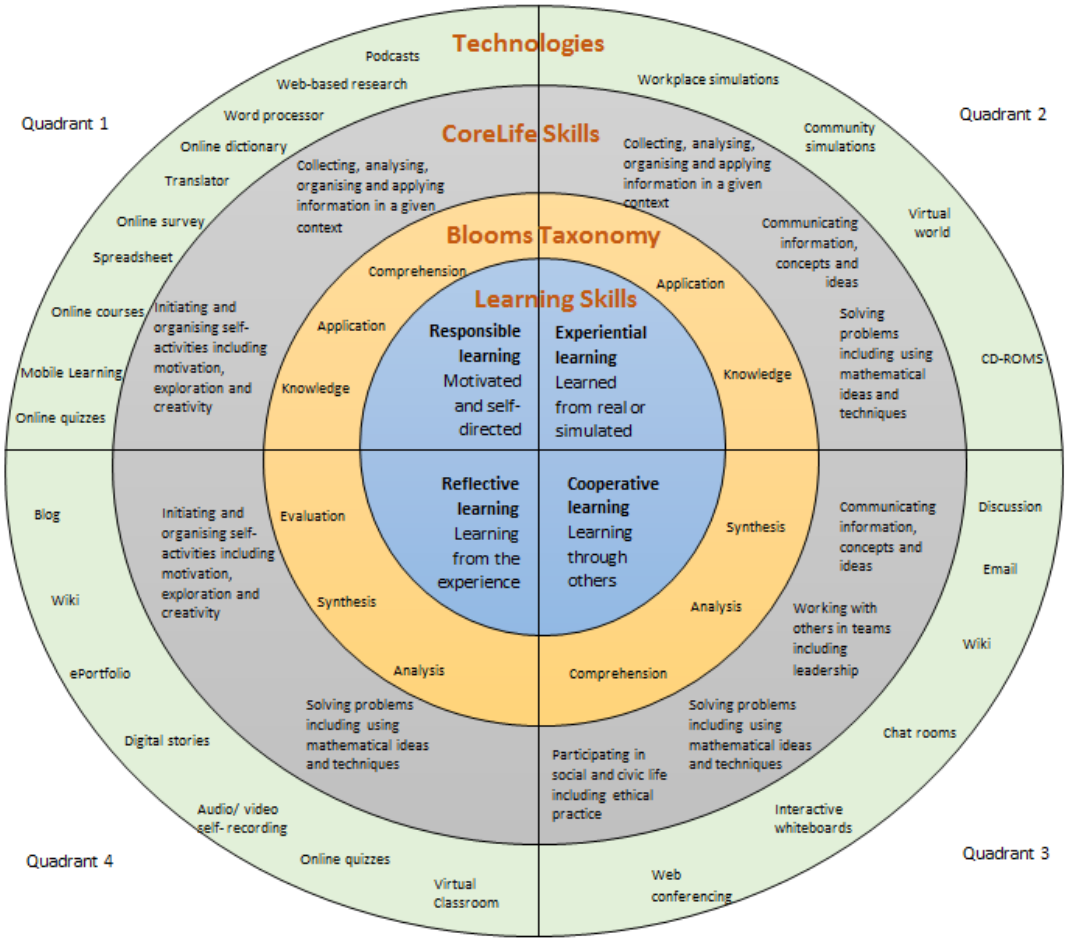



*Figure 6.2 TEL-CSD framework adapted from the employability skills model of the AFLF* (Bowman & Kearns, *2009, p. 29, Figure 5)*

So, while teaching a curriculum developed as per the VETAC Q+NOSS System Guidelines that clearly outlines the interlink between the learning outcomes, performance criteria and the CoreLife Skills; the teachers can use the TEL-CSD framework to design courses integrating technology for effective delivery.

The following five steps describe how the TEL-CSD framework illustrated in Figure 6.2 comprising of four concentric circles and four quadrants could be used.

**Step 1:** The teacher/learning technologist interprets the performance criteria corresponding to a learning outcome in a unit to create a class activity or assignment task. For example, the action verb of the performance criteria is 'evaluate'.

**Step 2:** In the concentric circle that represents Blooms Taxonomy, identify the quadrant in which the action verb appears. In this example, 'evaluate' appears in Quadrant 4. So, in subsequent steps only the elements of Quadrant 4 of learning skills, CoreLife Skills and technologies will be considered.

**Step 3:** Identify suitable 'learning skills' to be considered from the innermost concentric circle. In this case, the learning skills associated with Quadrant 4 is 'reflective learning'.

**Step 4:** Next, select the CoreLife Skills that need to be focused on from Quadrant 4 of the third concentric circle from the centre.

**Step 5:** Finally, select suitable technology from the range of tools and technologies presented in Quadrant 4 of the outermost concentric circle to create the activity or assignment task.

By drawing a comparison between Bloom's Taxonomy and CoreLife Skills as shown in the TEL-CSD framework, I propose that activities or tasks that encourage students to apply higher level cognitive skills will lead to enhanced CoreLife Skills because at higher levels students apply problem-solving and analysis skills, which are integral components of CoreLife Skills. However, I need to empirically evaluate the veracity of this relationship by considering a range of technological integration that

encourages students to apply higher order thinking, which is studied in the next chapter.

Therefore, the TEL-CSD framework aims to help teachers and learning technologists design courses by making it easier for them to select appropriate technologies. As a result, teachers will be able to accomplish a given learning outcome or performance criteria by integrating technology to enhance both students' Core Life Skills and learning skills.

The TEL-CSD framework, thus, forms "durable materials" (Law, 1992, p. 387) that embody a set of relations that emerge as a result of the core principles on which the TEL-CSD framework is formed and the technology that supports the implementation of these principles. Thus, I believe that the TEL-CSD framework would act as a translator to help teachers and e-learning developers in the ABC Institute undertake the technological innovation with the aim of enhancing students' CoreLife Skills.

## 6.3 Assessing feasibility of the TEL-CSD framework adoption in the ABC Institute

I conceptualised the idea of using technology to enhance CoreLife Skills in the beginning of Term 3 of the 2014-15 academic year and translated the employability skills model of AFLF to develop the TEL-CSD framework. As a member of the e-learning development team and focal actor, I discussed the feasibility of using the TEL-CSD framework for enhancing students' CoreLife Skills through technological innovation with the ABC Institute managers and teachers. Their views are decisive in

accepting or rejecting the TEL-CSD framework as managers are the decision makers and teachers are supposed to apply the framework while designing courses.

Ubert (Manager) recognised the usefulness of the TEL-CSD framework by stating that

> it is a very good framework. […] It is like a map to develop a course, develop a lesson plan. It is more or less a guide for matching suitable technological resources to desired learning outcomes. […] The relevant quadrant of the framework lists technological methods which could be used to teach [a] course. You can take any of those four quadrants and say for instance you select cooperative learning as example then next circle to see what CoreLife skills are needed, they need to communicate with others, team work, etc. and then you see which technology will be best to use… But any technology shown on this template can be used, though you (researcher) would have selected the most prominent ones. It is really good and easy to use and I personally support that something like that is used in future.

Norvin (Manager) also acknowledges that:

> [t]he framework is excellent. So, if we design our courses using this framework then [the CoreLife Skills] will be built into the course. But they (teachers) have to ensure that [CoreLife Skills] are actually implemented unless we have a way of assessing and evaluating the courses. But again, the implementation is little bit difficult.

Thus, Ubert (Manager) and Norvin (Manager) are convinced with the potential benefits of using the framework to ensure that technology is effectively used to develop students' CoreLife Skills. However, they recognised that using the TEL-CSD might be difficult and that the technologies specified may not be exhaustive. I do acknowledge that in the ever-evolving field of technology, including every possible technology in the framework is practically impossible. Nevertheless, the framework would guide its users to consider other relevant technologies. Norvin (Manager) also emphasised the need to assess the effective implementation of the framework as otherwise there is no guarantee that its purpose is met. This is indeed a valid concern

and this can be addressed by mapping the technological innovation undertaken to enhance students' CoreLife Skills at different levels of the LoTi and HEAT framework as discussed in section 2.3. Additionally, as discussed in section 5.3, the OPP for all actors to pass through is LoTi at least at Level 3, resulting in equivalent HEAT levels.

Sara (Teacher) acknowledges the benefit of the framework stating that:

> If you tap on the learning skill, those will develop the CoreLife skills, which in turn will be facilitated by technology. So, technology is an important part to facilitate the learning skills. Once we do this then automatically the CoreLife skills will follow.

Benci (Teacher, E-learning Developer) admits that:

> [T]his framework will 100% help me. When we teach students, especially in vocational context, we are aiming for all round development. […] Our intention is to offer blended learning. […] Our main focus is learning skills and by teaching this we are developing the CoreLife Skills. Sometimes knowingly it happens, sometimes unknowingly it happens. […] We are using technology to teach them and through this technology they are getting used with their CoreLife Skills.

Both Sara and Benci highlight that technology is basically implemented with the focus on enhancing learning, thereby learning skills. At the same time, both agree that development of learning skills will eventually lead to enhancement of students' CoreLife Skills as defined in the TEL-CSD framework. Hence, their perception is that using technology for teaching and learning will implicitly lead to CoreLife Skills development, as generally the primary focus remains on learning outcome and performance criteria rather than on CoreLife Skills. This again highlights the need to map CoreLife Skills against each performance criteria of given learning outcomes during curriculum development.

However, some teachers had a different view. Sana (Teacher) points out that the framework is exhaustive and would take a while for someone to comprehend. She said, "When you look at the four [quadrants], it's too much to serve". Shank (Teacher) has a very different perspective about CoreLife Skills. He states that:

> I basically don't agree to this (the TEL-CSD framework) because a skill is within a person. I don't agree that skill like working in a team is a skill, since it is the way you work or it is a way of life. Technology can be used to give information, to record information, for using the information. Maybe it can complement the skill.

Both Sana and Shank identified limitations of the TEL-CSD framework. Whilst Sana feels the framework is too complex to be acceptable; Shank do not foresee the benefit of using technology to develop skills.

Though teachers had varying perception about TEL-CSD framework, the managers acknowledge the usefulness of the TEL-CSD framework in identifying suitable technologies to develop a specific CoreLife Skills with a clear idea about how this in turn is related to relevant learning skills based on adult learning principles and cognitive skills as defined in Bloom's Taxonomy. Hence, they approved the application of the TEL-CSD framework in the ABC Institute for effective integration of technology for CoreLife Skills development starting from Term 1 2015-16 and assigned the responsibility to e-learning developers to execute the technological innovation.

Norvin (Manager) stated that "key stakeholders in terms of technology being implemented are the teachers". Though the institute provides the required facilities in terms of an IT lab, eCourse, ePortfolio, and blended learning policy to support the effective blending of technology in classroom delivery, the selection of suitable

technology for the delivery of the content is primarily at the teachers' discretion. Hence, teachers are accountable for the design and delivery of courses. So, if the teachers' views and interests are different from managers then a suitable strategy needs to be adopted for aligning the interests of teachers with the focal actors. Thus, negotiating actors' interests is important.

## 6.4 Negotiating actors' interests

In this section, focal actors review the interests of CoreLife Skills, curriculum, students, teachers and technology and apply suitable strategies and techniques to align their interests if they are not already aligned.

The ABC Institute offers NQA approved qualifications in which CoreLife Skills are embedded and linked to performance criteria in the curriculum. So, both are already aligned with the interests of the focal actors. However, it was observed that generally, teachers integrated CoreLife Skills within the course to the extent it was required for learners to achieve given performance criteria of a course and learners too focused more on passing the course. So, focal actors especially managers agreed to raise awareness about the significance of CoreLife Skills among teachers and learners to negotiate their interest with their own.

Ubert (Manager) stated:

> Key skills/CoreLife Skills/soft skills, or whatever terminology is being used, are essential skills and knowledge which have direct practical relevance for dealing with life in general, for preparing for employment (work experience, internship, etc.) and/or for employment as such.

Tony (Manager) stated that:

> CoreLife Skills are much more important for the employers. They look for life skills more than academic qualification, especially from university graduate[s]. [The TEL-CSD framework shows that] all these skills are today linked to ICT. As a result, it is absolutely necessary as a vocational education provider to teach these skills. This requirement is reflected in the institute's philosophy/strategy/vocational education framework.

Thus, managers not only advocated for emphasising CoreLife Skills in teaching and learning but also highlighted the significance of ICT in the workplace. Additionally, managers recommended professional development training and workshops on technologies such as eCourse and ePortfolio to explain the benefit of these tools and features to teachers and students for persuading them to adopt these technologies. Thus, initial negotiation strategies included raising awareness about CoreLife Skills and use of technology in education, motivating teachers and students to use technology to enhance students' CoreLife Skills by assuring training and workshops. However, some teachers believed that while following traditional teaching practices it is not essential to use technology and also asserted that CoreLife Skills could be developed without the use of technology.

Sana (Teacher) states,

> Most of the teacher[s] struggle to switch from the traditional practice to the use of technology. There is [a] fair amount of resentment [to] use it to suit their purpose, [due to] lack of time, [it] take[s] time to adapt. When one can achieve this without technology why should he or she use the technology? Technology is something which is changing every day. Do we have the time to do trial and error? So, when you look at all these challenges, for a layman teachers in terms of somebody who is not related to IT, integrating technology will be done according to his or her level.

Sana's concern about "layman teachers", with limited experience of using computers for educational purposes is justifiable, something which Rogers (1995b) and Schiller (2003) have identified as influencing the adoption of an innovation. The teacher's

concern about lack of time to practice new technology is also in agreement with numerous studies (Ertmer, 2004; Goktas, 2009; Goktas et al., 2013; Mumtaz, 2000; Richardson, 2000; Schoepp, 2005), where authors have acknowledged that lack of time to explore and experiment with technology constrain its possible integration. Additionally, technology is continuously evolving; hence, it is difficult for one to keep pace with it. Above all, Olivier and Shapiro (1993) claim that the teacher's self-efficacy determines the level of technology integration a teacher adopts. Since the issues highlighted by Sana (Teacher) are quite genuine, it was quite difficult for focal actors to negotiate with teachers with such perceptions.

On the other hand, Shank (Teacher) perceives that: "skills can be developed by technology but it is not necessary, without the technology also you can develop skills". Shank's views cannot be denied, though I would like to clarify that he is a keen user of technology and his view is not due to his resistance to acceptance and use technology.

Contradictory to the above views, Benci's (Teacher, e-Learning Developer) perspective is:

> We can't think of life without computer[s] these days. We are into the stream of teaching, so we have to adopt technology. At the end, our students are going to benefit. Our personal likes and dislike[s] should not affect them. We have to actually come forward to learn the technology.

Benci's interest is aligned with the interests of focal actors. Thus, she acted as a spokesperson to convince other teachers and students to adopt and use technology for enhancing students' CoreLife Skills and supporting teaching and learning.

Uden and Francis (2011) affirm that actors' "interests may vary widely. They may encourage or constrain the technology" (p. 25). This was evident from the diverse perspectives of different teachers about use of technology. Though Benci's role was crucial in translating the interest of other teachers who were critical about adopting technology, Norvin's (Manager) announcement about the new teachers' standards for UAE was a turning point: "The teachers' standards for the whole of the UAE has been accepted and approved and the information technology requirement for teachers is a required standard now". So, it became mandatory for teachers to possess ICT skills and most of them aligned their interest to be part of the proposed technological innovation.

Surprisingly, focal actors had to persuade teachers and students to adopt and use the technology rather than negotiating with them on approaches to using it to facilitate students' CoreLife Skills. Thus, I identified adoption and use of technology to be critical in mobilising alliance and it will be discussed further in Chapters 7 and 8.

## 6.5 Inscription

During inscription, e-learning developers used the TEL-CSD framework to configure and/or customise technological artefacts for effective course design and delivery in line with the interests of actors negotiated by the focal actors. eCourse and Mahara ePortfolio offer a range of tools and techniques allowing human actors to customise it according to their requirement. Hence, e-learning developers first opened the black box of an existing eCourse page template to inscribe additional tools that will be used for enhancing students' CoreLife Skills in the subsequent term, Term 1 in 2015-16.

For example, new Moodle plugins[4] were imported to eCourse to enhance online quizzes; wikis and discussion forums were added for collaborative activities with the aim of promoting team work and problem-solving; formative online tests were added to promote independent learning; an option to embed learners' presentation videos in course pages was added for peer-review and feedback. The inscription was not confined to eCourse but extended to other technologies such as ePortfolio for organising a student's portfolio and reflection; creation of an institute account in Vimeo for uploading videos for sharing; identification of suitable videos from YouTube that match with the learning outcome to be embedded in eCourse; identification of suitable simulation software for developing problem-solving skills; and creation of user accounts in Google to be able to work with tools such as Google docs, Google Forms, etc.

Additionally, Mac Book connector was purchased to connect learners' Mac Books to overhead projectors to facilitate presentations; a camcorder generally used for official purpose was made available to the teachers for video recording and a tripod purchased to facilitate video recording.

Finally, rules were defined and agreed, but more importantly, obeyed (Uden & Francis, 2011). The basic rule set out was the requirement from teachers to design their courses by making effective use of the tools and relevant technologies in accordance with the TEL-CSD framework for the enhancement of students' CoreLife

[4] https://moodle.org/plugins/

Skills. The immutable mobile produced as a result of inscription creates a favourable balance of power:

- for the managers and the e-learning developers, the immutable mobiles are the technological artefacts designed to enhance the development of students' CoreLife Skills along with their learning;
- for the teachers, it is a facilitating tool which will lure both teachers and students to use the technology to meet the goals set by the focal actors.

Thus, as a result of inscription, social structures comprising both social and technological entities are shaped and consolidated (Callon, 1986a).

## 6.6 Summary

This chapter explained how intéressemment, the second moment of translation was achieved in the ABC Institute by exploring the interests of key actors in order to identify suitable strategies to negotiate their interests with those of focal actors as defined during the first moment of translation. The chapter also explains how the employability skills model of the AFLF was translated to the TEL-CSD framework, which is recognised by ABC Institute managers and many teachers as a useful framework to facilitate technology integration with the aims of enhancing students' CoreLife Skills. The TEL-CSD was then used to inscribe the eCourse course page template and other technologies such as ePortfolio, Vimeo, Google apps to ensure that technologies are aligned to accomplish the set goal. The next chapter discusses the third moment of translation and explains how focal actors succeeded in enrolling

other actors to form a stable actor-network by persuading them to actually pass through the OPP as defined during problematisation.

## Chapter 7: Enrolment

In this chapter, I discuss the progression from intéressemment, the second moment of translation, to enrolment, the third moment of translation, wherein focal actors enrol other actors by challenging their current assumptions. They actually establish alliances identified during intéressemment, leading to the formation of socio-material assemblages with the aim of enhancing students' CoreLife Skills. My research remains sensitive to these socio-material assemblages created by the materiality of the classroom, the curriculum, and the technological artefacts influencing the students to develop their CoreLife Skills. Therefore, I explore the practical implementation of technology using the TEL-CSD framework by investigating eight cases of technological implementations.

I analysed interviews, technological artefacts and observation data, and used the LoTi and HEAT framework as a lens to present my findings. The LoTi framework assesses the extent of technology integration achieved by teachers in their classroom and its impact on enhancement of students' CoreLife Skills, examined by mapping the learners' performance to different levels of the HEAT framework. For effective data analysis, I used ATLAS.ti software wherein I assigned codes to quotations extracted from data, created code families and built network views as discussed in section 4.5.

As teachers' and students' adoption and use of technology is crucial for the successful implementation of any technological innovation, I also investigate the factors influencing their acceptance or dismissal of technology using the lens of the UTAUT framework introduced in section 2.5.1 and further discussed in Chapter 8.

## 7.1 Designing enrolment strategy

In this section, I explore strategies adopted by focal actors for enrolling other actors with the aim of developing students' CoreLife Skills using technology leading to the formation of an actor-network. The ABC Institute managers and e-learning developers who are the focal actors devised a range of enrolment strategies that challenged the assumptions of other actors, opened existing black boxes and transformed them to bring about technological innovation.

Before the start of Term 1 in 2015-16, the black box of the eCourse course page template was opened and using the TEL-CSD framework additional tools were inscribed on the template for providing features and facilities to enhance students' CoreLife Skills as discussed in section 6.5. Using this template, multiple course pages were created considering the number of courses taught during the term and each course page assigned to respective teachers based on the timetable prepared for the term. The students who opted to study a course during the term were enrolled on the respective course page in eCourse.

The teachers were given one-to-one training on the use of different features of eCourse, specifically the new course page and ePortfolio in line with the institute's *Staff Development Policy* document. As the training was provided right before the beginning of the term, the teachers did not get enough time to practice. Their lack of proficiency in using a range of ePortfolio tools was obvious from the type of comments they asked the e-learning developers, such as "How to upload the certificates", "I entered my personal details but it does not appear in my profile page". This situation supports the contention by many researchers (e.g. Ertmer, 2004;

Goktas, 2009; Goktas et al., 2013; Mumtaz, 2000; Richardson, 2000; Schoepp, 2005) that lack of time to explore and experience a technology will hinder its effective integration.

