Investigating 'Habitus Of Technology' As A Framework To Better Understand Technologies Of Learning: A Causal Layered Analysis Of Two Perspectives

Thesis

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Investigating 'Habitus of Technology' as a framework to better understand technologies of learning: a causal layered analysis of two perspectives.

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Abstract

This study investigates the conceptual framework of ‘Habitus of Technology’ as a socially constructed way of knowing, which privileges specific modes of thinking about technologies of learning. A literature review revealed a gap in understanding how our complex relationship with technology constraints professional agency and decision-making.

To investigate these phenomena, semi-structured interviews were conducted with two groups: the first was educational technology practitioners, and the second were futurists who had explored the future of education. The critical futures methodology and Causal Layered Analysis were used to analyse the participants’ narratives and reveal the beliefs and attitudes that constituted their Habitus of Technology. This revealed a single difference in the narratives between the narratives of the two groups of participants. However, the numerous similarities constituted a common habitus. The analysis also indicated that the Habitus of Technology approach constrains our understanding because it is grounded in humanist philosophy, which creates a binary separation between us and the world around us. Accordingly, in line with the methodology of the critical future, this study offers an alternative means of approaching the Habitus of Technology constraints. In this case, a ‘posthumanist’ reading is offered as a process of interrogation of the commonly accepted modes of thinking that support the Habitus of Technology.

The study supports the existence of a Habitus of Technology at both individual and group levels that limit the participants’ agency and vision of the potential of technology in the future of education.
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Chapter 1. Introduction

1.1. Introduction

Technology has been our companion and partner for over two million years, from the most rudimentary stone tools to quantum computers. It has spurred humanity towards the future evolving alongside humanity and affecting our educational development and social behaviours (Schick and Toth, 2013; Chakrabarty, 2018).

The significance of the history of technology and the value of the interpretative approach in understanding it is conveyed by the technology historian, Kranzberg (1986 p. 11) in his sixth law: “Technology is a very human activity – and so is the history of technology.” His assertion of the importance of technology in our social development reminds us that the long relationship with technology pre-dates the creation of human and technology philosophies, ontologies, and the humanist boundaries between them (Son, 2014).

Understanding the context gives meaning to how our relationship evolves and adapts to technological and human advancements. Habitus of Technology provides a framework to address the research questions and describes how individuals perceive and react to technology and their world (Bourdieu, 1998; Costa and Murphy, 2015).

The research questions concentrate on the socially structured environment that practitioners inhabit to understand the patterns of behaviours that privilege specific modes of thinking about technologies of learning (ToL) (Kirkwood and Price, 2013; 2014). Shen and Ho (2020, p. 7) examined 2,154 technology-enhanced learning documents and discovered that the research was dominated by the technology adoption model, experimental method, and the unified theory of acceptance. Williamson (2015) noted that the gap in understanding extends into everyday data managed by stakeholders while being manipulated by software that remains hidden and little understood. He also expresses concern over the lack of knowledge of the human issues in educational technology, including the role of stakeholders and developers in education technology policy and their influence in the design and development of the software that directs the technology.
Technologies are adopted in their pre-existing forms in existing educational norms, structures, and expectations; they are shaped and reshaped by the humans in the system, each responding to their particular assumptions and beliefs (Facer, 2011). These inherited and acquired patterns of behaviour favour specific modes of thinking about learning technologies, both now and in the future (Medina, 2003; Croce, 2015). This study addresses the identified gap in our understanding of learning technologies.

1.2. Technologies of Learning (ToL) defined

Educational technology terms are not clearly defined. Research is primarily concerned with the practical uses of technologies and design problems and tends not to concentrate on education technology theory (Passey, 2019). Hall (2011) expressed concern that there was a predisposition for research to investigate the ‘how’ of educational technology instead of the ‘why’, while Bayne (2015, p. 17) was concerned with the “unquestioning dependence on humanistic values’ guiding the discourse surrounding technology-enhanced learning”.

Technologies of Learning (ToL) as an overarching term does not solve these concerns but attempts to limit the assumptions constructed in the current terms. ToL are technologies that support the educational institution’s goals when used to enable and extend learning. The definition draws on the technologies of the self (Mitcheson, 2014) to acknowledge the influence and capacity of technologies to promote and advance self-learning. The concept also acknowledges the requirement of users’ willingness to constrain individual agency and become dependent on the technologies through, for example, surveillance, data collection, content delivery, feedback, and measurement (Peters, 2011; Coeckelbergh, 2013).

The technology of the self acknowledges that the transformation of an individual is only possible with the help of technologies and others through a process of reflection to understand the self and change individual practices (Papadimos, Manos and Murray, 2013). The single overarching term allows the research to concentrate on the broader concepts and explore professionals’ structures and beliefs.
1.3. Problem statement

The primary problem addressed in this thesis is the limited research literature addressing how an individual's existing beliefs, assumptions, professional structures, and world views – which together may be summarised as their ‘habitus’ – work to constrain their perception of the ToL.

To that end, the study explores this gap in the literature through the myths, archetypes, and beliefs that emerge in participant narratives. The research presents an alternative way to conceptualise the individuals' relationship with the ToL. Adopting a conceptual framework of ‘habitus’ works to fill the existing literature gap to examine in ToL to describe, analyse, and assess the ingrained habits, skills, and dispositions acquired due to our professional, cultural, and life experiences (Costa and Murphy, 2015).

This approach to understanding the human-technology relationship that permeates the field of ToL considers attitudes, beliefs and individual action in reproducing behaviours and the role of structures in keeping these practices active and ensuring resilience to change. Habitus of Technology provides a set of thinking tools and vocabulary to describe the structuring process and offers individuals group acceptance through practices, modes of cultural thinking and social capital (Davey, 2009; Nairn et al., 2012; Costa, 2015).

1.4. Research questions

The research questions looked for evidence of expected behaviour, beliefs, and assumptions by analysing the participants’ narratives for a shared Habitus of Technology. As part of the research planning, the intention was to select two reasonably diverse groups that would show intra-group similarity in the Habitus of Technology but diverge when the groups were compared.

The critical futures approach recognises that understanding constraints is incomplete without identifying the shared philosophical norms and values embedded within the narratives (Feenberg, 2000; Swartz et al., 2019; Romele, 2020).

The research questions also needed to consider whether an alternative value system would present the diversity in research approaches. They recognise
that it is essential to understand how our relationship with technology affects our technology and education decisions.

The research questions were:

**RQ1.** Do practitioners and futurists working in the field known broadly as ‘ToL’ have a common habitus?

**RQ2.** What beliefs and structures constitute the differences between the two groups of participants?

**RQ3.** What are the constraints associated with the current modes of thinking in both participant groups, and what are the possible alternative ways of thinking emerging from the research data?

1.5. Research approach

The overarching research plan could be considered an interpretative approach to interviewing to identify the beliefs, assumptions and values embedded in the participant narratives. The primary data source was a series of interviews, each analysed using causal layered analysis, a critical futures studies research method, to investigate the everyday structures that might constitute a Habitus of Technology. Habitus, in this instance, gives form to the participant’s orientation towards technology, the social world and the professional field as the first step in understanding the dispositions and structures that shape an individual’s Habitus of Technology (Sterne, 2003). Habitus also offers a vantage point to reflect on how individuals position themselves in relation to the world and how the world, in turn, situates those individuals (Silva, 2016a).

The study concludes by offering an alternative interpretation of the identified Habitus of Technology’s rules of behaviour, constraints, and structures through a posthumanism reading (Herbrechter and Callus, 2008).

The gap in the conventional research literature on education technology is addressed in this study by offering an alternative process of investigating the human-technology relationship (Lather and St. Pierre, 2013; Taylor, 2017; Ulmer, 2017).

The selection of two interview groups was based on the supposition that the practitioners and the futurists would exhibit differing philosophical beliefs and expectations of the future of ToL. The interviews were conducted with ten
practitioners in ToL and ten professional futurists. The participants either worked in the educational technology field or have considered technology’s relationship with education from a futurist perspective. Both groups were expected to socially, culturally, and politically situated education and technology from divergent experiences. Each was interviewed separately, using a common series of themed questions to ensure a reasonably consistent and orderly manner designed to stimulate conversation (Qu and Dumay, 2011).

The resulting data was analysed using causal layered analysis. Conventional research methods in social sciences continue to be centred on human exceptionalism as the dominant perception of the human above all other species as a method of ensuring the boundary between the learner and technology remains, despite the need for researchers to look beyond that limitation (Barad, 2007; Ferrando, 2012; de Freitas, 2017b). Examining how participants give meaning to the world of work and socially constructed views of education can be instrumental in understanding the plasticity of the habitus as acceptable behaviours being studied (Silva, 2016a).

The research questions require a methodology that can deconstruct the narratives on multiple epistemological levels and challenge the commonly accepted beliefs surrounding technology and education, thus divine future possibilities (Taylor, 2017; St. Pierre, 2019). Accordingly, this thesis takes advantage of a critical futures research process to investigate the indicators of the Habitus of Technology through the interviews. This approach does not see the future of technology in education as an emergent problem to be solved and ‘managed;’ the approach taken in this thesis views the future as the lived consequence of social and political decisions taken today and, in the past, (Facer, 2011).

Critical futures offer a model to challenge the temporal continuum of current qualitative research that accounts for the past and present education technologies without addressing the long-term consequences of the future of education as a holistic concept (Inayatullah, 1998b, 2002, 2019; Bussey, 2009).

The thesis employs causal layered analysis (CLA) to peel back the layers of cultural beliefs from four increasingly deep, epistemological vantage points in
the research participants’ narratives to support and operationalise the diverse research process. CLA was designed (Russo, 2003, 2010) to interrogate traditions, cognitive frameworks, and ways of knowing across four socio-cultural layers: litany, social, worldview and metaphor. It is used in a wide range of research settings, including scenario building, group facilitation, policy building and personal development. CLA was used to deconstruct the layers from a temporal (past, present, future) perspective and in the ever-deepening layers from conversational to cultural ideologies (Russo, 2003).

CLA accepts that the act of measuring is a shared responsibility between the interviewer and participant (Milojević and Inayatullah, 2015). This continuous intra-action accumulates during the interview, like pieces of a puzzle, to form what could be considered a representation of the current relationship with technology (Barad, 2007; Cole, 2011; Gemignani, 2017).

The narrative analysis using CLA allows for the emergence of expressions of power, resistance, shared beliefs, binary constraints, and technological archetypes, aligned in more profound layers of systemic worldviews and metaphors. The emerging themes become the image of the more in-depth structural worldviews of the participants, offering a view into their Habitus of Technology (Turnbull, 2006; Awazu and Newell, 2013; MacGill, 2015; Planella-Ribera, Pié-balaguer and Gil-Rodriguez, 2020).

This research does not consider that power is focused through technology but rather that it is co-constituted throughout institutions, processes and professions while simultaneously being accepted and resisted by individuals (Marks, 1998). In the Habitus of Technology concept, power becomes a resource and forms social capital in the community or group (Callewaert, 2017). This nuanced view of how power is expressed in the causal layers provides a means of placing individual beliefs, agency, and dispositions to address the first two research questions and provides the foundational data for exploring possible alternative modes of thinking from a posthumanist approach.
1.6. Summary of Study

This study indicates the existence of shared beliefs and structures in how the Habitus of Technology is pre-constructed in the participants’ vision of the role of technology in the future of education and ToL. This force (or habitus) appears to exert professional and institutional pressures on practitioners and futurists to frame stories about the future of technology in specific ways. The limited divergence in beliefs between the participant groups and their visions of the future has the effect of marginalising other less socially acceptable approaches favouring the status quo (Bourdieu, 1998; Reay, 2004; McDonough and Polzer, 2012).

1.7. Significance of the Study

This research has its origin in the unexplored research area that attempts to understand how participants’ beliefs and assumptions about technology shape their actions to constitute a Habitus of Technology (Sterne, 2003; Coeckelbergh 2021; Yatsenko, 2021). This knowledge gap offers an opportunity to explore this under-researched area of educational technology (Blacker, 1994; Williamson, 2015) acquired due to our professional, cultural, and life experiences (Costa and Murphy, 2015).

To understand the effects of habitus, this research employs a novel theoretical framework and critical futures method. Through this epistemological approach, new insights and opportunities for future research can be highlighted and offered for consideration.

The thesis attempts to fill several gaps in knowledge. Firstly, it addresses the lack of attention to and understanding how an individual’s existing beliefs, assumptions, professional structures, and world views affect how they perceive the future potential of the ToL. Secondly, it asks whether these beliefs, assumptions and systems constitute a Habitus of Technology and whether it is formed differently in each research group. Finally, it discusses how this gap in knowledge affects the ability of the field of ToL to adapt and influence the possible futures of education.
Without a better understanding of the physical and mental expression of the participants’ relationship with technology, it will be difficult to evolve the human-technology relationships and open new options for research into ToL. This study focuses on what effect the practitioner’s perceptions of educational technologies have on the formation of the Habitus of Technology and the subsequent consequences for the future of the ToL.

The research also explores alternative epistemologies for more in-depth conversations about the consequences of the underlying beliefs, assumptions and structures that consciously and unconsciously affect technology considerations in education.

1.8. Thesis layout

Chapter 2 reviews the current literature and identifies gaps in existing knowledge and understanding.

Chapter 3 describes the overarching methodologies and considerations that guide the research and address the research questions, including a justification for the CLA approach.

Chapter 4 gives a broad overview of the research and the research objectives and introduces the literature that guided, supported, and inspired the development of the conceptual framework of technology habitus to overcome the traditional boundaries between technology and humans.

Chapter 5 presents a synopsis of the practitioner interviews and an analysis of the interviews in four causal layers.

Chapter 6 presents a synopsis of the futurists’ interviews.

Chapter 7 discusses the results of the CLA, examines the Habitus of Technology structures and the possible constraints of the Habitus of Technology and works to address the emergent voices found in the participant narratives.

Chapter 8 addresses the methodological considerations, implications for the field of study, and research limitations and presents some concluding thoughts.
Chapter 2. Literature Review

2.1. Introduction

This chapter begins with a look at research supporting the current understanding of ToL, introducing the primary focuses of existing literature and demonstrating the gap that drives the research questions. The following section examines the trend in research into learning technologies and then the literature related to humanism concepts in technology. Section 2.4 looks at the supporting background philosophy underpinning technology beliefs and assumptions that guide our current relationship with technology. Section 2.5 explores the existence of a Habitus of Technology by introducing the background of the habitus concept and how it extends into the realm of learning technologies.

The literature review concludes by introducing philosophical posthumanism as a theory that proposes an alternate way of examining the human-technology relationship, rejecting the technology dualism and the embedded anthropocentric mode of thinking (Bolter, 2016; Ferrando, 2019).

2.2. Research trends in ToL

The literature review suggests that learning technologies have been predominately practical in implementation and design (Conole, Smith and White, 2006; Bennett and Oliver, 2011; Hew et al., 2019). As Bennett and Oliver (2011) reported, that ToL methods were principally driven by ‘common-sense’ assumptions about what technology can achieve, and advance that the noticeable absence of theory is representative of a tendency toward instrumental thinking. They suggest that educational research into technology may be better served by encouraging different kinds of research that build knowledge, including new theories, and integrating work from other disciplines (Bennett and Oliver, 2011). The case studies they investigated also highlighted that theory requires engagement, not just practical application in technology research; interpretation and adaptation make it valuable and ready for prime time. Discourse between studies is mainly in the context of the instrumental end focused on pragmatics (Bennett and Oliver, 2011). In reviewing policy and
funding arrangements, Conole’s (2006) research summarises and investigates the relationship between Higher education (HE) policy directives and practice. The article provides a “chronological map (1965-2006) of the relationship between tools, policies and funding initiatives that have characterised learning technology research and development in UK HE” (Conole, Smith and White, 2006 p. 42), noting the changes over the years through policy drivers noting the expanded and diversified context that shapes policy directives that directly impact e-learning practices. We consider these structures and trace the growth in learning technologies and associated research.

Conole (2006) concludes that while educational and technological initiatives are often criticized for not achieving stated goals, overall, technology has fundamentally changed practice, both in education and society. The conclusion offers areas of concern that may shed light on the participant interview data and are relevant to the structuring of social and professional practices that contribute to creating a habitus. The conclusions that are of primary interest are that the technology seems pragmatically adapted from and responsive to the tools available, providing little opportunity for researcher vision and research tool design. The other conclusion of interest to the research was the direct line from the policy (particularly with funding) and its impacts on practice (Conole, Smith and White, 2006) and the impact that may have on the participant assumptions and vision of the future of ToL.

The implications for learning technology are clear: an important external representation of success will be the size and power of whatever institutional structure is developed to support the deployment of learning technologies. Internal cohesiveness and collegiality, necessary for successful embedding of e-learning, is not favoured by the short-term approach. This prohibits the development of longer-term and more reflective research.

There is nothing wrong with pragmatic and instrumentalist research, nor does this study critique the process. It does, however, advocate for understanding how dominant modes of thinking favour one line of research and discourage other under-represented alternatives to add a counterbalance to the
“increasingly dominant position of theory-free or theory-applying work” (Bennett and Oliver, 2011, p. 187).

This gap is not only visible in relation to policy. Additionally, Friesen's (2009) research suggests the field also generally treats theory and empirical work as separate rather than as integral parts of the same enterprise.

ToL is seen as a set of tools for enhancing pedagogy, with the primary intention of improving the efficiency of the educational process and the intelligence-gathering apparatus in support of student achievement (Monahan, 2004). Technology is not just a contemporaneous device and artefact that exists alongside the creation of applied knowledge to solve a problem or improve practice. The reduction of technology through the instrumentality and natural necessity of this thinking masks the inextricable interconnection of the social and applied knowledge that technology is part of the development of learning theory and research (Friesen, 2013).

The research takes advantage of the emerging gap between what is currently being examined in ToL research and the effect of emergent technologies and social changes. The identification of the gap and assumptions in relation to the ToL are expanded in Section 2.4.2.

Hew (2019) reviewed 503 research articles from education-technology-related journals (Computers & Education; Learning, Media, and Technology; and British Journal of Educational Technology), finding that only 35% explicitly described their theories. Further to the 35% (183), less than forty research articles were specific to the area of educational technology. According to Gerrard, Rudolph and Sriprakash (2017), institutional desire increases the demand for qualitative evidence-based research to deliver ever more refined results, which ultimately runs a risk of reducing qualitative research to an instrument of stakeholder imperatives.

This reflects a research concentration on the practical problems of the relationship between technology and education (Costa, Hammond and Younie, 2019). The approach limits the opportunities to advance theory development by disempowering the voices that wish to explore education and technology along avenues that do not fit acceptable methodology practices, ultimately
building conformity and marginalising theory-building and new knowledge creation (Selwyn, 2016; Jameson, 2019)

Without a clearer understanding of how habitus uses technology to connect individuals to larger structures of power, worldviews and the systemic layers of technology, politics, and media present in everyday activities, it is difficult to find new possibilities for the future of ToL (Wacquant, 2018). The opportunities that accompany a novel perspective on the future of ToL are potent resources and allow us to rethink how we understand socio-technical change and the future of education (Facer, 2011).

2.2.1. Unexamined Areas for Research

The idea of researching technology and exploring the future of ToL forms the core of this thesis and opens discourse on new methods and methodologies. To achieve inroads towards acceptance of the diverse range of theories need to be explored to change the methodological assumptions upon which educational technology research is founded (Bennett and Oliver, 2011; Taylor, 2017; Hew et al., 2019).

The instrumentalist’s approach to knowledge creation in ToL is not just a matter of the commodification of education through technology integration (Oladi, 2013); it also presents a limited description of what could be done with new knowledge.

The process of ‘opening’ in this research is not merely to look at the data with the same tools in different ways; there is a need to be open to new research methods that include perspectives and multiple realities. New techniques also need to adapt to new technologies and new ways of interpreting data (Hall-Taylor, 2002; Inayatullah, 2009).

(Latour, 1993, p. 54) expressed the ‘opening up of the characteristics of research that support existing structures, arguing that foundations of dualism between technology and human are an insufficient model of social science research epistemology to explain the world around us. Technology, agency, and education become connected to the world by the narratives of our social
environment to transmit a structured body of knowledge and experiences in a field of study (Mertel, 2020).

If the nature of the phenomena is connected to the material and social environment, then the research questions we ask have a profound effect on answers (Reeves, 1995).

Bourdieu and Wacquant (1992) describe the move towards these unexamined research areas as a struggle over the commonly accepted opinions that often drive current research narratives of technology in the media, industry, and society. The path to breaking away from the epistemological barriers of accepted research is the relentless self-questioning of the method used to challenge the existing research into ToL. Ebel (1967, p. 81), a past president of the American Educational Research Association (AERA), advocated for a more substantial ontological break:

The process of education is not a natural phenomenon... It is human made, designed to serve our needs. It is not governed by any natural laws. It is not in need of research to find out how it works. It needs creative invention to make it work better.

The break with convention is not merely about accepting new research methodologies. It is also about uncovering the characteristics of the relationship people have with ToL and how that knowledge is understood in the present and offers alternative ways for individuals to see themselves in the research and make ethical choices about the futures they wish to be part of (Barad, 2007; Ferrando, 2019).

Technology is often seen as a tool to extend human capabilities. It builds dependencies and affordances but affects our perception of our place in the world (Lawson, 2008). The beliefs about the nature of dependencies and affordances are informed by the research’s epistemology or how we know and consider what is labelled as truth. When we step back, it becomes reasonable to assume that the meaning of the nature and quality of knowledge about educational technology is dependent on the discourse that dominates the field and the questions we ask about educational technology (Krumsvik, 2020).

The thesis identifies the separation of humanist ideology between ‘knowing’ and ‘being’ as artificial, embracing posthumanism as a means of collapsing the
theoretical distance between body/mind, human/non-human, and nature/culture. In this practice, ontology and epistemology become co-constitutive in the research process. Posthumanism offers an alternative way to interrogate the rich material, social, political, and intellectual entanglements that construct the Habitus of Technology (Charteris, Nye and Jones, 2019).

2.2.2. Critique of ToL

ToL is those technologies that, while used to enable and extend learning, are simultaneously constrained through surveillance, data collection, content delivery and measurement to support the educational institution’s goals. Hew (2019) reviewed 503 empirical articles, and his findings indicate a tendency to focus on practical and empirical constraints. The study reported a tendency to describe how a technology functioned in education and its effects on student outcomes. There was little development of explicit theoretical engagement that could broaden the research to investigate the reasons and mechanisms behind the results.

This study is not focused on the performance of technologies in the education system but instead on the relatively unexplored area of understanding how an individual's assumptions construct conventional ways of thinking about technology and limit new knowledge creation. It identifies current behaviours and beliefs that shape the perception of ToL and offers an alternative posthumanist reading to open up educational technology research into areas that are often ignored. Regardless of the methods, it is essential to reflect on the underpinning assumptions of research methods and that they are not epistemologically neutral (Kirkwood and Price, 2013).

It is natural and probably prudent that policymakers consider whether access to ToL enhances learning and the benefits of an individual learner’s use of technology. However, this study is less concerned with how technology fits into the institution and how the broader social contexts that affect ToL and society influence practitioners.

Technologies are created to provide solutions to problems. This simplifies technology and hides more significant critical questions about technology’s part
in our social and political structures and what constitutes knowledge in human practice with technology.

The richness of this cycle ensures that the field of ToL research can question itself and explore its connection with other domains of interest (Bennett and Oliver, 2011). The disruption of societal values brought on by technology often masks the medium and long-term consequences of the effect of technology on the social fabric of education. Whether you believe technology can become ‘forms of life,’ as Winner (2010) suggests, it does alter how people think and act (Hallström, 2020). Technologies are not independent of people; they merely perpetuate humanist and instrumental ideologies that form the foundations of our understanding of the human-technology relationship (Jandrić and Hayes, 2019).

The literature on ToL has a distinctly instrumental logic. It has embedded the assumption that technology is neutral and can be used without regard for cultural, political, or social concerns (addressed further in Section 2.4.2). As an example, a 2018 survey of key trends in technology-enhanced learning (TEL) across the UK higher education (HE) sector found a tendency to view technology as a tool (Voce et al., 2016). TEL is seen as an institutional service supporting course delivery with the five services considered to be important: the virtual learning environment (VLE), text matching tools, provision for the electronic management of assignments (EMA), reading list software and lecture capture provisions.

A review of the conclusions from the referenced surveys characterised educational technology research as under-theorised is valid (Hew et al., 2019), and that the use of theory in the field of learning technology has, primarily, been an instrumental means to an end, focused on pragmatics (Bennett and Oliver, 2011). The Heeter (2018) survey found that organisational structure was the fourth most prominent barrier to developing TEL tools, indicating that many respondents faced a shared set of hierarchical and structural challenges.

The common-sense narratives that present technology as a tool to enhance the student learning experience have consequences by ignoring technology as a socio-cultural-technical system which does not operate in isolation from human
labour, language, politics, or morality (Hayes, 2014; Kruger, 2016; Herbrechter, 2018). With its instrumentalist undertones, this mode of thinking makes things simple; after all, as Hayes and Jandrić (2014) note, technologies are created to solve problems and make life easier. However, these assumptions become increasingly tenuous with the integration of artificial intelligence and algorithmic cultures that digitally connect, measure, and influence societal changes and affect individuals’ perceptions of their technological experiences (Costa and Murphy, 2015).

ToL can transform our future selves through education. Technology and education are both instruments of social change, forcing practitioners to think about what it means to be a learner and, ultimately, a person (Klichowski, 2014).

2.3. Humanism

This thesis focuses on ToL, and a definition of humanism tailored to that field. “Humanism” broadly refers to the ideology positioning the human being as the centre and source of meaning and value. Humanism seeks to transform the world to fit human needs through the opportunities presented by science and technology in its most direct application. The literature highlights the entrenched legacy of humanism within education and the limited examination of individuals’ assumptions, beliefs, and experiences in the ToL field (Gane, 2005; Bayne and Jandrić, 2017; Mäkelä, 2017; Aung, 2020).

The presence and influence of humanism, like technology, are never neutral; humanism symbolises the privilege and exceptionalism we assign to select groups of our species and can be linked to the adverse effect our technological presence has had on the planet (Braidotti, 2019). This section explores the impact humanism has on individuals’ assumptions, beliefs, and experiences in the ToL field, looking at foundational knowledge of technological humanism and ending with a critique of the humanist concept.

2.3.1. Concepts of Humanism in Technology

Philosophical humanism is defined in numerous ways. A school of thought believes humans are different from other species and possess capabilities not
found in animals (Aung, 2020). Humanism as a research ideology gives primacy to studying human needs and interests. In its most direct application, humanism seeks to transform the world to fit human needs through the possibilities of science and the affordances of technology (Bridges-Rhoads and Van Cleave, 2017).

Humanism as a concept suffers from having no single meaning, and often the definitions are linked to the researcher’s preferences and topic (Lollini, 2008). Therefore, the study develops and employs the following description:

Humanism is a means of looking at the world from the point of view that separates the interest of ‘being’ human from the less-than-human (animals and those humans deemed not visible), non-human (technologies and the material world) and more-than-human entities (cognitive technologies, artificial intelligence, or AI).

This ‘explanation of humanism’ is offered as an image of the ideology that the research strives to distance itself from, rather than one it is trying to emulate. Technology from this perspective is theoretically separate from the user. It offers the opportunity to use an ordinary tool to extend our abilities in the world without considering the effects of technological interventions (Derry, 2008). The notion of everyday technology plays towards the belief that the human-technology connection is primarily rooted in instrumentalism (Feenberg, 2006). There is a separation between the ‘human’ and humanism. The former is the tool user, and the latter is the ideology that guides the beliefs, assumptions and narratives that shape the tool user’s perception of the tool’s capabilities (Giustiniani, 1985).

Unexplored in the literature is the possibility that technology has become Janus,¹ who presides over the moment of transition in the future of education where on one path the human remains in control and bestows on technology the mantel of change, the efficiencies to re-create universal learning and the eloquent voice to the future of education (Sorgner Lorenz, 2015; Lipowicz, 2019). On the other face, there is a fear of technology’s ability to erode

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¹ Janus, the god of beginnings and transitions in Roman mythology, presided over passages, doors, gates, and endings (GreekMythology.com, 2021).
humanity’s essence and learning and challenge the individual’s place in the education system (Hill, 2008; Facer, 2011).

Expressions of the dualism and tensions are found in the instrumental nature of technology and its essence in control and efficiency, which encourages the common-sense notion that technology and humans are separate entities. From a purely humanist vantage point, technology is the sum of its parts, and the affordances and value derived are no more than the designed use of the technology (Feenberg, 2008). In this belief, the ambiguity of technology is not responsible for the unintended application and the resulting consequences. ‘Guns don’t kill people; people kill people’ is an example of an instrumentalist mode of thinking (Okan, 1991; Blacker, 1994). Technology becomes a product of science and engineering, the sum of the parts, a grouping of mechanisms without moral significance (Feenberg, 1999; Verbeek, 2008; Omotoyinbo and Omotoyinbo, 2016)

Weaver and Snaza (2017) write those existing disciplinary forces within educational institutions already spend much of their energy replicating and fine-tuning methods wholly inadequate to the more-than-human world. Instrumentalism and the humanism ideology encourage the normalisation of the educational research methods in the technological field so that exclusionary practices and domination inherent to institutional methocentrism can become commonplace and limit forms of inquiry and acceptable practices (Weaver and Snaza, 2017).

The regularisation of behaviours and attitudes through technology instrumentalism creates the focus of the thesis in the Habitus of Technology, which provides a vocabulary to describe the activities, behaviours and beliefs that constrain the practical field of technology in education, which contrasts with the theoretical possibilities of new insight and change that appear in further exploration of methodologies that can open alternate possibilities.

2.3.2. Critique of Humanism

The concept of humanism is predated by our more ancient and primal relationship with technology in what we refer to as prehistoric tools. Our evolution as a species is mirrored in the technological advances that sustained
our hominin forebearers. Technology has co-evolved from prehistorical times to the present technology-enriched world (Schick and Toth, 2013). The codification of human beliefs and philosophies that placed the humanist boundaries between humans and technology came much later in the relationship (Van Den Eede, Goeminne and Van den Bossche, 2017).