The teachers were also introduced to the TEL-CSD framework as the management recognised them as key stakeholders for implementation of technology. However, some of the teachers were not confident to use the range of technologies specified in the TEL-CSD framework. Sana (Teacher) stated that: "The framework to me looks too complicated, too much to be accepted and even tried. When I can't accept it I will not try it". Norvin (Manager) also acknowledged that: "Teachers are going to have limited skills in terms of all these kinds of technologies. There is no question about it. They are going to use the one they are more familiar with". Thus, managers realised that it is unrealistic to expect the teachers to master all the technologies or expect them to apply the TEL-CSD framework independently.

Secondly, after the training session, as an e-learning developer I witnessed that teachers found it difficult to independently add different tools available in eCourse, for assignments, quizzes and questionnaires, all of which require additional configurations, such as setting the start and end dates, including the assessment criteria, and linking the results to specific types of assessments - formative or summative. Furthermore, these tools are linked to grades, so the IT manager was reluctant to give additional privilege to a teacher's role in eCourse considering security aspects. Hence, the management decided to assign an e-learning developer to each teacher to mentor and provide required support to facilitate effective use and integration of technology throughout the term. Sara's (Teacher) reaction to this was

> I think I am quite self-motivated and do spend extra time and effort as and when I do get the time. I won't say I master the skills [to integrate technology effectively] but as and when queries are there I just take the help of the IT staff (e-learning developer). […] With the help of IT, I would like to develop courses that will be effective.

This shows Sara's high self-efficacy, as evident from her self-motivation and interest in using technology for teaching and learning, motivates her to take help from the e-learning developer to effectively integrate technology in the courses she would deliver.

So the role of an e-learning developer was to assist teachers in identifying suitable tools and technologies for delivery, assessments, and CoreLife Skills enhancement by reviewing the curriculum and the TEL-CSD framework. Subsequently, the e-learning developer would integrate technology in the course based on mutual consensus between the teacher and the e-learning developer. Thus, from the perspective of the UTAUT framework, the facilitating condition, a UTAUT core construct, provided by the e-learning developers through training and support was vital in the enrolment of teachers and students to the network as they helped to promote their technology adoption.

Thus, the strategies adopted by focal actors to encourage teachers and students to pass through OPP include transformation of eCourse course page, training and workshops, and assigning an e-learning developer to each teacher for mentoring and support.

## 7.2 Persuading others to pass through OPP by forming alliances

The focal actors adopted a systematic approach to persuade other actors to pass through the OPP they set during problematisation, by identifying actors' roles and

identities (section 5.3), investigating actors' interests (section 6.1), negotiating their interests (section 6.4), inscription (section 6.5) and designing an enrolment strategy (section 7.1). Translators such as focal actors and the TEL-CSD framework applied "seduction or simple solicitation" or "pure and simple force" depending on the extent to which an actors' interest was aligned to the interests of the translator (Callon, 1986a, p. 9). So at times they negotiated and persuaded actors using mechanics of power, a power of persuasion rather than the power of possession (Crawford, 2005). Horowitz (2012) states that through the concept of "translation alignment" (p. 806), the power dynamics and how the success or failure of their alignment affects the alliances these translations create can be explored. Thus, I explore translation alignment between ABC management, e-learning developers, teachers, students, CoreLife Skills, curriculum and technologies. Hence, the goal of the influential actor, in the case of the focal actor, is accomplished only through enough alignment of translations to achieve adequate compatibility. Otherwise, "the power they entail in creating the alliances may lead to tenuous, fluctuating alliances that […are] at constant risk of collapsing" (Horowitz, 2012, p.808).

Before the start of Term 1 in 2015-16, the e-learning developers demonstrated samples of eCourse page designs considering the TEL-CSD framework to persuade the teachers to use the framework and technology to develop students' CoreLife Skills. However, there was a fair amount of resentment from some teachers, which revolved around issues pertaining to technology adoption. Norvin (Manager) acknowledged that "you cannot expect teachers to embrace all technologies"; however, by demonstrating effective use of technology and promoting its use, teachers were motivated to adopt and use selected technologies.

Though generally a simple solicitation technique was adopted by focal actors to persuade teachers, some felt that they had to pass through the OPP obligatorily under the influence of power. Those teachers admitted that their rationale for using technology was to align with the management requirement: "I can say that it (eCourse use) is mandatory from our management, so there is no other [way to] go but they (teachers) have to use it" (Benci Teacher, E-learning Developer), and "I think the management wants us to adapt to whatever new technological changes that has been brought in. Everybody is quite willing to do that" (Sara, Teacher).

These statements articulate performance of power by the ABC management though it comes in a way through professional development and promotion of technological usage, instead of a well-defined policy related to implementation of technology. This pressure was cascaded down to the students by their teachers as evident from the students' remarks: "It is required so I don't have any other option but it is fine with me. It makes me happy because I feel I will do it better" (Emma, Student). In addition, Aaliya (Student) agreed, "It's required to use Moodle and ePortfolio. It is OK for me because it is useful for me. I can do all my work [using] the Moodle or ePortfolio"

These statements reveal that students adopt and use eCourse and ePortfolio as it is almost obligatory to accomplish the blended learning policy set by the institute. Thus, the managers use blended learning policy as an instrument of power for aligning the interests of teachers and students with their own.

In addition, the institute revised the *Assessment Plan* document during the term to include online formative assessment. An extract from the plan is outlined below:

> Over the period a course is offered, there will be ten (10) online tests in the course... The online tests are mandatory and a learner must take all of the online tests in a course to be eligible for a final grade in that course. The instructor will use results of online tests to identify areas for which remedial instruction is needed. (ABC Institute, 2015a)

Thus, a convenient way for ABC Institute management to apply power was through the formulation of material artefacts such as a blended learning policy, staff development policy, assessment plan and compliance of these is a binding requirement for both teachers and students. However, an individual's personal characteristics influenced their willingness to accept or resist the use of technology, which has been expressed by both teachers and students throughout the translation process and discussed separately in section 8.1.2.

## 7.3 Establishment of a stable network of alliances

Following negotiation and persuasion, the actors who accepted their roles defined by the focal actors during intéressemment formed alliances with other actors to form the network and established a provisional stable network of alliances. The following subsection gives an account of different classroom activities and practices related to use of a range of technologies by teachers and students in the ABC Institute with the aim of enhancing students' CoreLife Skills. I classified these technological innovations carried out during Term 1 in 2015-16 into eight cases by mapping each to different levels of the LoTi and HEAT framework based on my analysis. As stated earlier, I use the LoTi and HEAT framework as a lens to understand how both human and non-human actors undergo translation to establish a network of alliance during

the term. While the LoTi framework helps to interpret the level of technology integration achieved by teachers, the HEAT framework explains the impact of technological innovation on students' skills by tracing the connection between actors while they undertake various activities to meet the requirements set in the curriculum.

My approach to using the LoTi and HEAT framework within the ANT study may not be acceptable to some ANT proponents as ANT does not explore or follow actors with any preconceived notion. However, let me clarify that I did not initiate the study with the LoTi or HEAT framework in mind, but while interpreting the data, I have used it as a lens. As I focus on a sociology of translation concept of ANT, I present how different actors experienced translation due to the influence of the other. Mapping the cases to different levels of the LoTi and HEAT, will help readers to comprehend how CoreLife Skills were assembled at different levels within the institute during the term. These cases also demonstrate the factors influencing adoption of technologies by both teachers and students.

### 7.3.1 LoTi Level 1: Awareness

At LoTi Level 1, teachers use technology for administrative purposes, presentation or retrieving course materials; and students use it as a reward for prior work completed in class (Moersch, 2010).

eCourse, the e-learning platform of the ABC Institute is the widely used technology in the ABC Institute for administrative purposes, teaching and learning, such as storing or retrieving course materials. All teachers were observed to use eCourse at least to manage their courses, such as marking students' attendance, uploading term

assignment briefs, grading and providing feedback to learners. Most of the teachers used MS PowerPoint presentation to support delivery. On reviewing 20 course pages in eCourse, it was evident that all teachers marked attendance on a regular basis, uploaded approved assignment briefs, course specifications and their presentations to eCourse. On the other hand, students were observed to use eCourse at least to download the assignment briefs, upload their assignments, view their grades and undertake the survey at the end of the term. The students wrote vocational assignments that gave them opportunities to apply their knowledge in vocational contexts using MS Word, then converted them to Portable Document Format (PDF) and uploaded to eCourse, as PDF is the only accepted format for assignment submission. Students used MS PowerPoint not only to view presentations uploaded by teachers but also to create their own to meet specific task requirements. Emma (Student) confirmed that "We are using MS Word a lot to do our assignments and PowerPoint to do presentations". Thus, frequent use of MS Word and MS PowerPoint increased effort expectancy (one of the constructs of UTAUT discussed in section 2.5.1) thereby increasing its adoption among both teachers and students. Emma (Student) acknowledged, "[b]efore I used to be intimidated when I did not know how to use [MS] Word or make presentation[s] but now it is completely fine because now we use it frequently... It is normal to use it every day". Ayeza (Student) also admitted "My experience with [MS] Word, PowerPoint is pretty good. I use… it a lot". These affirmations once again confirm with the finding of Cresswell et al. (2010) that regular use of software over a period of time minimises effort expectancy.

The new Assessment Plan 2015-2016 (2015) was crucial in further integration of technology as it became mandatory for all learners to attempt a formative online

weekly test. It is aimed at assessing learners' knowledge on the topics covered over the week. As per the TEL-CSD framework, the online quiz is supposed to promote self-directed learning by facilitating the learners to increase their knowledge, skill or performance for personal reasons. Basically, in the ABC Institute, eCourse Quiz is used as a formative assessment tool to help teachers assess the areas where learners seek attention. At the same time, it is also used as a self-assessment tool to help learners assess their own knowledge and understanding, which is at lower level of Bloom's Taxonomy. However, the quiz report from eCourse showed that though all teachers created ten formative online tests with the support of e-learning developers, not all students attended all online quizzes. Dorrian and Wache (2009) acknowledge that self-directed techniques offered through e-learning are not always met with enthusiasm by students. The factors influencing adoption and non-adoption of the quiz tool is discussed further in section 8.1.1.1 of the next chapter.

This evidence demonstrates that the use of eCourse in the ABC Institute produced at least HEAT at Level 1 across all courses. This will be further examined below, according to the four different aspects of HEAT that are: higher order thinking, engagement, authenticity, and technology.

H (Higher order thinking): Students used MS Word to organise the information. The online formative test helped learners to assess their knowledge and understanding of a given topic, which is at the fundamental level of Bloom's Taxonomy. Since learners had to take initiative to do the tests themselves and repeat it as many times as possible until they scored full marks, it promoted self-directed and responsible learning. Though taking initiative and organising self to take up these formative tests are

attributes of CoreLife Skills, these are personal ones in which technology cannot play any role.

E (Engagement): In such a teacher-centric classroom, the teacher directs the students and they just report facts. Consequently, learners do not have the flexibility to explore on their own, which makes them passive learners with hardly any engagement. For instance, downloading and reading learning resources in the form of MS PowerPoint, MS Word or PDF documents uploaded by their teachers.

A (Authenticity): All assessments are vocational and close to the real world situation, which helped learners to get a practical context for application of knowledge, though the use of technology to accomplish the assignment tasks was not evident in some assignments.

T (Technology): At this level, teachers integrated technology just to meet the basic requirements set by the institute, such as marking attendance, uploading notes and assignment briefs, grading assessment, and providing feedback through eCourse. As a result, the students' engagement with technology was also seen to be limited during the classroom observation.

Thus, the teachers who integrated technology at Level 1 succeeded in using it to support learning and meeting administrative needs but failed to pass through the OPP, since it leads to development of lower levels of cognitive skills, such as knowledge and comprehension, according to Bloom's taxonomy. Significant development of CoreLife Skills was not evident.

### 7.3.2 LoTi Level 2: Exploration

On analysing the data gathered, I identified a case wherein teachers integrated technology at Level 2 of LoTi, exploration. At this level, teachers do this so that students can use it for extension activities, enrichment exercises or information gathering assignments (Moersch, 2010).

**Case 1:**

This case explains the assemblage of the internet, website, search engine, Google Translate, online dictionary, teachers, and students, in carrying out classroom activities and assignments. I observed that the use of the internet and search engine were encouraged by most of the teachers in the ABC Institute by including tasks in assignments and class activities that require learners to search online for relevant information on specific topics. The TEL-CSD framework suggests use of web-based searches to help learners collect and analyse information in a given context. So, I am interested in exploring how use of the internet and search engines enhances students CoreLife Skills.

Mostly, students were observed to use Google rather than Google Scholar or any other search engines. “We use Google search a lot for searching information for our assignment, to know about the courses that we are learning, and for the things they (the teacher) asks us to search for” (Ayeza, Student). Google provides advanced search options to filter specific search criteria but they were hardly used by students. The teachers were observed to provide assistance and guidance to students for using appropriate keywords for effective searching. Thus, this facilitating condition, provided by teachers encouraged students to adopt and use search engines effectively.

On the other hand, Zaida (Student) pointed out an issue related to web searching. She states, "I think sometimes books help us more than [the] internet because sometimes the information in the internet is wrong". She further explained that "I know Wikipedia does not give true information [always]. So I have to go to [an] actual website to know if it is right or wrong". Hence, searching for an authentic source of information was identified to be challenging for students, for which they were observed to seek their teacher's assistance.

In general, using search engines was easy for students, but using them effectively required sound knowledge of the search filter option, logical thinking and ability to identify relevant information. Hence, effective usage of search engines was mostly facilitated by their teachers.

Once they gathered information, some students found it difficult to comprehend it and write responses in English to meet the task requirements as they were not fluent in English. Such students were observed to predominantly use Google Translate to interpret English text in Arabic. Sometimes they typed their responses in Arabic to get the English translation. In the TEL-CSD framework, the translator software is supposed to promote self-directed learning, which is evident in this case.

Potential benefits of translator software as recognised by students are: "I use Google Translate because I don't know so much English. I write answer in Arabic and then it is coming in English. So, after that I take the English one and translate to Arabic to see if it is right or not" (Aaliya, Student), and, "Every time, while I write [an]

assignment, I [type] it in Arabic, then I take some of the English words [and] I write [them] in my own words" (Zaida, Student)

Thus, Google Translate acts as a facilitating tool for students with a language barrier to work independently without seeking others' help. So, the students accepted and used the tool due to increased effort expectancy and performance expectancy, two constructs of the UTAUT model. The simplicity of Google Translate's features increased the effort expectancy, and the extent of help it offered to students in completing their day-to-day learning and assessment increased their performance expectancy.

Along with Google Translate, students were also observed to use an online dictionary. An online dictionary has also been included in the TEL-CSD framework to facilitate self-directed learning. Amani (Student) said that she uses an online dictionary in the English course "because sometimes we don't know any word". Earlier they used Google Translate but the Online Oxford Arabic dictionary with its additional features that allowed them to learn the use of a word in different sentences and its meaning in Arabic, was more helpful to learners. Additionally, students were seen to use other online dictionary websites, such as http://www.dictionary.com/ and http://dictionary.cambridge.org/ and some used dictionary mobile apps.

**Example:** In the *Starting a Small Business* course, the teacher included an activity that required students' to select any two businesses of their choice from a range of options provided and identify its Unique Selling Point (USP) by searching for organisational details using a search engine.

A screenshot of the activity posted in eCourse is illustrated in Figure 7.1. This activity requires students to only search for a USP from the respective company's website. Thus, the search engine basically helped them to identify the specific company website, which was then used to navigate to the company website.

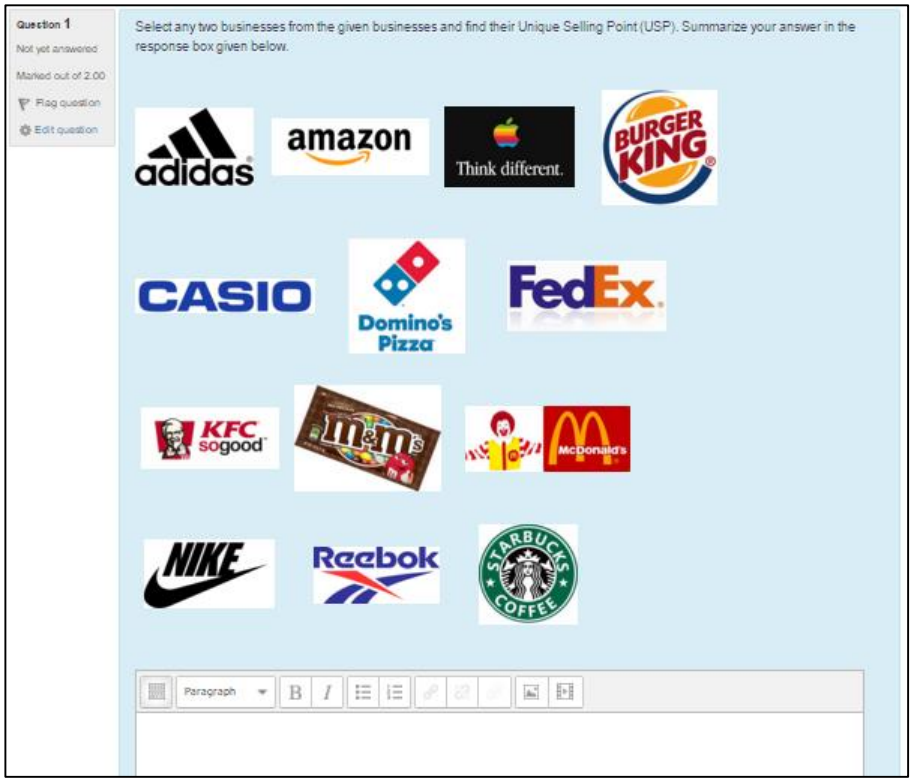



*Figure 7.1 Sample of a class activity from eCourse*

Some students then used Google Translate or an online dictionary to comprehend any details within the website, which they could not follow. Thus, this activity created HEAT at Level 2 as discussed below:

H (Higher order thinking): There is marginal improvement in terms of Bloom's Taxonomy as the learners used technology for knowledge and comprehension. Though collecting and organising information is one of the CoreLife Skills that is part of the information processing skills, scope for higher-order thinking, which involves analysis and application of information by students, was not evident at this level.

E (Engagement): The students were given an option to select companies of their choice from a comprehensive list provided by the teacher, which improved learners' engagement.

A (Authentication): The activity provided an authentic learning environment as students got exposed to international brands of companies.

T (Technology): The technology used at this level was for low-level cognitive tasks, such as to gather information using search engines and websites, to comprehend information using translator and an online dictionary, and organise the information gathered in eCourse. These technologies thus acted as a facilitator for collecting and organising information, although their use was not essential for completion of the given task.

Hence, teachers and students who achieved LoTi Level 2 still did not pass through the OPP as the use of technology did not provide evidence of sufficient CoreLife Skills development as proposed.

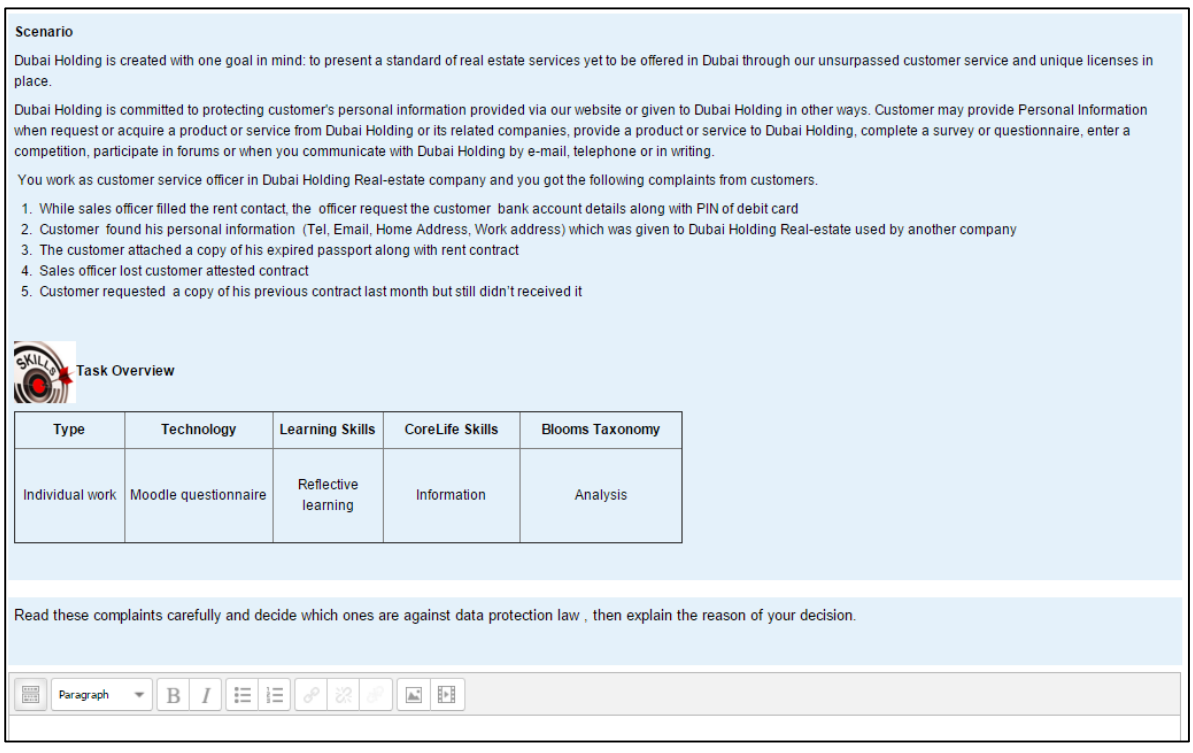
### 7.3.3 LoTi Level 3: Infusion

Some teachers demonstrated greater interest in integrating technology using the TEL-CSD framework in the courses they delivered to enhance students' CoreLife Skills. Mostly, they took the support and guidance of their assigned e-Learning developer in order to design their courses using a range of technologies. I identified two cases, Case 2 and Case 3, wherein teachers integrated technology at LoTi Level 3 and use of

technology by students was motivated by teacher-directed tasks (Moersch, 1995). According to Moersch (1995), technology-based tools used at this level include databases, spreadsheets, graphing packages, probes, calculators, multimedia applications, desktop publishing applications, telecommunications applications etc. The relevance of these technologies, which are more enhanced, still holders good.

**Case 2**

This case discusses the assemblage of the Moodle Questionnaire tool, teachers and students, in order to carry out a scenario-based activity wherein they had to address complaints received from a customer. The e-learning developer created a template for online activity in eCourse to include specific details about the technology used, the expected learning skills and CoreLife Skills being focused on and the level of Bloom's Taxonomy, to give learners a comprehensive overview of the skills being targeted using specific technology, as illustrated in Figure 7.2.



**Scenario**

Dubai Holding is created with one goal in mind: to present a standard of real estate services yet to be offered in Dubai through our unsurpassed customer service and unique licenses in place.

Dubai Holding is committed to protecting customer's personal information provided via our website or given to Dubai Holding in other ways. Customer may provide Personal Information when request or acquire a product or service from Dubai Holding or its related companies, provide a product or service to Dubai Holding, complete a survey or questionnaire, enter a competition, participate in forums or when you communicate with Dubai Holding by e-mail, telephone or in writing.

You work as customer service officer in Dubai Holding Real-estate company and you got the following complaints from customers.

1. While sales officer filled the rent contact, the officer request the customer bank account details along with PIN of debit card
2. Customer found his personal information (Tel, Email, Home Address, Work address) which was given to Dubai Holding Real-estate used by another company
3. The customer attached a copy of his expired passport along with rent contract
4. Sales officer lost customer attested contract
5. Customer requested a copy of his previous contract last month but still didn't received it

**Task Overview**

| Type | Technology | Learning Skills | CoreLife Skills | Blooms Taxonomy |
|---|---|---|---|---|
| Individual work | Moodle questionnaire | Reflective learning | Information | Analysis |

Read these complaints carefully and decide which ones are against data protection law , then explain the reason of your decision.

Paragraph

*Figure 7.2 Sample of a class activity from eCourse*

In this specific case, it is evident that the use of the Moodle Questionnaire tool is not essential for the accomplishment of the task, as students could either discuss the issues verbally or write their responses on a paper. However, using Moodle Questionnaire, students could post how they would address the complaint and the teacher could view responses from all learners in a comprehensive interface. The teacher then shared the range of views received from students and discussed further, which involves higher order thinking.

To summarise, though the specific task could have been achieved without the use of technology, the teacher's decision to include Moodle Questionnaire was to provide learners with a platform to gather students' views for further discussion.

**Case 3**

This case explains how a teacher translated a task in mathematics that required learners to create graphs and charts from a paper-based activity to an MS Excel-based activity. In the activity, as illustrated in Figure 7.3, the teacher asked students to create a line graph to show the trend of production and consumption of oil per day in the UAE between 1970 and 2010, using MS Excel. Thus, by transforming the activity that used graph papers, ruler, pencil and eraser to an MS Excel based activity, the teacher adding an extra task, Task 4.4, which utilised MS Excel's special feature of creating trend lines to estimate the production and consumption of oil per day in 2020 for effective analysis while explaining the graph, as required in Task 4.5.

**Task 4:**

In UAE, the production and consumption of oil per day is tabulated below:

| Year | 1970 | 1980 | 1990 | 2000 | 2010 |
|---|---|---|---|---|---|
| Production in barrel per day (000) | 750 | 1,500 | 2,700 | 2,500 | 3,000 |
| Consumption in barrels per day (000) | 50 | 100 | 250 | 300 | 500 |

4.1. Create a **line graph** based on the table given above to show the relationship between production and consumption of oil per day in different years.

4.2. Label the X-axis and Y-axis appropriately.

4.3. Add the title as 'UAE Oil production and consumption'

4.4. Add a trend line to show the projected production and consumption of oil per day in 2020.

4.5. Write at least four lines to explain the line graph you created.

*Figure 7.3 MS Excel activity to create line graph*

The students did not show reluctance to use MS Excel as they had been taught to use it in the ICT course. So, it was an opportunity for them to apply their knowledge. However, some students were sceptical to use MS Excel because it included lots of tools and features, which they were not conversant with. The teacher explained the potential benefit of creating the graph using MS Excel over graph paper, such as accuracy, speed and ability to create projections easily, which motivated all students in the class to align their interest with those of their teacher. Thus, in Case 2 and Case 3, HEAT at Level 3 was generated by the teachers as discussed below:

H (Higher order thinking): The students' learning involved analysis that required higher order cognitive processing as per Bloom's Taxonomy, where they used digital tools and resources to carry out teacher-directed instructions. So, the use of MS Excel and the scenario-based activity helped students to get deeper understanding of the underlying knowledge and improved their analytical skills.

E (Engagement): While some students showed greater engagement due to a new approach of learning using technology, some showed reluctance initially. But soon they translated their interest to align with the rest.

A (Authentic): Teachers work in accordance with the institute's philosophy of offering vocational education with an emphasis on key skills, by providing real-life scenarios to help learners get closer to the professional work environment. The examples illustrated in Case 2 and Case 3 provide evidence of offering authentic learning environments.

T (Technology): The use of technology was not essential for the accomplishment of the two activities discussed in Case 2 and Case 3. But students realised the potential benefit of using MS Excel to create a graph over using graph paper as it saves time and effort and also helps to generate a trend line quite easily.

Although at this level, a teacher-centric approach is used, the use of technology encouraged higher order thinking skills facilitating students to enhance their CoreLife Skills. Hence, both teachers and students at this level passed through the OPP to form a provisionally stable actor-network.

### 7.3.4 LoTi Level 4: Integration

At this level, integration of technology is aimed at providing a rich context for students' understanding of the pertinent concepts, themes, and processes that helps to identify and solve authentic problems relating to an overall theme/concept (Moersch, 1995). As I explored different cases of technology integration in classrooms, I could

identify three cases, Case 4, Case 5 and Case 6 wherein teachers integrated technology extensively to achieve LoTi at Level 4.

**Case 4**

This is an interesting case that discusses the assemblage of curriculum, assignment brief, presentation software, laptop, video recorder, projector, remote control, teacher and students to complete an assignment task.

An extract from the assignment brief of the *Sales Planning and Operation* course illustrated in Figure 7.5 describes the use of presentation software as an integral part of the assignment task in order to achieve the performance criteria P2.1 and P2.2 given in the unit standard as illustrated in Figure 7.4.

| Learning Outcome/Assessment Criteria | | | |
|---|---|---|---|
| LO 1 | P1.1 | Explain how personal selling supports the promotion mix | Task 1 |
| LO 1 | P1.2 | Compare buyer behaviour and the decision making process in different situations | Task 1 |
| LO 1 | P1.3 | Analyse the role of sales teams within marketing strategy | Task 1 |
| LO 2 | P2.1 | Prepare a sales presentation for a product or service | Task 2 |
| LO 2 | P2.2 | Carry out a sales presentation for a product or service | Task 2 |

*Figure 7.4 An extract of performance criteria of Sales Planning and Operation course*

**Task 2 (P2.1, P 2.2, M2, D2)**

Plan, prepare and carry out a sales presentation for the new product or service that your company is planning to launch. P2.1, P 2.2

***Guidelines**: Your presentation must have a minimum of five slides and you can choose any product/service of your choice.*

*Figure 7.5 An extract from Sales Planning and Operation assignment brief*

In response to Task 2, students had to assume the role of a sales team member in a company, select a product/service of their choice, prepare a sales plan and give a presentation to launch the product/service. The task requires students to demonstrate their deeper understanding of the product/service and ability to prepare a sales plan by undertaking extensive research using a range of appropriate sources. The students prepared their presentations using MS PowerPoint or Prezi, and presented it in front

of the audience using their laptop, projector and remote control to complete the assignment task corresponding to performance criteria P2.1 and P2.2. This case confirms that if the use of technology is specifically defined in the curriculum or performance criteria, then teachers ensure its appropriate integration during delivery and in their assignment brief.

Surprisingly, the teacher extended the use of technology by video recording the presentation using a handycam with the aim of gathering evidence of students' presentations to allow them to reflect on their own presentation and communication skills for further improvement as per the TEL-CSD framework. A sample of the video recording is illustrated in Figure 7.6.


*Figure 7.6 Video recording of a student presentation*

For effective sharing of video recordings, e-learning developers identified Vimeo as a suitable platform, but the recorded videos could not be shared using Vimeo for two reasons. Firstly, the video recorded using handycam was in high-definition (HD) video format, which is incompatible with Vimeo. Secondly, the file size of video files in HD format was too big to upload. Generally, e-learning developers use HandBrake, an open source video transcoder to compress files; however, the HD file

is not compatible with the software. Unfortunately, the e-learning developers were quite busy during the term and they could not search for alternative software to convert the HD file to a format compatible with Vimeo, compress the size to a smaller size and then upload the files to Vimeo. Thus, incompatible file format, big file size and lack of time prevented integration of Vimeo and obstructed effective utilisation of the video recording. Consequently, the recorded video was uploaded to the institute's secured shared folder, which is not accessible to the students. So, the purpose of viewing the recorded video by students to reflect on their performance and identify opportunities for improvement was not achieved. Since reflection on their own presentation was neither included as an assignment task nor stated in the curriculum, the students did not take further initiative to fulfil the additional task communicated verbally by their teachers. Thus, the outcome of technology integration was driven by the curriculum and assignment brief, which applied power in translating the students' interests. However, the video recording did not help students to enhance their communication and presentation skills as expected due to technical glitches and students' lack of interest to reflect on their own presentation because this was not part of the assessment requirements.

**Case 5**

Case 5 explains the assemblage of ePortfolio, TEL-CSD framework, students, teachers, and assignments that aim to help students get better career opportunities. According to the TEL-CSD framework, ePortfolio is supposed to enhance students' ability to organise information, develop creative abilities, reflect and evaluate their own learning and demonstrate problem-solving skills. In this case, the teacher teaching the *Personal and Professional Development* course, included an assignment

task asking students to use ePortfolio, to create their electronic profile with their personal, academic details, career goal, and academic goals, though the use of ePortfolio was not specified in the curriculum. The teacher included the task in the assignment brief to enforce power on students as without fulfilling the requirements set in the assignment brief, students cannot pass the course. A sample of the ePortfolio created by a student is illustrated in Figure 7.7.

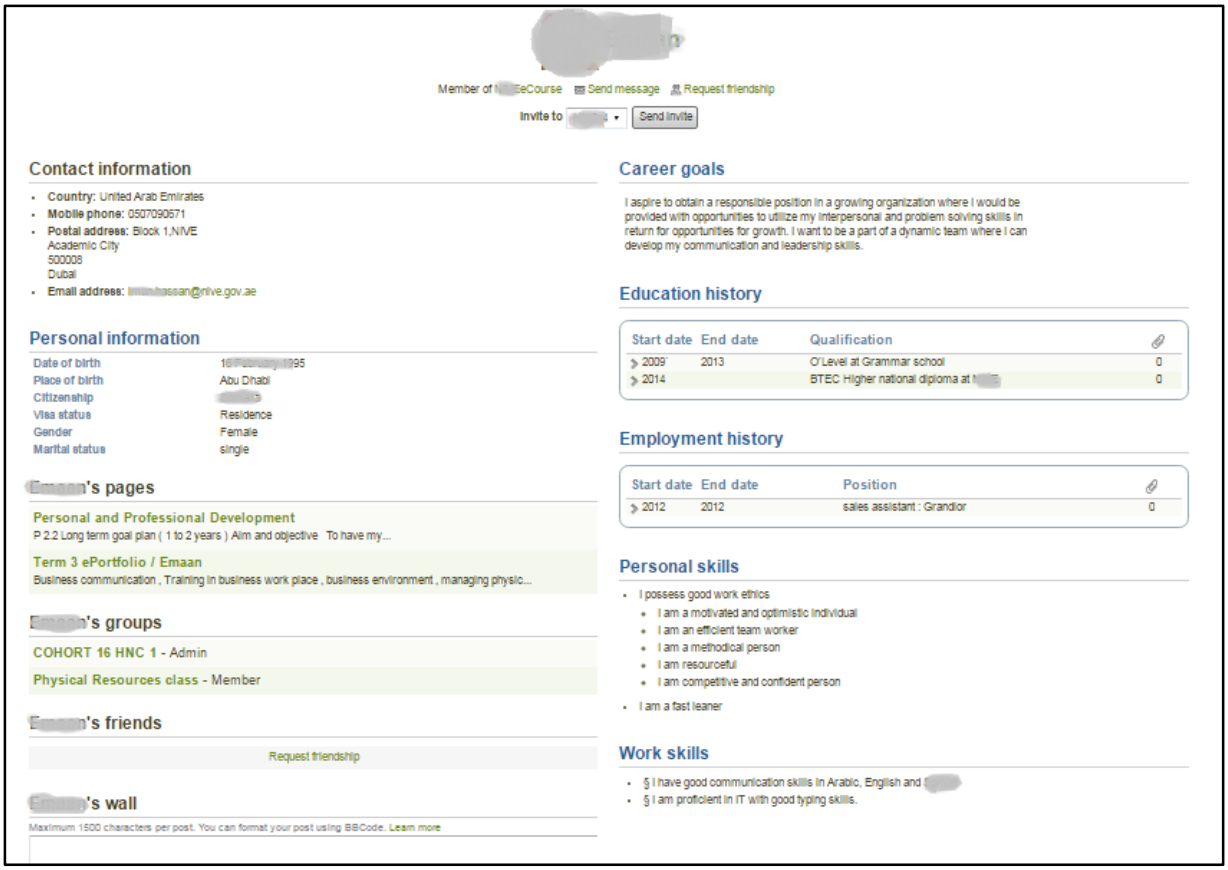



*Figure 7.7 ePortfolio of a student*

Students used ePortfolio pages to organise their personal details to create their résumé to share with potential employers so that their chances of employability were enhanced. They also used it to prepare their development plan by setting out their short-, medium- and long-term plans to monitor their own progress, as required in the assignment task. However, they hardly showed any creativity in terms of design and

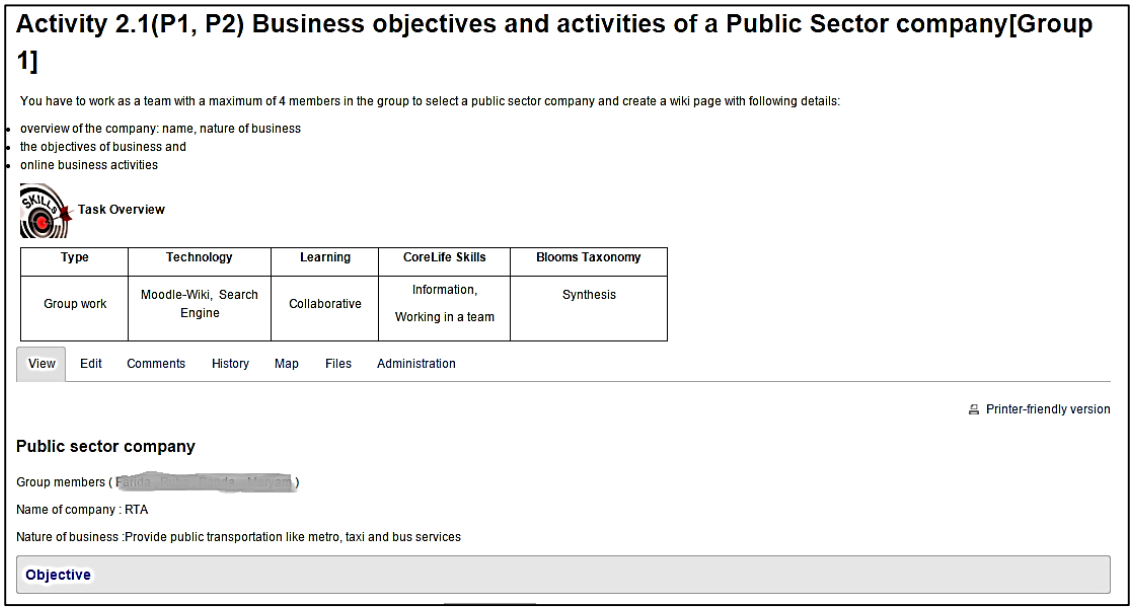
presentation. They were observed to have followed the teacher's instructions to fulfil the given requirement in spite of teacher's encouragement.

ePortfolio tools such as journal could have been used for recording students' reflections for sharing with others to seek feedback, and a discussion forum could have been used for collaboration, which could have facilitated students to develop their higher order cognitive skills. Unfortunately, journals and discussion forum tools of ePortfolio were not integrated as reflection was not included as an assignment task because it was not defined as a requirement in the curriculum. The teacher clarified that most of the students lacked proficiency in English language and struggled to write their refection. The use of journal or discussion tools, which could have helped to demonstrate higher order cognitive skills were not integrated. As a result, translation of ePortfolio was limited.

**Case 6**

This case explains the assemblage of the TEL-CSD framework, Moodle-wiki, a search engine, a website, teachers and students wherein students are required to work in groups to conduct research on a company's business objective and its online activities and present their findings as illustrated in Figure 7.8. The teacher added a Moodle wiki tool in the course page for each group and recommended students to use search engines to gather relevant information and present the assimilated information in a well-organised format to demonstrate their creativity and facilitate sharing of information as per the TEL-CSD framework. In the TEL-CSD framework, the purpose of a wiki is to provide a platform for collaborative and reflective learning by

working with others in a team, initiating and organising activities, and demonstrating creativity. It was observed that some groups embedded YouTube videos describing a company's online activities whereas others included images downloaded from the website for effective presentation.



**Activity 2.1(P1, P2) Business objectives and activities of a Public Sector company[Group 1]**

You have to work as a team with a maximum of 4 members in the group to select a public sector company and create a wiki page with following details:

- overview of the company: name, nature of business
- the objectives of business and
- online business activities

**Task Overview**

| Type | Technology | Learning | CoreLife Skills | Blooms Taxonomy |
|---|---|---|---|---|
| Group work | Moodle-Wiki, Search Engine | Collaborative | Information, Working in a team | Synthesis |

View Edit Comments History Map Files Administration

Printer-friendly version

**Public sector company**

Group members ( )

Name of company : RTA

Nature of business :Provide public transportation like metro, taxi and bus services

**Objective**

*Figure 7.8 Sample of collaborate task using wiki*

It was observed that generally students' responses to the collaborative activity was encouraging and most of them took the initiative to search for relevant information using search engines, contributed towards creating the wiki page, and completed the whole task as a team. However, some of them contributed little, leaving the task to other team members. The reasons for non-participation varied. Some gave the pretext that their laptop had a problem, some did not wish to explore how to use the wiki, and others lacked interest. This shows that students' personal attributes influence their participation and adoption of technology. On the other hand, this activity was not part of the assessment and did not contribute towards a grade. So, the students may not have considered it necessary to complete the activity, as they have failed to realise the potential benefit of developing CoreLife Skills, such as teamwork, use of technology, researching, synthesising and organising information. Consequently, except for these

students, the rest passed through the OPP set by the focal actors. Thus, in Case 4, Case 5 and Case 6 students who completed the given tasks could generate HEAT at Level 4 as detailed below, though at times the use of technology could not be fully exploited due to difficulty in seamlessly integrating technology.