Today, our perception is that our rudimentary stone tools were products of the human’s superior mind and symbolic of our victory over the natural world. As a result, the story we like to talk about the development of tools is that the more intelligent the human became, the better our tools became. However, the break from humanism explains that technological development is intimately entangled with human cognitive processes and mutual responsibility for technological innovations.

Humanity’s long intra-dependent relationship with technology reminds us that ToL and humanism are epistemologies and ideologies humans created. They hold certain assumptions that meet the needs of that time and become facts and codex of behaviours if left unchallenged. People forget that humans create the particular epistemologies and ideologies that frame our understanding of technology; we can re-create them to meet our evolving social, cultural, and educational needs (Hayes, 2014).

Instrumentalism views technical enhancements of the human learner as unproblematic since the human researcher, learning designer or technology developer are viewed as having control overextending or enhancing human abilities. The process of challenging the idea of the human as the centre of technological research creates avenues for posthumanist departures and a capacity for re-imagining ToL, HE pedagogy and methodologies (Charteris, Nye and Jones, 2019).

Methodocentrism is a product of constraints placed on the system by predetermined boundaries between the technology and the individual. The constraints that accompany the humanist ideology shape the factors representing the truth, legitimacy, validity, and importance of specific areas of educational technology research (Weaver and Snaza, 2017). The dualism and boundaries discipline our modes of thinking and influence how we see the
world. Humanism, as an ideology, narrows “the scholarly mind to think in particular ways according to dominant institutional and disciplinary epistemes” (Weaver and Snaza, 2017, p. 1057).

The narrowing of mental options is demonstrated in Costa’s (2013) research into scholar’s use of digital online spaces, which argues that academic habitus prevents participants from fully accepting the web as a space of learning because it conflicts with the long traditions of academic study and the legitimate power vested in the academic system.

The participants demonstrated a reluctance to deviate from the norms, rules and values that were part of the present academic system “as they provide students with a stable structure of practice that is known to them and which they have learnt to navigate” (Costa et al., 2018 p. 148) This familiarity with the rules of the game reinforces students’ recognition of the value of ‘playing the game’ and avoiding activities that can be regarded as risky and adopting those expected to yield a higher degree of academic recognition.

In Drew and Mann’s (2018) research article, the boundaries between humans and technology became apparent as students resisted the use of interactive lecture applications because they had an image or ‘sense of themselves as good’ academic researchers were challenged by using technology (Drew and Mann, 2018 p. 5). The issue was not if the technology was appropriate but the student’s resistance to anything that affected their image of the established and accepted ‘academic sensibilities’ (ibid). Many of the students saw the app as unprofessional and a challenge to the academic image they had created of themselves (ibid).

Global ranking produced another opportunity for the institution to re-enforce behaviours. Educational institutions passively and actively encourage “faculty members, especially junior faculty, to specialise in improving both productivity and visibility” (Leahey, 2007, p. 534). The concentration on ranking discourages activities that do not produce the desired results, limiting the opportunities and rewards for straying from acceptable practices.

On a darker note, technology becomes a means of humanist resistance against any ‘other’ voices, whether it be gender, racial, class, sexual, non-human, or
more-than-human (Egidi, 2009a; Braidotti, 2013b). This mediating tendency of habitus works to obscure the dissenting voices that argue for alternative perspectives. Humanism can enable individuals and organisations to control the narratives and policies to “engineer or steer the social process” (Egidi, 2009b p. 4).

Nash (1990, p. 420) argues that the relevance of this to research into the Habitus of Technology is that in “modern society, the school has become the most important agency for the reproduction of almost all social classes” and, in this research, the social class of educational technology researchers. The nature of educational technology research is understood when considering the humanistic relationships between education, technology, and society (An and Oliver, 2020). These socially constructed habits guide behaviours even when theoretical and social responsibilities urge researchers to pursue alternative modes of thinking the correct protocols are reinforced through positive feedback to instinctively act in acceptable ways even when opportunities offer alternative pathways to conduct research (ibid). Discipline in educational institutions is not achieved by overt punishment. However, it is achieved by acceptable practices, the expectations of managing life and professional rewards that might not be normative but are normalising (Colebrook, 2017).

Humanism is a process of constructing human subjectivity that involves both normalisation and problematisation of specific ways of thinking, talking, and acting. Pre-established timetables and routines are a basic requirement for educational institutions’ functioning and are products of disciplinarian societies (Broudy, 1973; Planella-Ribera, Pié-balaguer and Gil-Rodriguez, 2020). ToL plays a part in social forms of normality, standards and measures and is very similar to how we organise social practice in the habitus. Dependencies speak to the mutual needs of humans and technologies to achieve goals and, in this dependency on each other, they constrain and limit what each can do (Hodder, 2014, 2016).

Although the humanist critique of technology employs a critical and ethical language, it encourages differences between object and subject and limits knowledge. Metaphors help us understand technology and go beyond their
instrumental role to shape the evolution of technologies and the evolution of technologies in a process that normalised common sense practices to the status of inevitability while obstructs change, difference, and new knowledge (Carbonell, Sánchez-Esguevillas and Carro, 2016).

The vision of technology is constructed around that particular image of male, white and western (Badmington, 2004). If we are to alter or re-interpret the dominant image constructed by humanism, the binary tension between humans and technology can then be exposed as not meeting the needs of the futures of ToL.

Researchers, practitioners, and futurists need to impart a sense of the consequences and accept responsibility for the intra-actions which their work brings about (Carstens, 2019).

From the researcher’s perspective, to liberate educational technology from its humanist constraints is to liberate the human learner to be something more than a tool user.

2.4. Philosophy of Technology

To begin understanding technology from a philosophical and theoretical point of view, we need to examine the backgrounds, assumptions and beliefs that form the foundation of how we think about it (Latour, 1990; Patra, 2017). This process will explore the assumptions and beliefs that we take for granted about technologies and how that pattern of understanding has become commonplace. The Philosophy of Technology is a record of the early assumptions about technology and the theories that supported those assumptions about technology in the future.

The study of prehistoric human technology has received little scholarly attention in the Philosophy of Technology. The anthropology field typically sees stone tools creation as a product of human creativity, placing the technology as separate from the human, a neutral instrument (Skolimowski, 1966; Hegmon, 1998; Chakrabarty, 2018). As often in discussions, it is forgotten that technology pre-date’s philosophy, science, and the concept of humanism. There is little disagreement among the philosophers of technology that humans
are inherently technology (tool) users that conceptually construct a separation which provides the source of the human/technology dualism (Lemmens, 2015; Nagy, Eschrich and Finn, 2020).

In a world where technology is commonplace, we often mistake technical knowledge and efficiency for the ability to be self-aware about our relationship with technology. As a practice, the assumptions, behaviours, and habits manifest themselves in narratives and actions. The habitus of technologies is central to understanding the structural dominance of technologies in education; habitus has become a practice of inculcation structures to the social, foreshadowing the influence and complexity of human-technology relationships in our lives (Miranda and Alexandre, 2021).

As (Feenberg, 2012) explains, knowledge about the technology itself does not always help us become self-aware of technology’s role in our lives. Contemporary Philosophy of Technology research attempts to discover the facts. It tends to see the research inquiry process as a sort of jigsaw puzzle where the pieces need to be systematically ordered and arranged to identify, describe, and explain the properties of phenomena (Gemignani, 2017). In the real world, the nature of the technology-human relationship is messy (Lim, 2010; Milojević and Inayatullah, 2015).

Incorporating technologies into our daily work habits has become the defining concept of the present to the point of becoming involuntary and unconscious behaviour (Miranda and Alexandre, 2021). The behavioural structures create tensions in our relationships with technology by coercing the individual to change their habits rather than the habitus of the professional field or institution (Miranda and Alexandre, 2021).

The following sections explore the background of the modern philosophy that underpins the ToL. Section 2.4.2 explores the assumptions embedded in our belief systems about technology that contribute to the structuring concepts of the ‘Habitus of Technology.’
2.4.1. Background

Philosophy of technology is a comparatively young field of investigation emerging as a philosophical endeavour during the last half of the 19th century. Its formal origins as a field of study are often associated with the publication of Ernst Kapp’s book which is only available in German, ‘Grundlinien einer Philosophie der Technik’ (De Liso, 2013; Dalibert, 2014; Tsvyk and Tsvyk, 2017). However, while that may be considered the first reference to the philosophy of technology, many historical influencers prepared the ground for the inception of the technology as a philosophical study.

In classical Greek philosophy, reflection on the art of making involved both reviews of human action and ontological speculation about what the world was like. In Plato’s view, natural objects, and artificial objects (technologies) come into being in similar ways, both being made by an agent according to predetermined plans.

Aristotle added to the discussion by separating physics (the domain of natural things) and poiesis (the realm of non-natural things). He further broke down the fields of knowledge into what we today would call science or scientific knowledge (episteme), Art or Craft knowledge (techne), practical knowledge (phronesis), intellect or intuitive apprehension (nous), and finally, wisdom (sophia) (Gavrilov, 2021).

Mapping these five ‘ways of knowing’ onto the two domains of natural and non-natural, episteme becomes the natural domain. At the same time, techne and phronesis provide the division of the non-natural environment. Breaking down phronesis applies primarily to the knowledge of civic/social life, and techne works to explain the technologies associated with a society’s way of life. While nous and sophia do not directly map the natural and non-natural domains, they provide the foundational knowledge to examine them. Nous is particularly of interest to this research as it could be considered the foundation of philosophy and the means to explore new and unproven knowledge, while sophia is the application of philosophy and knowledge towards a state of personal perfection (Reydon, no date; Martin, 1988; Franssen et al., 2018), which includes techne of the self (Martin, 1988).
It is reasonable to argue that through the lens of nous ancient avenue of research, possibilities become open to the Philosophy of Technology to re-explore diverse areas such as anthropology and philosophy of posthumanism, psychology, ethics, feminism, politics, anthropology, and aesthetics functions that was informed by our human tastes and desires (Banerji, 2019; Swer and Du Toit, 2020; Ceder and Bodén, 2021).

In the Middle Ages, the names of Leonardo da Vinci (1452–1519), Michelangelo (1475–1564) and Raffaello (1483–1520) populate our thinking about technology. It was a period of technology guided by “learning-by-doing and learning-by-using” and where serendipity was an acceptable form of research as the mechanical arts expanded, achieving the appropriate means to achieve an end. The period of technology was still divided by the ancient dichotomy between the natural and artificial realms. The seven mechanical arts had replaced the five ways of knowing, consisting of fabric-making, armament, commerce, agriculture, hunting, medicine, and theatrics; the shift in the arts was to think of technologies as a means to subsume the works of human labour (De Liso, 2013). This approach elevated technology in social narratives and paved the way for the transition to Renaissance Enlightenment views of technology.

The European enlightenment of the 18th century focused on philosophy being beneficial to humanity and thinking about technology gained new momentum due to the many technological advances. Knowledge was using observation and natural philosophical experimentation, which heavily relied on constructing instruments, devices, and other craftsmanship works to make empirical investigations possible. As a result, human-centred research privileged science and technology solutions and became a force that reshaped western culture (Feenberg, 2017). The by-product of this enlightenment explored the technology of being through the metaphors of mechanical, clockworks and computer technology in more recent times. The 20th-century saw the rapid development of technology coincide with the importance of the Philosophy of Technology. This may account for the widely spread image of technology as instrumental, as delivering instruments, as means to ends, a narrative that has further supported the claim that technology is neutral values. As a result, the
dominant worldview treated technology as a ‘thing’ and technologies as solutions to human problems.

The German philosopher Martin Heidegger noted that technology in the 20th century advanced more rapidly than at any other time and became a visible influence on all aspects of life. From Heidegger’s perspective, the difference between older and contemporary technology is that older technologies had to work with nature like windmills and waterpower. Modern technology, in contrast, places nature as the source of resources but operates independently from it.

In the nascent educational technology field in early 20th century discussions, technology became all about the scientific management of education, the elimination of inefficiency and the school as an industrial plant (De Vaney and Butler, 1996). The approach of the early educational technologist of the mid-20th century saw technology through an instrumentalist lens as a neutral object and an end to a means under the control of the human (Feenberg, 1999; Kirkpatrick, 2020). This was a hardening of the boundaries between humans and technology (Latour, 1993). Along with the boundaries came the instrumentalist approach to education that positioned ToL as separate from and subordinate to the education field’s social practice (Bayne, 2015b; Patra, 2017).

This shift also highlights the more profound difficulty of educational technology research in questioning the reasons for the ontological separation of the human and ToL (Bayne, 2015b; Lewin and Lundie, 2016). This promoted a politically and economically attuned narrowing of research based on data that shunned the interdisciplinary approaches of earlier iterations of the Philosophy of Technology (Van Den Eede, Goeminne and Van den Bossche, 2017).

To better understand what is co-constituted within the human-technology relationship, there needs to be an acceptance that technical knowledge alone will not provide the answers that the community needs. Without understanding what drives technological progress, there is no comprehension of the human-technology relationship, and the Philosophy of Technology becomes an incomplete picture. Attempts to reduce human understanding of technology to
the applied sciences fail to perceive that most technological progress is driven by a human problem looking for a technical solution (Skolimowski, 1966).

Much of the historical work to organise and scope the Philosophy of Technology has been demarcating the boundaries of practice; however, that comes with unique problems for technology. The majority of technology is owned, created, and developed through commercial firms that compete in competitive markets and whose prime driver is not the production of technologies that work to complement the nation's social fabric but the goal of making a profit. As a result, technology is incorporated into our society’s social, educational, and political organisation as a commodity.

This has contributed to the incorporation of HE inside the capitalist market for education (Ball, 2012), resulting in the commodification of scholarly work and delivery of education in terms of performance, knowledge, and cultural assets (Ball, 2012; Hall and Stahl, 2012; Williams, 2012).

For this reason, technology is often considered a product or tool with a focus of design as an extension of the liberal faith in progress (Feenberg, 1999; Franssen and Koller, 2016). Philosophy of technology continues to be a field in the making, and the coexistence of several different approaches to doing philosophy does not name a delimited academic domain of investigation; instead, “Philosophy of Technology” denotes a considerable variety of philosophical endeavours that all in some way reflect on technology (Reydon, no date; Franssen et al., 2018). Technology as a social force might present too messy a phenomenon for philosophy boundaries to contain, which could explain the common tendency to interpret technology from a binary assumption as autonomous or human controlled. The belief that results from the binary assumptions will be explored in greater depth in section 2.4.2.

2.4.2. Technological assumptions

The hypothesis at the core of this research is that assumptions that form the foundation of the Philosophy of Technology can also contribute to the unconscious beliefs that guide the layers of world views and metaphors that shape human habitus in technology. This study offers a means to examine philosophical assumptions; the concept of habitus (section 2.5) becomes the
methodological construct employed to investigate if the influence of the beliefs becomes visible and constitutes a Habitus of Technology.

Assumptions in this research are understood about the foundational ideas that guide the Philosophy of Technology, which indirectly but pervasively shapes discourse in the field through time and place. Technologies in philosophical narratives often create metaphors capable of driving whole philosophical programs as ‘epistemology engines’ (Ihde, 2004). The measure of these ideals and beliefs connects the “philosophers” who profoundly influenced our modes of thinking about technology to the practitioners and philosophers who work and think about them daily (Thomson, 2012).

To represent the core assumption, this study adopts the organisational table “Technology Assumptions” created by Feenberg (2006, p. 5) (see Table 1).

<table>
<thead>
<tr>
<th>Technology is:</th>
<th>Autonomous</th>
<th>Humanly Controlled</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value-neutral: methods and goals are separated.</td>
<td>Determinism (aligned with modernisation)</td>
<td>Instrumentalism (supports a liberal belief in progress)</td>
</tr>
<tr>
<td>Value-laden: methods form a way of life that includes goals.</td>
<td>Substantivism (means and ends linked in systems)</td>
<td>Critical theory (identify and challenge power structures)</td>
</tr>
</tbody>
</table>

determinists believe that technology, once created, is no longer under our control, is a danger to the essence of being human, and, through human-technology dependencies, exerts control over humans. It shapes society to meet the requirements of efficiency and progress (Kruger-Ross, 2013; Feenberg, 2017). If determinism overestimated the independent effect of technology, in instrumentalism assumptions, technology becomes a neutral tool and autonomous in a world where people have lost control of technology (Feenberg, 2000).

From the perspective of substantivism, the tool becomes value-laden with the essence of technology development into an independent actor imposing itself on human societies unconditionally and inevitably (Lemmens, 2021).

Critical theory shares traits of both instrumentalism and substantivism. It agrees with instrumentalism that technology is in some sense controllable, and it agrees with substantivism that technology is also value laden. This seems a
paradoxical position highlighting the dualistic tension inherently structured into the Philosophy of Technology (Feenberg, 2006).

Embedded in all the classics and much of the contemporary Philosophy of Technology is the concept of dualism, the separation of technology from the human. Each of the four assumptions (Determinism, Instrumentalism, Substantivism and Critical theory) is divided by the contestation of value and the concept of control. The idea of value defines the philosophical foundation of technology; either technology is value-neutral (morally and politically neutral), as the Enlightenment movement articulated, or value-laden as the Greek philosopher’s articulated (Klenk, 2021; Miller, 2021). As a result, technology as a practice blend into much, if not all, of the social, economic, and political organisation of our society.

This is not to say that individuals blindly follow the instrumental and philosophical assumption; it is more realistic to view this unconscious harmonisation as a reward-based behaviours by the approval of others within the same group (Piroddi, 2021). The structuring process of collective beliefs promotes that certain technical base understandings of technology are rewarded, and some are not. While individuals display many of the assumptions and are not solely rigidly adhering to a single belief when structured through collective behaviours, they tend to align with the instrumental mode of thinking. The common sense of technology is centred on the worldview of a machine or instrumental device used to extend, enhance, or increase efficiency. The central idea to Patra’s (2017) contention that technology is identified as a machine or tool which strips of its ontological character and allow it to be re-imagined as an instrument for human use. Webster (2016) asked a similar question in his research on how the Philosophy of Technology assumptions influence the decisions that leaders make about educational technology. His findings are the Philosophy of technology views that were widely held by participants were, an instrumental view of technology, technological optimism, and a technological determinist perspective that saw technological change as inevitable.
The assumption of technology as neutral is a core belief of the instrumental perspective and utilised without regard for cultural, political, or social concerns (Feenberg, 2002). Within this perspective, a laptop computer is understood as a tool in the same way that a snowblower or pencil are tools at the disposal and discretion of the user.

Castañeda and Selwyn (2018) understood that metaphors and narratives we use to frame technology limit the ways in which digital technologies are understood. The author’s sees the educational element of educational technology as not simply common-sense or implicit which works to reduce the mental association potential of technology. The article promotes the need to develop visions conceptualising digital technology as something other than an instrument of learning management systems or learning analytics within the instructional design. Instead, more attention needs to be paid, in the author's opinion, to the interplay between the use of digital technology and people’s emotions, and feelings and to ask challenging questions about the social, cultural, political, and economic connotations of digital technology use in higher education. More over, it is also important to explore how the use of digital technologies in higher education settings profoundly shapes the emotions, moods and feelings of students and staff (Castañeda and Selwyn, 2018). From these common-sense narratives that present technology as a tool to enhance the student learning experience comes the consequences of ignoring technology as entangled with human labour, language, politics, or morality (Hayes, 2014; Kruger, 2016; Herbrechter, 2018).

With its instrumentalist undertones, this mode of thinking makes things simple; after all, as Hayes and Jandrić (2014) note, technologies are created to solve problems and make life easier.

However, these assumptions become increasingly questionable with the integration of artificial intelligence and algorithmic cultures that connect, measure, and influence societal changes and affect individuals' perceptions of their technological experiences (Costa and Murphy, 2015). As Facer (2011) noted, the ‘acceptable practices’ are often shaped by external structures and stakeholder funding priorities, coupled with professional expectations about
what constitutes good research internally within the professional system. Conole (2006) echoes this sentiment, observing that funding impacts perceptions of value and what is researched, shaping organisational structures in institutions and acceptable practices. The practices, approaches, and methods that structure behaviours become part of the history and dispositions of a field of study and begin to constitute the Habitus of Technology under investigation in this thesis.

A review of technology in educational uses in the following articles exhibited traits of the technology assumptions described in this section. The aim of Liem et al. 2008 study was to examine how the motivational belief constructs derived from self-efficacy, task value, and achievement goals relate to students' psychological, behavioural, and social functioning and achievement outcome. In this regard, the study asserted that individuals' adopting the future-oriented motivation and self-regulation model, which was described as a perceived instrumentality, would forecast the adoption of the mastery learning goals. The article supports a liberal belief in progress related to instrumentalism that students would only exert their best effort and spend a substantial amount of their time engaging in and mastering the academic if it was useful for them in the future and are less likely to pursue a mastery goal on the academic studies, they perceive to be less relevant for attaining their future goals. The research supported a learning environment where competitiveness is highly valued, and a meritocracy system could regulate and determine one's advancement should be encouraged over all others.

While Liem et al. (2008) study is a well-cited older study, more recent research also displays a technology as a value-neutral tool, instrumental or separate from the learner in a mediated education environment.

Shah's (2022) research felt that literature exploring MOOCs' pedagogical design is currently insufficient to cater to the diversity of geographically dispersed learners with varied motivations, educational backgrounds, and learning requirements. However, the research questions that guided this study had little mention of social and cultural influencers; instead of looking at completion rates metrics, how well the learner-centric MOOC (LCM) engaged
learners in assessment and discussion activities and did the learners perceive the usefulness of the LCM. The research findings felt a need for a prescriptive MOOC model and design; its goals and experimental evidence included learning analytics for providing feedback to learners, performance reports, self-reflection, and assessment integrated within tasks to provide feedback to learners. The ends and means for this study remained instrumental, focusing on completion rates, suggesting success when completion rates for the "15 LCMs were found to be 36.35±25.61, 95% CI: 10.74–61.96%, which is significantly higher than the completion rates reported in the literature" (Shah et al., 2022 p. 277). The metaphor of orchestration was used to describe the learning process and to manage the content creation with separation between the teaching-learning activities and technology as a neutral tool for operationalisation tasks.

Ferrer (2020) found that the concepts of student motivation and engagement in the tertiary study are well established in the literature. The paper aimed to understand the mechanisms linking students' motivation to engagement within online learning environments. The research collected 574 student surveys and, through the analysis, identified a need for educators to provide further attention to increasing positive attitudes. While it is acknowledged that students actively engage in the learning process and get pleasure and instrumental value from what they are doing, they also tend to attain better learning results. The interesting part of this study is that the technology in online learning is separated and absent from the learner's instrumental values and only appears as an imperative to incorporating online technologies into the delivery of “a robust information technology infrastructure is crucial, including accessible technical support, sufficient bandwidth and storage capabilities, and a learning management system that enables student individualisation and personalisation” (Ferrer et al., 2020, p. 334)

Almpanis's (2022) study aimed to explore home-working academics' experiences of Emergency Remote Teaching (ERT) during the COVID-19 pandemic with the aim to investigate the different ways in which each informant has responded to these ERT challenges. The use of semi-structured Skype-based interviews to obtain a detailed description of the context of each
participant. The interviews focused on the academics’ experiences designing and planning sessions, teaching and supporting learning, assessing, and providing feedback, developing an effective learning environment, and supporting students, and participating in continuous professional development (CPD), in line with UK Professional Standards Framework (UKPSF) areas of activity.

The study found that due to the abrupt move to ERT, the normal re-design and planning for online content was minimal. Participants reported that adopting an instrumentalist approach to educational technology and learning as a quick fix was evident in the interview data. The relevant finding for this thesis was that the foundational default position for using technology in a time of critical change was instrumental application. In fact, Almpanis (2022) noted that there is little evidence in the data to suggest that technology decisions were based on a careful strategy of harnessing the potentially transformative power of educational technology during this pandemic. The research belief was that the dominance of instrumentalist technology assumptions was an inevitable and less desirable outcome of this crisis.

The interview data suggested that the participants in our study adopted a simplistic, ‘uses determinist philosophy of technology that leads to instrumentalism. Uses determinism is an approach that perceives technology as offering neutral tools that extend our capacities (Kanuka, 2008). In contrast, Almpanis (2022) argued for a considered and reflective application of educational technology. However, from a technology assumptions perspective, it could be reasonable to suggest that in the absence of a straightforward approach, the participants reverted to their foundational beliefs about the ToL.

The individual studies reviewed and referenced in this thesis are supported and amplified by the meta-reviews in the following paragraphs.

Henderson's (2015) research investigated the use of Communities of Practice (CoP) in educational technology research. As part of the broader findings in his exploration of CoP, a strong instrumentalism strategy was noted in the field of educational technology. In the analysis of 34 CoP documents, 79% (n = 27, 23 articles, four reports) applied CoP as an instrumentalist research strategy to
achieve institutional or professional learning goals through educational technology. Of note to this research, Henderson (2015) indicated that the instrumentalism found in CoP research was often not a planned starting point but often a result of the institutional structures and acceptable practices.

In a similar analysis of UK universities, the 2018 survey (Voce et al., 2016) of key trends in technology-enhanced learning (TEL) across the UK higher education sector found a tendency to view technology instrumentally as a tool. Also, the Heeter (2018) survey found that organisational structure was seen as the fourth most prominent barrier to developing TEL tools, indicating many respondents shared similar structural environments.

Examining the data was from a text produced by 88 UK universities Teaching Excellence Framework (TEF) statements from the summer of 2017. The corpus analysis revealed a prominent instrumentalist discourse of technology being ‘used’ for specific ends or an end in itself (Matthews, 2021). Matthews (2021) felt there was a need to overcome the instrumental and other dualistic technology approaches before new opportunities of alternate and critical approaches can provide new perspectives on the relationship between the university and digital technologies.

Gill (2020) points to the rise of instrumentalism, which has, in his words, “travelled across the academic boundary to the high-tech culture of Silicon Valley.” This porousness of ideas and technologies are both a boon and troubling for educational technology; advances in tracking and monitoring learning have become commonplace in education. The narratives imply that both the creators (marketers) of technology and those who import it into education (consumers) view technology from the same philosophical foundation, which tends to create the sense of inevitability surrounding technology and a culture of technological dependency that aligns tightly to marketisation (Gill, 2020).

Other research supported a liberal belief in progress related to instrumentalism that students would only exert their best effort and spend a substantial amount of their time engaging in and mastering the academic if it was useful for them in the future and are less likely to pursue a mastery goal on the academic
studies, they perceive to be less relevant for attaining their future goals (Liem, A.D., Lau, S. and Nie, Y. 2008). While considerations of the human-technology relationship and how data extraction, artificial intelligence and cognitive technologies will shape the educational technology possibilities in the future and foreshadow a highly technological-focused, data-driven and surveillant dependent future for education (Bayne and Gallagher, 2021).

The tendency for technology to be used instrumentally within education is often underpinned by narratives that promote technology as the primary force driving educational practice. Almpanis’s (2022) study aimed to explore home-working academics’ experiences of Emergency Remote Teaching (ERT) during the COVID-19 pandemic with the aim to investigate the different ways in which each informant has responded to these ERT challenges. Participants reported that adopting an instrumentalist approach to educational technology and learning as a quick fix was evident in the interview data. The relevant finding for this thesis was that the foundational default position for using technology in a time of critical change was instrumental application. The omission of the very presence of teachers and students from the common-sense narrative of “using technology to enhance the student learning experience” speaks to the need to expand research to counter this narrative (Jandrić and Hayes, 2019).

The challenge is in challenging the technology-driven marginalisation of researchers, the trend in unbundled academic processes, and reliance on the datafication of higher education to frame how governments and corporations approach the scalability of student learning and engagement (Bayne and Gallagher, 2021).

Answering these questions helps to reveal the assumptions and beliefs behind practices that guide the actions of individuals. The process of examining the causal and narrative assertions gives insights into the assumptions and beliefs might be addressed to help understand how they constrain the views of the possible futures and clarify what kind of futures are desirable (Virmajoki, 2021).

Whether it is more contemporary concerns that technology is political (Winner, 1986) that is under investigation, or the technical mediation of experience (Ihde, 1993), thinkers such as Verbeek (2015), believes that substantive theory
adheres to outdated conceptions of human-society-technology relations, whereas Feenberg (1999) maintains the position that research can learn from the insights of (social) constructivism. While case-study research has many controversies surrounding it and its methodologies, another way of putting it is that the empirical turn is a turn to things in concrete (Coeckelbergh, 2018), as opposed to critical concepts in abstract, and perhaps more of an attitude than a methodology in the strict sense (Bantwal Rao, 2021) but technology, when conceived from a dualistic philosophy, retains instrumentalism character (Schirmacher, 2021). The popularity of Technology Enhanced Learning (TEL) as a phrase can perhaps be partly explained by the alluring and efficient neatness of its division of the social and the technological, and by the reduction of their complex entanglements to a clear relation of subordination: (stripping away the unmeasurable to find clarity in the question) technology can be utilised to enhance pre-existing personal and societal educational objectives (instrumentalism) detailing technology assumptions (Bayne, 2015b).

The assumptions appear familiar, self-evident, ordinary, everyday, expected, and accepted. As an ideology, it affects technology by centring the human as the measure of all things technological and separating technology from the essence of the human (Pithouse, 2003b; Knievel, 2006). However, from what is known as a posthumanist position (which is explored in greater detail in Section 2.6), technology is human nature, or as Ferrando (2019) observes, a human trait that resists and denies the tendencies to divide technology by value or control, opening paths to new alternatives. A new approach to technology theory is needed to evolve our perspectives. Shifting from the traditional western Philosophy of Technology primarily reflects technology-related matters as external to the body and limits our understanding of the assumptions underpinning human-technology relationships (Pitt, 1995; Feenberg, 2006; Van Den Eede, 2015a).

Other approaches exist outside of the Philosophy of Technology, working to change the assumptions that comprise the thinking about the relationship between people, education, and technology. Technology is an ongoing attempt to bring the world closer to the way one wishes it to be. Whereas science aims to understand the world, technology aims to change the world. Ulmer (2017)
argues that human-technology relationships are not defined by boundaries between humans and technology, nor by ideologies that place humans at the research centre. At some levels, the philosophical distance between human and technology collapses to the point of not being measurable. The technologies that enabled the analytic narrowing helped institute modern educational, social, and political systems of monitoring, supervising and constraining learners’ agency (Hope, 2014).