H (Higher order thinking): In Case 4, students developed skills to gather and organise information creatively in the presentation by critically applying their knowledge to prepare the sales plan. By presenting the sales plan in front of the audience, students also developed their communication skills. In Case 5, students engaged in planning and organising their résumé and produced their short-, medium- and long-term plan, which promotes students' analytical skills. In Case 6, students worked collaboratively to gather information and create the wiki page demonstrating their team work skills. Overall students demonstrated higher order thinking skills while performing these tasks as they had to apply their knowledge and analyse information gathered where technology mostly acted as a facilitator.

E (Engagement): Engagement was more in Case 6 compared to Case 4 and Case 5 as students partnered with others to identify a suitable topic, shared ideas and planned to perform collaborative tasks. They also partnered with teachers to help define the task, seek advice and negotiate a topic of their choice. All these suggest greater engagement of students with peers, teachers and technology.

A (Authentic): In all three cases, activities and assignments provided extensive real-world relevance though they did not get an opportunity to apply their learning in a real-world situation.

T (Technology): Mostly, use of technology is an integral part of task completion that ranges from creating sales presentation using presentation tools, creating ePortfolio, using search engines to identify topics and gathering information, to creating a wiki page(s) for effective presentation of information. Technology in turn promotes collaboration, organisation and good presentation. Thus, its use helped learners identify and solve authentic problems and develop higher order thinking skills related to a theme/concept (Tassell et al., 2013).

The three cases demonstrate how teachers and students passed through the OPP to create an actor network: the teachers effectively integrated technology at LoTi Level 4 and students who successfully accomplished the given tasks, generated HEAT at Level 4. Thus, students developed some of the CoreLife Skills, such as communication skills, presentation skills, working in a team, collecting, analysing and organising information. Additionally, use of a presentation tool, ePortfolio and wiki helped students to develop a range of learning skills such as collaborative learning skills, responsible learning, though reflective learning was not observed due to various factors identified in Case 4 and Case 5.

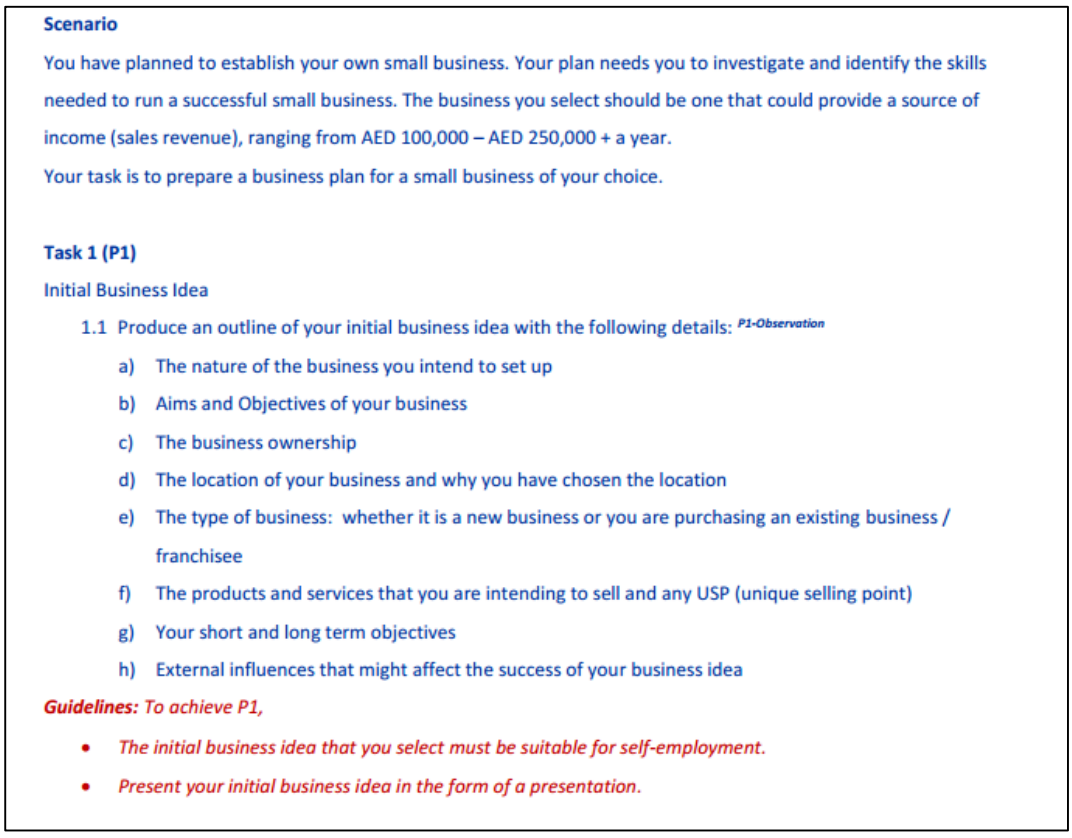
### 7.3.5 LoTi Level 5: Expansion

At Level 5, use of technology is extended to be commensurate with diversity, creativity and spontaneity of the teacher's experiential-based approach to teaching and learning and the student's level of complex thinking (Moersch, 2010). Two teachers demonstrated extensive integration of a range of technologies during delivery and assessment with an emphasis on enhancing students' CoreLife Skills. On analysis of data gathered, I identified two cases, Case 7 and Case 8, where two teachers

demonstrated greater integration of technology using the TEL-CSD framework across two courses – *Starting a Small Business* and *Business Online* taught to the same cohort of students during Term 1 in 2015-16.

**Case 7**

Case 7 explains the assemblage of the TEL-CSD framework, assignment brief, presentation software, laptop, remote, teacher's Samsung mobile, Vimeo, Moodle, website, MS Excel, teacher and students in *Starting a Small Business* course. As part the course assignment, the students were required to devise their own business proposal to start a small business. An extract from the assignment brief is illustrated in Figure 7.9 wherein students were given a range of tasks, which required them to demonstrate their higher order thinking.



**Scenario**

You have planned to establish your own small business. Your plan needs you to investigate and identify the skills needed to run a successful small business. The business you select should be one that could provide a source of income (sales revenue), ranging from AED 100,000 – AED 250,000 + a year.

Your task is to prepare a business plan for a small business of your choice.

**Task 1 (P1)**

Initial Business Idea

1.1 Produce an outline of your initial business idea with the following details: *P1-Observation*

a) The nature of the business you intend to set up
b) Aims and Objectives of your business
c) The business ownership
d) The location of your business and why you have chosen the location
e) The type of business: whether it is a new business or you are purchasing an existing business / franchisee
f) The products and services that you are intending to sell and any USP (unique selling point)
g) Your short and long term objectives
h) External influences that might affect the success of your business idea

***Guidelines:*** *To achieve P1,*

- *The initial business idea that you select must be suitable for self-employment.*
- *Present your initial business idea in the form of a presentation.*

*Figure 7.9 An extract of an Assignment Brief from the eCourse*

The teacher designed the assignment by providing students ample opportunity to use a range of technologies to develop and demonstrate a range of skills as suggested in the TEL-CSD framework. For instance, the TEL-CSD framework suggests discussion forum to support collaborative learning; facilitate communication of information, concepts and ideas; promote working with others in a team; solve problems; and encourage participation in social and civil life. Benci, the subject teacher, states: "I created a discussion forum [in eCourse so that] each one of them put their own business idea [and they] get a chance to see what others have selected. [Then] I asked the students to give a presentation about their initial business idea".

I observed a participant while giving presentation of his business idea and an excerpt from my observation record that explains how a student presented his business proposal in front of his peers is described subsequently.

> The student created a presentation explaining his business proposal using MS PowerPoint and uploaded it to the discussion forum by accessing eCourse from his laptop. The student then downloaded the presentation from eCourse to the laptop connected to the projector, opened the presentation and turned on the projector using the remote. Meanwhile, the teacher started to prepare her Samsung mobile phone to video record the presentation. Before starting to record, she configured the resolution of the mobile camera to 2048x1536 so that the size of the video file is reduced, though the image quality is compromised. The student presented his business idea to the audience with the aid of the PowerPoint presentation, which was recorded by the teacher in her Samsung mobile. Subsequently, other students provided their feedback on the presentation and business proposal through the discussion forum. The female students coming from an Arabic culture were generally reluctant to face the camera; hence, in such cases, the camera only focused on the presentation slides.
>
> **Excerpt from observation record, 16th November 2015**

The reluctance of female students to face the camera is also identified by Radecki, (2005), and this hinders the full utilisation of technology.

Later students provided their feedback on the presentation and the business ideas through the forum. Benci states,

> I have given the students an opportunity to peer assess, wherein they can communicate their views about others performance like what areas they need to improve. It inculcates their critical thinking skills too. Working with others in teams […], which is again one of the main CoreLife skills, which you can develop using technology.

By receiving feedback from peers, a student can reflect on their proposed business plan and make required changes. It also provides an opportunity to enhance students' critical thinking skills through a collaborative platform, such as a discussion forum. However, it is worth noting that discussion forum just provides a technological platform for collaboration but critical thinking and team work are human traits. Reviewing the discussion forum illustrated in Figure 7.10, it was evident that their remarks were mostly superficial and not critical as they lacked command over the English language.

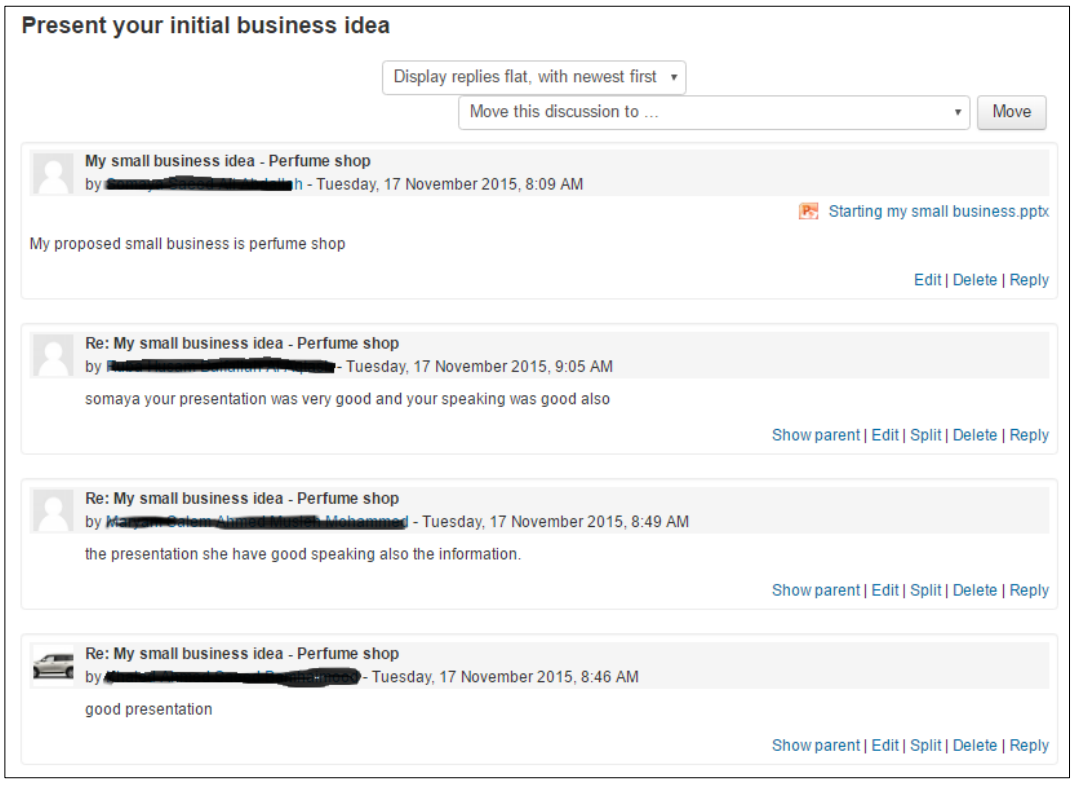



*Figure 7.10 Excerpt from discussion forum*

I include below another excerpt from my observation record that explains how the recorded video was integrated to Vimeo.

> After a couple of days, the teacher transferred the video file to her laptop, logged on to Vimeo using the username and password and uploaded the video recording to Vimeo. Since the file format of the video recording captured through the teacher's mobile was compatible with Vimeo, she could easily upload the file to Vimeo as neither compression nor conversion of file format was required. The uploaded video was password protected in Vimeo to ensure that unauthorised access is denied.
>
> **Excerpt from observation record, 19th November 2015**

A sample of the video uploaded to Vimeo and embedded to eCourse is displayed in Figure 7.11.


*Figure 7.11 Student's presentation video uploaded to Vimeo and embedded in eCourse*

The TEL-CSD framework suggests use of multimedia technologies like YouTube/Vimeo, audio recording for reflective learning. The students could watch the video or listen to the audio recording and reflect on what they had seen or heard to demonstrate greater understanding.

Once the students finalised their business plan, the teacher asked them to visit the Dubai Economic Department (DED) website to estimate the cost of obtaining a business license, as illustrated in Figure 7.12.

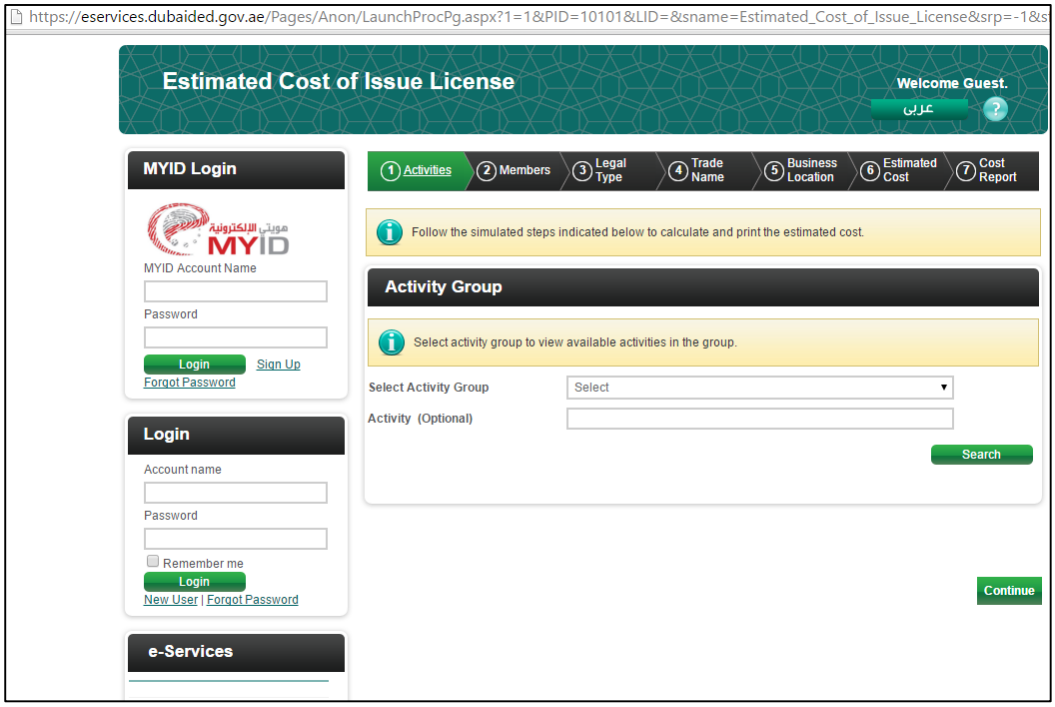
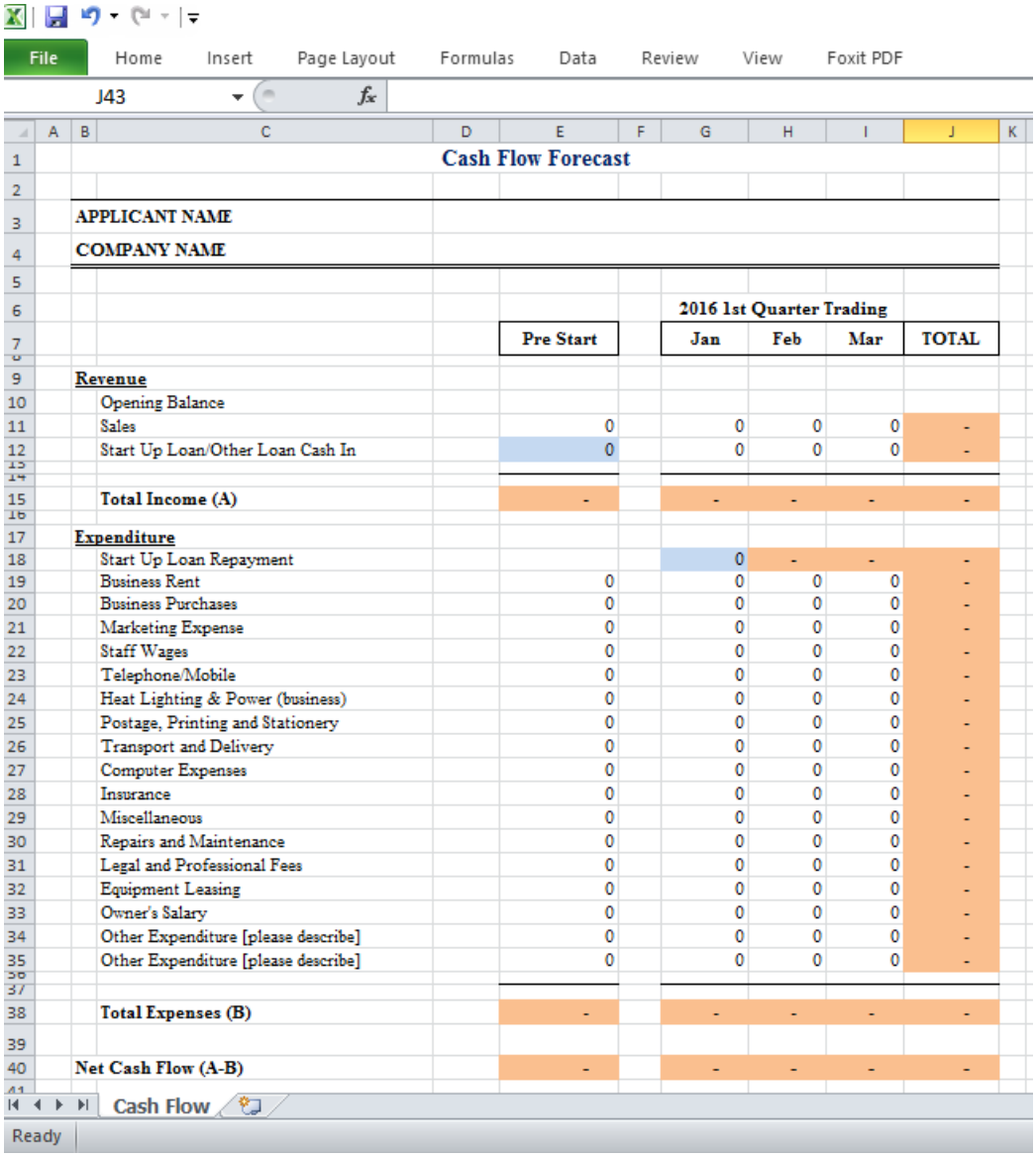



*Figure 7.12e-Service to estimate the cost of issuing license from DED website*

The e-Service from DED allows users to input basic details about their business in the first 5 steps and the system generates estimated cost and a report in PDF format. This is a real-life experience for the learners and familiarity with the DED website could help them in case they plan to set up their business in Dubai. Most of the students performed these tasks as it was linked to their summative assignment.

Additionally, learners were required to use spreadsheet applications to calculate cash flow forecasts of their business as illustrated in Figure 7.13. The learners had to apply formulae and functions to calculate the cash flow. This task could have been done using paper and calculator, but the teacher expressed that use of a spreadsheet is common in business and would help them in decision-making using additional decision-making Excel tools, such as 'What-if-analysis', which is an effective data analysis tool.