2.5. Habit of Technology

The problem statement asks how an individual’s existing beliefs, assumptions, professional structures, and world views work – which together may be summarised as their ‘habitus’ – to constrain their perception of the ToL. This thesis investigates the existence of a Habitus of Technology to explain this phenomenon and address the gap in the literature in the area of study. The scarcity of literature on technology as habitus points to the importance of opening ToL to debates from alternate understandings of the human-technology relationship.

Habitus is the social aptitude or understanding of how to conform to the practices of an identified group or profession (Wacquant, 2016). As a conceptual tool, it traces the intra-actions between layers of structures that shape society and individuals (Hunter, Smith and Emerald, 2015).

Of interest to this research is habitus as a reproduction of history that produces individual and collective practices orientated to maintain a status quo. As a reproduction of history, habitus functions as a lag between how it has always been done and how it could be done now (Wacquant, 2016). It actively ensures that experiences, attitudes, actions, and beliefs are distributed as collective knowledge. In this manner, thoughts, and actions ensure the ‘correctness’ of practices, constancy, and behaviours as explicit norms. This (Bourdieu, 1990; Bourdieu and Passeron, 1990) habitus operates at a sub-consciousness level and is often unique to the narratives and practices of a particular social location or profession and results from formal and informal education and training and social expectations (Bourdieu, 1977). However, even when the individual is aware of why they perform them, actions are considered normative practices.
(Burkitt, 2002) and accepted without question. While habitus is a potent structuring force, it remains susceptible to internal organisational and external social forces (Bourdieu, 1977).

For Burkitt (2002), technology complements and mediates productive human activities and is entangled in those social relations in which people are educated and trained. Everyday wisdom in this context could be described as knowledge in action or, as Bourdieu (1990) saw it, as the ‘feel for the game’ where an individual learns through experience what behaviours and beliefs are rewarded and consequentially can navigate situations with ease. In a similar context to this research, Jeon (2019) used the concept of a ‘Scientific Habitus’ to explain how scientists become willing participants in the constraining structure of expected behaviours due to training and institutional practices.

This research set out to shine a light on the knowledge gap between our understanding of the assumptions, beliefs, and cultural influence on our understanding of the potential of ToL. When research can identify with some certainty how assumptions about technology affect our professional agency, habits, actions, and decision-making, we are then armed with the information to find alternate ways to address the issues influencing the development and future of the ToL.

2.5.1. Habitus background

Bourdieu’s habitus framework is appealing for studying the human-technology relationship because of its ability to accept multiple levels of abstraction and continual intra-actions between worldviews and the social structures of science, media, and politics to the narratives of everyday life. Habitus provides a means to understand the external and historical factors that work to condition, constrain, and promote change within social structures and professions (Wacquant, 2018)

The literature reveals habitus as a structuring force of constraints and demands that individuals place upon themselves (Bourdieu, 1984; Reay, 2004). While behaviours and agency have flexibility in habitus, it does predispose individuals to submit to an acceptable form of behaviour. With relatively harmonised behaviour comes a tendency for everyone to think and act similarly. This
exclusion of practices, ideas and practitioners of other habitus and cultures limits opportunities for new ways of approaching problems (Bourdieu, 1998; Grenfell, 2014; Silva, 2016b).

Habitus was Bourdieu’s lifelong effort to develop a science of practice. However, the roots of habitus go back to Aristotle’s notion of hexis, re-articulated in phenomenology by the writings of Edmund Husserl. He described habitus as the connection between past experiences and future actions (Wacquant, 2016). However, in Bourdieu’s writings, habitus became a focused means to challenge the common-sense duality between the individual and the social by describing how dispositions and structures of society are inculcated inside persons.

The dispositions and structures of habitus become visible in the individual’s actions, narratives, and patterned tendencies to think, feel, and guide their creative responses (Wacquant, 2016). In this sense, habitus becomes the building block of culture, opening a path to the understanding of how we embody culture while at the same time, through our practices, changing or replicating the status quo (Hunter, Smith and Emerald, 2015).

The study aims to show that Habitus provides a framework (section 3.4) to conceptualise individuals’ reflections on their everyday experiences, beliefs, ways of talking about technology and vision for the future potential of ToL. It attaches individuals and groups to social structures and offers acceptable behaviours, modes of cultural thinking and social capital (Davey, 2009). Habitus is a social aptitude, bringing rhythm to practices in an identified group or profession, harmonising their behaviours through the influence of dispositions.

2.5.2. Habitus of Technology

The concept of the Habitus of Technology, an extension of the term Habitus, focuses on the human-technology relationship and is defined in this research as the physicality and social memory preconstructed by the philosophical assumptions entangled with social and cultural environment and often unique to the specific context (Burkitt, 2002; Sterne, 2003; Reay, 2004; Bourdieu, 2017).
Habitus of Technology provides a means to describe contemporary developments related to the assumptions and structures that guide that relationship (Costa, Burke and Murphy, 2019). The Habitus of Technology becomes the window into the culture and preconceptions associated with the ToL. Embedded in the concept of the Habitus of Technology are the theoretical legacies and assumptions of the Philosophy of Technology and how the individuals in a field experienced that technology. The ToL cannot be studied in isolation because perceptions of technologies do not exist independent of the professional practice (Sterne, 2003, 2006).

The ‘Habitus of Technology’ term is primarily used to frame the discussion about the habitus (the dispositions and dependencies) that are socially and culturally related to ToL. How technology mediates, human relationships is theorised as social interaction becomes an important step in studying habitus (Sterne, 2003; Czaja, 2011). Habitus of Technology can then be empirically viewed by asking participants how they see themselves and how they see the role of ToL in their professional and social lives (Czerniewicz and Brown, 2013). Conceptually, it provides a means to bridge the differences between the respective disciplines, and approaches, and examines the participant’s relationship with technology to understand the limitations of the current modes of thinking about ToL (Sterne, 2003; Snaza and Weaver, 2015).

Habitus, although widely used, appears to pay little attention to technology. Nevertheless, the struggle to make sense of the concept is worthwhile. It leaves room for new thought and forces an understanding deeper the relationship between technology, education, and culture (Nash, 1999; Reay, 2004). One of the limitations of extending habitus into the realm of technology is acknowledging that Bourdieu’s research into habitus never deals explicitly with the concept of technology as a social force and concept to probe the habitus (Burkitt, 2002; Sterne, 2003; Beckman et al., 2018). However, like habitus, technology is associated with habits and practices, encouraging an individual’s actions, intentions, and assumptions towards a specific unified belief and behaviour group. Technology is structured by human social practices and, in turn, structures socio-cultural practices (Sterne, 2003; Romele, 2020). The Habitus of Technology can be more than philosophical norms and ideological
intentions and possibly the connection between dispositions of habitus to the dependencies of the material and the socio-technical world (Romele, 2020).

Bourdieu (1998, p16) did address the mediating forces of technology, in this case, television, which he described as a “veritable Trojan Horse” that allowed the entry of commercialism into the sport. Under the influence of technology and those who controlled the technology, the sport changed from an accessible activity to a consumer product and media (television) spectacle. In many ways, the competition shifted from on the pitch to a power struggle in who controlled television, sponsoring rights, and national broadcasting rights. The battle turned into the advertising and marketing arenas of major industrial companies competing with each other for exclusive rights to link their products with the sports event, and finally, television channels (Bourdieu, Dauncey and Hare, 1998).

This conversion of sport into commercial spectacle and an advertising medium may be prescient in the influences of the Habitus of Technology in the commercialisation of education. This aligns with the progressive subordination of thought-time (academic labour) to money-time (education as a product) is a serious challenge to the future health of Higher Education (Noonan, 2015). This highlights how technologies transform the “habitus” of contemporary societies and become a window into the culture and preconceptions associated with the Technologies of Learning. Concerns with the locus of power and inequality animate Bourdieu’s work (Albert and Kleinman, 2011), which run in parallel to the technologies of learning being associated with disparities in learning access. Costa (2015) saw digital technologies as an evolving structure that provides an opportunity for new ideas views, sensitive to technological influences on the political, economic, cultural and as a space of action in which new practices emerge.

Professional practices, technological experiences and social culture are inscribed in our body and mind, generating social practices (Koukoutsaki-monnier, 2017) in the Habitus of Technology. It is the intersection of the habitus structures, and technology encounters with humans which creates a sense of the ‘vocabulary’ available to individuals to describe, adapt and cope with
expectations of social life. It is realistic to believe that ToL practitioners will mirror Costa's (2019) work that indicated that “students' technology practice” is influenced by their technological dispositions and assumptions. Their practices are shaped via cultural expectations of technology use, mainly through personal and social networks.

Habitus has been applied in educational research and offers educational technology research a tool to recognise the conflicted nature of policy and curriculum (Beckman et al., 2018). The conflict often is a result of assuming that technology is a socially, culturally, and politically neutral vehicle for educational outcomes. Beckman (2018) further looked at empirical research from 16 studies that used habitus to investigate school students’ technology practice and noted in the conclusion that technologies needed to be considered social tools and that students’ practices are complex and influenced by a broad range of social and cultural factors.

From a research agenda perspective, Reay (2004) found habitus could be used to uncover dispositions and dependencies that advantage specific modes of thinking over less acceptable in daily interactions and provides a method of investigating the social, cultural, and practical existing in the research data. Byrd (2019) located habitus as an underutilised theoretical tool in higher education research and when used, tended to discount the role of institutional structure and status, attributed habitus to students. Jeon’s (2019) work on exploring scientific habitus as distinct from general scholastic habitus offers a precedent for the distinction of the Habitus of Technology within the larger academic habitus.

Reay (2004) commented that one of the strongest cultural influences towards habitus comes from the educational experience and experiences. The identified group will most often make choices that reflect that group's belief system to reproduce the assumptions and behaviours, rarely questioning if there could or should be another possibility of thinking and behaving (Charlesworth, 2000).

Bourdieu used the term ‘art of inventing’ to describe habitus’ adaptability as a means of resilience to the influence of determinism and instrumentalism. The notion of the ‘art of inventing’ makes it possible for habitus to have an infinite
number of instances that, while unpredictable in scope, still limit diversity and behaviours (Bourdieu, 1990, p. 55). The socially constructed dependencies of technologies reflect how social practices in the habitus are organised. Dependencies then become the dialectic intra-reliance of humans and technologies for the human-technology relationship. This dialectic reliance and dependence are not equally shared in the Philosophy of Technology and humanism.

The tension between humans’ reliance on those technologies that support life and learning flows from the dualistic human relationship with technology. Costa (2019) found it concerning that the field of educational technology is engaged in very little theorisation about technology’s impact on everyday life. The human constructs the dispositions governing the use of technology and, for technology’s part, creates dependencies through enhancement and extensions of the human condition (Orlikowski, 1992; Hodder, 2016).

For Bourdieu, habitus was a concept that invited critique as part of the reflectivity of the process, opening the process to questions that challenged existing theories, methods, and epistemologies (Wacquant, 2006). Posthumanism becomes in this thesis the method of interrogating the dependencies and dispositions exposed through the exploration of the Habitus of Technology opening narratives about what is possible once researchers have an understanding and that highlighting the uniqueness of this research approach to this study.

Habitus of Technology adds considerably to understanding the cultural origins and social discourse about the learning field’s technologies and acts as a vital part of the reflective research process (Hunter, Smith and Emerald, 2015). Bourdieu’s notion of habitus was as soft power in which individuals are captive to the group's collective expectations and ingrained beliefs. ToL embodies the concept of technologies-of-self related to the user’s willingness to give up the agency and accept the dependencies of the educational systems’ use of technology (Coeckelbergh, 2013; Asimaki, 2014).

When considered from an external object's instrumental and humanist praxeology, it requires that you consider technology independently with each
encounter. The Habitus of Technology rejects the separation of external, and forces messy questions about the human-technology relationship as a social construct. The extension of habitus casts technology entangled in the inextricably physical human practice. When we resist the dualism that positions technology as ontologically separate from the human, we open opportunities to pursue the relationship as a complete constructed object of study (Sterne, 2003, 2006). At the level of actual practice, technologies are always organised through (and as) techniques of the body in similar context to posthumanism concept of technology as traits of the human (Ferrando, 2019). So, the ‘form,’ ‘use’ and ‘function’ of technology cannot be separated from the practices with which it is bundled, this anti-dualistic position, sees habitus through the technologies and techniques which become ways of experiencing and negotiating TOL. These questions open the possibility of anti-dualism tendencies towards objectivism, subjectivism, individualism, and technology into our understanding of ToL. The emergent relationship from this perspective becomes the familiar subset of practices, positions and dispositions found in habitus (Sterne, 2003).

**2.6. Philosophical posthumanism**

**2.6.1. Introduction**

This section of the literature review will present a background on posthumanism and associated theories. Emergent ideas became the catalyst for employing posthumanism to capture outlier narratives in the research. The need for a theoretical framework to examine the possibilities presented in the participant narratives was required to fulfil research question three (see Section 1.4).

However, a posthumanist viewpoint is different. As Snaza and Weaver recounted (2015), it changes how one relates to the present and the domination and constraints of many centuries of humanist thought.

Philosophical posthumanism is a theory that proposes an alternate way of examining the human condition, one that rejects the technology dualism and the embedded anthropocentric mode of thinking (Bolter, 2016; Ferrando, 2019).
It is also a theory and practice that rejects the binary separations of humanism that have undermined contemporary critical futures studies and technology studies. When human is the centre of the research and the unit measurement, it implies that humans are inherently more valuable than non-humans and technology. The separation of technology from the human creates tensions between the assumptions of technology, both as desired and a threat; it is one of humanity’s greatest dreams and fears that we will become the machine we create (Herbrechter, 2018).

Posthumanism, as an epistemology, views technology not as external to the human but as a characteristic of being human and not the primary focus of posthumanist research (Ferrando, 2019). This has interesting implications for ToL research design and ‘validity.’ If there is no ‘human student’ in the centre of the educational technology research, an opportunity to move beyond the knowledge whether it be in the forms of texts, sounds, or images that insufficiently represents the intra-actions between society, culture, geology, and ecology presents itself (Ulmer, 2017).

While part of the grouping of posthuman theories, philosophical posthumanism does not concern itself with the transformation of the human through technology.

It is not anti-human as a theory; it simply rejects humanism as an acceptable form of thought (Bolter, 2016; Ferrando, 2019). Posthumanism acknowledges the whole human experience to recognise the non-human, the more-than-human and is accommodating of unexplored possibilities. As such, inclusiveness must be reflected in its methods. A posthumanist methodology is not sustainable by exclusive traditions of western humanist thought (Ferrando, 2019).

The intention is to change how we see the human relationship with the world and acknowledge that technology is not external to this process of knowing. It requires decentring the human in particular discourses (evolutionary, ecological, technological) and interrogating and deconstructing discourses to uncover inherent humanistic, anthropocentric, normative conceptions of what it means to be human.
2.6.2. Background

Posthumanism has been used to define a varied collection of experiences that, according to Gladden (2018), encompass a wide range of labels from critical, cultural, philosophical, socio-political and science fiction perspectives. These include techno-idealism, meta-humanism, neo-humanism, anti-humanism, pre-humanism, feminist new materialism, post-humanities, and biopolitical posthumanism, including bio-conservatism and transhumanism. Such a wide range of philosophies and purposes questions whether it is possible to create a coherent definition of posthumanism (Gladden, 2018).

The focus of this study is primarily derived from Ferrando (2019). It includes the concepts of entanglement and intra-actions (introduced as a neologism to signify the mutual constitution of objects and agencies in contrast to "interaction) from Barad (2007) and the process of posthumanist reading (Herbrechter and Callus, 2008).

Posthumanism theory questions the idea that people are distinctive beings that ought to be privileged over all other life. Rejecting the separation between nature and culture, it resists the dualism of humans and technology and the binary distinctions we use to define what it means to be human (Bayne, 2018; Herbrechter, 2018). The idea of posthumanism as a focus of deconstruction to break humanism into layers of beliefs to eventually counter the dominant humanism worldview of humanism is an appealing one. As Herbrechter (2018) noted, the humanist worldview is beginning to be challenged by the relationship humans are being to have with technology, the critical state of the environment, and the rising voices of the less/more-than-human.

The humanist model for understanding technology is full of tensions, with the human conflicts with technology advocating for the human identity and essence to be free of technology’s influence. The tension leads to fears of becoming replaceable or interchangeable with technology. At another level, humanism’s most vital traits are to establish boundaries and separations to ensure the human remains are separate from the machine.

Posthumanism theory does not assume the ‘post’ means that our future leads to a technological species. It makes the case that it is time to discard humanism,
not being human. For posthumanism, the separation of subject and object, researcher and researched, is no longer suitable for the planet’s future. In modern philosophy, the dominant emphasis is on separating the mind/human and material/non-human (Ben-Zeev, 1989). When in reality the observer is interacting with the system which is observed, the human becomes entangled, part of the networks being explored and as it is no longer possible or desirable to separate human agency and identity from the social and technological environments (Hayles, 2006; Bayne, 2018). The following sections explore the intra-actions in greater detail, linking them to the posthumanist possibilities.

2.6.3. Intra-actions and entanglements

The knowledge and agency produced through the philosophies of technology and habitus are unbalanced and built around a binary power and control, resulting in an unsustainable inequality (Morley, 2016). Barad’s (2007) concept of ‘intra-action’ offers a valuable bridge from the agency built from structure and power of the habitus to the posthumanism belief in agency as a mutual co-construction of entangled agencies.

Agency in the traditional sense can be considered the ability of a human to act. The concept conceives the ability to work because of the intra-actions of people, technologies, and other materiality’s (Barad, 2010; Kuby, 2017; Pedersen and Pini, 2017).

The significance of intra-action as a concept is critical to understanding how agency and identity are understood is vital to this study. Humanism has bestowed the privilege of agency on people, while in habitus, they give up agency to become part of the collective belief assemblage. However, in the posthumanism concept, each object and subject have agency that precedes their intra-action. The notion of intra-action recognises that distinct agencies emerge or are co-constituted through their intra-actions (Barad, 2007).

The introduction of intra-action as a metaphor for the human-technology relationship provides a pathway to move beyond contemporary approaches and acknowledges that technology is entangled and inseparable with how humans learn, research, and experience their world.
The interview relationship as a phenomenon of study results from the intra-action between the participant, interviewer and the influences of the external world that form an individual’s dispositions. How we accept the intra-actions between humans and technology affect what is perceived as real and ‘common sense, making some technologies acceptable and others excluded, opening up possibilities while ignoring others (Barad, 1998, 2003; Vint, 2008; Holton, 2018).

2.6.4. Philosophical posthumanism

The conceptual framework of the Habitus of Technology is used to describe how past experiences, social expectations, and individual beliefs about ToL are expressed, in contrast to the posthumanism theoretical framework as an alternative approach to the relationship with technology.

Posthumanism, in this case, is not used to counter the existence of habitus; it offers the ability to move past the concepts of humanism and the binary separation of human/technology and object/subject that created the existing habitus (Zembylas and Bozalek, 2014; Ferrando, 2019). The binary oppositions created through humanism are social constructions that do not occur naturally in the world (Barad, 2007; Snaza, 2013).

They have become a political concept or force that positions educational research to presuppose education as a practice of humanisation. Still, they should not be an ontological or pedological given (Snaza, 2013). The method of decentring the human offers the opportunity to rethink educational research by embedding the human back in their cultural, ecological, technological, and educational structural networks (Bolter, 2016; Kruger, 2016). The term ‘decentring the human’ simply means not accepting that humans are the centre of attention and research.

The political force which has historically marginalised the experiences, perspectives, voices, and participation of underrepresented groups in research helps them find space in posthumanism philosophy (Ulmer, 2017; Ferrando, 2019). The space created becomes the gap between the unacceptable and expected.
Looking back at how we became the humans we are today, it can only be an artificial concept that posits that the human and the technical are external to each other and on separate development paths (Herbrechter, 2018). We continue to co-evolve together, leading to profound changes in the understanding of our future relationship with the technology (Schick and Toth, 2013; Chakrabarty, 2018; Herbrechter, 2018).

If technology was critical in making us human, then we should adopt a way of examining our relationship with technology to understand where that relationship will take us. When the focus shifts to the future, researchers are challenged to consider who decides the domain of human learning and from what perspective (Kruger, 2016; Bayne, 2018). Technology is a trait of being human in Ferrando’s (2019) philosophical posthumanism, not in the cartesian sense of ‘tools user’, but closer to the meaning of technologies used co-constituting the self.

Posthumanism works to enlarge the boundaries of contemporary thought by advancing self-awareness through the inseparability of ethics, ontology and epistemology when engaging in knowledge production (Barad, 2007; Toohey, 2019). The belief that research phenomena are best understood by breaking them into smaller parts is reductionist at best (Ferrando, 2019). However, phenomena result from and part of the ongoing intra-actions between their constituent parts (Barad, 2007 p 307). Collapsing the binary and dualistic barriers associated with the humanistic approaches reworks the concept of phenomena as the intra-actions of the human, non-human and more-than-human serving to extend agency into the non-human realm (Ferrando, 2019).

Posthumanism and critical futures studies originate from the same poststructuralist roots encouraging critical and creative thinking about the future of who and what we are in the process of becoming (Inayatullah, 2009, 2013). By focusing on what we can become, the capacity to critique becomes posthumanism’s most valuable quality, and can be used to challenge the conception of human exceptionalism (Kim, 2020).

Herbrechter and Callus (2008) suggest that to read in a posthuman way is to read against oneself and challenge one’s ingrained humanist tendencies and
self-understanding. The posthumanist reading of the narrative helps challenge the traditional empirical conception of language being presented as a ‘neutral way’ in research to describe the present reality (Inayatullah, 1998b; Bolter, 2016). The impulse to question ourselves continues to propel posthumanism research forward how to encourage ToL researchers to develop a self-understanding not based on an idea of humanity that is exclusive or exceptional (Herbrechter, 2018), but one where technology is a trait of the learner (Ferrando, 2019).

Education and the supporting technologies can be considered vital to the replication and entrenchment of humanism within society, and it should not be surprising that posthumanism seeks to be the contemporary critique of humanism (Herbrechter, 2021). Looking at new relationships between humans and their technology is questioning, interrogating, and discarding what is comfortable. While the concept of decentering of the human(ist) subject does not “automatically” lead to the inclusion of “other” voices and agencies, there needs to be an accompanying advocacy for and create an active process of deconstruction, of undoing, or “unlearning.”

Ferrando’s (2020) call to scholars to change what she considers outdated worldviews based on the false premises of human supremacy and the myth of unlimited resources. Posthumanism reading is a step towards disassembling traditional modes of thinking about technology in education so that something else might be constructed from the pieces (Herbrechter, 2018).

The idea that technology is a tool, an extension, for education is being challenged by posthumanism, opening profound changes to education. Emergent technological developments and, to some extent, the issues already exist unexplored. Posthumanism problematises humanism and instrumentalism and attempts to consider these implications for educational research practices (Kruger, 2016; Bayne, 2018). We are already posthuman in many senses, biotechnologies, genetic manipulation, cyborg implants, artificial intelligence, and pharmacology, altering our human makeup and threatening the status quo of education.
Technology already challenges the prevailing divisions of knowledge that partition the educational and research domains, raising critical methodological questions for academic scholars about curriculum and the impact the technology of learning will have now and, in the future, (Snaza and Weaver, 2015; Sorgner Lorenz, 2015).

Knox (2016) looks at the initiatives of the MOOC project, which in the article’s estimation fails to engage with the possibility that complex forms of the humanism expectations of “rational and self-directing individuals, with a universal desire for education” that are assumed in the creation of MOOC courses. He suggests that posthumanism is a means to ‘read’ against the educational dependency on the humanism mindset that underpins MOOC projects and suggests there are alternative frameworks escape the limitations that a humanist framework places on our understanding of technological change (Knox, 2016). To read against the dependencies presupposes that the researchers have an understanding and recognise what dependencies, dispositions and assumptions underpins MOOC’s, highlighting the research symbiosis in this study between habitus and posthumanism. Knox (2016) further suggests posthumanism is a possible way to avoid the limitations and pitfalls of technology instrumentalism and opens possibilities for the understanding of MOOC pedagogy.

As Snaza (2014) writes with fellow authors, the once stable research barriers between humans and technologies are becoming porous and impossible to continue to maintain the epistemology or politics in relation to way things were for the simple reason that it no longer exists, the world hybridized, contaminated, and entangled. Making it is possible to ask what the human-centred research will hold on to in a post-qualitative, post-anthropocentric landscape? We must learn to read against the epistemologies that ground humanist and instrumental technological knowledge to embrace new ontologies and theories and realise the shock of where the human may not be at the centre of learning (Pedersen and Pini, 2017).
2.6.5. Challenges

Miah (2007, p. 2) argues that “imaginations about how humanity is transformed by technology are specific, historically contingent manifestations of posthuman ideas”. He sees those claims deeply rooted in concepts as becoming alterity or otherness transgressions of boundaries and humanity’s position. Our imagination about how society is transformed by technology can be structural, historically contingent manifestations of the ideology of humanism. The ideals and philosophies of posthumanism dissolve the boundaries between technology and humans to open new alterities in the future.

Part of the challenge is a difficulty to think of the posthuman because few practices and examples guide how to think about being, acting, and questioning from a posthumanist frame of reference. Valera (2014, p. 483) described the situation as: “posthumanism has yet to settle, yet to succeed, yet to make its mark”. The study adds to this observation that there are many excellent references to posthumanism but little about what that means in practice.

This research draws from Knox’s (2016) use of critical posthumanism principally as a perspective from which to critique the educational reliance on humanism and instrumentalist interpretation of the possibility of educational technology in MOOCs for inspiration. Knox refers to critical posthumanism as a wide range of philosophical and theoretical positions from which to critique the academic reliance on humanism and to suggest alternative frameworks for thinking about the entanglement of humans and technologies in education.

The challenge of this study is to offer a way to uncover the structures that shape the education technology discourse through the conceptual use of the Habitus of Technology and offer a means to take past the identification stage. Drawing on Philosophical Posthumanism (Ferrando, 2019) for a theoretical position provides avenues of that narrative to be extended to explore alternative expressions of how ‘learning’ is being defined, practised, and imagined in areas of data-driven educational technologies and the advent of cognitive and artificial intelligence teaching system (Knox, Williamson and Bayne, 2020).

Regarding the pedagogical dimension of technology in the educational debate may be historically linked to the instrumentalist notion of technology as a tool
used to change, enhance, or extend education, especially at a ‘methodological’ level (Snaza, 2013). To question the role of technology in education misses the point of Ferrando’s (2019) claim that technology is a human trait; to be clearer, in this view we are entangled with technology.

The separation fades between technology and education under this premise; it may offer an answer to Selwyn’s (2016) observation that in the last 100 years, technology has not disrupted or transformed education. Posthumanism discards the practical idea of technology as an extension or a prosthesis for education. If technology evolved with us and spurred on our cognitive development (Schick and Toth, 2013; Chakrabarty, 2018; Herbrechter, 2018), then the problem may be in our separation of technology from the learner, denying an essential partner in the human learning process.

For many, the concept of posthumanism is controversial. For some, it is a contamination of the very essence of what they believe it means to be human (Valera, 2014). For others, the argument stirs fears of the dualistic distinction of technology and human at the core of humanism being displaced by a reconfiguration of technology, human identity and interconnected systems of data feedback, surveillance, and algorithms, that attempt to render the human essence into actionable data (Braidotti, 2013). Posthumanism exposes the alternative voices and becomes an emancipatory movement being fuelled by the resurgent ‘others’: the women’s rights movement, the antiracism and decolonisation movements and post-Anthropocene voices (Barad, 2007; Braidotti, 2013a; Ulmer, 2017; Ferrando, 2019). Posthumanism will inevitably mark the turning point against the ‘humanist centre’ as the dominant mode of thinking. This mode of thinking while anti-humanist and post-Anthropocene offers the altogether new possibility of conceptually viewing the future of technology and education without the image on the human as the centre of attention (de Freitas, 2017a; Braidotti, 2019; Ferrando, 2020).

2.7. Literature Review Conclusion

This chapter draws together the relevant literature for the thesis. The material covered was extensive, looking at research surveys in educational technologies, that indicated that the bulk of research into ToL was primarily
focused on solving practical problems from an instrumentally focused view of technology towards exploration and critique of the humanist influences of technologies. The presence and influence of humanism were assessed as never neutral, demonstrating the privilege and exceptionalism we assign to select portions of our species and constraining effect on our relationship with technology. In Section 2.3, the discussion focused on the ideological influence of humanism on the Philosophy of Technology resulting in a dominant instrumental and deterministic predisposition. The Habitus of Technology (Section 2.4) became the tool and vocabulary that described the influence the previous section had on the practitioners’ beliefs, assumptions, and agency and the futurist impact on the future of ToL. The final section of the current chapter (Section 2.5) describes posthumanism, which can potentially disrupt and challenge the concept of the Habitus of Technology. As a practical approach, a posthumanism reading of the Habitus of Technology is novel in the technology of learning and possibly a new application of philosophical posthumanism. The process is not used to counter habitus, instead offering a way of ‘reading’ the habitus and challenging the structures and assumptions that seem perfectly acceptable to the reader.

Having problematised existing literature grounded by a humanist research tradition, this thesis now turns to alternative research methodologies that are less constrained by that tradition. Causal Layered Analysis will be introduced in Chapter 3, Section 3.5.3, as a method that might be tailored to look for evidence of the Habitus of Technology. This will be situated in a broader Critical Futures Studies approach (Chapter 3, Section 3.5) intended to challenge standard views and to accommodate the examination of structures or dispositions as a means to change our understanding of existing practices.
Chapter 3. Methodology

3.1. Introduction

The methodology chapter begins with reflectivity in Section 3.2, giving insights into the researcher’s journey and philosophical grounding which resulted in the theoretical and conceptual frameworks. The overarching theoretical framework follows in Section 3.3, describing the framework and why this approach was selected. The conceptual framework is discussed in Section 3.4, giving more details about the methods used in the research. The final section introduces the concepts behind critical futures studies, concentrating on the overarching description. It also presents Causal Layered Analysis (CLA) in Section 3.5.3 as research method, with a history and a brief explanation.