Cash Flow Forecast

| | | | | | |
|---|---|---|---|---|---|
| APPLICANT NAME | | | | | |
| COMPANY NAME | | | | | |
| | | 2016 1st Quarter Trading | | | |
| | Pre Start | Jan | Feb | Mar | TOTAL |
| **Revenue** | | | | | |
| Opening Balance | | | | | |
| Sales | 0 | 0 | 0 | 0 | - |
| Start Up Loan/Other Loan Cash In | 0 | 0 | 0 | 0 | - |
| **Total Income (A)** | - | - | - | - | - |
| **Expenditure** | | | | | |
| Start Up Loan Repayment | | 0 | - | - | - |
| Business Rent | 0 | 0 | 0 | 0 | - |
| Business Purchases | 0 | 0 | 0 | 0 | - |
| Marketing Expense | 0 | 0 | 0 | 0 | - |
| Staff Wages | 0 | 0 | 0 | 0 | - |
| Telephone/Mobile | 0 | 0 | 0 | 0 | - |
| Heat Lighting & Power (business) | 0 | 0 | 0 | 0 | - |
| Postage, Printing and Stationery | 0 | 0 | 0 | 0 | - |
| Transport and Delivery | 0 | 0 | 0 | 0 | - |
| Computer Expenses | 0 | 0 | 0 | 0 | - |
| Insurance | 0 | 0 | 0 | 0 | - |
| Miscellaneous | 0 | 0 | 0 | 0 | - |
| Repairs and Maintenance | 0 | 0 | 0 | 0 | - |
| Legal and Professional Fees | 0 | 0 | 0 | 0 | - |
| Equipment Leasing | 0 | 0 | 0 | 0 | - |
| Owner's Salary | 0 | 0 | 0 | 0 | - |
| Other Expenditure [please describe] | 0 | 0 | 0 | 0 | - |
| Other Expenditure [please describe] | 0 | 0 | 0 | 0 | - |
| **Total Expenses (B)** | - | - | - | - | - |
| **Net Cash Flow (A-B)** | - | - | - | - | - |

*Figure 7.13 MS Excel worksheet template provided to learners to calculate Cash Flow Forecast*

Thus, in this case, the teacher has meticulously designed the course by identifying and integrating technologies relevant for the subject, though it was not specified in the curriculum. It is interesting to note that Benci is an e-learning developer. This illustrates that teachers with high levels of self-efficacy are in favour of technological changes and inclined towards adopting the technological options (Olivier & Shapiro, 1993). As a result, the teacher used innovative ways of integrating technology to fulfil the task requirement. At the same time, students adopted technology as it was an assignment task requirement.

**Case 8**

This case is an extension of Case 7 wherein the teacher of the *Business Online* course to the same cohort of students studying *Starting a Small Business* integrated the assignment for both courses. This case explains the assemblage of assignment brief, Google Forms, Moodle forum, students, teachers, TEL-CSD framework and web authoring software to complete the *Business Online* course assignment. As part of the *Business Online* assignment, learners were asked to design and develop a website for the business they identified to setup in *Starting a Small Business* course. This gave them a real context to apply their knowledge of online business and the techniques of using web authoring software to design and develop a website. A sample of the website designed by a student is displayed in Figure 7.14. Students could demonstrate their creativity, organisational skills while developing the website.

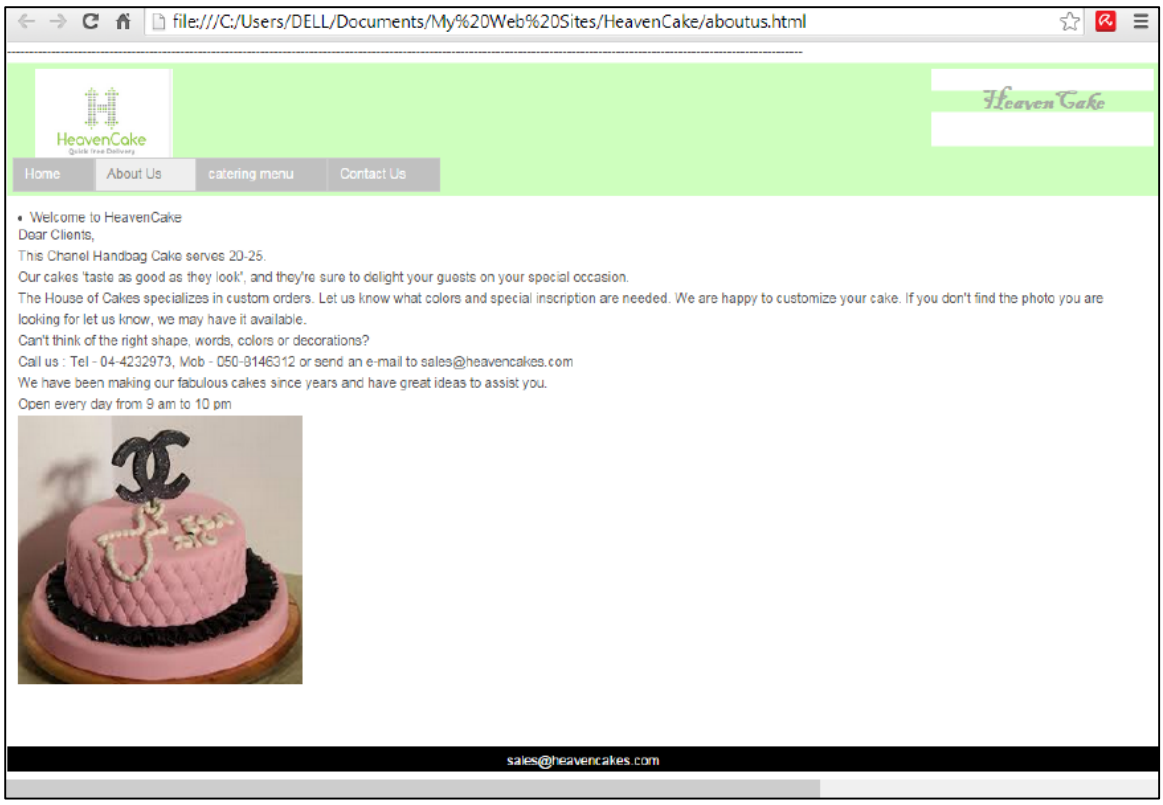



*Figure 7.14 A sample webpage designed by a student*

Another assignment task required students to design an online survey questionnaire to gather public opinion about online business that would extend the activity beyond the classroom. It stimulated students' critical thinking as they had to come up with relevant, valid questions of different forms - multiple choice, true-false, checkboxes, etc. The students also learnt to use different tools of Google Forms to design a survey questionnaire. A sample of the Google Forms is illustrated in Figure 7.15.

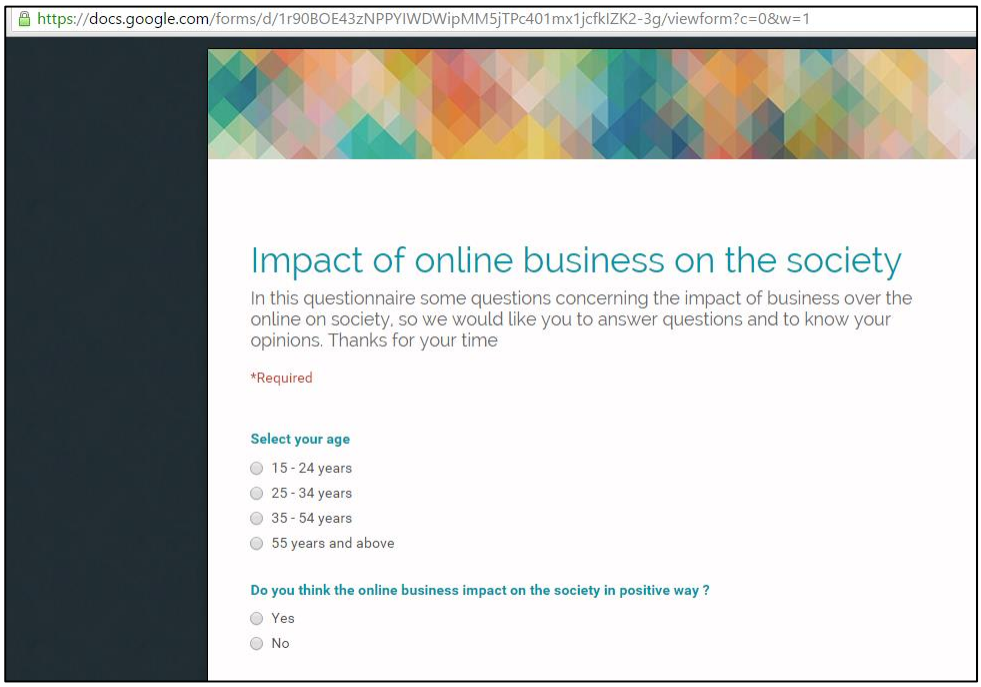



*Figure 7.15 Survey using Google Forms*

I was amazed to see how students were thrilled to see the automatically generated graphs by Google Forms based on the survey data. They analysed and evaluated the graphs, which stimulated higher order thinking to complete another assignment task.

Therefore, the students who successfully completed the range of tasks using technology in both *Starting a Small Business* and *Business Online* courses could produce HEAT at Level 5 to create a temporarily stable actor-network as detailed below.

H (Higher order thinking): The learners elevated their cognitive thinking skills to address issues that required analysis and evaluation. In Case 7, students demonstrated their ability to prepare a comprehensive plan to start a new business that requires application of higher order cognitive skills, such as analysis, evaluation and synthesis. In Case 8, students demonstrated their creativity by designing and developing website pages to meet the needs of target audiences. They participated in investigating the impact of online business on society and analysed the results. Students enhanced their problem-solving skills by critically analysing the case study and reviewing the solutions proposed by their peers in the online forum. Thus, the teachers assigned tasks to tap students' higher order thinking skills by making effective use of a range of technologies. However, only learners who passed though the OPP could achieve the same.

E (Engagement): The engagement was not just confined to teachers and students but extended to the local community. Students had opportunities to present their business proposal and receive feedback from both the teacher and peers. At the same time, they could express their viewpoints by participating in online discussion and commenting on others' views.

A (Authentic): The authentic assignments helped learners to get practical knowledge of starting a small business and going online to improve business. The integrated assignment gave learners opportunities to get a holistic view of doing business. They got real-world experience by visiting the DED website to determine licensing cost to setup a business in Dubai and also designed and developed their own website.

T (Technology): The use of technology was vital in the whole learning process and directly connected to task completion. The seamless use of technology by students helped them to develop their information gathering and analytical skills, for instance, use of MS Excel for cost estimation, DED e-Services to determine licensing cost to setup a business in Dubai, Google Forms to create online surveys and gather information from the public easily, online discussions for critiquing, presenting views, developing communication skills, and using web authoring software for creating websites to present information to target audiences.

So, a drastic change was observed from teacher-centric to learner-centric pedagogical approaches. The following statement from Mohannad (Manager, E-learning Team Leader) supports the notion that technology facilitates "recording, listening, participating in discussion anytime anywhere and changed the way we teach. It is a learner centric approach now. [It] develops the self-directed learning skills of learners".

### 7.3.6 LoTi Level 6: Refinement

At LoTi Level 6, technology use is directly connected and required for task completion, but instead of teachers, students have to determine suitable application(s) that would best address their needs (Moersch, 2010). By analysing different activities and assignments undertaken during the term, I infer that teachers could not achieve LoTi at Level 6 and students could not produce HEAT at Level 6, since it requires instructional curriculum to be entirely learner-based. Sara's (Teacher) view is very

crucial to understand why it was difficult to achieve LoTi level 6 in the ABC Institute. She states that:

> I definitely feel that the educational technologies will be supportive in developing the CoreLife skills of students. Of course students are familiar with different types of technologies that are used in [the institute] and they are keen to learn but only that they are not motivated to do something that is self-induced. If it is done through direction then they are willing to use it [otherwise] it is not self-induced that they will do it.

In a heterogeneous class, if the majority of students fail to integrate technology for effective delivery, then the basic learning outcome cannot be achieved. Hence, considering the level of students and their attitude as perceived by teachers, achieving the stated objective was impracticable. As a result, teachers did not attempt to achieve technology integration at LoTi level 6.

## 7.4 Summary

This chapter reviewed eight cases of technological innovation undertaken in various classes for different courses offered during Term 1 in 2015-2016 in the ABC Institute. It explains how a temporarily stable actor-network was created through the assemblage of students, teachers, e-learning developers, technologies, managers, policies, assignment briefs and class activities when the main actors passed through the OPP as set by focal actors in section 5.3. Using the LoTi and HEAT framework as a lens for analysis, I observed that when teachers integrated technology at Levels 3, 4, and 5 then they could generate HEAT at levels 3, 4, and 5 respectively among students, leading to greater enhancement of skills at higher levels. LoTi at Level 6, the highest level for technology integration that teachers could achieve, was not practical because that requires learners to design the course delivery themselves using suitable

technology, which most of the students in the class were not motivated to do. The next chapter investigates the factors influencing the stability of the actor-network created with specific emphasis on technology adoption by teachers and students.

## Chapter 8: Mobilisation of allies

Having discussed the first three moments of translation – problematisation, intéressemment and enrolment - in the last three chapters, in this chapter I discuss the final moment of translation, mobilisation. During enrolment, a temporarily stable network was created through the assemblage of ABC Institute managers, assignment briefs, class activities, CoreLife Skills, curriculum, e-learning developers, policies, students, teachers and technologies when the actors passed through the OPP. However, the actor-network created is likely to be destabilised when an existing actor leaves the network, a new actor is introduced in the network, or there is change in actor interest. For instance, addition or removal of actors, such as students, teachers, e-learning developers or managers, introduction of new technologies by replacing obsolete technology, changes in the curriculum or the characteristics of CoreLife Skills are inevitable. In such cases, the interests of the actor will no longer be aligned with the interests of focal actors. Hence, in this chapter I investigate factors that influence actors to maintain commitment to the problematised cause of action set by focal actors and ensures the continued position of the OPP (Rhodes, 2009).

I investigate adoption of technology by teachers and students more closely in this chapter using the lens of UTAUT, as the research aims to enhance students' CoreLife Skills using technology, and without its acceptance and adoption by teachers and students, the expected outcome cannot be achieved. The UTAUT is enrolled as an actor in the network to review its usefulness for assessing technology acceptance by considering the views of both human and non-human actors.

I conclude the chapter by tracing actions to be taken by focal actors to create a punctualised network on the basis of the sources of enablers and inhibitors identified in the research that influence sustainability of the stable actor-network created in the ABC Institute during the term.

Information gathered from both human and non-human actors using diverse methods, such as interview, observation and technological artefacts were effectively analysed in this chapter using ATLAS.ti software wherein I assigned codes to quotations extracted from data, created code families and built network views, as discussed in section 4.5.

## 8.1 Examination of irreversibility

The sustainability of the actor-network created in the ABC Institute depends on the degree of difficulty to change the actors' positions. If actors easily revert back to their original positions by breaking their alliance with the focal actors then it indicates the vulnerability of the actor-network. Since the network was formed with the aim of enhancing students' CoreLife Skills through effective integration of technology, the extent of technological integration achieved by the teachers in different courses and its impact on students is essentially helpful to understand if there are chances of betrayal by any actors, which could lead to reversal of actors' positions, destabilising the network. In this respect, the extent of technology adoption achieved by teachers and students is crucial.

### 8.1.1 Adoption of technology by teachers and students

In this section, I explore factors influencing teachers' and students' acceptance and use of technologies widely used during the term and how it helped to mobilise more alliances to extend the actor-network created. In an ANT-influenced study, focusing on human actors may be criticised by ANT proponents; however, as the study focuses on developing students' CoreLife Skills using technology, investigating factors affecting technology adoption by teachers and students is highly significant.

Keller (2006, p. 2) states that the "enthusiasm of the few" is essential, but sustainable acceptance and use of technology by a critical mass of users will lead to successful implementation of technology. This study does not aim to measure the success of technological implementation but to understand how it is assembled for CoreLife Skills development. Hence, I am interested in identifying factors that influence the acceptance and use of technology by teachers and students who represent the critical mass of users, as their technology acceptance is important in assembling and maintaining a sustainable actor-network.

I discuss the acceptance and use of three technologies - eCourse, ePortfolio and mobile devices by teachers and students using the lens of UTAUT (discussed in section 2.5.1). I analysed how the four UTAUT constructs - performance expectancy, effort expectancy, facilitating conditions and social influence - impacted technology adoption. At the core, the UTAUT model uses 'behavioural intention' as a predictor of the technology 'use behaviour' (Thomas, Singh, & Gaffar, 2013), which will be helpful in assessing the sustainability of the network.

#### 8.1.1.1 eCourse (Moodle)

Technically all students and teachers are enrolled in eCourse as part of the institute's policy. This does not necessarily guarantee that all those enrolled accept and use its tools and features. Generally, teachers and students who passed through the OPP established themselves as spokespersons and translated the interest of those with whom they are associated to align with the interests of focal actors, and eventually enrolled them to the network (Rhodes, 2009). Thus, both teachers and students acted as spokespersons to motivate their colleagues to join the actor-network. The following statements support the claim:

> "All teachers have been motivating [us] to use all of the technologies. We are persuaded and motivated to use" (Markoz, Student).
>
> "All the teachers and administration encourage. They say use Moodle, ePortfolio it will be beneficial to you" (Emma, Student).
>
> "My friends and teachers encourage me" (Aaliya, Student).
>
> "I have to encourage them (classmates) to use it (eCourse, ePortfolio). Some of them really use it but some don't bother" (Zuhair, Student)

Thus, social influence through teachers' encouragement and peer pressure motivated students to translate their interest to join the actor-network and mobilised more allies. However, social influence need not necessarily lead to successful translation as Zuhair claims that not everyone used technologies recommended by their teachers due to their personal attitude, which is not a UTAUT construct; hence, this will be discussed separately in section 8.1.2.

I reviewed how eCourse influenced the performance expectancy of both teachers and students. Benci (Teacher) explains how her teaching performance improved as a result of integrating eCourse.

> Before the introduction of Moodle, we were using the normal teaching methods. If you see a classroom, it is a heterogeneous group of learners. We can't say that all the learners will learn in the same way when we consider VARK. Someone could be very good in learning through visual or through oral, reading or writing. I want to cover the whole [topic] in understandable way, convenient for the learner, at a very short duration, in an effective manner. All these things are possible only with the help of technology.

Through such detailed explanation, the teacher confirms the benefits of integrating a range of tools available in eCourse to meet the needs of diverse learners, resulting in improvement of her teaching performance.

Mostly students also felt that eCourse helped to improve their *performance expectancy*. Rabia (Student) feels "eCourse is necessary because it help[s] me to learn more things". She uses eCourse to access learning resources, undertake quizzes and check grades. Maazin (Student) states "eCourse helps me because if I lose my hand-out/paper I can go to Moodle and get all my activities". Adnan (Student) states that "Moodle is useful because every college has their own website for uploading assignment[s], presentation[s]. In [ABC Institute] also we have Moodle". Thus, students acknowledge that the ABC Institute follows modern practices to simplify the way students do their work. Markoz (Student) compares the pre-Moodle and post-Moodle era and states:

> [b]ack in the day teacher was the only one who used the internet, printed it (learning resources in the form of hand-out) and gave them [to students]. However, without making all these clutter, student can now access whatever he needs to access through the Moodle. You are saving the environment, benefiting the world and you (the institution, teachers and e-learning developers) are making a lot of things better.

Thus, the learner recognises that eCourse facilitates easy access to learning resources, and provides a paperless environment-friendly platform, adding a new dimension to its range of advantages.

The effort expectancy of teachers and students to use the basic features of eCourse was observed to be high. Generally, teachers could easily upload learning resources such as PowerPoint presentations, activities in word or PDF format and assignment briefs in PDF format. Some teachers extended the use of eCourse tools by adding the Book tool to explain topics, and created a glossary of terminologies. However, teachers with low self-efficacy found it difficult to identify appropriate tools available in eCourse to meet a specific requirement and showed resistance to accepting and using these tools. To translate the interests of these teachers to those of focal actors, facilitation conditions, such as training, allocation of e-learning developers to assist teachers in effectively integrating technology was provided. Sara (Teacher) acknowledged that, as a result, teachers at least used basic features of technology. She added "When queries are there we just take the help of the IT staff (e-learning developers)". Consequently, the *use behaviour* of teachers improved.

While observing students, it was evident that all could log in to eCourse and knew how to access respective course pages for all the units they studied. They could access the learning resources, undertake online tests, open new threads to participate in discussion or reply to existing posts, create wiki pages, check their attendance, grade and feedback easily. So, students' effort expectancy to use eCourse is generally high, which does positively impact their behavioural intention and use behaviour. However, some of them showed reluctance to using these tools not because they did not know how to, but due to their personal reservations, which will be discussed in section 8.1.2.

Facilitating conditions are provided to students in order to ease their use of technology, which they acknowledged to be helpful. Adnan (Student) states, "If there is any new change they [teachers, e-learning team] come to us and tell us that we upgrade something new on Moodle. So they teach us about this". Markoz (Student) also appreciated the support offered by teachers:

> Always teachers were there and they always guided us and it made it easy. However, if there were no teachers and I was learning by myself, it would have been very hard because it [Moodle] is not use[r]-friendly and no guides [are] provided within the website.

The learner highlights the technical limitations of Moodle, which might hinder initial adoption of technology without proper assistance.