3.2. Researcher reflexivity

Reflexivity acknowledges the researcher’s role in choosing the approach and research plan and is a cognitive process of self-interrogation (Mortari, 2015). Reflexivity makes the researcher’s position visible to the reader and the researcher, allowing both to understand the assumptions and beliefs that pre-exist the research. In many ways, reflexivity can be seen to create legitimacy and transparency in the research procedures.

In reflexivity, the processes are tools that can reshape and transform a personal habitus. The extent of the transformation is often dependent on the epistemological layer involved; the more profound the layer, the greater the intensity of the change, the repetition of a given experience and the duration over time (Russo, 2003; Hilgers, 2009). The research did not begin with a fully formed philosophical or ontological position. On a macro level, there was an assumption that current modes of thinking about technologies and education were insufficient to address humanity’s future educational and societal needs. The humanist boundaries separating humans from technology and the beliefs supporting the Anthropocene age also raise issues. The literature review led to posthumanism’s philosophical position, which offered a mode of thinking about technologies that addressed the consequences of our choices on the future of education, society, and the planet (Ferrando, 2019).
From a personal and introspective position, the process of discovering and learning how to apply CLA became a diffractive journey of seeing my beliefs and assumptions regarding education and technology exposed as they passed through the layers of literature and conversations with causal layered practitioners. This realization of the entanglement of layers of the everyday, social, cultural, and archetypal human-technology relationship became the perspective that informed the research.

The creation of knowledge in this research process not only involved finding and reporting the results but through critical futures became concerned with understanding the implications of that knowledge on the possible futures and the consequences of those choices (Inayatullah, 1998b). Embedded in the consequence of choice is an understanding that the researcher is entangled and shares responsibility for choices that may emerge from the research process (Barad, 2007).

While the research participants lead in the co-creation of data with the interviewer, they are not the only participants in the transformation of the data for analysis. Technology, as the subject of the narrative, also plays a role – especially in the transcription of the conversations into a textual and visual representation of the interview (Nordstrom, 2015). The researcher must understand the technological influences and personal beliefs involved while acknowledging that each participant has a different belief system guiding their responses.

The inseparability of ethics, ontology and epistemology are accepted in this research, allowing a greater understanding of the intra-actions between humans and technology as a form of co-constituted agency (Barad, 2007, p. 90). The synthesis of these often competing and conflicting personal positions and technological influences during the analysis phase ultimately allows the Habitus of Technology to emerge from the data.

Posthumanism as a researcher's philosophical belief does not challenge what it means to be human. Instead, it rejects humanism and the boundaries associated with the concept of human agency to encourage future research into the expanded possibilities of the relationship between humans and ToL.
3.3. Theoretical framework

The theoretical framework is the foundation from which the research creates knowledge. It serves as the structure and support for the rationale for the study, the problem statement, the purpose, the significance, and the research questions. (Grant and Osanloo, 2014; Dickson, Emad Kamil and Adu Agyem, 2018). Posthumanism as a framework draws primarily from Ferrando's (2019 p. 44) philosophy as an ethical onto-epistemological approach that reflects upon the broader meaning of technological developments, which rejects the human-technology boundaries. The philosophy of the posthumanist framework collapses the traditional barriers between ontology, epistemology, methodology and methods (Barad, 2007).

Significantly to the Theoretical Framework, Ferrando’s posthumanism sees technology as a trait of the human, not something to be feared, rebelled against, used as a tool, or reaching a state of singularity. Posthumanism technologies, with their roots in poststructuralism and is influenced by Foucault’s notion of the Technologies of the Self as a form of technology intra-action with the individual to attain happiness, wisdom, and possibly immortality (Burkitt, 2002; Ferrando, 2019). Burkitt (2002) provides a theoretical linkage from the technologies of self as a form of resistance to the power of habitus.

The connection to the research and the Conceptual Framework of Habitus is one of choice, it is a representation of the belief system of the research, choosing philosophical posthumanism as the theoretical framework positions this to the thesis and reflects a desire to consider humans intra-connected with their environments and technologies. Habitus as a conceptual framework represents what the thesis is searching for and becomes a powerful tool in making the dispositions and dependencies visible for analysis. Technology can be the re-enforce disposition and dependencies of the present habitus through the interactions with individuals, or intra-act to create the possibility of a more inclusive human or, possibly, a human free of constraints of humanism (Burkitt, 2002; Brodwin, 2017). Habitus of Technology becomes a richly textured conceptual framework for describing the dispositions created by broad social structures into the field of TOL and the practitioner. This offers a solid
sociological framework and, importantly, a conceptualisation of the structure of the human-technology relationship.

From this vantage point, the Philosophical Posthumanism Field (Ferrando, 2012, 2013, 2021) is created from three intra-related beliefs; post-humanism, post-anthropocentrism, and post-dualism, which focus on decentring the human from the research discourse. Post-anthropocentrism decentres humans from the environmental advocacy, where the human is what we are making a better world for, but also with other living things, and with the wider environment of non-human species (Ferrando, 2017) Post-anthropocentrism criticizes species hierarchy and anthropocentric exceptionalism. Barad's (2007) posthumanist writings provide a theoretical bridge to the intra-related beliefs, post-humanism, post-anthropocentrism, and post-dualism in the research by adding the essential concepts of intra-action and entanglement to the Theoretical Framework.

While it may seem disconcerting for this research to theorise the de-centring the human and challenging human supremacy in creating agency, it creates openings to examine problems through a new, less self-centred lens (Hodder, 2016; de Freitas, 2017a; Ulmer, 2017). The possibilities offered are significant when combined with existing methods. Interviews become the intra-actions of language, technology and environment and the individual representations of social, cultural, and environmental influences (Ulmer, 2017).

The neologism "intra-action" contrasts the usual "interaction," which assumes that separate individual agencies precede their interaction; the notion of intra-action recognises that distinct agencies do not precede but rather emerge through their intra-action. It is not so much that they change from one moment to the next or from one place to another, but that space, time, and matter do not exist before the intra-actions that reconstitute entanglements (Barad, 2007).

When the qualitative approach of interviewing and analysis is informed and guided by the philosophy of posthumanism, the binary separation of interviewer and interviewee becomes less critical. Instead, the intra-action between the two becomes moment-by-moment sources of meaning creation, emerging through the uniqueness of the technologies in use and the specific time of the meeting.
(Taylor, 2017). The concepts of entanglement and intra-action challenge the separability of the human from technology and the interviewer from the interviewee.

The second influencer of posthumanism to round out the Theoretical Framework is adapted from Herbrechter and Callus’s (2008) work on posthumanist reading. Reading in a posthuman way is to read against oneself, against one’s deep-seated self-understanding as a group member.

Habitus is built on self-discipline as a member or even representative of a particular group or profession. As a human, it is natural to project understanding and empathise with metaphors, assumptions and beliefs that drive the dominant narrative. It is just common sense, after all.

To read through the lens of posthumanism is to question all that is normal and comfortable, to trouble the identity of those in a group and those who are not, while resisting the need to reassert what is familiar and defining.

A posthumanist reading understands that under each accepted technology narrative, there may be anxieties and repression that is cultivated through the humanist ideologies; the aim is to show that the other voices can be heard in a less defensive way of thinking about the human in its posthumanism allows others to share the centre stage as the research phenomena (Herbrechter and Callus, 2008).

The choice of Posthumanism as a theoretical framework represents the research’s desire to understand how change is created and how assumption, agency and the human-technology relationship can evolve from those conceived through humanism. The strength of posthumanities in the future is associated with what Braidotti (2019) described as the “split temporality of the present as both what we are ceasing to be and what we are in the process of becoming” From a research perspective, the advantage is giving alternative forms to the participant’s habitus orientation towards technology, the social world, the professional field, and the future.

Petersen (2018) reminds us that one of the challenges of introducing this research approach is not to get distracted by its expectations. By trying to erode
the hold on technology exerted by dualistic and humanist research, researchers could inadvertently see it as a binary comparison that becomes somewhat self-critiquing. Petersen also reminds us that the researcher must question deeply even those theories introduced and supported in the thesis.

3.4. Conceptual framework

The conceptual framework is a product of qualitative processes of theorisation and is not merely a collection of concepts but, instead, a construct in which each concept plays an integral role.

Bourdieu’s habitus framework becomes appealing to the study of the human-technology relationship for its ability to accept multiple levels of abstraction and continual intra-actions between dispositions, structures, worldviews, and metaphors worldviews to the narratives of everyday life. Equally important is habitus enticing practice of methodological flexibility (Wacquant, 2018) that challenges established techniques of technology inquiry.

The conceptual framework analysis should effectively represent the relevant social, cultural, political, and environmental phenomenon or social behaviour and the multidisciplinary literature on the phenomenon. The methodology and methods aim to deconstruct each concept; to identify its primary attributes; the question is whether the proposed framework and its concepts make sense to other researchers and practitioners (Jabareen, 2009). Primarily the conceptual framework of habitus is synthesised from the diverse literature review. The conceptual framework in this research leans heavily on several researchers that converge habitus and technology.

Sterne (2003) introduced to the research the idea that there might be a Habitus of Technology, and Bourdieu’s work (Bourdieu, 2017) could be extended into technology, Burkitt (2002) bridged the gap between posthumanism and habitus through the Technologies of the Self that played an essential role in the definition of the ToL. Baumlin (2020 p. 12) comes close to crossing into the posthumanism realm of entanglement when describing the circle of technology; the citizen must rely on the corporation, which must rely on the politician, who must rely on the scientist, who must rely on the citizen, and so on”. Echoing the
habitus dependencies of humanity’s need for technology and technologies need for humanity.

The conceptual framework of the Habitus of Technology gives more detail on how the research will be accomplished and is the tool used to start answering the research questions. Practitioners’ assumptions of technology shape their narratives about the future of technology employed in the education (Milojević, 2005; Bussey, 2009; Facer, 2013). The exploration of the habitus of technologies through the participants’ narratives forces the researcher to reflect on the worldviews and deep cultural metaphors of technology that are moulded by our collective belief network and introspection related to our own experiences (Burkitt, 2002; Sterne, 2003). Habitus, like posthumanism, is resistant to the dualism that physically separates humans from their environment, the natural world and technology. As a concept, it recognises that the social construction of human attitudes, habits, dispositions, and dependencies connect to social and cognitive aspects through the ‘rules’ that govern economics, political structures, professional fields, and worldviews (Bourdieu and Passeron, 1990; Davison, 2004). Habitus becomes a conceptual approach to examining the foundational agency/structure by means of observation and analyses rooted in the practical expression of agency. The premise that knowledge produced by social analysts is entangled in the conditions of intellectual work and the struggle for practical efficacy and pursuit of recognition is often referred to in habitus literature as the sense of the game (Calhoun, 2013).

Habitus is the practical expression of the external and historical factors that work to condition, constrain, and promote change within social structures becomes the phenomenon of study and the starting point for the investigation.

Incorporating technologies into our daily work habits has become the defining concept of the present. The structures of the industrial society create tensions in our relationships with technology by pressuring the individual to change their habits, rather than the habitus of the professional field or institution (Miranda and Alexandre, 2021).
As a practice and of interest to the study is, the assumptions, behaviours, and habits manifest themselves in narratives and actions. The habitus of technologies is central to understanding the structural dominance of technologies in education; habitus has become a practice of inculcation structures to the social, foreshadowing the influence and complexity of human-technology relationships in our lives. The ambience of technology is omnipresent, becoming to the point of becoming involuntary and unconscious behaviour (Miranda and Alexandre, 2021).

The connection to the research and the Conceptual Framework of Habitus is one of choice and reflects a desire to consider humans intra-connected with their environments and technologies. Technology can be the re-enforce disposition and dependencies of the present habitus through the interactions with individuals, or intra-act to create the possibility of a more inclusive human or, possibly, a human free of constraints of humanism (Burkitt, 2002; Brodwin, 2017). Habitus of Technology becomes a richly textured conceptual framework for describing the dispositions created by broad social structures into the field of TOL and the practitioner. This offers a solid sociological framework and, importantly, a conceptualisation of the structure of the human-technology relationship.

The choice to use posthumanism and the habitus of technologies as frameworks opens pathways through which individual narratives may be explored as a way of understanding assumptions and experiences about ToL; not as separate entities interacting, but as entangled entities intra-acting. The process raises the question of what qualitative enquiry might look like through the lens of posthumanist research (Ferrando, 2012; Lather and St. Pierre, 2013; Ulmer, 2018). There is a need to find new methods of understanding ToL. Ultimately, education must be more flexible, culturally diverse and meet changing societal expectations. Education in the future will need the capacity to radically transform the way education is understood to stay relevant (Facer, 2011; Scott, 2015; Ulmer, 2017).

To break the durability of habitus, we need to understand what holds it together. Habitus change constantly in response to new experiences,
dispositions are subject to a combination of constancy and variation, which varies according to the individual and the degree of flexibility or rigidity associated with their particular habitus (Silva, 2016b; Bourdieu, 2017).

3.5. **Critical futures studies**

3.5.1. **Introduction**

This section introduces the concepts behind critical futures studies, concentrating on the overarching description. The section will also introduce CLA as research method, confining itself to the history and briefly explaining both. CLA is discussed later in this chapter.

As a modern organised movement, future studies developed in the aftermath of the Second World War and critical futures studies established themselves in the early 1960s. In these early years, many of its core assumptions, concepts, methods, and beliefs were developed (Son, 2015). In more recent times, critical futures studies (CFS) have become a framework for social activism and learning (Ahlqvist and Rhisiart, 2015). The primary purpose identifies and deconstructs the unquestioned, accepted, and dominant conceptions in the present and re-ordering knowledge by presenting plausible alternatives in the present and future (Inayatullah, 1998d; Fischer and Dannenberg, 2021).

This questioning approach is shared by critical futurists, feminists and non-western futurists, the last group being concerned with decolonising western time and future images and developing dissenting futures (Milojević, 2003, 2005).

3.5.2. **Background to CFS**

The term ‘critical’ does not mean simply ‘to criticise.’ It does not take a negative or threatening approach but includes a range of methods and tools with which realise the full potential of Habitus of Technology by problematising existing economic orders and interrogating commonly accepted social practices (Bussey, Inayatullah and Milojević, 2008).

Discourse about futures studies is divided into three distinct but interrelated practices: predictive, cultural, and critical. The predictive or empirical approach
is simply a reflective process that enhances the past and present as a ‘predictor’ of the future. The cultural or interpretative approach expands the discourse of the possible futures across cultures and communities, creating a desired or enhanced future at the expense of existing political structures. The critical or poststructuralist – the one used in this study – takes the path that, by problematising and deconstructing the behaviours of the present, creates new epistemological opportunities to describe alternative futures (Inayatullah, 1990b).

The methodological foundations of CFS present a process designed to challenge common views and accommodate the examination of structures or dispositions to change our understanding of existing practices (Inayatullah, 2004b, 2013; Russo, 2010). It provides the research with the data to ‘put things together’ in new ways; critical futures open the process to be not only a data-gathering exercise, but also a means to re-frame many conventional ideas about technology, including the move away from the default and provide a reflective learning frame to move from status quo to a critical, dynamic, and proactive frame (Slaughter, 2002).

Several of the principles associated with CFS make the concept attractive, situating technology as more than neutral tools but as cultural practices that manifest ideological and social appeal (Slaughter, 2002). The critical portion of the paradigm frees examination of technology from the pressures of research that often dismisses questions that are seen as imprecise or not empirically answerable (Feenberg, 2008, 2017). The poststructuralist core of CFS works to deconstruct and encourages questioning of the role that humans and technologies play in shaping our perception of the future (Hideg, 2002; Poulsen, 2005; Inayatullah, 2009).

Challenging what is taken for granted or just common sense frees research from being concerned only with understanding knowledge as evidence. Instead, it expands the responsibility of accepting the consequences of the data. The critical futures approach encompasses a concern for which discourses have been victorious in constituting the present. The research approach pays particular attention to who and what is not heard in the
discussion and what ideas have become unimportant or contentious? (Inayatullah, 1998a).

CFS in this application is not solely based on the poststructuralist deconstruction of texts and interviews to expose their dependencies and dispositions. It is most useful and insightful when it questions everyday assumptions and activities that we take for granted and gives voice to those marginalised to expand the realm of the possible (Voros, 2001; Turnbull, 2006; Fan and Khng, 2014). The future may seem unpredictable but remains subject to colonisation by dominant industries, political interests and social choices that tend to lock people into technological dependencies limiting their perception of the future (Godhe and Goode, 2018).

### 3.6 Causal Layered Analysis

This study’s core framework and approach to analysis relied heavily on Sohail Inayatullah’s Causal Layered Analysis (CLA) (2004?). This foresight method provides a structure to frame and enables the synthesis of complex issues where system levels could be looked at through varying dimensions. Inayatullah (2004) explains that the use of the CLA is meant to provide a deep understanding of contextual problems to create transformative, authentic, alternative futures. This defining feature of the CLA is that it is “concerned less with predicting a particular future, and more with opening up the present and past to create alternative futures” (Inayatullah, 2004, p. 8).

As a post-structural methodology (Inayatullah, 1990b, 1998c; Inayatullah et al., 2009), as it is used in this research CLA seeks to deconstruct the layers of the participant’s understanding by exploring the assumptions, ideologies, worldviews, epistemes, myths, and metaphors embedded in interview narratives. Causal Layered Analysis works to surface individual and collective cultural assumptions and narratives that are usually not visible in day-to-day life (Conway, 2022).

In the research methodology, the role of CLA is to connect the research interview data to the research question and provide evidence that can support the concept of the Habitus of Technology. CLA as a method employs an
interpretative and critical approach that allows in-depth insights into different ways of understanding underlying issues inherent in a phenomenon (Fan and Khng, 2014). The research process promotes reflection interpretation of data by taking the data through four intra-connected layers of analysis, namely Litany, Systemic (Social Causes), Worldview and Myth or Metaphor. The inclusion of the worldview and metaphor layer offers an additional means to reveal how beliefs and assumptions are formed that are not traditionally considered using other mainstream research methods (Fan and Khng, 2014).

Examining the interview data with CLA starts with understanding who is privileged in the participant narratives. Secondly, an attempt is made to understand what layer of knowledge (litany, social/systemic/worldview, myth/metaphor) is privilege centred? By understanding which of the four layers the knowledge is centred on, we then can form a perspective on the Habitus of Technology and understand if the dispositions and dependencies result from institutional, economic, social, and philosophical influences?

The research process flows from the first step of interviews of the participants, which is transcribed into the raw data that CLA deconstructs for analysis and discusses, ending the research cycle with the final reconstruction as part of the posthumanist reading. The analysis through the lens of CLA works to uncover layers of beliefs and assumptions to help the researcher understand if the participant's relationship with technology constitutes a habitus. The interview data and resulting findings will provide the context to understand better the dispositions and dependencies that frame the participants' beliefs towards the future of the ToL. Findings from this study will enable practitioners in this field to the impact of their beliefs and organisational practices that constrain the potential of ToL to validate that view of the future of ToL (Gomes and Moqaddemerad, 2016).

Individuals' narratives are a powerful force in creating the structure that binds an organisation to a particular path into the future (Costa, 2013; Fleetwood, 2016). New narratives open up when they can propel change; the transformative impact of CLA emerges when the narrative is deconstructed, and a new story appears, but an unexamined historical narrative may only
provide direction on a familiar course. As the CLA researchers work vertically through the layers, opportunities for changes occur at each level that sustains the new narrative. In this way, an alternative future more relevant to present needs becomes clear (Halford, 2021).

While the approach offered in this research is refined to investigate the layers of technology, habitus, and the future of ToL in our narratives, it continues to carry many of the markers of other CLA interview approaches to analysing complex questions. In one study, CLA deconstructed empirical evidence to question the future by undefining or reinterpreting a specific professional association's future mission using face-to-face interviews (Fan and Khng, 2014). In another study, Facebook search and email invitations were used to explore native garden design through semi-structured interviews using CLA (Uren et al., 2019). Another conducted interviews to understand different stakeholders’ concepts of the IoT-powered healthcare sector's possible future business model using the CLA method (Gomes and Moqaddemerad, 2016).

Other examples include examining the divided relationship between academic and administrative staff in the university to explore what lies beneath surface indications of the ‘divide’ and identify whether it is myth or reality (Conway, 2012). Causal Layered Analysis (CLIA) was used as a methodology in this research to delve beneath the apparent issue to explore the underpinning systems, structures and worldviews that created the tensions. Conway (2012) reported that the use of CLA in this research demonstrated that we need to re-write the ‘unwritten’ rule book that currently determines how universities are managed to enable a reframing of the perceptions about the value that administrators bring to that management process. CLA has also supported diverse research, including deconstructing organisational politics focusing on women and men in a rapidly changing Senior Executive Service (SES) (Hall-Taylor, 2002). While concentrating on the impact of significant changes in SES conditions of employment and what senior executives understood to be contemporary career barriers. One of the relevant observations of this research was the comment, “Perhaps we need to acknowledge that while situations may be socially constructed and therefore not ‘real’ [to positivist], the experience of those structures is certainly real.” (Hall-Taylor, 2002 p. 556). Hall-Taylor, (2002)
concluded that casual layered analysis illustrates how deconstruction and reconstruction give voice to multiple realities. At the same time, when used correctly avoids researcher appropriation and interpretation of data.

The choice of Causal Layered Analysis provides insights into the researcher's thinking about the methodologies and methods. First, Posthumanism, as mentioned many times in this thesis, is an anti-humanism, anti-dualistic and post Anthropocene stance that envisions the human-technology relationship is entangled and intra-active (Barad, 2007; Ferrando, 2019). Causal Layered Analysis as the method of this research becomes the intersection points of Habitus and Posthumanism.

Causal Layered Analysis is qualitative, and as such, the research is contextual; it occurs in the case of this study within a specific time and place as an intra-action between two people. In traditional qualitative interviewing, the researcher asks the participant to relate their perspective of the ToL, often without any control over the outcome (Dodgson, 2019). From a posthumanist position, the interview must be considered as knowledge being entangled in the moment and place understanding what is being produced is layers of knowing/being/doing.

In Causal Layered Analysis, the process of substantiation is in-built through the layers of analysis, deconstruction, and reconstruction. While the concept of layers does not have a precise definition, futurists have many descriptions and notes to leave enough tantalising hints (de Simone, 2004; Bussey, 2014a; Ramos, 2015) and merge to provide a working definition that will serve this research. Each of the four layers becomes an ever-higher epistemological vantage point to examine the dominant social, cultural, or deeply personal influencers. It is, in many ways, a reality check using the four layers as vectors to cross-check and analyse the research data.

Therefore, the social and cultural assumptions become an essential part of understanding the Habitus of Technology. Causal Layered Analysis researchers need to understand everyday narratives at a superficial level up into the deep structures of social, cultural and worldviews as they emerge from critical futures studies methods.
From the instrumentalism and humanist vantage point of technology, society tends to concentrate analysis on the data population trends, new technologies, economic growth, infrastructure developments, and other social indicators.

The Causal Layered Analysis approach emphasises “social interiors” as social patterns, language, worldviews, paradigms, and values. This approach provided places emphasis on “social interiors” in contrast to exterior forms of society (population trends, new technologies, economic growth, infrastructure developments, and other indicators) as targets for analysis (Kaivo-oja, 2017).

In Causal Layered Analysis, there are four layers of analysis (Inayatullah, 1990b, 1998b; Russo, 2010), which are commonly described as the Litany (identifying unquestioned views of reality), Social/Systemic Causes (identifying social, technical-economic, environmental, and political influences), Worldview (deeper autonomous social, linguistic, and cultural structures) and Myth/Metaphor (identifying deeply unconscious stories of experience and views of reality). In the discussion that follows, I explore CLA in terms of the technologies of learning to which CLA is applied in this research.

**Table 2. Causal Layers Definition, modified from (Inayatullah 2017, p. 5.)**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description of layer.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Litany</td>
<td>What we say about technology in our everyday conversations. What are the dominant narratives?</td>
</tr>
<tr>
<td>Social/Causal</td>
<td>What we do at work and the intra-act with the dispositions and dependencies of a profession and social group.</td>
</tr>
<tr>
<td>Worldview</td>
<td>How we think and what do our values match stakeholder opinions and viewpoints. What are the expectations of technology?</td>
</tr>
<tr>
<td>Myth/Metaphor</td>
<td>Who are we, cultural, philosophical, and mythical archetypes? How do our preconceptions, grand narratives of technology, and faith shape each layer?</td>
</tr>
</tbody>
</table>
3.6.1 Litany

The litany layer in this research is a practical everyday expression of the participant's socio-cultural environment; in contrast, the standard definition of this layer in CLA literature is a less focused look at the unquestioned view of reality or possibly what everyone is saying. The research approached Litany neither as uncontested facts nor as superficial expressions of ToL. The participants were not viewed as passive repositories of information awaiting the researcher's question. On the contrary, from the researcher's perspective, they are active members in the conversation, quite possibly the most important.

The litany holds the clues to the Habitus of Technology, making it essential in the analysis to look for the sameness of expressions, beliefs towards limitations or accepted practices, listening for world views and where individual agency exists. A theme runs through the interview that relates to the participant's understanding of the ToL based on the assumptions, dispositions, and beliefs that guide the interpretation of the issue. Participants often express the weight of the other deeper CLA layers in the everyday common-sense adages of life (Inayatullah, 1998a; Breen, Dzidic and Bishop, 2015b). It is important to differentiate that CLA is not being used to investigate the participant's truthfulness in the interview but the existence of the dispositions of the Habitus of Technology.

3.6.2 Social/Systemic Causes

The Social/Systemic Causes standard definition encompasses the social, technical-economic, environmental, and political influences that impact an individual's life but are not overtly useful for analysis. Deconstructing the narratives identifies societal work habits, beliefs, structures, and rules that support a group’s culture are generally identified in the second of four layers. The social/systemic emerges in the Litany as absolutes. Often in an expression of powerless (unable to keep up or no control over decisions being made) and historical structures, “it's always been that way”.

The traditional empirical qualitative analyses are commonly found within the Litany and Systemic Levels of analysis. The Litany provides the empirical evidence for deconstruction, whereas the Systemic Level provides the
researcher with interpretive data where meanings inherent in human dependencies and actions are scrutinised.

3.6.3 Worldview

However, the analysis focuses on using CLA to move deeper into the worldview layer, where narratives reflect how we think about technology. As Holdaway (2016) observes, this is where the marginalised and ignored discourses are uncovered and where values are exposed, and beliefs are analysed. In actuality, finding the marginalised and ignored discourses absent in the discourse is the strength of CLA, as it is essential to pay attention to what is unsaid and unmentioned. Worldviews are the product of the dispositions, thinking and behavioural patterns of those who developed, tested, and implemented the technology into the educational system (Holdaway, 2016). The narrowing of dominant language about educational technology, as always provides an “exchange value” (Hayes and Jandrić, 2014 p. 201) expressed as efficiency, savings, and improvements for learning (Hakkarainen, 2009; Bayne, 2015b). The pairing of techno-education with global neo-liberal ideologies to improve, to enhance (student) learning creates the disappearing person in the value exchange (Hayes and Jandrić, 2014). In the participant narratives, one of the markers for CLA to investigate is who is not mentioned or marginalised in the discussion and where the power resides.

3.6.4 Myth/Metaphor

The Myth/Metaphor layer is the deepest layer and the farthest from traditional empirical research and helps identify the profoundly subconscious stories of human experience and views of reality. The structures of the Habitus of Technology can be visualised and normalised by the final, most philosophical layer of the participant’s identity (Inayatullah, 2009). At this level, the challenge in the analysis is to unearth the core myth or metaphor that supports the foundation of the participants’ litany (Inayatullah, 2004c)

The image of ‘who we are and the worth of the marginalised ‘other’ are unconsciously justified at this level. Finally, it is the source of our deep-seated fears and hopes for technology in the broadest sense, the future and society, which permeate down to inform and influence the other three causal layers
The assumption that the future is layered is a metaphor for working our way down the myth and metaphor layer to visualise how each layer is entangled connects to the narratives found in the litany.

CLA is a critical futures research method that offers a novel way to examine ToL. It is poststructuralist and forms part of the theory of the critical future and so seeks to integrate empiricist, interpretive and crucial modes of knowing in a unified system of ideas (Inayatullah, 1990b, 1998b). The most obvious comparison to CLA is thematic analysis (Braun and Clarke, 2006; Nowell et al., 2017), an established method for identifying, analysing, organising, describing, and reporting themes found in a data set. Further, it offers a more accessible and documented form of analysis for the researcher to examine the perspectives of different research participants (Braun and Clarke, 2006; Marín et al., 2018). Its strengths lie in summarising key features of large data sets, and it forces the researcher to take a well-structured, hierarchal approach to produce a linear and organised final report (Nowell et al., 2017). In this process, codes and articles have distinct boundaries and separations and are not interchangeable or intra-active as the phenomenon of interest (Nowell et al., 2017).

In comparison, CLA uses individual, national, global, and cultural perspectives to explore how individuals see themselves. Bishop (2013) observed that the process of CLA deconstruction according to four layers gives a depth beyond a typical thematic analysis. The process helps investigate habitus from the perspective of myths, truths, and agency through their stories, beliefs, or actions (Bussey, 2014). CLA is not solely concerned with the ‘truths’ in the narratives as a future study’s method. Instead, it considers how that truth functions more significantly in the Habitus of Technology, attempting to identify who has the power to evoke and disseminate the truth and who gains and who loses by making a particular truth common sense and acceptable (Inayatullah, 2004b; Bussey, 2014).
3.6.5 Summary of CLA

As a method, it has a deconstructive approach to structure (in this case, the Habitus of Technology), with the primary function of problematising current thinking of the future, interrogating worldviews, myths, and metaphors about the field of ToL (Inayatullah, 1990a; Bussey, 2014; Ramos, 2015). Thus, by design, CLA does not simply diagnose but seeks to alter how things are understood. In analysis, layers of research are inherently intra-connected and mutually influential (Russo, 2010).

The application of CLA is also highly dependent on the context and setting of the research (Inayatullah, 1998a). CLA appears, on the surface, to be user-friendly but ends up requiring not only a deep understanding of the researcher's ontological assumption but an equally strong understanding of the research participants' belief systems and process of knowledge creation.

The complexity of CLA, the limited examples of it in action and the experience level of the researcher provide multiple opportunities to revisit the interview narratives. The bonus of these false starts was that, with each attempt, the data was analysed anew, and the researcher achieved a deeper understanding of what was said through the audio, visual and textual transcripts.

The repetition created a deeper level of understanding and confidence in the practical application of the analysis process and the theoretical and methodological position of CLA, as each new attempt required further research into the process and the framework foundations. The unintended cost of selecting this methodology was the steep learning curve. However, the unintended payoff was the opportunity to learn about our relationship with technology and how it is expressed in narratives.

Researchers that see the world as either true or false and the empiricist who reject the interpretative and vertical layers of research into technology will find CLA challenging to accept and full of limitations. These limitations are countered by investigating up and down the layers of inquiry and not being constrained by the demands of the humanist ideological perspective (Inayatullah, 1998a). CLA works in the spaces between the layers of these different perspectives; it does not reject other forms of research but considers
them the beginning of the process to advance the understanding of the research topic (MacGill, 2015). CLA has a critical poststructuralist tradition-oriented toward action learning from the analysis process. Understanding the intra-action between the layers is essential to the learning process and provides the impetus to employ the posthumanism reading used in this study.

The intra-actions between the layers are important; the relationship between humans and technology and the world we live in creates meaning and a shared understanding of the myth and metaphor layer. Myth and metaphor shape and organise the worldview that drives the systemic layer and then the litany of our lives (MacGill, 2015). The worldview layer supplies the area to form and create a common culture but often at the expense of seeing alternative possibilities. CLA’s ability to break down the narratives into ever-deepening epistemological layers allows for reframing the myth/metaphor layer, becoming a practical tool to recognise habitus traits exposing the unconsidered alternative futures (MacGill, 2015).

The participants’ narratives explored through the CLA process give rich insights into who or what counts in the human-technology relationship. The narrative becomes an intra-active performance in time between the interviewer, the participant, and the environment around them, revealing ways of knowing in the causal layers and jointly creating stories in the process (Barad, 2007; Smith and Monforte, 2020).

CLA helps unravel the current explanations in each layer found in the participants’ narratives. Their visions of how things are structured in the present build images of what is possible in the future, ultimately describing the structures and dispositions of the Habitus of Technology. The emergence of a dominant vision that pre-constructs the technological world and education occurred primarily because that has been institutionalised and supports our existing assumptions and beliefs about technology and the separation of humans, things, and the future (Milojević, 2004). For this reason, CLA appears to be a method tailored to look for evidence of the Habitus of Technology by identifying the differences and commonalities, beliefs, assumptions, and values embedded in participant discourse.
While CLA is driven by context and location of use several steps to usage remain common for this particular application.

1. The research must spend considerable time becoming familiar with the philosophy of technology, the cultural, worldviews and myths that surround the ToL,
2. The interviews themselves should have limited interference from the interviewer, the goal is to allow the participant to express their assumption and beliefs surrounds their involvement with the ToL,
3. Post interview, the examination of the data and familiarisation with the data is fundamentally important to being able to connect the CLA layers to images the participant has of their technology relationship,
4. It is important to be aware of the litanies that appear to be unquestioned, common sense and readily accepted, for these statements often hold the key to the dispositions and dependencies that are crucial to the analysis, and
5. Understand that the worldview and metaphor layers require deep consideration and will not always present themselves in shorter interview scenarios.

3.6.6. Critique of CFS

Critical futures as a practice offers two contrasting approaches. The first is futures research, which adopts classical science futures research criteria to adapt to existing methods and solidifies the process of forecasting. This approach emphasises technical and data-driven futures forecasting methods, with little attention to the social and cultural influences. Futures studies use methodologies that broaden and deepen the circle of verbal-qualitative methods (Hideg, 2002). The qualitative interview methods find their epistemologies in the philosophies of structuralism, post-structuralism, and post-modernism to achieve their critical voice (Slaughter, 2002). The intention is not to resurrect the ‘two cultures’ debate (Standish, 2014) but to highlight the moderating influence of the theoretical framework of posthumanism on the discussion. The debates highlight the predisposition to draw boundaries between two opposing approaches in an institution as rallying points to be
defended (Standish, 2014). Posthumanism as a posthumanism, post-anthropocentrism and post-dualism philosophy rejects the boundaries of dualistic arguments freeing the research to explore new approaches to everyday problems (Ferrando, 2019).

The choice of CFS as a methodology is not a rejection of other research approaches but was chosen as a means to achieve richer insights into an underexplored area of technology research. Both approaches focus on isolating the questions to be answered from their social context rather than exploring the social implications to understand the questions and answers (Standish, 2014).

These notions give rise to the power of the narrative in the material construction of practical reality – past, present, and future – and the requirement of justification for inquiring about the future. The future can be real if the technologies, actions, and narratives are organised in an operational pattern that creates a desired future (Selin, 2008). Some visions have hope, while others bring concerns. The power lies not in words but in the credibility and social influence of the political and cultural promises. Hope, fear, and hype demand an interrogation into how futures are told and by whom.

Since it is difficult to deal with truth and credibility regarding different representations of the future, the story of a future cannot exist alone. The narrative, by nature, is enmeshed with the object, the relationship in the present, the dependencies of the technology, and the individuals’ desires (Selin 2007). The objective of CFS is not to just look ahead in time and space but to accept responsibility for what has happened before and investigate what is happening now (Sardar, 2010).

Many of the assumptions that drove this line of thinking are binary and conflicted, separating the human from science and technology, resulting in a future that results in ‘the present will continue,’ which futurist Dator (2019, p. 110) argues, “often encourage[s] people to ignore the future entirely and to hope that we can just muddle through somehow... ignorant of things to come”.

Future studies as a field promise progress and frame technology as solutions while avoiding technology’s social dimension. If we narrow the focus of the concepts of CFS to the field of ToL through the work of Selin (2008) and Dator
(2019), we can observe how research evaluates and modifies technologies that are still seen as developing in response to society’s needs. The image that is left is one where the notions of technological futures in education are not matched by our academic research or practical understanding of the human-technology relationship being created. Technology, as a result, is a projected, deterministic, autonomous, and desirable force locked in a perpetual feedback loop where desire generates a continuous need for newer, better, and more desirable technology. Knowledge of the technological influences on practitioners is limited and often under-researched due to the unrelenting speed of development. The spectre of technological determinism feeds off of this illusion of self-perpetuating momentum, locking research into a linear, dualistic separation of the human and technology that works to narrow the possible images of the future of ToL.
Chapter 4. Research Methods

4.1. Introduction

The choice of methods responds to the type and purpose of the research questions, responding to what the researcher wants to find out and why they want to know. Methods should connect gaps in the literature to the research questions in the realm of existing theories, ideas, and concepts. All methods have their advantages and disadvantages; the choice of method is a choice to align the desired evidence and limitations with the researcher’s intent (Timmermans and Tavory, 2012; Al-Saadi, 2014).

This chapter discusses the research design (Section 4.2), data collection (Section 4.3), data analysis (Section 4.4), method of sourcing the interview participants (Section 4.5) and interview format (Section 4.6). Finally, it addresses ethics issues.

4.2. Research design

The research questions structured the design of the research (see Section 1.4). The first asked whether the participants in the two research groups demonstrate a Habitus of Technology; the second, whether the groups differ in how the Habitus of Technology is constructed; and the third, what constraints are associated with the Habitus of Technology in the future. The third also offered the possibility of exploring emergent voices in the data, as embraced through the posthumanist reading.

This thesis introduces a critical futures research process to the field of ToL as a means to investigate the Habitus of Technology through the interview narratives of two groups of participants: practitioners and futurists. This uses the causal layered model to challenge the temporal continuum of the current qualitative research that accounts for the past and present of the technologies of education without addressing the long-term consequences of the future of education as a holistic concept (Inayatullah, 1998b, 2002, 2019; Bussey, 2009). CLA brings together multiple positions of epistemological engagement in four layers, each of which is an ever-higher epistemological vantage point to
examine the dominant social, cultural, or deeply personal influencers using the four layers to cross-check and analyse the research data.

CLA explores vertically through the unconscious and conscious belief systems and linearly through the narrative similar to thematic categories, but it is a combination of both informing each other that enables a deeper understanding (Inayatullah, 1998b). CLA also accepts that the act of measuring (in this case, interviewing) is a shared responsibility between the interviewer and participant (Milojević and Inayatullah, 2015).

The research design adopts a traditional structure, divided into three phases, the first being data collection using semi-structured interviews and, in the case of two participants, email interviews conducted between February and July 2019. The second phase was the data analysis, using CLA to deconstruct the interview information in four epistemological layers and the final phase was the discussion portion of the research, which examined the results of the analysis to address the research questions.

4.3. Data collection

The data was gathered through 20 semi-structured interviews. The purpose of the semi-structured interviews was to allow the researcher and the interview participants to meet and discuss the research questions. The data came from semi-structured interviews carried out with each of the ten practitioners and eight futurists. The length of the 18 interviews was approximately 60 min, while two of the futurists were interviewed via email due to scheduling conflicts. Most of the other interviews were conducted online, with one face-to-face.

The skill in interviewing lies in aligning the information needed to inform the research questions to the information that the participant will give. In most circumstances, this co-generated information did not exist before the interview and resulted from the intra-action between the two people involved. Creating a safe verbal space in the interview provides the participant with an opportunity to express information that cannot be collected from any other source.

The answers or tangents in the interview may not give a response to a specific question but are the catalysts to understanding the participant’s beliefs and
views of the larger research goals and questions. The interview is successful when the interviewer provides sufficient structure to maintain the topic focus but is flexible enough for the participants’ emergent beliefs to be expressed. Interviews provided the raw data to understand how the participants see their relationship with ToL, education, society and, if possible, the future. The interview strategy was to allow the participants’ beliefs, assumptions, and experiences to emerge in the conversation through themed questions.

In the data collection phase, the purpose of the interview process was explained, and consent was gained from the participants to audio and video-record the interviews. Any questions that the participants had were answered, and the participants were assured that I wanted to hear their stories, which was essential to the research and subsequent analysis.

However, in the posthumanism framework, the interview becomes the phenomenon of research, encompassing the interviewer and the participant. As a result of this intra-action, the video conferencing process co-constitutes the knowledge created through the interview (Nordstrom, 2015).

While the interviews ask the how, why, and what, and are typically the most common qualitative research questions, there are many challenges to an interview format: the environment, the technology used, the confidence the interviewee has in their topic, and their willingness to express their views to someone who is essentially a stranger exist for almost all interviews (Leech, 2002; Hammersley, 2006; Anderson and Kirkpatrick, 2015; Nordstrom, 2015).

The techniques for a good interview do not vary much. The rapport of the person being interviewed is possibly the most common advice to individuals about to start interviews (Leech, 2002; Hammersley, 2006; Anderson and Kirkpatrick, 2015). However, while it is important, there is limited time in an interview; the ones in this study were all roughly 1 hour, not much time for an authentic rapport.

From experience, having interviewed hundreds of individuals in my previous career, I find that it is equally important to give them confidence that their knowledge matters and that, as the interviewer, I want to hear and learn from them.
The approach used in this study to build that confidence was simply to get the interviewee talking and get comfortable hearing themselves telling you about their beliefs through ‘grand tour’ questions (Leech, 2002; Edwards and Holland, 2013). As the name suggests, these ask interviewees to give a verbal tour of a broad topic they are comfortable with and know well as a means to get comfortable. The ‘grand tour’ questions that worked well in this study were getting the interviewee to talk about what technology meant to them personally and following up with a similar question about education (see Appendix 3, questions 1 and 2).

Counter to common expectations that the interviewer holds the balance of power in the interview; my experience was that the interviewee shared much of the power, choosing to tell their stories, whether to join the online call and having the agency leave the interview whenever they wished.

4.4. Data analysis

Using CLA as a stand-alone methodology, data analysis helped understand and gather different perspectives from the participants (Inayatullah, 1998a, 2017). The role of CLA is to connect the research interview data to the research question and provide evidence that can support the concept of the Habitus of Technology. CLA accomplishes its task by deploying four different layered epistemological lenses that deconstruct the text. This examines the research phenomena at other times (past, present and future) and progressively deeper layers, from superficial daily conversations to embedded cultural beliefs (Fan and Khng, 2014).

A quick examination of Google’s Ngram² feature (displays the history of phrases that have occurred in English literature) of the expressions of technology as a tool, a solution, a problem, and speed of change all show a rapid increase from about the mid-1950s to the present.

² Google Ngram
https://books.google.com/ngrams/graph?content=technology+as+a+tool&year_start=1800&year_end=2019&corpus=26&smoothing=7&direct_url=t1%3B%2Ctechnology%20as%20a%20tool%3B%2Cc0
Examining long-term paradigms through the four layers is particularly useful in understanding complex social issues and cultural structures (Bishop and Dzidic, 2014). Webster’s (2017) research conclusion that the philosophy of technology assumptions matters and those assumptions shape leaders’ approaches to technology decision-making informs this research. The dominant issue in Webster’s (2017) research was the concern for the pace of technological change. “Keep up with technology or be left” behind became the metaphor of respondents, with an instrumentalist perspective that technology is not an end in itself but rather is a tool, a means to achieve educational goals and ends.

CLA inquiry into the participants’ assumptions and experiences provides an analysis depth that is not possible using traditional methods (Russo, 2003; Fan and Khng, 2014; Milojević and Inayatullah, 2015). The interview data and resulting findings will provide the context to understand better the dispositions and dependencies that frame the participants’ beliefs towards the future of the ToL. The research goal was not to find a precise answer to each question but rather to build a rich picture of participant experiences with ToL. The research process flows from the first step of interviews of the participants, which is transcribed into the raw data that CLA deconstructs for analysis and discusses, ending the research cycle with the final reconstruction as part of the posthumanist reading.
One of the limitations of using the CLA methodology, as with any qualitative research based on interviews and perceptions, is the possibility of social desirability biases in the research participants’ responses (Bergen and Labonté, 2020). However, by using the four layers as interconnected and explicit epistemological ways of knowing to examine the answers, the participant and researcher’s biases were significantly reduced (Fan and Khng, 2014).

Litany in this research is a practical expression of the participant’s socio-cultural environment, while the standard definition of this layer in CLA literature is the unquestioned view of reality or possibly what everyone is saying. The research approached Litany neither as uncontested facts nor a superficial expression of the investigated phenomena. The participants are not passive repositories of information awaiting the following question: from the research perspective, they are active members in the conversation, quite possibly the most important.

A theme runs through the interview that relates to the participant’s understanding of the ToL based on the assumptions, dispositions, and beliefs that guide the interpretation of the issue. It is important to differentiate that CLA is not being used to investigate the participant’s truthfulness but the existence of traits of the Habitus of Technology in the interview.

The litany holds the clues to the Habitus of Technology, making it an essential practice to look for the sameness of expressions, beliefs towards limitations or accepted practices, or world views and what level of agency exists. The weight of the other CLA layers is felt and often expressed by participants as just how it is and other everyday common-sense adages that guide life (Inayatullah, 1998a; Breen, Dzidic and Bishop, 2015b).

The Social/Systemic Causes standard definition encompasses the social, technical-economic, environmental, and political influences that impact an individual’s life but are not overtly useful for analysis. Deconstructing the narratives identifies the societal work habits, beliefs, structures, and rules that support a group’s culture are generally identified in the second of four layers. The social/systemic emerges in the Litany as absolutes.
The traditional empirical qualitative analyses are commonly found within the Litany and Systemic Levels of analysis. The Litany provides the empirical evidence for deconstruction, whereas the Systemic Level provides the researcher with interpretive data where meanings inherent in human experience and actions are scrutinised. This is also the point at which most of the technology in education research ends.

However, the analysis focuses on using CLA to move deeper into the worldview layer, where narratives reflect how we think about technology. As Holdaway (2016) observes, this is where the marginalised and ignored discourses are uncovered and where values are exposed, and beliefs are analysed. In actuality, finding the marginalised and ignored discourses absent in the discourse is the strength of CLA, as it is essential to pay attention to what is unsaid and unmentioned. Worldviews are the product of the dispositions, thinking and behavioural patterns of those who developed, tested, and implemented the technology into the educational system (Holdaway, 2016).

The narrowing of dominant language about educational technology as always provides an “exchange value” (Hayes and Jandrić, 2014, p.201) expressed as efficiency, savings, and improvements for learning (Hakkarainen, 2009; Bayne, 2015b). The pairing techno-education with global neo-liberal ideologies to improve and enhance (student) learning creates the disappearing person in the value exchange (Hayes and Jandrić, 2014). In the participant narratives, one of the markers for CLA to investigate is who is not mentioned or marginalised in the discussion and where the power resides.

The Myth/Metaphor layer is the deepest layer and the farthest from traditional empirical research and helps identify the profoundly subconscious stories of human experience and views of reality. The structures of the Habitus of Technology can be visualised and normalised by the final, most philosophical layer of the participant’s identity (Inayatullah, 2009). At this level, the challenge in the analysis is to unearth the core myth or metaphor that supports the foundation of the participants’ litany (Inayatullah, 2004c).

The image of ‘who we are and the worth of the marginalised ‘other’ are unconsciously justified at this level. Finally, it is the source of our deep-seated
fears and hopes for technology in the broadest sense, the future and society, which permeate down to inform and influence the other three causal layers (Inayatullah, 2004b, 2009; Wright, 2004; Watson, 2009).

Using CLA in science and technology studies aims to understand the assumptions and projects not to be constrained by such assumptions and practices; we must find ways to critically identify and examine the assumptions (Turnbull, 2006).

The assumption that the future is layered is a metaphor for working our way down the myth and metaphor layer to visualise how each layer is entangled connects to the narratives found in the litany.

4.5. Participants

There are many ways to recruit participants, Hoepfl (1997) noted that there was up to sixteen variations of purposeful approaches that might have been used; however, in general, academic researchers often favour the convenience sample approach that provides suitable participants for the research (Edwards and Holland, 2013).

Recruitment was achieved in this study using purposeful selection, which focussed on selecting individuals who would provide information most likely to resolve the research questions. Reaching out to those in their professional circles and research field (Edwards and Holland, 2013) presented one method but did not provide easy access to the group of futurists. Snowball was also considered but suffered from continually having to go through the process of recruitment. The snowball approach strengths were in selecting individuals in sensitive areas or very small selection requirements (Hoepfl, 1997). The final choice was to use a database method and extend the reach through online activities. The use of LinkedIn³ as the database benefits from being continually updated. Members have auditable data trails to provide a thicker picture of their suitability for the research.

³ LinkedIn is a social network (500 million+ members) that focuses on professional networking and career development. https://linkedin.com
The recruiting process was conducted entirely online. The breadth and depth of the membership of LinkedIn, a professional social media site, and my long-term presence on LinkedIn made it a place of convenience to source participants. LinkedIn is primarily a professional member platform focussed on linking professionals for collaboration and employment. The platform has built-in protocols that limit unwanted solicitation while enabling individual members to maintain distance from a stranger (in this case, the researcher) asking to interview them.

The site features provided a link to the researcher's profile, gave access to all background activities online and offered the prospective participant the option to block or ignore the request. This approach gave the prospective participant control over accepting the request and reduced any pressure to participate that they might have felt, offering them a safe way to decline or ignore the request.

An evolving series of keywords facilitated the search for quality participants with the relevant skills and background. The keywords used were variations of ‘technology,’ ‘education,’ ‘TEL,’ ‘Philosophy of Technology,’ ‘future of education,’ ‘learning design,’ ‘futurist’ and ‘foresight’ and resulted in two lists of 13 individuals who met the criteria for each group as possible candidates.

The individuals on the list were each sent an individualised email through the LinkedIn platform briefly detailing the research and asking if they would be willing to participate in a one-hour interview. Twenty-two of the 26 individuals expressed an interest in learning more about the study and the interview.

The participants were then provided with information about the study, why they were selected, how long the interview would take and why they should give up their time to participate in the research (Edwards and Holland, 2013). Two did not initially express an interest in continuing and were dropped from further correspondence. The remaining participants were sent the necessary consent forms and information to complete and return.

The remaining 20 participants were asked to suggest dates and times for the interview. They represented a diverse group and were all professionally employed in their fields. The participants comprised eight women and 12 men, including three sought-after international speakers and six published authors.
(other than academic articles) and were located in ten countries: five from Canada, four from the UK, two each from Portugal and Australia and one each from the USA, China, Germany, Italy, and Israel.

As with most qualitative studies, the goal is to understand why people have thoughts and feelings that might affect the way they behave (Sutton and Austin, 2015). This study focused on the behaviour and assumptions that govern the participants’ perception of ToL. In the end, the method chosen matched the intent and needs of the research and the researcher's expectations.

The research limited the scope of participants to focus on two groups. The first was a group of practitioners representing participants professionally active in the academic field of ToL or the professional education field. The second group was predominantly self-styled professional futurists and foresight specialists engaged in futures studies. The process sought individuals who had a verifiable professional history, an interesting field of research or a good following of fellow professionals in their field together with, ideally, a relevant biography or online history (Spaulding and Rockinson-Szapkiw, 2012; Webster, 2016).

The initial assumption in the research planning was that these two groups should show a level of intra-group similarity in terms of their dispositions and dependencies, philosophical beliefs, and expectations of technology. However, the groups should diverge with unique dispositions and dependencies in an inter-group comparison of practitioners and futurists. This approach would provide data to map commonalities and divergences in each group's internal influences and philosophies while providing a reference point for comparison.

The primary limitation in selecting participants was that the interviews were conducted in English due to the researcher’s monolingual status. The interviewer and participants were also from a western philosophical background and first-world countries. Secondly, the lack of ability to include technology assumptions from non-western philosophies and English speakers may have worked to harmonise the responses to the interview question. To counter this, the intent was to source two different participant groups that represented divergent interests.
Research on interview methods still positions face-to-face interviews as superior to other modes. Johnson (2019) reduced the question to a difference of 1,157 more words in a face-to-face interview and three minutes less on average than Skype. He measured the level of detail by the word count of the transcript and field notes, suggesting that there does seem to be benefits to travelling to conduct in-person interviews and adding that the findings do not indicate that Skype interviews are unacceptable and might be preferred in some situations. However, three interviews were conducted via Skype; one was face-to-face, and two were via email. The quality of participants achieved in this research could not have been replicated without significant difficulty if all interviews had been face-to-face.

4.6. Semi-structured interview

The litanies we hear every day help shape our identities and provide meaningful frameworks for beliefs and assumptions. In doing so, they also simultaneously shape boundaries for what is perceived plausible and desirable. The litany becomes the words we repeatedly say about ourselves, our past and our beliefs (Milojević and Inayatullah, 2015).

The choice of the semi-structured interview reflects the intention of the research approaches to expose the litanies of the participants from their interview narratives. The semi-structured interview method employed is adapted to include the narrative interview (Anderson, 2015) ideals of placing the people being interviewed at the heart of a research study and letting the interviewee have some control over the direction, content, and pace of the interview. The interview method also recognises that “the interviewer is not a neutral, objective, unbiased observer but has what could be considered an empathetic involvement in the interview intra-actions (McIntosh and Morse, 2015). Both of these methods complemented the semi-structured interviews to maintain a focus but be flexible to allow for the change in the participant’s responses.

The semi-structured interview constructed in this format offers a flexible departure from the rigid, survey-like methods of structured interviews but still
imposes sufficient boundaries to guide the conversation in a way that unstructured interviews and narrative interviews cannot. (Edwards and Holland, 2013; Anderson and Kirkpatrick, 2015; Milojević and Inayatullah, 2015).

The concept that informed the interview questions (see Appendix 3) drew inspiration from the book the “Philosophy of Technology: 5 Questions” (Olsen and Selinger, 2007), which featured a collection of 25 short interviews of the leading voices and scholars in the field were posed the same five questions. The book has become one of the ‘must-reads’ in the Philosophy of Technology and is an interesting means to explore a topic (Kantor, 2007; Rosenberger, 2010).

The 20 participants were presented with the same five-question developed by the interviewer. The broadness of each of the five provided latitude for the interviewees’ different backgrounds and experience levels while leaving space for each participant to approach the question in a manner they were most comfortable with. The questions grew out of the reading literature, Philosophy of Technology books, everyday conversation with other students, staff, and online contacts in social media. Each of the interviewees has their strengths and experiences. The questions needed to focus on their interests and strengths without masking their beliefs and assumptions concerning ToL.

The first themed question area was similar to the grand tour style of questioning (Fox, Edwards and Wilkes, 2010). Each participant was asked what technology meant to them. The goal was not to look for a definition but to allow the participant to describe how technology fits into their lives. During this narrative exchange, the participants were also asked whether education could exist without technology. In this interview segment, the questions were designed to expose any humanist and dualistic boundaries between people and technologies. The participants were also questioned about which emergent technologies would harm education and which technologies excited them.

The second was more specific and addressed the influence of the public press, popular media, and science fiction on ToL. The participants were asked whether they believed that the media adversely impacted the independence of technology research and, more specifically, ToL. The discussion thread was
dependent on their answers and aimed to discover how they perceived the effect of the dominant messaging of the media on their work. This series of questions looked for feelings of agency and stakeholder involvement in ToL from the participant’s perspective.

These questions segued into the third themed area, which asked the participants whether and why they believed that technology at the institutional level aimed to increase efficiency in delivery, student analysis, administration, and logistics. The conversation was steered towards understanding whether the participants believed this technological trend in education positively. The segment was designed to provide insight into the participants’ views of the institutional role of technologies as a force for good or a point of disruption. The focus of questioning narrowed as the conversation transitioned to the next themed segment.

The fourth area was related to participants’ views on cognitive technologies. They were asked what they thought about the statement by the researcher as one of these questions, technology does not teach people, people teach people. The researcher also steered participants towards questions on why learning technologies only seemed to serve the institution and whether they saw a time when ToL would be distributed equally between the institution and the learner. In this portion of the interview, the distinction is made between who owns the technology and data and controls that data’s use and ability to be shared. Each of the questions asked of the participants aimed to expose the participants’ ideologies and obtain a clearer picture of their beliefs and assumptions.

The final segment asked why the metaphor of the ‘schoolhouse’ remains unchallenged when we envision the future of technology in education. The metaphor represents the resistance of education to change. The purpose of the questions was to ascertain whether the participants believed that education needs to change and can change and whether they had a vision of what a future educational institution resembled. Finally, the participants were asked who should be responsible for the long-term consequences of the effect of technologies on learning, education, and society. The conversation also
explored whether the results of ToL should form part of the research findings and the public narratives of experts. The interviews then could become a site of transformation for the interviewee and the interviewer, positioning the interviews as a form of research and personal learning.

The themes provided a window into the participants’ beliefs, boundaries and agency surrounding the research topic while providing a flexible conversation catalyst. The hope was that the more deeply they explored the topic, the greater the insight gained. From a practical perspective, using narrative interview techniques in the semi-structured format loosens the fixed agenda, allowing the interviewee a high degree of agency in the direction, content, and pace of the interview (Anderson and Kirkpatrick, 2015).

Some participants may find it difficult to tell their story to a researcher who was locked into finding answers to a series of questions. The approach encouraged the participants to think about a topic and explore it through their own words and experiences (Anderson and Kirkpatrick, 2015).

This process challenges the research to acknowledge not just the entanglement of the objects and people in the interview but also the technologies that facilitate the interviews in a world where face-to-face is often a screen-to-screen (Nordstrom, 2015).

Voice transcription software brought this aspect into sharp focus in this research when the effect of having a visual picture of the conversation by watching the transcribed text scrolling down a second computer screen in real-time as a witness to the interview was considered. The words appearing on the second monitor also served as a reminder of the power and influence that technologies have in our daily intra-actions and conversations, reinforcing the concept that an interview is a collaboration in which the responses are not preformed but come into being at the moment of the intra-action between participant and interviewer.

As with any research method, there is the question of how much data is needed. While there are no definitive rules about the size of interview samples in qualitative research, the issue is often clouded by the belief that more interviews make the data defensible (Mason, 2010). This research was guided by the
principle of interviewing sufficient people to build a convincing narrative based on richly detailed narratives while remaining able adequately to answer the research questions (Edwards and Holland, 2013).

The volume and richness of data from each interview demonstrated that, in this case, a small sample size of 20 participants was acceptable (Mason, 2010; Edwards and Holland, 2013). The interviews were stopped at 20 as the data provided confidence that empirically little new or valuable data was being collected (Saunders et al., 2018).

4.7. Posthumanist reading of the data

Posthumanism reading provides an opportunity to respond to emergent litanies manifested in the participant narratives and address research question three that asks, ‘what are the possible alternative modes of thinking emerging from the research data’?

The practice of posthumanist reading advocated in this research is a synthesis of the works of Philosophical Posthumanism of Ferrando (2019, 2020, 2021) and the introspective work on posthumanist reading and other foundational works (Herbrechter and Callus, 2008; Herbrechter, 2012, 2021).

The practice of posthumanist reading is not directly about the technologies of learning or the Habitus of Technology. It is about decentring the dispositions, assumptions and dependencies and asking what new opportunities would exist in the technologies of learning if the humanist tendencies that constructed the Habitus of Technology identified in the research were rejected. In essence, the question asks what the Habitus of Technology would look like if interrogated through the participant’s emergent voices. The posthumanist theoretical framework guiding this research offers a reading of the discussion to investigate how emergent voices might open new understandings of ToL and their place in the future of education.

In the cultivation of the practice of posthumanist reading, the manifestation of ‘care’ emerged from the post-humanist and post-dualist positions as the critical position of the post-Anthropocene reflection. The care of humans, non-humans, more-than-humans, and the planet becomes the meta-position of
posthumanism’s philosophy. In that sense, a posthumanist reading is neither radically transformative of the human nor redefining its understanding of what it is to be human; it is suspect of the humanist underpinning of technology. In reading and calling into question, the humanism assumptions within the Habitus of Technology, a critical posthumanist approach aim to open up possibilities for alternatives to the constraints of humanism as a system of values (Herbrechter and Callus, 2008).