So, the preliminary observations show that generally, both teachers and students consider eCourse to be useful. Yet, to get a greater insight about the extent to which they accepted and used three tools of eCourse - discussion forum, quiz and wiki - I next review these three tools closely.

- *Discussion forum*

The forum tool was inscribed in an eCourse page template for the term to ensure integration of discussion forums in each course delivered. However, some teachers integrated them in their teaching.

Markoz (Student) who actively participates in discussion forums and Moodle chat states,

> We have discussions online based, which has boosted our social communications in many ways. We have so many things through which we can communicate and comment and take people's opinion and teacher's opinion without the need of calling or having direct contact with the person at one's own pleasure and luxury.

Markoz (Student) highlights two significant benefits of online discussion forums. Firstly, it develops the communication skills through social collaboration and information exchange. Secondly, it offers flexibility to communicate asynchronously without direct contact. These benefits promote students' performance expectancy.

Shank (Teacher) claims, the "[d]iscussion forum is quite often used by me". Markoz (Student) states, "He [Shank] used a lot of discussion topics which helped to create a better communication base with the teachers and the students, and ease the process of understanding the [topic]".

The teachers' and students' views related to discussion forums confirms Grabinger and Dunlap's (2000) assertion that collaboration helps learners to validate their learning experiences, though in order to achieve this, they require a level of articulation to collectively build knowledge and get a deeper understanding of what is being studied. However, students with language barriers had problems in articulating their thoughts and ideas and could not contribute much to the forum.

According to Shana (2009), a discussion forum:

> provides better cognitive and exploratory learning (Haggerty et al., 2001), increased student-to-student discussion and cooperation (Kassop, 2003; Stodel et al. 2006), superior learner empowerment (Kassop, 2003), and upgraded critical thinking skills (Shapley, 2000; Collison et al., 2000) (p. 217).

However, the actual purposes of a discussion forum as explained by Shana was barely achieved, as most of the students did not engage in exploratory learning as

they refrained from commenting on others' posts, which would have demonstrated their critical thinking skills. This shows that communication skills and critical thinking skills cannot be achieved by just using discussion forum tools; rather, human intervention is required in this socio-technical interaction.

- *Quiz*

During inscription, ten online tests were added to the course page template based on the assessment plan for the term. The e-learning developers offered the facilitating condition by creating online quizzes in eCourse. This restricted the teachers from adopting quiz tools for design and development, though it helped to mobilise more teachers with low technological self-efficacy to engage in the technological innovation as their work was shared by e-learning developers.

Both teachers and students identified potential benefits of online quizzes. Sara (Teacher) states: "I think online quiz is good for them to test their knowledge. Even if they make mistakes they are given a chance to reattempt which I think helps them to learn where they have gone wrong and rectify those mistakes". Azar (Student) shares a similar view: "Online quiz is better than the written quiz. You have a mistake then you can take it again". This is also acknowledged by Emma (Student) who states: "It (Online quiz) was very helpful as the questions kept repeating. So the information that you were noticing were stuck on your head". Thus, students recognised that repeating the quiz multiple times helped them to reinforce their understanding and thereby improve their performance efficiency. However, repeating the quiz multiple times is self-directed and requires students' initiative.

In contrast, Maazin (Student) does not think that an online quiz has an edge over a paper-based quiz as he states: "if the quiz is online or physical by the end of the day you learn something. So, it does not make a difference if it is online or paper based". However, he still did the online test as it was the institute's requirement.

While assessing effort expectancy, Zaida (Student) states, "When I am free I can just do some online quiz anywhere. The quiz is much easy. You don't have to think, you can just select the answer from whatever is given to you". Zaida's response highlights the benefit of blended learning that allows learners to work anywhere, anytime. However, it also raises concern as it gives the impressions that she finds the quiz easy because she can randomly select any answer, which does not serve the actual purpose of developing a reflective form of thinking from using the quiz.

Benci (Teacher) states that the automatic grading and feedback facility of the quiz tool is rewarding as it saves teachers valuable time. "Feedback of the quiz results is most important. I am not going to sit and manually correct […] So it makes my job very easy. … I can track my learners' progress quickly and can respond accordingly".

This empirical evidence shows that effort expectancy has a positive impact on performance efficiency*;* hence, it is a motivating factor for both teachers and students to use the quiz tool. Thus, power dynamics applied through the assessment plan mostly played a crucial role in mobilising students to attempt quizzes and extend the actor-network, though some did not appreciate how the

online quiz helped them to assess and improve their knowledge and understanding and promote independent learning skills.

- *Wiki*

The eCourse page template designed for the term did not include a wiki by default but was added, based on teachers' requirements. The teacher encourages students to develop a wiki page by explaining the benefits of using it to facilitate collaborative learning and team work. Thus, the teacher acted as a translator to bring about both technological translation through insertion of a wiki tool in eCourse and social translation, by influencing students to create wiki pages.

Students appreciated working in a group. Ayeza (Student) says: "Team work is the most important thing in [the] workplace". Groups of 3-4 students collectively developed their respective wiki pages. Zaida (Student), a member of the group, enthusiastically explained that they "collected information from the YouTube, Google, and website to create this wiki page. Everybody [had] to share work. Some [identified a suitable] video, some of them [compiled] the information, some of them [created] the wiki page".

A wiki allows multiple users to edit the wiki page and embed YouTube videos and images in addition to text. However, technology alone cannot bring about desired outcomes unless the students personally show interest in working collaboratively while creating the wiki page.

I also investigated the behaviour intention and use behaviour of both teachers and students to identify if they plan to continue to use eCourse in subsequent terms and maintain the actor-network.

Sara (Teacher) is motivated to use eCourse as regular enhancement simplifies her work. “We are upgrading whatever already exists and every time we improve our technology, such as Moodle, it is always beneficial. I would definitely like to use it if it makes my work simpler and faster”.

The learners wanted to take advantages of the learning resources disseminated through eCourse in order to help them complete their assignment, as evident from Adnan’s (Student) statement. “Everyone use[s] it (Moodle) because they (teachers’) upload assignments. We download assignment briefs and presentations to do the assignments and upload our assignments. I see news; calendar to know when is the holidays, the submission date”.

Generally, it was observed that learners give high significance to assignments as it is directly linked to their grades. So, assignments play a vital role in translating the interest of students to use eCourse or any technology. Thus, it is evident that eCourse was adopted by teachers and students considering performance expectancy, effort expectancy, facilitating conditions and social influence, the four UTAUT constructs, only through socio-material translation. However, development of students’ CoreLife Skills is achievable only when they take personal interest in achieving the specific goal and use technology effectively to achieve the intended objective.

#### 8.1.1.2 ePortfolio

The ABC Institute implemented ePortfolio after giving training to its teachers just before the beginning of the term. Consequently, teachers did not get enough time to practice and faced challenges during class to answer students' queries. The e-learning developers assigned to each teacher helped to resolve issues and ensure smooth implementation of technology. Thus, training and support from e-learning developers are the facilitating conditions provided by the ABC Institute to encourage adoption of ePortfolio by teachers.

The teachers included tasks to create ePortfolio in assignments of the *Personal and Professional Development, Career Planning,* and *Working with and Leading People* courses. In the first two courses, students were required to produce their Curriculum Vitae and prepare their personal developmental plan whereas, in the third course, the students had to perform a group activity and record evidence of their work by creating a page in the ePortfolio. Teachers motivated students to create their ePortfolio to enhance their chances of employability. Adnan admits that his decision to use ePortfolio was influenced by his teacher. "Last time [my teacher] explain to me that if I go for interview, I can show them ePortfolio to explain what I am studying. It makes me feel good". Maazin (Student) states: "I used ePortfolio to create my own personal portfolio to show my CV because it is more 21st century way and it is much professional. What my teacher said that people (employer) will go on to my ePortfolio and see what kind of stuff I have done and what I know. It will help me a lot". Ayeza (Student) also admits that: "ePortfolio will help me in getting my future job".

Additionally, realising the potential benefit of ePortfolio, Markoz (Student) advocated the use of ePortfolio to his classmates. He says "ePortfolio is something great [and] I

do encourage. Although several students may not find the time it is something that should be encouraged and should be used". Realising the potential benefit of ePortfolio, Markoz (Student) advocated the use of ePortfolio to his classmates and helped to mobilise more students to use ePortfolio.

Thus, both teachers and students influenced other students to adopt ePortfolio by highlighting its significance in seeking jobs. Also, the performance expectancy of students was high as they were convinced that ePortfolio could help them to get a job, which proportionately influenced their behavioural intention. Adnan (Student) developed competency in using ePortfolio in a short span of time as he says, "in ePortfolio, I put my information and directly it makes my CV. It is so easy. You can upload whatever you want people to see like media or certificate".

However, the effort expectancy of most of the students was low as they did not get sufficient time to practice. "I am still in the process of learning how to use ePortfolio properly but I use Moodle better. It is simple" Emma (Student). Another student, Aaliya said, "Moodle, I know but ePortfolio is difficult for me because it is new and I don't know so much. But then I will use it again"; and Zuhair (Student) suggested, "I have a bit of [a] learning cure. If I keep trying different option[s] in ePortfolio then I might find it easy like Moodle".

Emma, Aaliya and Zuhair compare the ease of using Moodle with ePortfolio and find that ePortfolio is more complex, primarily because they are not conversant with using different tools and features of ePortfolio. However, prolonged use of Moodle by both teachers and students has improved their degree of ease. This confirms the finding of Cresswell et al. (2010) that "over time users get more proficient in using software and

to some extent find ways to accommodate it within their existing work practices" (p. 4).

Generally, participants used ePortfolio around twice or thrice a month and for limited time compared to Moodle, which they used almost daily for prolonged hours. The results show that the use behaviour impacts the effort expectancy. Due to infrequent and limited usage of ePortfolio, students did not explore the different tools and features of ePortfolio, or were not able to recall them when they used them next time. This is contradictory to the assertion made by Venkatesh et al. (2003) that effort expectancy influences behavioural intention to use the system, which in turn influences the use behaviour. Despite limited experience of using ePortfolio, the UTAUT factors that persuaded students to adopt it include the social influence from teachers and peers and performance expectancy that creating an electronic portfolio would enhance chances of securing a suitable job. Above all the power applied by assignment was critical in motivating students to create their ePortfolio; though application of power is not a UTAUT construct. However, reviewing around 20 students' ePortfolio, it was evident that not all students exploited the full potential of the technology. Most of them developed their résumé, some created their developmental plan and some also created pages. Though "e-portfolios are being used as a tool to stimulate 'reflective learning' and to develop the habits of responsible, self-directed learners"( AFLF, 2009, p. 27), there was no empirical evidence found of using ePortfolio as a reflective tool.

#### 8.1.1.3 Mobile devices

In the ABC Institute, most teachers and students use smartphones, but a few either did not have or did not use one. The free secured Wi-Fi connectivity provided by the ABC Institute ensured that all of them had access to the Internet. So, one may assume that anybody who has a mobile telephone has already adopted the device. However, I analysed factors that influence teachers and students to adopt mobile devices from the perspective of teaching, learning and CoreLife Skills enhancement.

Students preferred mobile devices over computers or laptops for performing simple activities considering the high effort expectancy, especially due to their smaller size, preinstalled apps and availability as evident from the following statements. "Sometimes when I am doing my assignments in the laptop, I feel I have to open Google Translate in my phone because it is in my hand. I have the app for translate and it [opens] faster" (Aaliya Student); "I don't [like to] open multiple tasks or another tab on my computer so, I use my phone to get extra information to go to other websites" (Emma, Student); and "I use mobile for translating difficult words. I have dictionary app. Also, I can download some books and read it" (Rabia, Student).

I also observed a student who used Google Translate app installed in his mobile telephone to click the picture of a task written in English printed on a paper. The app converts the picture to electronic text and translated to Arabic. These features were not introduced to them by teachers but they had about learnt them from fellow students. This shows that based on their requirements, students are willing to explore different features of mobile apps to support their learning.

Some of the teachers and students used mobile devices as they improve their performance expectancy. For instance, teachers were observed to video record presentations or audio record speaking tests using their mobile devices to use them as supporting evidence of students' work or for later use. Aaliya (Student) states: "We recorded [the meeting using] the [mobile] phones because after that we [had] to listen again and write". Thus, the audio recording helped in preparing the meeting minutes to complete a class activity.

I observed some students and teachers who accessed eCourse from their mobile telephones. Emma (Student) states: "I can also access Moodle in my mobile and see my attendance, resources". To easily access eCourse from mobile, some teachers and students installed Moodle Mobile App. It helped teachers to receive notifications on assignment submissions in their mobile device, to plan grading. Also, students received notification when the grades were released. Some teachers configured their mobile devices to access the institute's mailbox and stay up-to-date with office communications.

Generally, both performance expectancy and effort expectancy positively influenced teachers and students to adopt mobile devices. However, effort expectancy associated with use of mobile devices varied between teachers and students based on their individual interest and needs, though the devices offered a range of features. For example, Adnan (Student) states: "I use iPhone. It is like computer; nothing less nothing more. You can download the apps and […] it is easy to work from my mobile. Secondly, recording audio or video using mobile devices and transferring to laptop was easy".

As Norvin (Manager) anticipated, the major challenge the teachers faced while students used mobile devices in class was that they easily got distracted. Benci (Teacher) said, "though students are using mobile to do class activity but they are also doing something else. It is very difficult to track". Azar (Student) acknowledged that, "using mobile is [causing distraction] from WhatsApp, Facebook. Still we can use it". Since benefits of using mobile devices outweigh the drawbacks, teachers accepted it as a mediating tool for teaching, and students were happy to adopt and use mobile devices for learning.

Having reviewed the adoption of eCourse, ePortfolio, and mobile devices using the lens of UTAUT, it is evident that apart from the four core constructs of UTAUT - performance expectancy, effort expectancy, facilitating condition and social influence, there are other factors like performance of power, personal attitude and technological glitches that influence adoption of technology by teachers and students, which are discussed further in the subsequent section. Overall, the behavioural intention of teachers and students to adopt technologies used in the ABC Institute was more concerned with the performance expectancy as evident from the following comments: "I think use of technology is very useful, it enhances whatever I am teaching in class. It is always more effective for the learners also" (Sara, Teacher); "The factors that influenced me to adopt technologies used in [ABC] Institute are that it will simplify my work, make my work easier" (Markoz, Student); and "Using the technology makes my learning easier" (Rabia, Student).

Thus, using an ANT approach, I explored wide-ranging factors that influence teachers and students to adopt technology that extends beyond social factors, such as personal

attributes, benefits, ease of use, social influence, facilitating conditions and covers power applied by materials, such as assignments, policies and curriculum. An improved understanding of these factors would help focal actors to increase teachers' and students' acceptance and use of technologies to meet the set objectives.

### 8.1.2 Identification of source of enablers and inhibitors

Drawing on the empirical results from Chapter 6, Chapter 7 and section 8.1.1, I identified numerous factors that support the formation and sustainability of the actor-network created during the term. However, I could also identify factors that minimise mobilisation of allies or inhibit the sustainability of the network in the ABC Institute. Since these factors are discussed in greater details in these chapters and section above, I will only briefly summarise them in the following subsection.

#### 8.1.2.1 Preparing teachers for technological innovation

The ABC Institute identified teachers to be key stakeholders for implementation of technology. So they were oriented towards the need to enhance students' CoreLife Skills and the institute's plan to use technology for achieving the objective. The e-learning developers trained teachers on ways of integrating technology for the purpose. This confirms Richardson's (2000) and Strudler and Wetzel's (1999) findings that as teachers play a significant role in drawing up well-articulated school-level ICT policy and implementation process, these should be articulated to them explaining why and how they are expected to integrate technology in their lessons.

#### 8.1.2.2 Technological infrastructure

The ABC Institute provides suitable technological infrastructure as per the institute's blended learning policy to ensure that students learn at least part of the content and instruction via digital and online media with some element of students' control over time, place, path, or pace. The institute offers Moodle, ePortfolio, and facilitates integration of technology in classrooms and laboratories by providing Wi-Fi connectivity, projectors and computers. Thus, the ABC Institute took care of issues that could limit effective integration of blended learning including internet access, power, networking equipment, and facilities (Bailey & Martin, 2013).

#### 8.1.2.3 TEL-CSD framework

The TEL-CSD framework clearly maps learning skills and cognitive skills against the CoreLife Skills and identified relevant technologies that could facilitate creation of activities at specific levels of Bloom's Taxonomy. It acts as a translator and facilitates teachers and e-learning developers to effectively design and integrate technology in the classroom. Thus, the TEL-CSD framework provides a descriptive framework to help teachers plan and design a good learning experience, as suggested by Williamson and Redish (2009).

#### 8.1.2.4 Technical guidance and support

The technical guidance and support provided by e-learning developers to teachers was helpful for effective integration of technology to enhance students' CoreLife Skills. Sara (Teacher) acknowledged the support received from an e-learning developer by saying: "I don't go into the technical aspect of it. It is the IT department which does it

for us. Then for me to [integrate technology] is very simple". This division of responsibility motivates teachers to continue their alliance with the focal actors.

IT support was extended to both teachers and students to address technical issues, provide advice, training and workshops to maintain the actor-network. Lack of technical support is identified to be one of the top three barriers to technology integration in a study conducted in an UAE university (Schoepp, 2005).

#### 8.1.2.5 Professional development training

As per the institute's staff development policy, professional development training was provided to teachers at regular intervals to ensure they maintain their alliance. As proposed by Glazer, Hannafin, and Song (2005) the training was not limited to simply learning about a new tool but extended beyond this by providing mentoring support throughout their development of activities.

#### 8.1.2.6 Raising students' awareness about CoreLife Skills

Raising awareness about significance of CoreLife Skills and links of programmes delivered in the ABC Institute with local industry and business need was significant in influencing students to translate their interest with those of focal actors. They were informed that many employers in the UAE think that students have insufficient employability skills, such as working with teams, and strong communication skills especially in English, which they look for in a cross-cultural work environment (Kapur, 2013).

### 8.1.2.7 CoreLife Skills and technology integrated curriculum

Development of a comprehensive curriculum in which CoreLife Skills and use of relevant technology are clearly mapped to the performance criteria is significant for effective integration of the two. It will also facilitate teachers to easily integrate both while delivering the curriculum. The qualifications offered at ABC Institute are developed as per the VETAC Q+NOSS system guidelines that require performance criteria in unit standards to be mapped to one or more CoreLife Skills (NQA, 2014). When CoreLife Skills are already embedded in the curriculum, the ABC Institute must employ a range of initiatives to make them more explicit to students, as is done in many universities (Cranmer, 2006).

### 8.1.2.8 Power dynamics

The power dynamics applied by the ABC Institute managers and teachers through negotiation, persuasion, seduction, or force, in the form of materials, such as graded assignments, assessment plans, the Staff Development Policy and Blended Learning Policy, was crucial in mobilising allies. For instance, teachers added assignment tasks that required students to use technology to achieve specific performance criteria and enhance their CoreLife Skills. As assignments are linked to grades, they apply power to mobilise students to form allies. Vess (2004) confirms that students rarely explored web resources unless it was required for a specific graded assignment. Thus, the assignment acts as a translator that defines what teachers and the ABC Institute managers desire to obtain. Thus, power dynamics were influential in aligning the interests of those who were rigid in accepting and using technology to promote students' CoreLife Skills. However, sustainable use of technology by such users to

meet the purpose cannot be guaranteed because the moment the factor enforcing power is removed from the actor-network, the user or actor is likely to stray.

#### 8.1.2.9 Insufficient time to practise new technology before implementation

Teachers in general felt that they did not get enough time to explore technologies for effective integration in the classroom. This is a common issue identified in numerous studies (Ertmer, 2004; Goktas, 2009; Goktas et al., 2013; Mumtaz, 2000; Richardson, 2000; Schoepp, 2005). For example, Sana (Teacher) who did not get enough time to experiment with ePortfolio states: "I wasn't well versed with it (ePortfolio) so I had to call in for an IT specialized person to [help]. Now […], every time there is a glitch or problem that a learner faces, the expert needs to be called".

This also supports Coppola's (2004) assertion that effective use of technology depends on a teacher's sound knowledge of technology, pedagogical knowledge and skills; otherwise a lot of precious instruction time will be wasted. As a result, the teacher felt that she lost her credibility in front of the students due to her inability to clarify basic technical questions. Such feelings increase the chances of a teacher's betrayal of the actor-network.

#### 8.1.2.10 Issues related to multimedia based interactive online resources

According to Neo and Neo (2001), multimedia-based interactive learning resources focus on problem-based learning solutions and promote students' creative and critical thinking skills, skills of working collaboratively as a team, and exposure to real-life

situations of problem solving. Hence, I asked ABC managers to reflect on their perceptions and uses of interactive online resources in the institute.