The tradition of humanism is deeply rooted in Western technology thought; every other animal, environment and technology has generally been defined as separate from the human. It is tough to overcome the human-machine divide in regular reading, like the human-animal divide and the exclusion of marginalised groups. Still, it is essential that we can see past the standard delineation of two separate ontological categories (human and others) (Walter, 2019). When we question what a posthumanist reading would do or be and how one can critically read assumptions and values about the human. While no examples were discoverable in the literature, Herbrechter and Callus (2008) offer these observations; while it is difficult to read against the assumptions and values of humanism, it is necessary to take a position of analytical distance in which to interrogate the text and challenges the common-sense assertion in the narrative from a posthumanism vantage point.

A posthumanist reading is enabled by the deconstruction of the narrative of humanism, not the human. A posthumanist reading offers the opportunity to consider the consequences of the continuation of current thinking about technology and, in that process, offers new images of possible futures (Bridges-Rhoads and Van Cleave, 2017). Posthumanism does not exist as an intellectual movement without humanism; it diffracts humanism’s idea to become the framework to question the narrative findings. In this research, it is also possible to say that it is technically a posthumanist re-reading, as the Habitus of Technology represents the first reading from a critical futures point of view. The diffraction referenced describes how the beliefs and assumptions that create the humanism expression of technology are exposed as posthumanism principles pass through those technology expressions during the reading process (Barad, 2007). However, through the literature and to aid in finding
likely results for the research question, few posthumanist reading tenets can be proposed to identify areas of interest.

1. For Posthumanism the problem is not “technology,” but the humanist intentions behind the technologies,

2. The Earth (like everything non-human) does have value on its own, and should not be just a “resource,” to be turned into consumer goods,

3. Social and structural frames and metaphors/myths help us navigate human existence: they can be helpful, but they can also become outdated and natural obstacles to new methods of understanding (Ferrando, 2021).

4. A posthumanist methodology does not recognise the primacy of the written text; it is aware that Posthumanism can be performed in many ways that look for articulation points outside a necessarily human-centred discourse like the humanism (Ferrando, 2021).

5. Although technology and other cultural artefacts are not part of the biological body, when they become part of human life, they also become part of the human body schema and cognitive structure (Kravchenko and Kyzymenko, 2019)

Posthumanism is used as a reading method to change how the human-technology relationship is framed. It draws inspiration from a post-structuralist Foucauldian reading that centres dependencies and dispositions between humans and structures (English, 2006; Herbrechter and Callus, 2008). Drawing attention to the idea that technologies have always been a part of culture and society and essential to our self-formation (Peters, 2006). Posthumanism has the scope of finding alternative ways of examining the human-technology relationship. Reading as a process (Herbrechter, 2015) works to critically engage with CLA data to examine research question 3.

By interpreting the research findings through a lens of posthumanism reading, the process reveals how commonly accepted assumptions about humanism change when applying a different philosophy. From a practical perspective, the reading of the narratives’ findings focuses on elements where the relationship
with technology is expressed as common sense or acceptable practice and the areas the reader would have skipped over in everyday reading. These mundane expressions attract the interest and consideration of posthumanism, inquiring about who benefits, who is given a voice and what voices are disavowed in the human/ToL.

This process challenged my understanding of technology as I worked to understand the tensions and constraints in the participants. The reading’s final intent is to offer a response to what a posthumanist Habitus of Technology would look like and what opportunities open when the knowledge and structures that support the human-centred view are challenged (Marks, 1998; Herbrechter and Callus, 2008).

4.8. Ethical concerns

The Open University Human Research Ethics Committee reviewed and approved the research described in this thesis [References: HREC/3040/Mercer approval date: 09/11/2018]. The research guidelines from the British Educational Research Association and the ethical guidelines for the Open University and British Educational Research Association (2018)\(^4\) were consulted. Participant identifier information was collected as part of the research process; however, this was no more extensive than already available through the participants’ biographies, social media, or promotional material.

Data management was conducted following the Open University’s GDPR requirements\(^5\) and, throughout the analysis and reporting processes, steps were taken to protect the personal identity of participants. The research recorded only the name, biography, gender, and present work title gathered from their online profiles. No information about participants’ ethnicity, religion, disability, health, or sexual orientation was recorded or considered relevant.

To minimise the risk of harm, the research did not elicit statements that would put the participants at any risk. Ultimately, the researcher has an obligation and ability to choose not to use a piece of data that would put the participants at risk.

Pseudonyms were used in the thesis and any personal comments or data that might readily identify the participant were stripped from the interview texts. As per the ethics approval, all personal data, including the role and geographic information relevant to the findings, will be retained on an encrypted drive in full, until January 2023, to allow for further consultation by the researcher. After this, the data will be deleted.

To recruit and select interview volunteers for the main study, candidates were contacted based on their LinkedIn profiles, their field of work and their interest in the future of technology in HE. Each participant’s perceived suitability was based on their ability to provide insights into the concepts that support the investigation of the RQs and explore the topic in the broader sense.

Informed consent was obtained from all participants before the interview, which outlined the permissions for audio/visual and textual recording and the use of data in the final analysis. The participants were provided with any information they requested in ample time before the interview and, before the interview, confirmed that they had no questions. Only four asked whether they needed to prepare anything specifically for the interview. Each was assured that there was no homework and that the interview was only concerned with their opinions, beliefs and views on educational technologies and the future of education.

There were no issues with gatekeepers or special permissions that needed to be addressed to gain access to the interview participants. The participants’ data was anonymised according to ethical guidelines and the researcher had a part to play in ensuring that all known risks were minimised for participants. No deceptive practices were employed in the research. All the participants were advised in writing about their rights to withdraw, the handling of the data and anonymisation of the final thesis as part of the consent process. They were again informed of their right to withdraw before the start of the interview.
All the participants were professionals in their field and gave no information that would cause ethical concerns; the researcher reciprocated that professionalism and asked no questions that might place them as individuals in jeopardy.
Chapter 5. Practitioner interviews

This chapter provides a synopsis of the interviews of participating academics. This is followed by using CLA to interrogate the narratives to provide glimpses into the future (Inayatullah, 1990b, 2009, 2017). The analysis of the narratives into the causal layers includes the following synopsis, full transcripts, audio, video, and the tables found in Annexes, B. The CFS approach is given greater nuance to the understanding of how technology, education and humans are entangled and intra-acting in the layers, allowing the analysis of the layers to fully embrace the interplay between the layers (Barad, 2003, 2007, 2010; Shotter, 2014; Niemimaa, 2016).

The interviewees were all asked the same themed questions (Appendix 3). The interview was allowed to progress and follow its natural path; the views and beliefs of each participant led the interview. Not all participants chose to answer all the questions directly, and occasionally their answers left the question unresolved. In some, based on the participant’s personality or direction the interview was taking, some of the sub-questions were not asked directly by the interviewer.

These techniques were employed to try and ensure that the underlying beliefs and assumptions belonged as much as possible to the participant and were not artificially introduced by the interviewer. Section 5.1 is an analysis of the practitioners in numerical order. Their responses to the themed areas are presented in Sections 5.2 to 5.6, and Section 5.7 summarises the chapter.

5.1. Practitioner participants

The practitioners represented a broad spectrum of backgrounds, responsibilities, and experiences. They offered a personal view that reflected their technology relationship based on their experiences and beliefs. The following table (Table 3) provides a brief overview of the diversity of participants.
Table 3. List of practitioners

<table>
<thead>
<tr>
<th>Participants</th>
<th>Biographies</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Evidence-based researcher in TEL</td>
</tr>
<tr>
<td>P2</td>
<td>Freelance coach, editor, and educator + research fellow</td>
</tr>
<tr>
<td>P3</td>
<td>Senior executive Learning Consultant</td>
</tr>
<tr>
<td>P4</td>
<td>International speaker, author, and educator</td>
</tr>
<tr>
<td>P5</td>
<td>Educator in private sector consultant for social and data analytics.</td>
</tr>
<tr>
<td>P6</td>
<td>Senior Training Management Office at the NATO</td>
</tr>
<tr>
<td>A7</td>
<td>Philosopher of Education and Professor</td>
</tr>
<tr>
<td>A8</td>
<td>PhD graduate, Teaching Assistant</td>
</tr>
<tr>
<td>P9</td>
<td>Global educational professional, presently teaching in China,</td>
</tr>
<tr>
<td>P10</td>
<td>Senior Co-design Manager at digital educational technology organization</td>
</tr>
</tbody>
</table>

5.1.1. Practitioner 1

P1 was one of the few who did not describe technology as a primary tool; instead, she described it as “omnipresent like it’s ubiquitous’ and entangled in her life... I don’t see any more dichotomy in technology.”

When responding to whether education can exist without technology, she said that it was more a question of the culture and society of the country. She recalled that countries where technology was deeply integrated into society, such as Estonia, were more likely to see technology as a focus for education than more technologically sceptical EU countries like Italy, where she now studied and worked.

This question continued to resonate throughout the interview. It exposed the tensions and the dualistic nature of the participant’s relationship with technology, with P1 in one portion of the interview claiming, “We cannot exist without it [technology]”. Seeing the relationship as possibly inevitable and structurally supported, “like we shouldn’t oppose, like, we have to live this way or that way,” ending the statement again in conflict, saying, “unless we go dystopic…and we imagine a future where there’s no technology.”

This tension may result from no clear concept of what constitutes technology in the conversations, commenting that technology did not have a long history in education: “how long like 50 years, not even”. The concept became complicated when the participant started to discuss the effects media and economic forces had on the technology research. P1 saw those theories supporting technology did not develop, “because technology also comes with a
theory”. That impression aligns with technology’s use as ‘pre-constructed’ by external socially organised forces that shape a technological object in an organised field (Sterne, 2003).

She commented that funding drove research in learning analytics, not ideas and questions. This line of thinking inverted the research cycle where ideas were invented to match the needs of the funder, not the other way around. This chasing of funds was becoming more intense and technology-driven, expressing the frustration of the speed of technology change, and P1 lamented that “we cannot catch up”.

In an introspective look at P1’s chosen field of study of learning analytics, she indicated:

We didn’t start the field … of learning analytics, it started from a push from technology, like it was guided by technological advances, not by so much [by] the reasons and questions’ and she ended the statement with the question ‘So we are going positivist again’?

This self-reflective portion of the interview highlighted the confusion and tension in the participant about the concept of technology, education, and the structural economic drivers, commenting “I think it’s everything, almost everything in the world has some economic reasons.”

When the conversation turned towards the effect of learning analytics and economic structural influence on the research, P1 questioned if the value of the research matched the needs of the learner, indicating that “professionals are conscious about this and the consequences of it on learning analytics” but was unsure of students’ opinions, especially on the subject of analytical surveillance. P1 questioned whether students would freely give their data, if allowed to consent to data gathering and if that data helped them to learn: “Does it change my behaviour... Is this data-based dashboard actionable?” She considered this the seminal questions that face the field and technology in general and that adoption at present did not seem to put learning first.

The idea of our relationship with technology as a cognitive enhancement for learning emerged as P1 considered the future of learning technologies: “We have an extension in our heads or physical extensions, wearables, or
something like that … We will be really distributed,” which started a deeper questioning of the effect it would have on our lives, adding “[n]ow we know, more or less, because we have some technologies of future already. They just have to be put together, but the brain is not an information processor.” The complexity was daunting and P1 resisted the concepts of thinking about the future effect of ToL. “I follow it [the future of education], but I’m not into that, like, I’m not reading professionally, like what is going to happen in the future.” P1 debated the qualities of the human, highlighting again the dualism and tension that seems to exist in the participants’ perception of technology:

I mean, maybe human being is less reliable and error prone. But then we are multiple more flexible; we can have several other qualities that can help us distinguish from taking out the meaning in a different way from, from the information, [that technology doesn’t].

P1 also revisited a question asked earlier in the interview but not answered (if technology could teach humans) feeling that technology could teach if the learner was experienced but learning to learn was a human responsibility.

In the final question at the end of the interview, P1 was asked who was responsible for the consequences that ToL had on society, answering “I don’t think anyone can be responsible … just a single country or single person”. When pressed, she stated that the conversation about the consequences should start at the researcher and university level.

5.1.2. Practitioner 2

During the interview, P2 indicated she preferred to answer the questions from the perspective of her employment as an educator. As a result, her transcript was included as a practitioner, mindful that some intersections from a futurist perspective may surface in the narrative.

When asked about what education means, she said that she saw it as a system of “formularisation and a government system [of] measuring” specifically designed for “grading. It is competitive” and not actually for learning. She remarked, “maybe even hindering, like the intrinsically learning motivation of people,” that education was the transfer of social structures to children.
Later in the interview, P2 came back to this, lamenting that “most of the teachers are too old, most of the content is too old”. She added that from the social structure’s context, “Education is something where some old normally white men decide what society should know, transfer that into plans.” This theme of ‘old’ reappeared several times in the interview, with the institutions, content, and the system “is really old, didn’t change too much [school organisation]. Like even [not much different] … in ancient Egypt” to demonstrate the robustness of the educational system mode of thinking.

The fixation on age continued into how technology could be employed in the role of teaching individuals. She saw technology as ‘OK’ to be the teacher if you are “you know, your 50s and [not] your, your first educational route’, seeing the humanist interaction as essential for school-aged children because education was not only “about like learning to read-only to go learning … [but] It’s about the struggle”.

This binary method of addressing the issues (young/old or education/learning) continued into the role of technology as a teacher: “I’m quite skeptical with the technology and the learning.” P2 acknowledged that technologies could replace systems that were designed to provide knowledge transfer:

> because these [technologies] are great for knowledge transfer, like Wikipedia, stuff like this, you know, it could have all the knowledge there and you have it accessible from everywhere, which is amazing.

This flexible flow of the interview allowed P2 to revisit the concept that knowledge is not the same as learning and education. She promoted a social constructivist belief “that learning was best together with people to discuss to learn in a group to exchange” if you were to “take this [learning] seriously.”

When the discussion shifted to the dominant narrative found in the media about technology, P2 was concerned about the influence of the dominant narratives:

> Not just in the educational field, but in general, like most narratives of emerging tech are presenting themselves [as the inevitable future] … there’s no way around [it], this is going to happen. It’s happening because people are doing it, you know so that people could do it differently.
P2 saw the discussion of workplace disruption by technology through the lens of choice: “you’re losing [your] job because your boss decided to replace you with a freer way of using the same things”.

From an educational system context, P2 saw the industry linkage between technology and education as unbreakable and stated: “will it change definitely … we can do nothing about it”. The futurist in P2 surfaced during this part of the conversation, asserting that the future could be changed, asking, “what do you think education should be like... how would we like to learn... and how can we take advantage of such technologies?” Stepping back from challenging the system, P2 asserted “I’m quite happy to be changing slowly, at least in academia”. This contrast in thinking highlighted the conflicting statements on education being driven by old white men, teachers and content that seem unchanging. From this perspective, the lack of change:

is a good thing for once, because it’s enabling us to have strong traditions, you know, if education would change with everything else, so fast, and quickly, they would not have education, because education takes time, the time to remember to reflect, to repeat and repeat it.

The narratives shifted towards the human-technology relationship, and she suggested we have “this tendency to, either or, like humans or the technology.” The conception of technology being external to the individual framed most of this portion of the interview with P2 wondering, “what technology is maybe doing this to me …. So, what are we going to do with it?” She questioned if the focus of the discussion was overly concerned with how technology enhances the individual and not enough on human agency. The humanist modes of thinking shifted back onto ToL, with P2 saying, “I think this discussion, this kind of narrative is contributing to an actual lack of agency,” and if there is a radical change to education “it’s not a good idea, then you have to change everything and you spoil the whole generation”. The tension in this humanist ideology was voiced a short while later by wondering if we need to acknowledge the effects of technology not only on the human, but:

... start a conversation [not] just only between us and our technology is also on us as part of the world and our technology being part of the same world and how we actually do the whole interaction.
The interview ended with the last question on education structures and business and economic influencers. P2 thought the systemic influences made the education system too rigid and constrained by the need to measure activity:

I think all those grading and measuring and acting as if all those human beings became kind [of] machines that you are programming during school. I don’t think this is quite helpful in the narratives; I don’t see how we actually get rid of it easily.

5.1.3. Practitioner 3

P3 saw education as a remnant of the “Industrial Revolution, one of the critical worldviews of education, an 18th century model of sticking people in rows and teaching them”. He saw technology as a potential innovator: “[as a] matter of fact, it’s [technology] had the capacity to do that for a while. Where it runs into the resistance, of course, is the institutional mindset and all the inertia that goes with it.”

P3 also envisioned a dystopian side of the potential of ToL, picturing a school model like the surveillance in the movie Minority Report6 “kind of thinking concerning learning…with the concept of, of social credit and what that means to, you know, to you and your access to learning through technology”. He suggested this would evolve into a learning divide between the ‘have nots’ of social credit having access to only the old model of education while those with higher scores receive the full benefit of innovative ToL.

This uneasiness with the encroachment of technologies into human cognition continued a more dystopian feeling. P3 stated that “you can’t technologies the brain and the cognitive processes until we actually get into, you know, truly cybernetic type of activities and boy, I hope I’m not alive for that”. He went on to imply that this future vision might be inevitable as humans will always seek the easy path for learning “people are going to want to make things easier for ourselves.” P3 saw this process of using technologies as tools “to make our

6 Minority Report movie: a future technology makes it possible for police to catch criminals before a crime is committed. https://www.imdb.com/title/tt0181689/.
lives easier” but was concerned we were losing control “, but the pace of change is so rapid that it’s hard to keep up”.

P3 did not see a field of educational technology (the term used in the interview questions), describing it more “as a bucket [of money] in a great market spin and people are capitalising on that and earning a living from it” and “but it’s a solution in search of a problem”. When asked about the influence of external media on the choices, he saw the narratives as reinforcing “preconceived notions…without actually doing, you know, any kind of research and or the gap analysis to say, “Hey, does this work” ‘?

P3 saw many of the influences not always of a technological nature but as what might be characterised as the worldview of education:

influences on that process…in something like the formal education stream, you’re dealing with issues of standardised curriculum, standardised testing and matching rubrics and stuff like that.

He saw education as a social construct that would exist regardless of economic or social forces and that workplace learning might be more agile than formal education which “will take a massive, massive shift to turn that into something different.” He ended on the note:

I honestly don’t think enough people think about the learner or more importantly, what the learning experience is going to be for the learner and there’s still a set of people who think that learning is something that has to happen separately from what they do during the day.

5.1.4. Practitioner 4

P4 saw technology as a tool that “can be the accelerator if we allow it to be implemented in the right way”. Commenting on the power of the external discourse on technology seemed to indicate that it projected a worldview where “new technology is always better” and seems to support the concept of dromology (Hanke, 1980) where the first to acquire new technology would eventually win, when he said, “where people look at the latest new technologies that are grabbed, got to get up before my competitors do and then they buy the
damn thing”. P4 criticised the influence of the external narratives of educational technologies by saying:

I think those kinds of dominant narratives, those kinds of discourses are driving people in the wrong direction … all they see is, it’s a walled garden in which you can store things and do certain things, they forget that learning is more complex than that.

When asked if technology could teach people, he considered that technology leveraged an element of “discovery and serendipity.” He added that he believed that humans generally taught themselves, making the question complex: “it’s not just about technology…the first-ever tool was language; it was the first technology. And I think without language, we can’t learn.” Technology, in P4’s estimation, could not, however, overcome the resistance to change in the educational system when commenting on virtual environments:

Second Life, it’s still going on there they [established educational institutions] started to colonise it through land grants, and so then they would build schoolrooms, lecture theatres, with rows and rows of seats and you know, they were basically replicating the traditional environment. Why would they do that when you can control the weather when you can run when you can fly around on butterflies?

Shifting to the economic structures that support education, P4 saw education as a “political football, and it’s seen as, as a social technology, it’s seen as a social control mechanism”. He said that groups seek to control through funding as a means of power and structure:

But certain political groups and whoever the group is the first funding, they want a piece of it, don’t they, want to, they want to know that the money is being used in a way that they approve of.

Speaking from his experiences, P4 considered UK teachers under surveillance:

It’s almost like Big Brother, you know, that constantly watched and scrutinised to see, you know if they put a foot wrong… political situation, everyone’s running scared of the funders.

P4 added later in the interview biases towards a prescribed way of thinking:

I think people are institutional, the inculcated, it’s the idea of a situation that you can belong to an institution, you, when you become a university lecturer, you are representing the whole university in your classroom, that kind of idea, I think, I think that’s, that’s a professional mindset.
With some intensity, he said:

I [was] forced into this when I was doing my thesis. So, I had to measure everything against other things and produce statistics to show, you know, differentials and I went down through pathway analysis, multiplayer analysis, structural equation modelling and all the other statistical crap that you can imagine, but I wish I hadn’t. I wish I stood my ground now and said, “Look, I want to do a very qualitative study, I want to deep dive into people’s emotions.”

The conversation turned to the tension between technologies in education and academics. P4 added a new twist to the traditional dualism of human-technology boundaries, where the technology becomes the mediator between technologists and academics:

I think there’s a huge disconnect between academics and technologists and hopefully the learning technologies is supposed to bridge the gap between the two.

P4 again brought up the lack of time as a factor:

Because you know, let’s face it, I mean, we’ve all been so pressurised in the field of learning and teaching, lecturers had hardly any time to themselves [which results in academics] throw[ing] their hands up in horror [to] run to the nearest corner and hope it [technology] will go away.

P4 indicated there was a need to move “beyond the social constructivist approach” and break free of the “the tetheredness of learning, to a great extent, you don’t need information and communications technology (ICT) rooms, anywhere” adding in closing.

What you need is an organisational wide or a school-wide or university-wide system that allows you to take your laptop and your mobile device wherever you need to be [to learn].

5.1.5. Practitioner 5

P5’s takes on technology was typically a:

… set of tools with which we [are] trying to achieve specific goals or certain objectives’ evoking the instrumentalist view that technology is neutral – it’s how we apply it that is good or bad.

P5 described education as the:

… ability to progress as a human being and progress, I mean, in whatever area in a person’s lifetime, right? So, what I mean with
that is essential is the ability to adapt to the environment and the circumstances to adapt to relationships that we have with other beings, whether they are, you know, humans, people or animals or plants or the planet.

When asked if education is dependent on technology, he said:

... because of education being strongly dependent on technology, but because of our mindset, we must, like, ingrained in our brain that we cannot conceive education without technology, just like we cannot conceive business without technology.

P5 brought the conversation back to human-centred beliefs:

I see it essentially, to me, learning as a human activity, humanists in the human being sense, right, whereas technology is just a tool, to just like, you get an axe, just let you get a razor, just like you get a knife, whatever, right? It doesn’t necessarily belong to what being a human is. But learning is learning, and we’re learning, always, constantly.

5.1.6. Practitioner 6

P6’s description of education saw it as a new experience, information or concept that changed or “challenged the individual’s current mental model”. While he viewed education as stand-alone and independent from technology, P6 saw technology as an influencer of the message and the deliverer, using a delivery metaphor of “how it’s farmed out to everyone else”.

The technology that he saw as likely to have the most significant effect on education in the future matches the ongoing discussion in the public domain: for example, AI and blockchain technologies. He cited AI technology replacing Teaching Assistants and blockchain as a secure means to track and distribute accreditation and certifications. Interestingly, P6 saw the issue of accreditation and certification (extending to degree-granting) as a form of institutional power over the student, saying, “the whole system of accreditation holds a lot of power with it”.

When asked “who does the technology serve,’ the conversation rapidly went from the role of technology is to serve both the learner and the institution to:

But you know, there’s always a financial aspect, who’s paying for it... suppose somebody else is paying for it [technology]. In that
case, they are basically want to control your data, your competence, your description of your competency sets, you know, that's part of the equation as well.'

He added that whoever pays is the owner of the measurement regime, the data, and the analysis of that data, and therefore the education system had not innovated ‘democratise’ in his words, adding “a lot of institutions, they paid a lot of money to maintain the status quo, right.”

The follow-on question asked how much external media and stakeholders influenced choices about the future of education and technology. P6 answered:

A lot of, I guess, momentum and discussing ideas. I don’t know how transformative they are. I think a lot of the actual transformation activities happening outside of education … I don’t see, at least in my perspective, many organisations that are doing things that are incredibly research-based and changed their model of organisational learning, I agree that we [learning technology researchers and designers] are putting a lot of input a lot of onuses on the individual [learner] [to] keep up on their own.’

When the discussion turned to the concept of educating for future needs, not ones of the present, he was excited that his organisation was addressing this issue. P6 was one of the few participants who answered this question directly.

When the employers were asked what their job descriptions and staff would look like in 5-10 years, he found that leaders “didn’t really have a good answer to that”. The leaders found it difficult to plan for the future because:

it’s like; it could be this, it could be that, depending on how the cutting [budget] goes… Again, it comes down; if you’re doing it, it usually comes down to a financial argument, right? Unless you have the burning bridge or something must change, people are just going to continue to…do the things, but they say you need to have the impetus to move you ahead. So, unless you’re putting the money again into the research and development to start looking at these features, feature concepts, future organisations, you know.

P6 later introduced IT systems and software as another structural constraint and dependency to the issue of innovation and opportunities to select alternate pathways for the future. He started from the viewpoint:

I think that expediency continues to win out over long-term thinking; it’s what’s easiest to get lazy, you look at technology, especially you’re talking electronic technology, what’s the easiest to get certified for use in the current operational environment...?
Looking at a learning management system, which one has already been accredited by another institution, okay, what’s it’s too much work to bring in and test and certify this other technology? Let’s use one that’s already been tested.

The conversation then extended to how this line of thinking made both the options and choices open to the institution limited to the solutions that matched the IT systems, not necessarily the answer to the institutional problem:

One might be better in the long term organisationally because it’s, it’s structured actually to look at competency or development in a different way. But this is the one that currently fits with our IT solution.

The interview ended with P6 discussing how the same technologies are different depending on if they are in the educational institution of used for personal use:

I have to say, I'm pretty happy that the technology there from trying to do my job day to day, again, [but] in the learning environment, it's contrived, reconstructed, it’s, again, not organic, not natural, it’s very much programmed and not necessarily as the technology enables you to do what you need to do.

5.1.7. Practitioner 7

P7’s interview was particularly interesting, as he seemed to resist answering questions directly, resulting in a wide-ranging conversation. When asked about his feelings towards technology and education, he explored this concept a little further:

I feel committed to, to how to say, to stick to the idea of an individual who has free will otherwise... I'm not averse to the extent that it [technology] is influencing us and certainly don’t have any estimation of what it will do. So, ask in 10 or 15 years, where there’s a lot of conversation about it, but not in the people who are in charge of education.

Our conversation followed this track, exploring the duality of the problem in technology development and human-focused education:

So, it's two different kinds of people [those] who think differently … feel [our] cultures different if you want. And this has…going in the 50 years, to describe the gap between the natural sciences and technology. And I would add technology on the one hand and humanities on the other. And this gap still exists [and adds] up to a different way of thinking.
He saw this divide as the result of the (tensions) between “the divide between the technocratic thinkers and the … educator.”

Coming back to the technology, he offered that AI was on the verge of putting huge power in the hands of the owners:

I tend to agree that it can change our life If I can do that it might lead to the formation of another species, like young actress [we had discussed Hatsune Miku\(^7\) as a stand-in for lecturers in our conversation before the interview and I think this is whom he meant] was created of you know.

When discussing technology, he saw technology as more than an influencer, but as affecting ‘basic humanistic values’ and for education to progress into the future...

is to find a way to understand the risks and possible advantages to analyse and then to see how we can use technology for the good… life, which means in my... way of thinking very humanistic values.

The need for P7 to try to re-assert the human as the centre of technology comes out clearly in this exchange.

I asked what happens when the learner and their technologies become smarter than the education institution, which provoked a re-appraisal of the influence of AI. He estimated in the next 10–15 years, AI would:

… know us much better than we know ourselves now because he (the AI becomes gendered) will be able to monitor any purpose in our body and our mind and to correlate it with work is going outside and what impact us. So, it will understand what we are.

Extending this thought process, P7 saw [learning] “smart agents at now has helped us in everything we do … we will have much more knowledge about us... the question is, again, how will this knowledge be used by whom?”. Finally, he wondered:

…in the age of in which you can bring the knowledge to the test centre, [there is] no point in bringing the learner to the knowledge

\(^7\) A Vocaloid opensource software developed by Crypton Future Media synchronised to holographic anthropomorphic characters who sing and dance to fan-generated songs. [https://ec.crypton.co.jp/pages/prod/vocaloid/cv01_us](https://ec.crypton.co.jp/pages/prod/vocaloid/cv01_us).
and you can bring the knowledge to the individual in [a] much more personalised way, [more] effectively than a teacher can do.

P7 ended this portion of the conversation with the thought that the education system was at its core self-protective:

…education systems have adopted some kind of shield against everything that goes against the interests of threatens them. And certain autonomous agent, certainly threaten them’

The remaining portion of the conversation became reflective on the human in the system, the teacher, stating that the:

…individual [teacher] in the formula is a problem. The fact that in most in most countries, teachers are suspected of not doing the good work and hence are controlled.

He went on to say that most teachers cannot enjoy the luxury of “really thinking for the sake of thinking” because of “what you call habitus, so the environment in which they work makes them even more mediocre. So, I don’t really think that because of this facts teacher can be the revolutionary class [as technology or external individuals can be revolutionary].” P7 went on to say his research into the literature indicated that:

In 10 or 15 years … artificial intelligence will be able to do the teaching job much, much, much better than they get [from] the teacher. And if they [AI] can drive the car, they can also teach.

He questions the need for the role of teaching in the future of education:

Indeed, for the sake of teaching, teaching, teaching won’t be necessary anymore... The AI robot will be able to do a much better job than the best teacher would have been able to do because they can follow where? any student is at any moment. Analysing any cognitive move, the student does or doesn’t do...being able to solve their problem and the students will have a much better teacher.

5.1.8. Practitioner 8

P8 saw the technology itself as a form of learning: “there’s education around learning a new piece of technology”. When asked if education could exist without technology, her answer was divided between the past, where the answer was yes, and the present and future saying, “Not for today’s kids, no.” The tension in her narrative surfaced:
I think...kids can, I think you can learn a lot without technology. Right kids can learn, for example, put kids outside in woods on that [they] could learn all sorts of things... but... sometimes you do need the technology to pull us together.

She closed with a humanistic defence:

Technology can’t necessarily replace emotional learning ... it’s not, it’s never going to because as you say, that person interaction can’t be replaced by technology.

P8 brought in the idea of social media as means to support learners, citing her membership of the Facebook group Older Wiser Learners (OWLs):

If you’re based at home, so you’re not based on a campus, groups on Facebook, like PhD OWLs can provide a means of social interaction and belonging ... that you can help to compensate? not wholly, will go a long way to bridging that gap.

She expected that universities were shifting towards meeting the needs of the business world and the universities should:

...research to support economic development contributes to that university should [capitalise] on their intellectual property. They are seeing this relationship as a way for universities to exchange the ideas with business, this knowledge exchange, [for] earning income from exploiting their ideas. That’s the shift. But again, that’s just part of the broader social developments.

5.1.9. Practitioner 9

P9 saw technology as necessary from a personal wellness criterion and essential from a teaching and education point of view, explaining that:

...we use technology in so many ways, it’s indispensable, and I can’t even imagine going back to not having that technology available; we just simply wouldn’t be able to offer our program. Personally, I think; also, it’s very important.

P9 saw education as a continuous and lifelong endeavour, and technology was the process for that endeavour: “technology has done to a great extent is kind of blur the lines between the two [formal and informal], because we can learn all the time”. He saw the role of the teacher as the means through which:

...younger students learn how to learn; the content is not that important anymore. You can get content anywhere, you do not need a teacher for that once you’re above a certain age, but even very young people can get content. But what they need help with is understanding how to analyse information.
The human-technology relationship from his perspective was:

I don’t like to see it separated, and I’ll put it that way. And I think in the past, that’s been the tendency, especially in education, to separate the two things. And I see a convergence. I don’t even I don’t. I think you shouldn’t even notice that it’s there. I think it’s like air, especially … you can see this with young people who’ve grown up with the stuff,’ adding its ‘part of us.’

P9 seemed to contradict this ‘part of us’ convergence later in the interview with the thought that was a source of conflict:

Technology is always unstoppable. And we just need to learn how to manage it and manage people’s behaviour towards [to] encourage positive behaviour, I guess.

This divergence continued when describing AI not as a partner in education for teachers but either as a replacement or a servant:

And I thought, this is fabulous, this is great because it frees the teacher up to do other things … I mean, this technology is now we’re replacing accountants, things that we used to think would never be replaced by computers or positions, they are being replaced by computers, as we speak.

This tension between seeing technology as a partner versus a servant continued:

Oh, it’s great to use a smartphone, instead of having somebody use a paper-based dictionary, as a simple example … it’s getting back to what you asked me before about the separation of technology from education, I think, I think it should just be intuitive. If something works, just use it; you shouldn’t even have to think about it… I had some good success with my students using them in the classroom. And so, when someone tells me without having ever tried it, another teacher that [said] just smartphones are wrong, that’s a narrative they’ve imported.

The concept of the dominant external narrative continued, with P9 voicing the perceived speed of change:

So, I think with technology, it’s very, very important to have an open mind and not try to not listen to the narratives around the technology … however difficult that may be. One thing we know more than ever… new things are coming out so quickly.

Extending this conversation, he considered the pace of change in the education system:
especially in formal education tends to lag behind developments outside of education, which to me always seems strange... they have their jargon, they’ve got their political culture, and it’s very resistant to change.

5.1.10. Practitioner 10

P10 was the only interview conducted physically face-to-face. His take on technology was:

I guess the only time I’m conscious of technology is when I see emerging technology. Does that make sense? So, so at some point, technology stops being technology, [it] used to be for me that the new technology was cruise control on my car … So, when I think about technology, it’s always about that emergence or just new or just, just come out or further use. And I that’s, that’s what I think about the technology. I don’t think about it consciously.

Interestingly, this is a reoccurring concept in the practitioners’ interviews: they seemed to consider only technology that was new in their narratives.

He pointed out that from his view of education technology was “the opportunity to focus on the important things there more that allows you to start thinking about what’s the key thing about the learning.” Exploring his reasoning further, a technology from his perspective was not necessary for learning but “technology greases the wheels,’ adding that “I don’t think education ends if, for example, computers and the internet turned off.” P10 did see technology and education as a future-leaning activity:

Education is about the future; education is about, you know what I was going to say, young minds … only way that we can give back to that new generation.

When asked about the effect of external narratives and dominant media on what educational technology we would choose to research, his answer was direct:

What really, really annoys me is that its vendor driven. So, it’s like, the tail is wagging the dog in this respect, you know, they start talking about AI, when there is no AI, they talk about use cases for blockchain when they haven’t got it working... I haven’t seen a really good example of an AI in tech. I’ve seen some chatbots that can do simple things, but an actual and learning, I’m not seeing anything yet.
When the conversation moved to higher-level influences, P10 was equally direct:

The government and vendors let’s just look at those groups the government is trying to drive policy that has nothing to do with what’s going on in education.

He quipped that he was not the “world’s greatest vendor to interview” then went on to say:

Well, that’s just rhetoric and soundbites. But that’s what government is. Now we’ve seen a reduction of [money and staff], you know, that careful narrative around the kind of policy [supporting the reductions] and you see industry four dot zero.

P10 focused on the effect of technology in the future of education in saying:

Build as much as we can into [present] helping people to do as much as they can in the now because that raises the expectation about what they’ll do in the future. That’s what I mean about the present being the future... it’s not about the technology, it’s about the administration. And when we start looking at why learning technology doesn’t move as fast as it could... if we could break the organisational culture, then we could break the model, but then when we see what the vendors are doing.

When asked if technology could teach people, he replied:

Teaching is an act of human labour, whether it’s on the individual who’s learning or whether it’s on somebody working with somebody else … technology can’t teach people, people teach people, whether it’s themselves, but other people.

He finished by commenting on educational technology as a field to gravitate towards the next new thing in technology with little in-depth understanding of the consequences:

You know what, Ed Tech horoscopes, education technology, horoscopes are all of these we keep talking about AI gone, we’re still talking about AR and VR. We’ve been looking at AR and VR for ten years. And people are still saying it’s the next big thing in five years. I hope somebody is finally saying AR and VR is the BlackBerry of education.

5.2. Practitioner litany layer

The concept of litany in CLA is essential to analysing the narratives; it provides the gateway into the deeper layers of the participant’s understanding of their
world. It gives voice to the social worldviews and myths/metaphors that offer the images that help construct the Habitus of Technology.

The litany layer expresses the participant’s accounts of their experiences, assumptions, and beliefs without personal reflection. The objective is to look past the common and accepted assumptions to assemble an understanding of the more profound influences, beliefs and structures that guide that mode of thinking.

5.2.1. Technology is a tool

The concept of tools and technology being external to the human was a powerful theme in the litany of the practitioners. It occurred in the litanies of eight of the ten participants, becoming one of the most common themes. The concept of technology as a tool serves to provide the dispositions and dependencies occurring in the narratives.

From the simple statements that reduced technology to a bare essential in P2’s comment “[s]o, technology is a helping thing” to the complex and thoughtful assessment of P4 describing technology as “a very complex question … Technology as a set of tools for me the first-ever tool was language…”. These assumptions of technology as neutral support an instrumental perspective (Feenberg, 2006) where ToL is understood in the same way that a hammer or shovel is a tool that is at the disposal and discretion of the user, not vice versa (Kruger-Ross, 2013).

P5 brought the conversation back to the human-centred beliefs that surrounded learning:

To me, learning [is] a human activity, humanists in the human being sense, whereas technology to is just a tool, to just like, you get an axe … just like you get a knife, whatever, right? [technology] Doesn’t necessarily belong into what being a human is.

Table 4 gives examples from the practitioner narratives. It provides an overview of the strength of the litany surrounding technology as a tool and the one emergent voice who envisioned her (P1) relationship with technology as having no separation and ubiquitous in her life.
Table 4. Technology is a tool

<table>
<thead>
<tr>
<th>Participant</th>
<th>Technology is a tool</th>
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<tbody>
<tr>
<td>P1</td>
<td>“[Technology is] omnipresent like it’s ubiquitous and I don’t see any more any dichotomy in Technology.”</td>
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<tr>
<td>P2</td>
<td>“So, Technology is a helping thing.”</td>
</tr>
<tr>
<td>P3</td>
<td>“People are going to want to make things easier for ourselves…the tools are happening now to make our lives easier, but the pace of change is so rapid that it’s hard to it’s hard to keep up.”</td>
</tr>
<tr>
<td>P4</td>
<td>“… it’s a very complex question. And it’s not just about Technology, Technology as a set of tools for me that the first-ever tool was language, it was the first Technology.”</td>
</tr>
<tr>
<td>P5</td>
<td>“Well, for me, Technology is essentially a set of tools with which we were basically trying to achieve certain goals or certain objectives.”</td>
</tr>
<tr>
<td>P6</td>
<td>“I think it’s a little bit of both its most I look at it more as a friend servant, I say I look at it as more it helps me out that, you know, allows me to do things more efficiently.”</td>
</tr>
<tr>
<td>P7</td>
<td>“Technology is progress, progress is good and hence, Technology is good.”</td>
</tr>
<tr>
<td>P10</td>
<td>“I think Technology gives you the opportunity to focus on the important things there more that gives you the opportunity to start thinking about what’s the key thing about learning.”</td>
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</table>

The litany seeing technology as something external to humans, a tool, is the cornerstone of thought that starts the process of revealing technology as a habitus. When technology is a tool, it embodies the humanist concept of being external to the human. P5 raises this belief: “technology is essentially a set of tools’, with P6 adding technology was seen external more as a servant “its [technology] … I look at it more as a friend servant.”

Technology through the litanies can be conceived as an extension of our body where the technology as external can then move at a different rate to our understanding of it. P3 voiced this in the interview: “the tools are happening now to make our lives easier, but the pace of change is so rapid that it’s hard to it’s hard to keep up”.

Humanism at a basic level supports the distinction between science and technology: where is science is focused on the accumulation of knowledge, which society sees as a positive endeavour, technology, in the humanist concept, is the practical application of this knowledge. Humanity struggles to justify and ethically use this knowledge, while a technology’s value is dependent on the tool being used in the right way (Volpi, 2013). Technology
the tool then becomes a force that can exert control over the human or become a replacement for the human in the workspace. P4 expressed some concern that technology “can be the accelerator if we allow it to be if we implement it in the right way”. The next sections expose and give examples of the litany to support each of the concepts.

5.2.2. Technology as an extension of body and mind

The thought of technology as an extension, a helper, and a means to get things done faster is a familiar litany in the practitioners. Seven of ten (Table 5) saw technology as an extension of human faculties and capabilities. The participant narratives express similarities to Steinert (2016), who presents technology as not merely an extension of abilities or cognition but something that also affects how participants experience the world and, in turn frame their understanding in this research ToL.

Table 5. Technology as an extension of the body and mind

<table>
<thead>
<tr>
<th>Participant</th>
<th>Technology as an extension of body and mind</th>
</tr>
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<tbody>
<tr>
<td>P1</td>
<td>“We have an extension in our heads or physical extensions, wearables, or something like that … We will be really distributed.”</td>
</tr>
<tr>
<td>P3</td>
<td>“People are going to want to make things easier for ourselves…the tools are happening now to make our lives easier.”</td>
</tr>
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<td>P4</td>
<td>“Can be the accelerator if we allow it to be if we implement it in the right way.”</td>
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</tr>
<tr>
<td>P7</td>
<td>“Smart agents [can] now…help us in everything we do…”</td>
</tr>
<tr>
<td>P9</td>
<td>“Young people who’ve grown up with, with the stuff…such as smartphones and very high-speed internet…and I really think for them, they don’t even think that it’s there.”</td>
</tr>
<tr>
<td>P10</td>
<td>“I think Technology gives you the opportunity to focus on the important things.”</td>
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</table>

The litany of technology as an extension leaves open the question of which of our human faculties and capabilities should be extended, who decides and who is not included in the discussion. P9 saw the younger generations as having grown up with smartphones in their hands: “I think, for them, they don’t even think that it’s there”. The use of technology as an external enhancement to daily life also opens the conversation to the speed of change, and P4 comments that
it “can be the accelerator if we allow it” in technologies and the need to adapt continually to new technologies (Beard and Gunn, 2002).

5.2.3. Technology is changing too fast

One of the dominant litanies that appeared in the collective narratives of the practitioners was the concept of ‘speed of change’ (see Table 6). The issues of speed and power in the litanies of the participants were shown in distinct ways: the unease of the loss of control over the process and the concerns over the technology cycle being driven by external stakeholders for their own needs (Hanke, 1980; Beard and Gunn, 2002). For example, P1 expressed concerns about being unable to keep up “it’s becoming more intense and more intense new technologies every day, and we cannot catch up”.

Table 6. Technology is changing too fast

<table>
<thead>
<tr>
<th>Participant</th>
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<tbody>
<tr>
<td>P1</td>
<td>[technology] “we cannot catch up.”</td>
</tr>
<tr>
<td>P2</td>
<td>“If education would change with everything else, so fast, and quickly, they would not have an education.”</td>
</tr>
<tr>
<td>P3</td>
<td>“The pace of change is so rapid that it’s hard to it’s hard to keep up.”</td>
</tr>
<tr>
<td>P4</td>
<td>“Where people look at the latest new technologies that’s grabbed, got to get up before my competitors do and then they buy the damn thing.”</td>
</tr>
<tr>
<td>P9</td>
<td>“One thing we know more than ever… new things are coming out so quickly.”</td>
</tr>
<tr>
<td>P10</td>
<td>“It’s not about the technology, it’s about the administration. And when we start looking at why learning technology doesn’t move as fast as it could.’</td>
</tr>
</tbody>
</table>

P3 invoked images of speed and the cost of not understanding the latest technologies when he said, “new technology is always better”. The concept of winning through being the first to adopt or buy new technology was referenced “where people look at the latest new technologies that’s grabbed, got to get up before my competitors do and then they buy the damn thing.” Power and speed are inseparable from technology, and it will no longer be necessary to fully understand the technology but to be first to employ the technology (Zhang, 2013)

P7 extended this concept of speed making time a luxury for teachers and questioning of the environment and professional habitus reinforced this concept:
[no time for] really thinking for the sake of thinking [because of] what you call habitus, so the environment in which they work makes them even more mediocre. So, I don’t really think that because of this fact, teachers can be the revolutionary class.

Some of the participant responses to the speed of change included the hope to ride out the changes until they are no longer part of the system. P10 emulated that feeling when he said: “don’t care, I just want to do my job, I’m already going to retire in 10 years”. The participants voiced pressure to keep up with the latest emergent technologies. The seemingly relentless pace change led to the participants saying that there was difficulty to keep up with technology for its own sake. While the pressure of the speed of change was unique to the practitioners, it matched the concerns of the educational professional in Webster’s (2016) survey results. The undercurrent of practitioner narratives was one of “keep up or be left behind.”

5.2.4. Analytics are in control

Education forms an environment where the technologies are part of developing learning analytics and surveillance-based research to predict the futures of educational spaces for financial gain (Hall, 2016; de Freitas and Dixon-Román, 2017). Table 7 shows examples from the practitioner narratives on their observation with data and analytics.

P1 observed this trend in her narrative:

We didn’t start the field … of learning analytics; it started from a push from technology like it was guided by technological advances, not by so much [by] the reasons and questions.

Table 7. Analytics are in control

<table>
<thead>
<tr>
<th>Participant</th>
<th>Analytics are in control</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>“We didn’t start the field … of learning analytics; it started from a push from technology like it was guided by technological advances, not by so much [by] the reasons and questions.”</td>
</tr>
<tr>
<td>P2</td>
<td>[technology is the] “formularisation and a government system [of] measuring.”</td>
</tr>
<tr>
<td>P3</td>
<td>[the future is] “with the concept of, of social credit and what that means to, you know, to…your access to learning through technology.”</td>
</tr>
<tr>
<td>P6</td>
<td>“If they’re paying for it, they want to control, wants to measure…to use it for whatever type of internal analysis…there’s a lot of data that they can use to help make the organisation more effective.”</td>
</tr>
</tbody>
</table>
This separation of the learner from the technologies of educational power is described in P6’s observation:

> The whole system of accreditation [education] holds a lot of power. It’s not designed from a user perspective, like and generally make people better like increase their performance, it’s usually about the cost savings … we see there’s a neoliberal problem.

A key driver in the narratives was the image of success defined through data. The narratives rarely included them as a professional. It was framed as something outside their control as a competing influence that created openings to discuss technological power over their field of endeavour (Hall, 2016). P6 separates the external stakeholders (they) and technology (it) from himself:

> If they’re paying for it, they want to control, want to measure…to use it for whatever type of internal analysis … there’s a lot of data that they can use to help make the organisation more effective.

### 5.2.5. Humans should not be replaced by technology

The question primarily responsible for this part of the analysis was ‘do you agree with the statement: Technology does not teach people, people teach people’? which was a rewording of the instrumentalist statement ‘guns don’t kill people, people kill people.’

The question was humanist and instrumentalist based; the responses were in kind. The participants saw the problem as a binary ‘us or it’ argument. Instrumental technology operates at the level of cultural text or theory as an ideology that attempts the replication of humanist ideas with all modes of thinking about technology in the research context (Weaver and Snaza, 2017).

The following table (Table 8) gives examples from the seven practitioner narratives on their observation human-technology relationship.
Table 8. Humans should not be replaced by technology

<table>
<thead>
<tr>
<th>Participant</th>
<th>Humans should be replaced by technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>“What happens then. And the machine assumes that I didn’t study, or I didn’t do my, my homework or I just skipped something.”</td>
</tr>
<tr>
<td>P2</td>
<td>[felt technology] “you know, in your 50s and [not] your, your first educational route” [education was really] “It’s about the struggle”.</td>
</tr>
<tr>
<td>P3</td>
<td>“…technology has the capacity to do that. Matter of fact, it’s had the capacity to do that for a while. Where it runs into the resistance, of course, is the institutional mindset and all the inertia that goes with it.”</td>
</tr>
<tr>
<td>P4</td>
<td>“So, so here we teach ourselves, people teach each other, and technology can be used to help us to learn.”</td>
</tr>
<tr>
<td>P6</td>
<td>“They actually replace the TA with artificial intelligence and it just continuing to get to get better, right, you look at alpha go.”</td>
</tr>
<tr>
<td>P7</td>
<td>“The AI robot will be able to do a much better job than the best teacher would have been able to do because they can follow any student is at any moment. Analysing any cognitive move, the student does or doesn’t do…being able to solve their problem and the students will have a much better teacher.”</td>
</tr>
<tr>
<td>P9</td>
<td>“…this is great because it frees the teacher up to do other things …. I mean, this technology is now we’re replacing accountants, things that we used to think would never be replaced by computers or positions, they are being replaced by computers, as we speak.”</td>
</tr>
<tr>
<td>P10</td>
<td>“Teaching is an act of human labour, whether it’s on the individual who’s learning or whether it’s on somebody working with somebody else, … technology can’t teach people; people teach people.”</td>
</tr>
</tbody>
</table>

The litany surrounding technology and teaching provided a perspective to see the humanist boundaries that existed between humans and technology. Each of the answers echoed those boundaries and the dualistic separation of human learning from technological teaching. The narratives had an edge to them; for example, P6 argued that “education stands by itself” as a human activity and can “exist without technology”.

Notions of humans being the learners while technology belonged to the institution of education became visible when P10 defended this line of thinking:

Teaching is an act of human labour, whether it’s on the individual who’s learning or whether it’s on somebody working with somebody else … technology can’t teach people; people teach people.

P3 brought the question around to the influence of the technology:

But I think in terms of just basic technology and implications, where it’s coming from, how it’s designed and also that takes spin on privacy, right, who’s got access to your information? Who controls it and what are people going to do with it?
5.2.6. Dystopia, ageism, and sexism

The litany that expressed frustrations, fears and desires for change became the litany of dystopianism and ageism.

The litany of ageism and male-dominated gender problems became issues as P2 said that:

... education is something where some old normally white men decide what society should know ... this feeling of human should be part of [a] production line, total economic particles, you know, that contribute to and are measured by the capital.

Ageism has become one of the proscribed prejudices that are represented in education and particularly in the youth-obsessed culture of technology (Fukuyama, 2009) (see Table 9).

Table 9. Dystopia, ageism, and sexism

<table>
<thead>
<tr>
<th>Participant</th>
<th>Dystopia, ageism, and sexism</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>“We cannot exist without it [technology]... unless we go dystopic...and we imagine a future where there’s no technology.”</td>
</tr>
<tr>
<td>P2</td>
<td>“Most of the teachers, they are too old, most of the content is too old...Education is something where some old normally white men decide.”</td>
</tr>
<tr>
<td>P3</td>
<td>“I foresee that there’s a potential divide... into a have and have nots... the have nots [learners] will be stuck in the industrial revolution model [of education].”</td>
</tr>
<tr>
<td>P4</td>
<td>“Throw[ing] their hands up in horror [to] run to the nearest corner and hope it [technology] will go away.”</td>
</tr>
<tr>
<td>P7</td>
<td>“What you call habitus, so the environment in which they work makes them [teachers] even more mediocre. So, I don’t really think that because of this facts teacher cannot be the revolutionary class [as technology or external individuals can be revolutionary].”</td>
</tr>
<tr>
<td>P8</td>
<td>[should the learners own their data] “no...not unless...[we] go to a socialist regime or something or revolution happens”?</td>
</tr>
<tr>
<td>P9</td>
<td>“Technology is always unstoppable. And we just need to learn how to manage it and manage people’s behaviour towards [to] encourage positive behaviour, I guess.”</td>
</tr>
</tbody>
</table>

There seemed to be a gap in the interview’s responses on utopian views of technology when asked what emergent technology excited them. P2 was clearly at one end of the scale: “I’m quite sceptical with the technology and the learning”. Others like P1 (“I’m very scared about the data and how it can be used”) and P9 seem to be representative of most of the participants when he indicated that technology was here and inevitable it would be considered as:
... an acceptable thing because the benefits far outweigh the disadvantages. So, I think it’s the same thing with AI, it’s, I think it’s, it’s here, it’s already here, it’s, you know, it’s not going to go away...it’s very, very convenient for enabling a lot of things. But we need to manage that.

Far from excitement, it seemed that during the interview, in the absence of a clear vision of technology in the future of education, the dystopian view of technology seemed to be the default approach.

5.3. Practitioner social and systemic layer

This layer of analysis aimed to expose the professional, economic, and political structures that influence how the litany operates (MacGill, 2015). The social and systemic layer looks into ‘what we do’ (Breen, Dzidic and Bishop, 2015a) to question people’s relationship with technology, social systems, professional structures, and the world around them. This layer is inhabited by the professional and the expert, where preference is given to quantitative data, not the reasons behind the data gathering (Bishop and Dzidic, 2014).

The layer is articulated in terms of a system interconnection of structures, dependencies and dispositions that include research, education, commerce and or the social capital of humanist beliefs (Haigh, 2016).

Deconstructing the participants’ narratives focused on the social and systemic discussions of technology as a tool and commodity, linking to the stakeholder and business-driven decisions. There was an emphasis on the structural controls placed on ToL in the education system. The structures were aligned with connecting governments and education technology global vendors to universities to satisfy the business demands in the narratives (Farrow, 2019). P1 echoed this:

> The way we get the funding here in Europe and the universities, we have to invent ideas … it doesn’t go from innovation like we don’t have ideas and then we go, and we find the funding source.

Education’s inter-dependency with technology and economic factors appears in P5’s narrative: “[w]e cannot conceive education without technology, just like we cannot conceive business without technology’. At the same time, P4 echoes
the political impact of technology and education: “I think that education is a political football, it’s seen as, as a social technology”.

Table 10. Practitioner social and systemic layer

<table>
<thead>
<tr>
<th>Participant</th>
<th>Tools can be bought, sold, and replaced</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>“…the way we get the funding here in Europe and the universities, we have to invent ideas…it doesn’t go from innovation like we don’t have ideas and then we go, and we find the funding source.”</td>
</tr>
<tr>
<td>P3</td>
<td>“I think educational technology as a bucket is a great market spin and people are capitalising on that and earning a living from it.”</td>
</tr>
<tr>
<td>P10</td>
<td>“…we have a whole load of vendors going [to] sell you something that’s going to help you to do what the government want you to do…institutions are constantly responding to the policies of the government, the sales pitches of vendors…”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>Tools make life easier, learning better</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>“Quite easy to replace, [human] knowledge transfer, through internet computers, because these are great for knowledge transfer…and you have it accessible from everywhere…”</td>
</tr>
<tr>
<td>P4</td>
<td>“…what I’m trying to say is that new technology should expand your imagination they should give you I think, license and latitude and space to be able to imagine new things that couldn’t be done in a real space.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>Technology as Structure/dependent on the present system.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>“I went to live in Estonia, which is the 22nd century in terms of technology… all the schools in Estonia are very ICT enhanced”.</td>
</tr>
<tr>
<td>P2</td>
<td>“Education is something where some old normally white men decide what society should know, transfer that into plans…”</td>
</tr>
<tr>
<td>P4</td>
<td>“When they implement a learning management system, all they see is it’s a walled garden in which you can store things and do certain things; they forget that actually learning is more complex than that… they’re missing the boat on it.”</td>
</tr>
<tr>
<td>P6</td>
<td>“In terms of developing something new, we just keep looking in a circle towards what each other’s doing and trying to replicate that.”</td>
</tr>
<tr>
<td>P7</td>
<td>“Individual [teacher] in the formula is a problem. The fact that in most countries, teachers are suspected of not doing the good work and hence our controlled [technology monitoring and policy].”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>Protect the essence/security of being human.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>“…we have this tendency to, either or, like humans or the technology.”</td>
</tr>
<tr>
<td>P5</td>
<td>“I always like to think of education as something that you cannot attach to the current modern world… whether its technology-based or whether its business based or whatever else,…”</td>
</tr>
<tr>
<td>P10</td>
<td>“We need to be both excited by and concerned about his data, data is the thing that we need to be watchful of data is so important that both as a learning tool as a reflective tool for students, but also as this surveillance society…”</td>
</tr>
</tbody>
</table>
The process of structures that governs our expectations of technology seeks to overwhelm social structures and worldviews (Hampson, 2010) and reduce technology’s potential to a shared vision that rejects other voices that think differently. P6 said about the inward and closed thinking: “[i]n terms of developing something new, we just keep looking in a circle towards what each other’s doing and trying to replicate that”. Throughout the narratives, there is a tension between the shared humanism vision of technology and the other voices that see new potential for technology. P2 saw this dualism as “we have this tendency to be, either or, to like humans or [like] the technology”. Table 10 gives examples of the practitioner narratives associated with the social and systemic layer of CLA.

The participant narratives expressed the pressures of economic imperatives on education and the universities. The dependencies of technology innovation on the financial support of external stakeholders served to make thinking about technology in any form other than what was commonly believed to be acceptable as problematic. There was a thread of thought that ran through many of the narratives that decisions about technology were outside their control and made by other stakeholders. Some of the participants pointed to the educational technology industry. For example, P10 said “[a]nd what really, really annoys me is that its vendor driven. So, it’s like, the tail is wagging the dog in this respect,’ with P9 adding “[f]irst, is you’re absolutely right [when asked about funding], It is a business”.

The social and systemic level explores the participant’s assumptions regarding social, technological, and other causes of systemic interrelations through their narratives (Minkkinen, Auffermann and Heinonen, 2017). The layer is itself informed by the worldview layer and, in the next section of the analysis, gives voice to the shared beliefs which provide a framework through which the social and systemic layer operates (MacGill, 2015).

5.4. Practitioner worldview layer

The worldview layer is an expression of the commonly held sets of professional and societal shared beliefs that provide the framework and reference points for the litany and the social and systemic layers (MacGill, 2015). The worldview
discourse layer is anchored by the symbols of our profession, culture, and society; often, those symbols are embodied in our education systems. The deconstruction of these issues often triggers emotions of tradition, customs, and an organisation's acceptable practices.

P3 saw worldviews as confining practice to the acceptable comfort zones:

We don’t think about the evolution. We don’t think about anything other than what sits in her little comfort zone, buying tech, and chasing tech.

This layer evokes the emotional responses resulting from the perceived differences between learning as the domain of humans and the encroachment of ToL into that privileged space. The emotions of concern and fear play out in P3’s comments:

You can’t technologize the brain and the cognitive processes [used for learning] until we actually get into, you know, truly cybernetic type of activities. And boy, I hope I’m not alive for that.

This may be why most participants referred to education and technology as a business, not a place to learn; education is a measurement, not development of the individual. P6 saw it as the business of data: “who does the technology serve … if somebody else is paying for it [technology], then they are, they basically want to control your data’, Table 11, gives examples from the practitioner narratives on the worldview layer of CLA

Table 11. Practitioner worldview layer

<table>
<thead>
<tr>
<th>Participant</th>
<th>Image of Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>P3</td>
<td>“We don’t think about the evolution we don’t think about anything other than what sits in her little comfort zone and buying tech and chasing tech.”</td>
</tr>
<tr>
<td>P4</td>
<td>“New technology is always better… got to get up before my competitors do and then they buy the damn thing.”</td>
</tr>
<tr>
<td>P10</td>
<td>“At some point, technology stops being technology … I think about technology, it’s always about that emergence or just new or just come out or new use.”</td>
</tr>
</tbody>
</table>

Participant A.I. – friend or foe.

P2 “The statement should be like; you’re losing the job because your boss decided to replace you with a freer way [technology] of [doing] the same things.”

P4 “It’s seen as, as a social technology, it’s seen as a social control mechanism.”
<table>
<thead>
<tr>
<th>Participant</th>
<th>Speed of technology change.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P9</td>
<td>“I mean, this technology is now we’re replacing accountants, things that we used to think would never be replaced by computers or positions [teachers], they are being replaced by computers, as we speak.”</td>
</tr>
<tr>
<td>P6</td>
<td>“Who does the technology serve… if somebody else is paying for it [technology], then they are, they basically want to control your data.”</td>
</tr>
<tr>
<td>P7</td>
<td>“[Technology] is to find a way to understand the risks and possible advantages to analyse and then to see how we can use technology for good for the good life, which means in my in my way of thinking very humanistic values.”</td>
</tr>
</tbody>
</table>

The worldviews of the participants may seem like an amalgamation of the social and systemic and litany layers when the opposite is true. The worldview of ‘image of technology’ splinters into individual discourses that are expressed in the social and litany layers. It reflects the values and norms that guide the participant’s expectations and shared beliefs and about the possible futures open to them (Graham, 2001; Haigh, 2016).