Ubert (Manager) claims that: "offering interactive online resources will help to develop independent learning skills especially for English, problem solving in mathematics and research". However, Mohannad (Manager, E-learning Team Leader) admits that: "it is challenging to develop interactive teaching and learning resources. The problem is we need someone to review and approve the content. We need subject experts, someone from the industry to advice how to develop good quality learning resource". Tony (Manager) suggests to:

> have a dedicated team to develop resources, activities, quality assured, all approved then we can use it, revisit to suit a specific requirement […] It is great idea to have that but who is going to do it. We don't have enough resources. We have the problem with the time.

Ubert identified that use of interactive learning resources could help students to develop their problem-solving skills. Further, Neo and Neo (2002) report that interactive multimedia resources focus on development of self-directed learning, and Oyibe, Edinyang, and Effiong (2015) recognise that problem-solving is a cognitive learning strategy developed in self-directed learning. Thus, multimedia-based interactive learning resources need to be developed with a focus on self-directed learning and problem-based learning that enable learners to demonstrate their problem-solving skills. However, Mohannad and Tony (Managers) identified factors, such as lack of resources to develop interactive materials and lack of time to develop and quality assure developed resources, hinder the development of interactive learning resources. Moreover, it is difficult for academics (in this case teachers) to develop such resources using multimedia authoring tools that require technical skills

and also quite challenging for them to integrate multimedia materials in the classroom (Neo & Neo, 2002). Alternatively, readymade interactive resources could be purchased or freely available resources used. However, reviewing a few samples of interactive resources as an e-learning developer, I found most are not suitable for ABC Institute students, primarily because either they are not culturally appropriate or the level of English is too high. Thus, development and integration of appropriate interactive learning resources to facilitate enhancement of students' CoreLife Skills is challenging.

#### 8.1.2.11 Technical limitations and glitches

Generally, technology is considered to help its users to ease their work and improve work performance. However, some may experience technical issues or some limitations while using these technologies, which restrict use: "eCourse is good but it just doesn't grab the person's attention. Once you click the menu it just stutters and it is just not from the Wi-Fi, it's just not from the computer, it is from the menu itself. There should be better coding" (Markoz, Student). Ayeza (Student) said, "Sometimes I type my answers in an activity (e.g. online questionnaire) and I am not saving it, so once internet connection is lost, I don't find my answer. It happens a lot".

Most of the classes were held in classrooms where learners used their own devices to access the learning resources. Sana's (Teacher) concern is that in students' devices: "the versions are different, uses different processors, version of word (MS office). We need to really think […] actually how much of technology can be integrated". It is quite challenging to ensure that a technology-integrated activity will work well across

all devices such as laptops with various versions of Windows, MS Office, Mac Book, iPad, Tablet, iPhone, and other smart devices.

A problem was witnessed in a *Business Online* class, when online web prototype designing software used in class worked smoothly in Internet Explorer but failed in Google Chrome due to technological glitches. As a result, three students who did not have Internet Explorer installed in their laptop could not perform the task along with the rest. The teacher attempted to install it on one of the student's laptops but did not succeed as some other prerequisite files were missing. However, not all teachers are competent to address technical issues during the class and it may not be always possible to get immediate technical support. Such technical issues were observed to cause frustration to both teachers and students and demotivate them from continuing with such activity, resulting in destabilising the network. This finding supports Zhao and Frank's (2003) assertion that teachers may opt to use technology in their teaching only if there is a strong need as it is inherently unreliable and can break down at any time.

#### 8.1.2.12 Low technological self-efficacy of teachers

It was observed that teachers with low technological self-efficacy found it difficult to design and integrate technology to enhance students' CoreLife Skills. This was evident from the eight case studies in which teachers with high technological self-efficacy integrated technology at a higher level of LoTi and consequently students could generate a higher level of HEAT The findings confirm Koh and Frick's (2009) assertion that there is a positive relationship between a teacher's computer self-efficacy and computer technology integration in the classroom. Studies reveal that

many VET teachers lack "e-facilitation skills required to support the use of e-learning for 'cooperative learning' and interpersonal skills development purposes" (Bowman & Kearns, 2009, p. 14). Teachers with low technological self-efficacy and e-facilitation skills preferred traditional approaches without using technology. Hence, training and support provided by e-learning developers did not help them enough to pass through OPP. Those with low or medium self-efficacy formed alliances by accepting focal actors' interests when they received support from e-learning developers. However, this alliance is vulnerable since the moment they lose their confidence on the external support, they may stray and destabilise the network.

#### 8.1.2.13 Teachers' willingness to adopt technologies

In the ABC Institute, while some teachers were willing to accept new technologies some had concerns. For instance, Sana (Teacher) states:

> I think the willingness of a person to adapt to changes is a very individual factor. Some people may be probably rigid because of their own individual, mental makeup that they don't want to adopt anything new […] You cannot force technology to someone. If you force in technology which is one size fits all then we might not succeed. There has to be a need and the passion associated with it.

Dawes (1999) acknowledges that teachers' resistance to change is prevalent in the literature and their decision to use technology is based on confirmation of their beliefs about the effectiveness of these technological innovations. Thus, a teacher's willingness is related to their perceptions and it will not always be possible to persuade them to pass through OPP set by focal actors. As a result, not all teachers could integrate technology at Level 3 or above so that students could generate HEAT at least at Level 3 to demonstrate development of their CoreLife Skills to some extent.

#### 8.1.2.14 Students' intentions using technology

The empirical study reveals that students primarily used e-learning technologies, such as Moodle and ePortfolio to comply with the requirements set by teachers and the institute, without appreciating how it helps them in enhancing their communication skills, collaborative skills, problem-solving skills, and self-management. However, they were found to be self-motivated to use Google Translate, mobile devices for audio and video recording, and websites and apps to facilitate their learning. In general, all four UTAUT constructs - effort expectancy, performance expectancy, facilitating conditions and social influence - positively influenced students' intentions to use technology (Venkatesh et al., 2003), though personal attributes, such as negative attitude, lack of interest, and resistance to change did adversely affect some students from adopting technology.

This ANT-sensitised study helped to explore a range of factors that not only enable actors to maintain a stable actor-network, but also help them to mobilise more allies. It also helped to identify issues that focal actors need to address in order to ensure that the actor-network is sustained and not destabilised.

### 8.1.3 Tracing actions for network sustainability

Having reviewed the factors that influence the enhancement of students' CoreLife Skills using technology, appropriate actions were taken to ensure the sustainability of the network. The teachers who had difficulty in integrating technology were offered assistance by e-learning developers to design and develop their courses. The teachers and students who already passed through the OPP were encouraged to act as *spokespersons* to motivate others to pass through the OPP. Great effort was taken by

the IT department to handle any technical issues faced by either students or teachers to allow them to seamlessly work with technology. Since some students were not willing to do anything extra that does not contribute towards their final grade, the formative online test was made a component of the final grade, assignment tasks were designed to incorporate the effective use of technology to enhance learners' CoreLife Skills along with the achievement of learning outcomes. Above all, the teachers were motivated to integrate technology; at the same time students were encouraged to use it by focal actors and spokespersons. The focal actors also needed to analyse the individual's self-efficacy, personal attitude, resistance to change or willingness to try new approaches using technology, in order to identify suitable strategies to enrol and sustain them in the actor-network.

## 8.2 Creation of a punctualised network

The actor-network was created when the teachers passed through OPP at LoTi Level 3 and succeeded in generating HEAT among learners at Level 3 and above by implementing a technology enhanced learning environment with or without the support of e-learning developers. The actor-network assembled by teachers, students, computers, laptops, eCourse, ePortfolio, handycam, mobile devices, tablets, Wi-Fi connectivity, assignments, etc. reached a state of punctualisation when the students could develop their CoreLife Skills with the use of technology. Thus, for the sustainability of the actor network, any issues that emerged during the implementation of technology or its subsequent use were effectively handled by the teachers, e-learning developers and IT support staff so that all actors continued to maintain alliance to fulfil the set goal.

## 8.3 Summary

This chapter provides a comprehensive review of a range of factors that influence the socio-material assemblage of an actor-network consisting of both human and non-human actors and its sustainability in the ABC Institute. These factors are broadly classified into two - factors influencing the assemblage of the actor-network and those that influence the adoption of technology which is crucial in this research, as it aims to investigate the use technology for the enhancement of students' CoreLife Skills.

# PART IV: RESEARCH CONTRIBUTION AND CONCLUSION

This concluding part of the thesis includes the last chapter - Chapter 9 - in which I summarise the research findings against the research questions. I present the main contribution of the research by analysing the implications of technological innovation on enhancement of students' CoreLife Skills, and assess the implications of using five frameworks – ANT methodological and analytical framework, TEL-CSD, LoTi, HEAT, and UTAUT - in this research. The chapter concludes by identifying opportunities for further research.

# Chapter 9: Conclusion and contribution of the study

In this concluding chapter, I consolidate my research findings and their contribution to knowledge. Considering my nine years' teaching experience and five years' active participation as an e-learning developer in the ABC Institute, I conducted an endogenous research study using an ANT approach. My IT background was pivotal in choosing ANT as my research approach, as it focuses on "science and technology in the making" as opposed to "ready-made science and technology" (Latour, 1987).

The ABC Institute seeks to implement contemporary educational practices for overall development of students' knowledge and skills and encourages integration of technology for effective teaching and learning. Thus, this philosophy formed the basis of my research exploration. I advanced my interest in using technology for effective teaching and learning for enhancement of students' CoreLife Skills by translating the interests of both human and non-human actors engaged in the translation process. To unfold this translation process, I adapted the ANT concept of sociology of translation (Callon, 1986a) to develop an ANT methodological and analytical framework, which details what a researcher could discuss under each of the four moments of translation - problematisation, intéressemment, enrolment and mobilisation of allies. For mobilising the allies to develop a sustainable actor-network that integrates technology for enhancement of a student's CoreLife Skills, I also explored factors influencing technology adoption by teachers and students.

## 9.1 Addressing the research questions

In my research, I addressed two principal research questions. In the first, I pose the question '*How is CoreLife Skills development among students being assembled in a VET institute through technological innovation?*' Using an ANT methodological and analytical framework, I analysed the socio-material translation undergone by a range of actors while assembling an actor-network in the ABC Institute, which is elaborated in Chapters 5 through 8. I addressed the three research sub-questions of the first principal research question in Chapter 6, Chapter 7 and Chapter 8.

In Chapter 5, as part of problematisation, I discussed the first moment of translation, in which I found lack of CoreLife Skills among graduates to influence their employment prospects. To address the problem, I proposed to integrate technology during teaching and learning to enhance students' CoreLife Skills. As focal actor, I identified and defined the roles of the main actors who would assemble an actor-network with the aim of integrating technology to enhance students' CoreLife Skills. To ensure that the interests of all main actors were aligned and a socio-material assemblage of human and non-human actors was formed to fulfil the set objectives, I defined the OPP using the LoTi and HEAT framework. Integration of technology by teachers at LoTi Level 3 leading to generation of HEAT at Level 3 among students was set as an OPP with the expectation that it would lead to reasonable enhancement in students' CoreLife Skills.

In Chapter 6, I discussed how, as an e-learning developer and researcher, during the second moment of translation - intéressemment, I negotiated with managers of the

ABC Institute to align their interest in developing students' skills with my interest in using technology to achieve that. To accomplish this translation, I addressed the research sub-question RQ 1.1: '*How can a technology implementation framework be developed that facilitates CoreLife Skills development among students?'* I unfolded the sequential development of the TEL-CSD framework that comprises of four key components - technology, CoreLife Skills, Bloom's Taxonomy and Learning Skills based on adult learning principles (Precision Consultancy, 2006). The implication of using TEL-CSD framework on the development of the seven CoreLife Skills is discussed in section 9.2.3.

In Chapter 7, I discussed how enrolment strategies, such as negotiation, persuasion and/or force were applied by some focal actors to translate the interests of other actors to those of focal actors and eventually enrol them in the network. This addresses the research sub-question RQ1.2: *'How do human and non-human actors engage in translation to achieve the goal of developing students' CoreLife Skills through technological innovation?'* Using eight cases of technological innovation, I presented how technology was integrated at LoTi Level 1 through Level 5 producing equivalent HEAT and the key findings are summarised in section 9.2.2. The impact of the assemblage of a range of human and non-human actors, such as the TEL-CSD framework, UTAUT model, teachers, students, e-learning developers, managers, eCourse, ePortfolio, Google Translate, online dictionary, YouTube, Vimeo, mobile devices, curriculum, and CoreLife Skills, on the development of each of the seven CoreLife Skills is further discussed in sub-section 9.2.3.

In Chapter 8, I address research sub-question RQ1.3: '*What enables and inhibits actions to shape technology and the network for developing CoreLife Skills?'* and the second primary research question RQ2: *'How does technology adoption by teachers and students influence the technological innovation to enhance students' CoreLife Skills and what is the usefulness of UTAUT as a technology adoption model?'* I identified factors influencing the sustainability of the actor-network created through the socio-material assemblage of human and non-human actors, which are broadly classified into two: factors that influence technology integration for enhancement of students' CoreLife Skills; and factors that impact the adoption of technology by teachers and students. The factors influencing adoption of technology are critical in creating a sustainable network as technology adoption is crucial for effective technological innovation. The use of the TEL-CSD framework, communication of the institute's goals to stakeholders, such as teachers, students, e-learning developers; and policies, such as blended learning policy and staff development policy; new student orientation; support provided by e-learning developers and IT help desk; curriculum with details of CoreLife Skills; and use of technology, assignment briefs, interactive online resources; and use of a range of devices by students, all influenced the assemblage of the actor-network. On the other hand, factors identified to influence adoption of technology by teachers and students include self-efficacy, time, willingness to embrace technology, power dynamics, personal characteristics and other UTAUT factors, that greatly impacted the integration of technology for development of students' CoreLife Skills. The key findings related to the usefulness of the UTAUT model in studying technology adoption is discussed further in section 9.2.4.

## 9.2 Implications of this research

In this research, I have weaved in five different frameworks: the ANT methodological and analytical framework, TEL-CSD, LoTi and HEAT (Moersch, 2010), and the UTAUT model (Venkatesh et al., 2003) - fittingly to effectively convey my ANT story of technological innovation accomplished in the ABC Institute. The following sub-section reviews the implications of the five frameworks and my research findings on extending the knowledge in the area of ANT sensitised educational research, technology integration frameworks for the advancement of students' CoreLife Skills, factors influencing technology adoption, and usefulness of UTAUT to assess it.

### 9.2.1 ANT in educational research

Of the range of ANT concepts discussed in section 3.2, Callon's (1986) sociology of translation is more a methodology, a way of doing sociology than a theory. However, I could find limited educational research informed by this ANT concept (e.g. Hamilton, 2011; Luck, 2009; Tatnall, 2010) probably because the sociology of translation concept of ANT is not entirely credited by some ANT proponents. In this study I advance an ANT methodological and analytical framework by extending the sociology of translation and drawing on the work of McBride (2000) who presented ANT as an analytical tool, and Carroll, Richardson, and Whelan (2012) who presented it as a research methodology. The framework was helpful in analysing the socio-material assemblages to unfold the ANT story of technological innovation undertaken in the ABC Institute. By exploring different realities experienced and enacted by different actors, I could get a nuanced picture of the dynamic relationships between different actors and identify factors that influence them to undergo translation with the aim of enhancing students' CoreLife Skills, which is discussed in section 8.1.2. However, the

limitation of the approach is that the analyst cannot judge the outcome of a process as they can only look backwards to what has happened and not what might happen, because the contingent character of transformation makes it unpredictable (Eden, Tunstall, & Tsapsell, 2000). Consequently, it curbs the possibility of claiming knowledge from my findings and hinders generalizability of the research findings. Nevertheless, the framework facilitates pragmatic application of the sociology of translation and promotes effective analysis of the trajectory of changes undergone by actors in building an actor-network to meet the set goal.

### 9.2.2 Technology integration informed by the LoTi and HEAT frameworks

I have used the LoTi and HEAT frameworks as a lens to analyse and present my research findings, unlike as a conventional quantitative approach to test a hypothesis. Table 9.1 summarises my research findings by showing the correlation between technology integration achieved by teachers in each of the eight cases by mapping them to different LoTi levels, the corresponding HEAT generated by students and its implication on development of students' CoreLife Skills.

Although there is no direct correlation between level of HEAT and CoreLife Skills, based on my empirical findings, I propose that at higher levels of HEAT there is an increased possibility of enhancing students' CoreLife Skills as evident from Case 3 through Case 8 wherein integration of technology at LoTi Level 3 and above, resulted in generation of HEAT at corresponding levels.

| Cases | Technology integration by teachers (LoTi) | Impact of technology use on students (HEAT) | Implication for development of CoreLife Skills |
|---|---|---|---|
| Case 1 | **LoTi Level 2:**<br>Assemblage of internet, website, search engine, Google Translate, online dictionary, teachers, students | **H**: use of technology for knowledge and comprehension<br>**E**: students could select companies of their choice to complete task, which improved their engagement<br>**A**: provided authentic context by letting students know more about international brands of companies<br>**T**: act as a facilitator for collecting and organising information, although their use is not essential for completion of the given task | Helped students to collect and organise information |
| Case 2 | **LoTi Level 3:**<br>Assemblage of Moodle questionnaire tool, students and teacher. | **H**: apply analytical skills, higher order thinking skills<br>**E**: greater engagement due to new approach of learning using technology<br>**A**: evidence of offering authentic learning environment<br>**T**: use of technology was not essential for the accomplishment but has potential benefit | Enabled deeper understanding of the underlying knowledge and improved students' analytical skills |
| Case 3 | **LoTi Level 3:**<br>Assemblage of MS Excel, students and teacher | | |
| Case 4 | **LoTi Level 4:**<br>Assemblage of curriculum, assignment brief, presentation software, laptop, video recorder, projector, remote, students, TEL-CSD framework, and teacher | **H**: demonstrated higher order thinking skills while performing these tasks as they had to apply their knowledge and analyse information gathered<br>**E**: greater engagement of students with peers, teachers and technology<br>**A**: provide extensive real world relevance though they did not get opportunity to apply their learning in a real world situation<br>**T**: use of technology is integral part of task completion and helps students identify and solve authentic problems and develop higher order thinking skills | Students developed a range of CoreLife Skills, such as communication skills, presentation skills, working in a team, collecting, analysing and organising information |
| Case 5 | **LoTi Level 4:**<br>Assemblage of assignments, ePortfolio, TEL-CSD framework, students, and teacher. | | |
| Case 6 | **LoTi Level 4:**<br>Assemblage of Moodle-wiki, search engine, students, TEL-CSD framework, teacher, and website | | |
| Case 7 | **LoTi Level 5:**<br>Assemblage of assignment brief, laptop, Moodle, website, MS Excel, presentation software, remote control, students, teacher, teacher's Samsung mobile, TEL-CSD framework and Vimeo | **H:** students demonstrated increased cognitive thinking skills to address issues that required analysis and evaluation<br>**E:** engagement was not just confined to peers, technology and teachers but extended to local community<br>**A:** integrated assignment gave learners' opportunity to get a holistic view of doing business; students' got real world experience by visiting DED website to determine licensing cost to set up a business in Dubai and also designed and developed their own website<br>**T:** use of technology was an integral part of task completion | Demonstrated a range of CoreLife Skills such as problem solving, communication skills, information management, working in a team, initiating and organising self, application of a range of technology |
| Case 8 | **LoTi Level 5:**<br>Assemblage of assignment brief, Google forms, Moodle forum, students, teachers, TEL-CSD framework and web authoring software | | |

*Table 9.1Summary of eight technological innovations and their implication of CoreLife Skills using the lens of LoTi and HEAT framework*

### 9.2.3 Role of technology in enhancing students' CoreLife Skills

For identifying appropriate technology to enhance specific CoreLife Skills, I translated the employability skills model of the AFLF (Bowman & Kearns, 2009, p. 29, Figure 5) and advanced the TEL-CSD framework in order to meet the requirements of the UAE as set out by the NQA. Using the framework, teachers and learning technologists identify suitable technology to integrate in order to achieve a particular learning skill at a specific level of Bloom's Taxonomy leading to enhancement of a specific or a range of CoreLife Skills. My findings suggest that the TEL-CSD framework is helpful in devising an immutable mobile such as an eCourse (Moodle) course page template that can be used as a standard for designing a range of courses offered in the institute each term. Thus, it supports the claim of Williamson and Redish (2009) that "[p]roviding teachers with a descriptive framework, such as the indicators of engaged learning, is especially important to support change. If no criteria are provided, teachers will continue to plan and design the same types of learning experiences that they have implemented in the past" ( p. 40).

The technological innovation carried out in the ABC Institute using TEL-CSD as a guiding framework and integrating different technologies such as eCourse, web search, translator, online dictionary, video, ePortfolio, mobile devices, resulted in the transformation of teaching practices from a teacher-centric approach to a learner-centric one, empowering the students to become independent, which was identified as a major concern by the UAE employers. The impact of these on the development of the seven CoreLife Skills is summarised in Table 9.2. Here, I have not discussed the impact of technology on learning skills and cognitive skills that the TEL-CSD framework includes, as it is beyond the scope of my study.

| CoreLife Skills | Technologies used | Implications |
|---|---|---|
| **Information management:** Skills related to information gathering, analysis, organisation and application of information in a given context | Google Translator and Online Oxford Arabic dictionary, MS Word, wiki, MS Excel | The technology requires human input and it is up to the students and teachers to decide how they wish to benefit from the use of technology to manage information effectively. |
| **Communication Skills:** Ability to communicate information, concepts and ideas | Moodle discussion forum, chat tool, MS PowerPoint presentation, audio/ video recording | Discussion forum, chat tool provides a medium for communication. MS PowerPoint is used to present ideas and concepts in front of the audience. Audio and video recording of communication is done with the intention of using it as a reflective tool to identify areas for improving communication skills. However, YouTube videos and interactive learning resources for developing communication skills will have direct implication on students' communication skills. |
| **Organising self:** Ability to organize self, events and activities by demonstrating entrepreneurial spirit, creativity and innovation | ePortfolio, Quiz | Initiating and organising self-activities including motivation, exploration and creativity are human traits and technology may not directly influence the development of these skills but mediate or assist the development of these. |
| **Working in a team:** Working with others to become a team player and develop leadership skills | Wiki, Moodle discussion forum | Technology is a mediating tool to help students to collaborate and demonstrate their work creativity. Also, it provides a collaborative platform for students to share their views or ideas and critique on others views or ideas. |
| **Problem solving:** Ability to solve problems including mathematical ideas and techniques | MS Excel, Moodle discussion forum, Quiz, | The realistic, scenario based tasks stimulated students' critical thinking and problem solving skills where technology acted as a mediating tool. Incorporating interactive learning resources that give students opportunities to take a range of decisions would directly help to develop their problem-solving skills. |
| **Technology:** Applying information and communication technology (ICT) | Moodle, ePortfolio, MS Word, Excel and PowerPoint, mobile devices, apps, multimedia tools | Students got ample opportunity to use a range of technologies some specific to academic purposes like e-learning tools and others, such as MS Office applications that can be useful in the workplace. |
| **Societal:** Participating in social and civic life including ethical practice | Social media | Social media has been shown to be a useful technology but its use was not encouraged in the ABC Institute; hence I did not explore the use of technology for enhancement of societal skills. |

*Table 9.2 Implication of using technology on CoreLife Skills*

Thus, my findings suggests that integration of technology and cognitive skills in curriculum and assessment promotes students' CoreLife Skills as proposed by

Ranginya and McKenzie (2005) and Schoepp and Danaher (2016), though it is not practical without teachers and students' initiative and technology adoption.

### 9.2.4 Technology adoption

I have used UTAUT as a theoretical lens to analyse factors influencing teachers and students' technology adoption and enrolled it as an actor in the network for assessing its usefulness in studying technology adoption. Hence, the factors that influenced teachers and students to adopt technology and form the actor-network during intéressemment are broadly classified into UTAUT factors - social influence, facilitating condition, performance expectancy and effort expectancy and non-UTAUT factors.

Social influence from the management, fellow teachers and students helped in aligning their interest to the interests of the translator to adopt technology. Providing professional development training and inscription of tools in the eCourse course template are facilitating conditions that eventually facilitated in forming a system of alliance. Many teachers and students considered technology to enhance their work and had high performance expectancy, which also increased adoption. Technologies with simple features increased effort expectancy of teachers and students and encouraged them to use it often. These factors reflect the propositions of Venkatesh et al. (2003).

In addition, this qualitative study helped to identify additional non-UTAUT factors that influence technology adoption. My findings confirm with the findings of many researchers (Ertmer, 2004; Goktas, 2009; Goktas et al., 2013; Mumtaz, 2000; Richardson, 2000; Schoepp, 2005) that insufficient time to explore the different

features of a new technology hinders adoption and effective integration of technology in the classroom. Resistance to change and preference for traditional teaching practices was yet another factor that limited teachers' technology adoption, as acknowledged by Dawes (1999). I also found that low self-efficacy and negative attitude of some teachers hindered technology adoption as reported by Abbad et al., (2009) and Fishbein and Ajzen (1977). Venkatesh et al. (2003) have not explicitly included personal attitude in the UTAUT model, though it is an important component in the TRA and TAM models proposed by Fishbein and Ajzen (1977). Venkatesh et al. (2003) justify that attitude towards the use of technologies does not provide enough unique information beyond what is already provided jointly by performance expectancy and effort expectancy; hence, the impact of attitude on behavioural intension is spurious (Thomas et al., 2013). However, the empirical evidence highlights that sometimes the personal attitude and other characteristics of an individual overshadows performance efficiency and effort expectancy.

Additionally, power dynamics applied by focal actors and materials such as assignment, policy and curriculum were identified to influence adoption of technology. The power dynamics are not similar to the social influence construct of UTAUT as power is used to pressurise users to accept and use technology, whereas social influence means "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451).

Thus, the ANT sensitised study helped in critiquing the proposed universality of the UTAUT as a technology adoption model since influences such as power dynamics,

personal characteristics, lack of time, technical limitations and glitches are absent in the UTAUT.

## 9.3 Contributions to knowledge

The research is significant for both the ABC Institute as well as wider national and international vocational education contexts. Research on enhancement of students' CoreLife Skills using technology and exploration of the influence of adoption of technology by teachers and students on the achievement of the research objective, is the first-of-its-kind in the UAE to the best of my knowledge. My findings are therefore significant not only for the education sector in general, where use of educational technology in on the rise, but to the vocational education sector specifically, because a focus on enhancement of students' employability skills is gaining popularity in countries, such as Australia and the UK.

My key finding that emerged through detailed analysis of the socio-material assemblage of human and non-human actors is that technology in itself does not enhance students' CoreLife Skills but it depends on how teachers and learning technologists integrate technology with this aim, and students' personal attributes (e.g. self-efficacy, attitude and interest) that influence their decision to accept, use and engage with technology. Thus, technology mostly facilitates but is not a direct determinant for enhancement of students' CoreLife Skills. My research finding confirms Feng's (2009) claim that: "There is no straightforward equivalence between e-learning and employability skills. Information technology itself does not promise successful employment" (p. 225).

Another significant contribution of my research is the TEL-CSD framework that integrates CoreLife Skills, learning skills and cognitive skills as Bloom's Taxonomy, and maps these to relevant technologies that can help to develop corresponding CoreLife Skills. I conclude that CoreLife Skills cannot be developed independently as they are linked to learning skills and cognitive skills. My research findings confirm that when students successfully perform tasks at higher cognitive levels of Bloom's Taxonomy, then there are better chances of enhancing CoreLife Skills, provided the technology-integrated learning environment is designed with the objective of enhancing both learning and CoreLife Skills.

Of late, use of an ANT approach to study technological innovation in educational research is gaining significance. The ANT methodological and analytical framework deduced from Callon's (1986) sociology of translation may interest researchers who would like to use ANT as a methodology and an analytical tool to unfold the messy relationship between humans and non-humans in moments of change.

At the national level, the results of the study can be relevant to NQA and VETAC in improving VETAC Q+NOSS System guidelines so that use of technology for enhancement of students' CoreLife Skills is also accounted for during curriculum development. Additional national policy will be helpful in ensuring the VET provides integrated technology effectively for enhancement of teaching, learning and CoreLife Skills development.

## 9.4 Suggestions for future research

Having used a range of frameworks and technologies, and recognising the limitations of my research design in section 4.7, this research has raised many suggestions for future research. I suggest the ANT methodological and analytical framework and TEL-CSD framework that I deduced are tested to check their feasibility in upcoming research. Though I used a range of technologies, simulation technologies for enhancement of problem-solving skills and social media for exploring its potential in enhancing societal skills were not investigated and are worth exploring. Based on my empirical findings, I conclude that CoreLife Skills cannot be enhanced independently as they are related to cognitive skills and learning skills. I recommend research to assess the correlation between cognitive skills and learning skills on CoreLife Skills. Also, I could not explore the correlation between self-directed learning and CoreLife Skills, though the literature suggests that technology in general and e-learning in particular provides a good platform for self-directed learning, which is believed to provide greater opportunity to enhance CoreLife Skills.

## 9.5 Concluding statement

CoreLife Skills are developed and refined over a lifetime. Hence, technology can provide an excellent platform for learning, practising and on-going development of these skills to keep pace with the dynamic needs of industry and employers. Hence, "[t]he employability skills in combination with information and communication technologies appear to be key drivers that will contribute to shaping the evolving approach to VET under 21st Century conditions" (Bowman & Kearns, 2009, p. 30).

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# Chapter 10: Appendix One: HEAT framework

| | HEAT Levels | Higher-Order Thinking | Engaged Learning | Authentic Learning | Technology Integration | |
|---|---|---|---|---|---|---|
| Lower-order Thinking | **Level 0 Non-Use** | • Lecture; Students<br>• Taking notes only<br>• No questions asked | • Teacher directed completely<br>• No student interaction | • No connection to real world | • No technology use is evident by students or teacher | Teacher-directed |
| | **Level 1 Awareness** | • Students learning at Remembering and Understanding level of Bloom's Taxonomy | • Students report facts they have learned on tests or questions posed by teacher<br>• One single correct answer | • Non-relevant problems using textbook/ worksheets<br>• Short one-method/one-answer problems | • Teacher uses technology for demonstration or lecture<br>• Minimal or no student technology use | |
| | **Level 2 Application** | • Students learning at Applying level of Bloom's Taxonomy<br>• Teacher questioning | • Students are engaged in a task or activity directed by the teacher<br>• Multiple solutions accepted | • Learning experiences use real world objects or topics and provide some application to real world | • Students technology use for lower-order thinking tasks | |
| Higher-order Thinking | **Level 3 Exploration** | • Students learning at an Analyzing, Evaluating, or Creating levels of Bloom's Taxonomy<br>• Teacher-directed questioning and instruction | • Student choice for projects or to solve a problem posed by teacher<br>• Students are engaged in projects based on preferred learning styles, interests or passions<br>• Multiple instructional strategies | • Learning may be relevant to the real world or the past<br>• Learning occurs in a simulated real-world situation such as a class store | • Technology use appears to be an add-on or alternative—not essential for task completion<br>• Technology is used for higher-order thinking tasks such as analysis and decision-making. | |
| | **Level 4 Integration** | • Student-generated questions/projects at Analyzing, Evaluating, or Creating levels of Bloom's Taxonomy<br>• Multiple indicators of learning | • Students partner with the teacher to help define the task, process, and/or solution<br>• Problem solving based on student questions<br>• Students partner with other students to collaborate on learning projects | • The learning experience provides real world tasks which can be integrated across subject areas<br>• Learning has a classroom or school emphasis and impact | • Technology use is integrated and essential to task completion<br>• Technology use promotes collaboration among students for planning, implementing, and/or evaluating their work.<br>• Technology is used as a tool to help students identify and solve higher-order thinking, authentic problems relating to an overall theme/concept. | Student-directed |
| | **Level 5 Expansion** | • Student learning/questioning at Analyzing, Evaluating, or Creating level of Bloom's Taxonomy<br>• Complex thinking involves extensive non-linear problem solving, decision making, experimental inquiry and investigation over time | • Students partner with the teacher to help define the task, the process, and/or the solution<br>• Students partner with local community/field experts on learning projects<br>• Opportunity to express different points of view<br>• Mutual feedback between teacher and student | • The learner experiences the real world and has opportunity to apply their learning to a real world current issue<br>• Authentic assessment; Access to expert thinking and modeling processes<br>• Learning has a local or community emphasis and makes a positive impact<br>• Student beginning to think like a field expert or discipline | • Technology use is directly connected to task completion involving one or more applications<br>• Technology extends the classroom by expanding student experiences and collaboration beyond the school to the local community.<br>• Technology supports collaboration, higher-order thinking, and productivity. | |
| | **Level 6 Refinement** | • Student learning/questioning at Analyzing, Evaluating, or Creating level of Bloom's Taxonomy<br>• Complex, open-ended learning environment | • Students partner with the teacher to help define the task, the process, and the solution<br>• Students partner with global experts on learning projects on global issues<br>• Student-designed problem-solving and issues resolution are the norm | • The learner experiences and makes a positive impact on real, global issues and events.<br>• Student produce products like a field expert<br>• | • Technology use is directly connected and needed for task completion and students determine which application(s) would best address their needs<br>• Technology is a seamless tool used by students through their own initiative to find solutions related to an identified "real" global problem or issue of significance to them.<br>• Technology provides a seamless medium for information queries, problem solving, and/or product development. | |

***Guidance for Applying the HEAT Framework:*** Revised January 2011

1. Components H, E, and A are based on the student's interaction with the content, not the technology. Don't be overly impressed with the glitz of technology. If a student creates a multimedia presentation about facts on a topic, it is a level 2.
2. Note the thick black line separating levels 3 and 4. The lower levels 0-3 are teacher-directed, and the higher levels 4-6 are more student-directed; i.e., students have more choices; they partner with other students, teachers, and outside experts in designing tasks, process, and solutions. In other words, they are more responsible for their own learning.
3. Note the buff colored shading for levels 3 and 4. This indicates the target levels for teachers to provide consistent instruction. While a Level 3 is still teacher-directed, students are using higher-order thinking of Bloom's Taxonomy. Students are beginning to take more responsibility for their own learning in Level 4. Levels 5 and 6 could be attained after consistent learning at levels 3 and 4 and could be accomplished a few times a year.
4. What is the difference between "*relevant*" and "*real*" learning? According to Prensky (2010) "*relevant*" means that students can relate something you are teaching, or you say, to something they know such as a recent film or TV show rather than an old classic or something less familiar to them. Relevant, for example, means taking readings from current newspapers rather than dated textbooks. "*Real*" means there is a perceived connection by the students between what they are learning and their ability to use that learning to do something useful in the world. Examples of *real* learning include measuring a company's carbon footprint and proposing how they can save money by going green, how did reading a book change your life, analyzing a tweet stream from Afghanistan and sending our own tweets, applying science concepts to change your family's eating or drinking habits, or improving the local drinking water.
5. How much of a particular cell must be fulfilled to achieve the level? The primary determinants are the type of learning environment (Is the lesson primarily teacher-directed or student directed?) and the level of learning (lower-order thinking or higher-order thinking). Most of the indicators in a cell must be accomplished to rate at that level after it is determined if it is teacher-directed or student-directed and if it is lower- or higher-order thinking.

Moersch, C. (2002). Measures of success: Six instruments to assess teachers' use of Technology. *Learning & Leading with Technology*, 30(3), 10-18.
Prensky, M. (2010). *Teaching digital natives: Partnering for real learning*. Thousand Oaks, CA: Corwin.



*Figure 10.1 HEAT framework*

Maxwell, M., Stobaugh, R., & Tassell, J. (2011). Copyright retained by authors. Please see website for additional information about the framework: https://tmky.wikispaces.com/file/view/HEAT+Framework4.27.pdf

# Chapter 11: Appendix Two: UTAUT questionnaire

The unified theory of acceptance and use of technology (UTAUT) questionnaire for interviewing teachers and students was prepared by adapting the survey questionnaire used by Williamson and Parolin (2013) in their quantitative study to investigating E-Planning in Practice by applying the UTAUT as illustrated in Figure 11.1 below.

| Construct | Survey Items |
|---|---|
| Performance Expectancy | PE1: I believe using information systems increase productivity<br>PE2: Using our information system increases my productivity<br>PE3: Using our information system makes it easier to do my job |
| Effort Efficiency | EE1: My interactions with information system in this organisation are clear<br>EE2: I find it easy to learn new tasks in our information systems<br>EE3: Learning to use new information system is easy for me |
| Facilitating Conditions | FC1: Our information systems are up and running when we need them<br>FC2: My organisation provides adequate technical support for information system users<br>FC3: Information in different system is consistent<br>FC4: IT staff understand the day to day software needs of planners in this organisation |
| Social Influence | SI1: There is a perception in this organisation that you should be using information systems<br>SI2: Using information systems is encouraged by my organisation<br>SI3: Knowledge of our information systems makes a good impression on my colleagues<br>SI4: Information systems are being used by all planners in this organisation<br>SI5: My colleagues encourage me to use the information system in this organisation<br>SI6: Information system used by planners fit into your organisations existing values and needs |
| Behavioural Intention | BI1: I intend to use software used for my planning tasks.<br>BI2: Software used for planning today, is better than previous methods |
| Use Behaviour | UB1: I use information systems in my work<br>UB2: Information systems are convenient for me to use<br>UB3: The information systems I use are adequate for my tasks |

*Figure 11.1Questionnaire items by UTAUT constructs and its determinants (Williamson & Parolin, 2013, p. 21, Table 2)*

## 11.1 UTAUT questionnaire for teachers

1. **Performance Expectancy:**
    a. How does the use of educational technology influence the delivery of your courses? Give examples to support your response.
    b. How does the use of educational technology influence assessment process? Give examples to support your answer.
    c. Does using educational technology make your life easier/harder as a teacher? Give examples to support your answer.

2. **Effort Efficiency:**
    a. How comfortable are you using different features offered by educational technologies such as Moodle, ePortfolio, software implemented in the institute? Please elaborate by giving examples.
    b. What is your personal disposition towards learning different features of educational technologies used in the institute?
    c. What is your experience of learning to use new technologies?

3. **Facilitating Condition:**
    a. Do you think that educational technologies such as Moodle, ePortfolio and relevant software and hardware are up and running when you need them? Support your answer by giving examples.
    b. Comment on the technical support you receive for educational technologies from the institute.
    c. What are your perceptions of the competency of the technical support team and their understanding of the day to day technology needs?

4. **Social Influence:**
    a. What is the institute's expectation from teachers about the use of educational technologies?
    b. Do you think that the institute's expectation about the use of educational technology by teachers is reasonable? Why?
    c. Do you think knowledge of educational technology in the institute makes a good impression on your colleagues? Why?
    d. Do you think all teachers use educational technology implemented in the institute? In your opinion what influences their decision.
    e. In your opinion, does the way the educational technology being used by the teachers fit with institute's aim of enhancing teaching, learning and CoreLife Skills, values and needs.

5. **Use Behaviour**
    a. Which educational technologies you generally use? How often? For what purpose? From which places (work, home etc.)?
    b. Do you think the educational technology that you use is adequate to fulfil your and institutional needs? Please explain.

c. Which educational technologies did you use to deliver courses this term for the purpose of promoting CoreLife Skills among learners?
d. Do you use smart devices to access Moodle, ePortfolio? Why?

**6. Behavioural intention**

a. If it is optional to use technology for delivery and assessment, would you prefer to use it in future terms? Why?

## 11.2 UTAUT questionnaire for students

**1. Performance Expectancy:**

a. Which technologies you have used this term and how useful it was in achieving the CoreLife Skills as defined by National Qualification Authority (NQA) of the UAE?
b. Does using educational technology make your life easier/harder as a student? Give examples to support your answer.

**2. Effort Efficiency:**

a. How comfortable are you using different features offered by educational technologies such as Moodle, ePortfolio implemented in the institute? Please elaborate by giving examples.
b. What is your personal nature towards learning different features of technologies used in the institute? For example, are you self-motivated, spend extra time and effort to learn and master the skills or try to meet the minimum expectation of your teacher?
c. What's your experience of learning to use new technologies?

**3. Facilitating condition:**

a. Do you think that educational technologies such as Moodle, ePortfolio and relevant software and hardware are up and running when you need them? Support your answer by giving examples.
b. Comment on the technical support, you receive for educational technologies from the institute. Any recommendations?
c. What are your perceptions of the competency of the technical support team and their understanding of the day to day technological needs?

4. **Social Influence:**
    a. There is a perception in this institute that you should be using educational technologies such as Moodle, ePortfolio? What is your comment?
    b. What kind of encouragement do you receive for using technologies and from whom?
    c. Do you think knowledge of using educational technology in the institute makes a good impression on your classmates? Why?
    d. Do you think all students use educational technology implemented in the institute? Why?
    e. In your opinion, does the implementation of educational technology and its use by the students help in achieving the institution's goal of developing student's CoreLife Skills and enhancing learning skills?

5. **Use Behaviour**
    a. Which educational technologies you generally use for learning? How often? From which places (institute, home or other place)?
    b. Do you think the educational technology that you have used is adequate to fulfil your learning needs and CoreLife Skills development? Please explain.
    c. Do you use mobile devices to access Moodle, ePortfolio? Why?

6. **Behavioural Intention**
    a. Did you have to adapt yourself to use educational technology to develop your CoreLife skills? Why?
    b. If it was optional to use technology, will you use technologies such as Moodle, ePortfolio etc. in future terms? Why?