Technology becomes subordinate to economic drivers and the moral and intellectual activities that create the dispositions and dependencies that are associated with a habitus. The narrative of P6 saw the issue as “whoever the group [stakeholders] is funding first, they want a piece of it don’t they … everyone’s running scared of the funders”. This narrowing of the role of the practitioner by funding pressures excludes them from the process of decision-making and analysis of the long-term consequences of those discussions (Christians, 2011).

Technology became seen as friend or foe by leveraging data to understand the education structures better and to place the human in a position that where they were vulnerable in occupations that were once untouchable (Farrow, 2019). The worldview of technology as new, for example, encompasses the need to buy the latest version: “new technology is always better … got to get up before my competitors do and then they buy the damn thing” (P4). These structures support the consumer-driven nature of technology. It feeds the feeling of speed...
of change, where we cannot keep up with what is new and what is changed. P3 expressed this as “[t]her tools are happening now to make our lives easier, but the pace of change is so rapid that it’s hard to it’s hard to keep up”.

The prevailing worldviews in industrial societies are often instrumental and fed down from the myth and metaphor layer to support a dominant economic view that ToL is something to be bought and invested in (Christians, 2011; Farrow, 2019). Instrumentalism at a worldview level supports the structuralism expressed in the narratives of the participants and provides the foundations of a Habitus of Technology (Bourdieu, 1977; Sterne, 2003).

5.5. Practitioner myth and metaphor layer

Finally, at the metaphor layer, the participant is guided by the deeply ingrained personal ideologies, philosophies and collective social stories that are the nexus of the Habitus of Technology. Our visions of possible dystopian futures and utopian lifestyles mingle with the metaphors to speak to the in-depth stories, the collective archetypes.

This level provides an emotional level experience to the worldview. The language used is less specific but more concerned with evoking visual images and with touching the heart instead of appealing to the reason (Wright, 2004; Kotze, 2010; Bishop and Dzidic, 2014). P5 express this as:

our human nature, the human condition, it [technology] help[s] improve that. With some tools, we can do a lot of harm…unless we regulate ourselves, it [technology] will destroy us.

There was an underlying expression of the metaphor of resistance to change that worked its way through most interviewees. For example, P7 said:

Education systems have adopted some kind of shield against everything that goes against their interests or threatens them, and certain autonomous agents certainly threaten them.

The word myth is often used in the sense of something untrue. However, in this research, we use it in the sense of the organisation of images and those emotions that give sense to a profession and life (MacGill, 2015).
P9 saw the language of the university system as a means to ensure conformity “the university system, they have their jargon, they’ve got their political culture and it’s very resistant to change”.

The concept of metaphors becomes expressions of coherent meaning and frameworks from which to operate in the world, profession, or self (MacGill, 2015).

However, the dominant metaphor was one of tools. Almost all the participants used the image of a tool in their everyday litany when describing the metaphor of technology and education. P2 and P3 saw technology as ‘helping’ and ‘making our lives easier’. P5 and P6 described it as a means to ‘achieve’ and providing ‘efficiency’, while P3 and P7 used the words ‘change’, ‘rapid’ and ‘progress’ in their narratives.

Table 12. Practitioner myth and metaphor

<table>
<thead>
<tr>
<th>Participant</th>
<th>Schoolhouse metaphor, resistance to change</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2</td>
<td>“And I’m quite happy to change slowly, at least in academia.”</td>
</tr>
<tr>
<td>P3</td>
<td>“…technology has the capacity to do that [change the schoolhouse] …where it runs into the resistance, of course, is the institutional mindset and all the inertia that goes with it…”</td>
</tr>
<tr>
<td>P6</td>
<td>“a lot of institutions, they paid a lot of money in order to maintain the status quo, right.”</td>
</tr>
<tr>
<td>P7</td>
<td>“Education systems have adopted some kind of shield against everything that goes against the interests of threatens them. And certain autonomous agent, certainly threaten them.”</td>
</tr>
<tr>
<td>P9</td>
<td>“The University System, they have their jargon, they’ve got their political culture and it’s very resistant to change.”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Participant</th>
<th>Humanism, dualism, and essence of learning.</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>“I’m a little bit sceptical …like the kids cannot be left like with the technology and they cannot teach them just like that… But more you advance, in your degree and the subject, if you’re an independent learner, then yes, it can [technology as a teacher]. Okay.”</td>
</tr>
<tr>
<td>P2</td>
<td>“I see as learning is, what we do as humans.”</td>
</tr>
<tr>
<td>P5</td>
<td>“…our human nature, the human condition, it [technology] help improve that. With some tools, we can do a lot of harm, we can do a lot of harm and things along less we certainly we regulate ourselves, it will destroy us…”</td>
</tr>
<tr>
<td>P7</td>
<td>“The gap between the natural science and technology. And I would add technology on the one hand and humanities on the other. And this gap still exists up to a different way of thinking.”</td>
</tr>
</tbody>
</table>
“Teaching is an act of human labour... human labour involved at that beginning and the still the human labour of somebody actually wanting to learn... so no, education, technology can't teach people, people teach people, whether it's themselves, but other people…”

The externalisation of the technology aligns with the concepts of humanism, where the dominant thought is to ensure technology remains a tool, a mere thing. Here a tool is something used to increase effectiveness, efficiency and make your life easier, but you should not let it become part of the purpose or function of the self. Work done with the use of tools becomes a mediated activity, making it possible to create technology that works instead of the human (Coeckelbergh, 2013; Juchniewicz, 2018).

Metaphors are privileged in CLA, but not at all costs. Each of the layers has influences on the beliefs, assumptions and behaviours of the participants and becomes affected by a societal, technological, or emergent idea.

5.6. Participant emergent ideas

CLA process exposed in the narratives emergent beliefs and assumptions worth capturing for the final analysis. Emergent ideas (Table 13) become the catalyst for change, and the decision to capture one of the participant’s litanies as an emergent idea stemmed from its complete departure from the other nine narratives.

Table 13. Emergent Ideas

<table>
<thead>
<tr>
<th>Participant</th>
<th>Emergent Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>&quot;Omnipresent like it’s ubiquitous...I don’t see any more any dichotomy in technology.&quot;</td>
</tr>
</tbody>
</table>

When P1 was asked what technology meant to her, her simple reply was it was “omnipresent like it’s ubiquitous’ expressing technology as enmeshed in her life “I don’t see any more any dichotomy in technology”. This ‘belief’ became a departure from the remainder of the participants. Her technological awareness also saw culture as socially constructing how technology would or could be used in that demographic.

P1 suggested that our perception of what technology could be in the future was linked to the worldview of a country. She contrasted her personal experiences of two European countries: Georgia, where technology is entangled with
everyday activities, with her present location of Italy. In Italy, technology is resisted in education, banking, and public administration:

From a personal point of view, I lived in Georgia, which is quite technological in [a way] one wouldn’t expect. And it is very advanced in the services, the public services you can get in Georgia, it’s very easy, even physical, or online. Everything is like there’s no country that makes things so easy, I think, not even Estonia.

But when looking at Italy, she said:

But then I came to live here [Italy] is completely different. People do not trust technology so much. I don’t see Italy going fully technological anytime soon.

She added that her belief network altered: “here I understood that there is more to life than technology.” This country’s culture produces very different perceptions of what is possible for technology and what is acceptable.

5.7. Practitioner participants: conclusion

The chapter has focused on presenting the practitioner narratives and using CLA to deconstruct the narratives into the constituent layers for discussion in Chapter 7. Section 5.6 highlighted the emergent ideas of a closer relationship with technology and the cultural influences the worldviews of a country have on the human-technology relationship.
Chapter 6. Futurists interviews

The futurist interviews provided an opportunity to investigate the research questions through the lens of a different professional field that is often associated with technology and education. By exploring the Habitus of Technology through the beliefs and assumptions of the futurists as a different profession, the research was able to identify the commonalities and divergent structures across these professions.

The chapter provides a summation of each of the futurist interviews and follows the same format, process of deconstruction and methodology as with the practitioner group in Chapter 5.

6.1. Futurist participants

The Futurists, like the practitioners, represented a broad spectrum of backgrounds, responsibilities, and experiences. They offered a view that reflected their technology relationship based on their experiences and beliefs. The following table (Table 14) provides a brief overview of the diversity of participants.

Table 14. Futurist participants

<table>
<thead>
<tr>
<th>Participants</th>
<th>Biographies</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Education philosopher, MOOC and online learning pioneer and futurist.</td>
</tr>
<tr>
<td>F2</td>
<td>HE futurist and foresight consultant, keynote speaker and strategist.</td>
</tr>
<tr>
<td>F3</td>
<td>A visiting professor, innovator, futurist, entrepreneur of the field of ICT.</td>
</tr>
<tr>
<td>F4</td>
<td>Professional futurist, strategic foresight consultant, lecturer, researcher</td>
</tr>
<tr>
<td>F5</td>
<td>Futurist working for the science and technology innovation business sector.</td>
</tr>
<tr>
<td>F6</td>
<td>Writer, speaker, educator, He is a senior consultant at major think tank</td>
</tr>
<tr>
<td>F7</td>
<td>A future of learning specialist, consultant in learning strategy innovation</td>
</tr>
<tr>
<td>F8</td>
<td>A futurist, author, consultant, foresight director, and university lecturer.</td>
</tr>
<tr>
<td>F9</td>
<td>Futurist, researcher, educator, and author</td>
</tr>
<tr>
<td>F10</td>
<td>Innovative futurist, author, TV presenter and researcher</td>
</tr>
</tbody>
</table>

6.1.1. Futurist 1

F1 viewed technology as a tool that provides the “methods and processes of standardisation, optimisation”. Technology is the tool that made education accessible and rewarding with:
practices that make it better...for example, by being more accessible, possibly more effective, certainly more useful, potentially more motivating, and ultimately, more rewarding.

The idea that technology was an extension and external to the educational process supported the humanist separation between human and machine.

I mean, technology doesn’t have anything like intentionality. You know, there’s the old slogan: information wants to be free. No, information doesn’t want anything, [it is] inanimate, technology doesn’t want anything ... [like] ... a symbiotic relationship.

The division between the human as the learner and technology was reinforced later in the interview:

So, learning can exist without technology and always has, your brain is a thing that works. In fact, that’s [its] only function... I think that this piece of [education] technology can be viewed as a tool, but it’s also an extension of my capacity.

Reinforcing the view of the separation between learning and education, he added ‘education is a technology’ placing the formal institutional process as ToL. The belief in the separation of learning from technology and education continued in his responses.

I think it’s inherent in the definition of education, that it involves technology...and then there are various tools, devices, etcetera, that support [education].

He did not reconcile whether he saw education as a technological tool or if the relationship contradicted his denial of a symbiotic arrangement.

When asked about the idea of collecting student data, he replied: “I’m pretty indifferent about surveillance, in the sense that, you know, people can see what I do in the public world as it is, anyways.” However, he clarified this with the concept that data was not the problem. Rather, the problem as he saw it was embedded in the intentions of collectors of data:

Once this information was used, if the surveillance begins to impact on my capacity to grow and develop and do things in ways that I want to and especially in ways that benefit me, as opposed to ... the educational institution, it’s at that point that they’ve crossed the line.

When asked why educational technologies seemed to serve the institution, not the learner, he was quite clear:
I’ve attempted throughout my career to develop technology that benefits, you know, primarily, if not only the learner [but] … technology development doesn’t just happen, it’s the result of development, resources, and time … and individual learners have none of those three things.

He added that value and measurements of efficiency drive the development of ToL, so in his opinion:

The technology has to benefit the institution, has to produce some kind of tangible return to the institution. And hopefully, if we’re lucky, [technology] may also result in some tangible benefit to the student. But that’s not a requirement. The requirement is that it benefits whoever’s paying for it.

The conversation shifted to the effects of the public narratives on education technologies. F1 provided a different take on the issue from the other participants:

From the perspective of education, it’s neither a good thing nor a bad thing, because [public narrative] has nothing to do with education, it has everything to do with how companies compete with each other. And companies don’t compete with each other on the basis of whether they educate, they compete with each other on the basis of whether they make money…'

He followed on with comments on the narratives about education and contradicted the dominant narrative of the reason for education is to make job-ready graduates:

I’m not sure that there’s a story to be told in education. … We certainly hear that story a lot … for example, we hear the story about, national productivity is based on science and technology. We hear the story … where [technology] innovation is a change … that realises greater benefits for lower expenditures.

He indicated that the dominant stories were used to justify the need for education to be profitable, not make world-ready citizens.

His passion for education and learning showed through when he talked about how education’s story and disruptive qualities were really about the effect on the individual:

The story for individual learning is having a richer understanding of their culture … for the person involved, that’s, you know, revolutionary and even innovative and like helps them do interesting things like, just find something for themselves... And I
think we have to separate the story of learning from the story of innovation, we have to separate from the story of disruption for any individual person. Yeah, education, learning is hugely disruptive.

When asked if he saw technology itself as having pre-constructed narratives which he saw as the expression of technological dependencies, he replied:

These stories, these technologies come with the stories, they come literally with stories this is not a metaphor... In either case, they differ from my own approach to this stuff. I prefer to think less in terms of stories and more in terms of affordances, I prefer to think of what it allows you to do that you couldn’t do before, which can’t be defined necessarily ahead of time, as opposed to, what is the story about how you’re going to use this technology.

As the conversation shifted towards the future of technology and education, F1 had an interesting take on the future of the traditional school.

As this [personalised digital assistant] becomes more affordable, it will become wider. It will, elements of it will be integrated into the classroom, 50 years from now. It’ll only be the people who are poor, who are educated in a classroom, with teachers or probably by their robot tutor.

Addressing the question of AI replacing educational staff, he suggested that:

The question is not whether AI will replace us, the future features people working with AI more and more. He was one of the few who did not see conflict in this relationship, but question if we were ready to work with cognitive technologies. AI is one of these technologies like the spoon that extends our capacity … I mean, the real question is, what do we bring to this equation.

6.1.2. Futurist 2

F2 described technology in absolute terms:

I know my etymologies enough to know technology is any tool and basically, it’s what...allowed us to descend from the trees and start doing things with anything other than our hands. Languages was the first technology.

He added that almost any technology that we experienced before the age of 30 was cool, but after age 30 was:

…the work of the devil or something.... And I think for most people, technology means a tool that they are conscious of as a tool. So, a wristwatch they don’t think of is technology, but SIRI
voice or Amazon Alexa or something. They’re conscious that of its technology.

The effect of this mode of thinking is in assuming that technology is a tool; other ways of thinking about technology are made invisible to the person. The structure and agency of the individual changes as you do not just adopt a tool to make life more efficient, you change how you approach that facet of life (Kruger-Ross, 2013).

Turning the conversation to technology teaching people, the division between human teacher and technology came to the forefront:

I guess I believe people teach themselves and that’s the only way you will learn anything...But I think we’re still a generation or two away from [AI] being able to mediate learning without needing a person right there in the process.

He finished off the thought with the structural control of money in that consciousness of ToL: “[f]unding seems to shape it. So, automation is required in order to teach more students with less money every day.”

F2 shifted to a common theme among the participants that the education system was a social influencer and if technology becomes the teacher:

then we’re going to have a very different society, people are not going to be socialised at all, for face-to-face interaction … but I don’t think a teacher is the reason why I don’t think a teacher teaches the student. But I think a teacher can be the reason why the student learns.

Later in the conversation, F2 indicated that educational staff and faculty were resistive and often oblivious to the effect of AI, stating that their...

preferred response is always I hope I retire before it’s an issue...And they’re all just hoping to sort of make it to the end of their career without having to radically transform what I think, you know, you can call that denial.

returning to the question of whether education can exist without technology, F2 said:

Well, yeah, I don’t think life exists without technology … We use it to entertain ourselves. We use it to educate ourselves. I yeah, I don’t think there’s any way you can take technology out of education.

F2 further developed his thought on technology in education:
The adoption of technologies, in educational institutions, is a highly social and cultural process ... [and suffers from] the disadvantage of [inhouse] expertise, the more we have constructed a system of knowledge, the less flexible it is.

Interestingly, some of the resistance to technology was centred around what could be considered conspiracy theories about technologies:

    So, I kind of get concerns [from educators] about Wi-Fi signals and cellular signals. And whether those things are, I am sure electrical fields have an impact on the human body.

This is used to lend credence to some of the arguments against allowing students to use technology all the time. When questioned if he believed that Wi-Fi might hurt the students, he shifted the answer along a thread “I’m not prepared to say they’re all completely out to lunch,’ moving the conversation towards the iniquitousness of the technology in a young person’s world.

    You’re disengaging a whole generation of students [without Wi-Fi and cell phones] asking them to use one less sense, tying a hand behind their back ... it’s like stepping back into the 19th century.

He later added in frustration that denying or hampering technology in the educational setting was reducing their senses and limiting how they perceive the world. “But it’d be a bit like forcing us to use a horse and buggy to commute to work.”

Addressing the question of the resilience of the schoolhouse metaphor, F2 stated the resilience was embedded in the education process: “the Deputy Minister once told me that implementing a curriculum change in K to 12 takes 15 years”. To complicate matters, if things do not change F2 sees an arms race building between the technology of the students and the institutions:

    Yeah, the problem is that education is a game that students enter and level up every year. And the goal is to get the grades with the least work possible. And so, they find cheat codes, they find workarounds. They’re fixated on getting the grade instead of on learning anything.

F2 ended the conversation with some personal concerns on education heading in the opposite direction to the one needed:

    Increasingly capturing [data] and the narrowing disciplinary specialties [loss of humanities and arts programs], that’s going to become a bigger issue that those students really need to be
interdisciplinarity trained… renaissance people that can… teach themselves to learn things as they go.

6.1.3. Futurist 3

When asked what technology was from his perspective, F3 replied:

I had a conversation with someone yesterday that caused me to go back to think to[a] time when I became conscious of technology. And it was a sense of a bright, shiny thing.

F3 was aware of the potential of new technologies from the first time he became aware, “here was something that could disrupt or could significantly improve on what went before”. He continued by adding that he was fascinated by the unintended consequences of technology that have become intertwined in both his personal and professional life:

I often look at others … and am conscious of the excitement of the bright, shiny thing. And when that’s consumer technology or more invisible, immersive technology, ubiquitous technology that we take for granted.

F3 was the single interview participant who expressed excitement about technology’s prospects in any field of endeavour. He added that he was “struck by the way that we can embed, we can bring back to education, we can improve research quality, the opportunities for peer-reviewing are immense.”

The conversation shifted to his concerns about the viability of financial, educational institutions:

… being dependent on international students, in many senses, for financial reasons, most of the academic institutions are effectively bankrupt. Therefore, their primary objective is to get funding for research … for an admin fee to cover the costs of running the university.

The consequences of that highly competitive funding were limiting both the scope of research and the willingness to take on research areas that were long-term or not mainstream concerns. He commented that funding only flows to places where:

… emphasis is placed on things that simply prove what someone’s been trying to say. If that research is being funded in that manner, generally, people are not interested in a period, a window of time when they’re not going to be around.
This ‘push to please’ places pressure on researchers to find evidence that supports the research questions demanded by the funders.

But that answer didn’t meet the evidence that didn’t support the answer people wanted. So therefore, it was chosen to be ignored. Is it that people have found a way of being more creative with data to create the illusion of certainty? I don’t know. It might be, but I am conscious of [how] it’s fascinating how people measure things incorrectly.

6.1.4. Futurist 4

F4’s view on technology was demonstrated as an essentialist mode of thinking when she said:

I believe that technology is beholden to us. And to the next generation, I see technology … as tools, and maybe I have a traditional view of technology, I see technology as our servants.

Shifting that towards education, she followed up by saying:

Even here, in Silicon Valley is completely off [on education], it’s focusing on the wrong thing, is kind of turning kids into robots doing things that technology is much better at doing.

Her views on technology saw technology as our servants that should offload the human in areas it was better so humans could tackle the bigger issues:

It’s interesting, like we keep talking about, oh, we can’t have technology, because we’re going to lose our jobs. But hey, there’s so many problems in this world that really, really need attention. And it’s going to take a lot of man-hours just thinking through solutions.

When the conversation turned to technology providing education, she responded with a critical appraisal of the individualised education that is being promised by some technologies of education. Her background and passion for technology saw a preference for science-based education, “especially STEM… it’s harder to learn creativity, but you really have to learn sort of the building blocks to be able to create the future.”

While questioning if a generalist education was the proper way to go:

Okay, we’re going to completely individualise an education there, you seem to be very artistic. So, let’s not worry about math for you, you know, let’s just worry about these [arts-based]. I think that will be wrong, because here you are, at an early age you
might not definitely meet all the core components, [for life in the future world].

During this phase of the interview, she revisited the role of technology and portrayed a more humanist position, clarifying her line of thinking by saying:

So that’s kind of how I see technology being a tool to help augment those conversations. So [helping] people find, learn more about the reality around them [in] this complex world.

She added in retrospect that a data-driven reality was not always accurate. “Around that fake data-driven reality.”

Continuing on this line of thinking, she added while technology and sciences are important and need to be part of education, the content, “might not necessarily to be driven by technology… [but by the] …needs of the humans.”

F4 also raised concern where technologies and the design and development were becoming dangerously centralised, leaving only an illusion of the dream of technological democratisation:

I think democratisation of technologies that was like [is lost], not only bifurcation, but you also have, the people behind the curtain. And then you have the users. And the people behind the curtains are becoming fewer and fewer and they get more and more powerful.

She then highlighted the danger of losing the ability to control those that control our technologies:

So, we actually use the technology in a way that separates us from the power and also makes her dumber, in a way, you know, we might know how to use technology and our intuition … we don’t really know, the back side of, you know, the what’s behind what’s going on, you know, behind the curtain.

Her concern emphasised the biases and gender problems with technology development by describing the narrow culture that builds technology. In her words, they need to be male, under 30, Jordon Peterson⁸ fans with libertarian⁹

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beliefs. She firmly added they need some 40-year-old mothers to balance things and sort things out.

6.1.5. Futurist 5

When F5 was asked the first question on what technology meant to them, she answered:

I think that’s a weird question. Because technology is an integral part of everyday life and is an integral part of society. And I think that to say, to try and separate, its effect is very, very difficult.

She added that from an academic position, she thought about the philosophical work of her technology beliefs:

My background in science is science and technology studies. So, like, we spent much time thinking about the implications of the interconnectedness of society and technology and how, actually, you know, like, this whole debate around a technology called determinism and how culture shapes technology, as much as technology shapes society, lots of people, you know.

When focused on education and technology, the answer did not reflect the earlier notion of the difficulty in separating technology:

But I think for education, education purposes, like education can exist independently of technology, I think, to some degree and but I think it’s just how you teach people and give them the tools to understand how to learn with technology.

She then extended the thought with more mainstream views of the purpose of education to prepare individuals for work:

And, you know, how do we equip people with the right skills to go about using that tech knowledge in a way that’s useful?

She continued to discuss the consequences of those technologies on education and society:

[they] could have implications for many different domains, not just for education and...whether it be education or just like the public domain...there’s how do we regulate [it]? And how do we think of all the future implications of bringing technology to have a new use? Or? Yeah, especially like with very dramatic and sort of future visions. Like, yeah, hologram teachers and things like that?

She expressed a level of hopelessness and lack of ability to influence decisions:
How do we regulate the new technologies in education? I mean, … but it feels like just deciding on the curriculum in the UK for school children is a very bureaucratic and not a very innovative and flexible process.

F5 saw ToL, in general as lacking the monetary draw to attract start-ups to challenge existing educational technology sectors. This, coupled with a strong bureaucracy, make innovators look elsewhere:

I think that it is sad that people who have an idea specifically may be designed like technology as an educational tool, for example, that they can’t, probably wouldn’t, be able to get the funding necessarily.... I’ve been like researching lots of innovation, funding streams, recently, government innovation, funding streams... all of them, you must either have a certain amount of employees already, you need to be making a certain amount of revenue already.

She emphasised that the traditional neoliberal economic rules structurally limit independent educational technology development.

She saw the availability of funding streams as having the potential:

…to shape the way in which the technology comes about [and what is developed]. But now, from her perspective, she explained that I’ve just done some research on innovation funding, and it seems that lots of it [funding allocation] are very random.

6.1.6. Futurist 6

F6 answered the question of technology from a different angle that saw technology as entangled in our everyday lives:

A wonderful anthropologist Ian Hodder has written a book called the entangled history of humans and things, right? So really quite wonderful, right? Because and we’re entangled in things.10

The concept of entanglement is important and a break from the other interview participants. The concept that F6 highlights is the idea that humans depend on things, in this case, technology (Hodder, 2016). Technologies, in turn, become dependent on the human for their use. The intra-dependencies between humans and technology create structures that limit the opportunities for future

progress. To escape the theories and paradigms of the past there must be fresh ways to articulate the human/thing (technology) relationship.

He summarised the entangled relationship humans have with technologies when he rejected the binary and humanist thoughts of technology: “[a]nd so, you know, language in tech and culture, our technologies, [that’s] what made us human.”

On the question of technologies on the horizon that would affect education, he identified distributed ledger systems as the new accounting system for education, suggesting that we should not have control over who sees our data, but we should know who is using it and why “we have this technology that allows me to be alerted when someone looks at my data.” He noted that this approach to data security:

show[s] the bones of a new paradigm, a new accounting paradigm that’s more appropriate for the anti-rival nature of information, right, where it’s really the combination of information that it’s like, you know, the value of a network.

In the process of re-reading this interview it became clear that it altered the path of the research when he identified technology entanglement in his comments:

So, you know, technology is us, this is what McLuhan says, ‘technology is the most human part of us’ so and, you know, Ian Hodder [is] struggling with this question … in his latest book,11 when he says, you know, where are we headed, you know, the evolution of humans and things, right?

F6’s narrative highlighted the concepts of intra-actions as the questions and answers co-constructed the outcome of his answers and subsequent answers. He articulated some of ideas of the research having a direct effect on those researched:

What Kaufman12 says is that life creates the conditions of its own. Becoming each step by taking [about] the environment changes the environment and the conditions of the next step [of that

11 Ian Hodder: Where Are We Heading? The Evolution of Humans and Things http://www.ianhodder.com/books/where-are-we-heading.
12 Stuart Kauffman, a medical doctor, a theoretical biologist, a MacArthur fellow, and a proponent of self-organisation of complex adaptive systems as part of Darwinian evolutionary theory https://informationphilosopher.com/solutions/scientists/kauffman/.
environment. And it changes in ways that I can’t necessarily predict. In fact, you can’t predict, right?

6.1.7. Futurist 7

When F7 asked about how technology fits in education, her narrative indicated a dualistic separation of technology as separate from learning. Later, she added that “I think digital is very different.” When asked if technology was value-neutral, she offered: “yes, that’s a tricky question. I see it as you plan what you want the learning experience to be and what will support that.” The response seems to discuss value-added rather than the value-neutrality of technology, which was evident in the second part of the answer.

Now, if you see the most wonderful thing in the world and it’s taking a piece of technology. If you don’t think correctly, if it’s not solving a problem for you or meeting a need or if it’s just replacing something, then it’s kind of useless... But if you technically just replace a teacher with a piece of technology that’s not a value add … you take that further down, and you actually make that into something where they’re constructing their knowledge and it’s a better experience for them learning, that’s where you get your true value.

When the conversation shifted to the role technology could play in teaching, she supported learning from a humanist ideology.

So, you need someone still to guide people; you need a human element to all of these theories; absolutely by no means would I ever say that we don’t need teachers and we don’t need educators; there’s a role for the human element.

On the binary boundaries between technology and humans, she suggested: “But if the human element isn’t there to say, Okay, everything’s telling me that there’s something wrong here.” When asked if the human element could be removed, F7 was firm, saying:

No, only think the human element can be removed anyway and the values at this point in time, the values and what we bring the human element that we bring are irreplaceable.

She had a very instrumentalist vision where education serves as the foundation for the growth and maintenance of structures of power and economy, with technology as a supporting role in that vision (Oladi, 2013).
I’ve always said, you know, the role of education was to prepare people for the workplace…so if you take that out of education, you’re literally creating this false sense of life and its security and learning and engagement and employment that doesn’t reflect the real world.

When questioned on what future technology excited her, she was quick to respond:

I think the value of data and how data can be engaged to inform any teacher at any time, not just about where a student may be now, but where they’ve been and data from outside school.

When the follow-up question asked about the privacy and consent with the data, F7 replied:

I think that it’s always a horse that is already bolted. I often think about what data is out there about me, but I’m a straight-living citizen because I’ve nothing to hide. So, I’m okay with that.

She then shifted perspectives, underlining the tension surrounding the data issues, when she added:

To me, the data belongs to a person, and it’s about we should be focusing on how it should be about the student and about how they have improved or not improved, not about where they sit concerning other students.

When asked what prevents innovation in education technology, F7 cautioned that:

I think money is a significant factor in this … Because I’ll go back to the purpose of education … if we’re preparing them for the real world, whether it be an active citizen or as an employee or a democratic citizen, whatever you want to call us. Why aren’t we just taking what’s in society and then looking at it in education?

She finished the interview with a final thought that technology “is disrupting education, but whether its improving education is where I have my question mark.”

6.1.8. Futurist 8

F8’s views of technology followed two lines of thought. First, technology was a tool:

When I talk about technology in my classes, I talked about how technology is different from art because we make art for
something to make something beautiful to create something inspiring to praise.

The second concerns the deterministic beliefs that support education:

I have a love/hate relationship with technology on a personal level you know I’m not a huge fan of technology, I think that’s why I became a futurist to critique technology and to look at it as something that’s not just benign and given but we create.

Her critique of technology quickly switched to privacy and surveillance:

Yeah, to, you know, collect information about them and how they hang out and how they study what they’re doing, which I think is just so invasive but yeah, I mean I guess it falls on all the invasions of the technology business on education...all the information they’re collecting and mining and selling about our students. It’s very dangerous.

She added these thoughts on data harvesting and student awareness and consent “I mean they have zero sensitivity to the concept of … It’s just already been so ingrained. They [the students] don’t question at all.” She tried to reconcile the negatives with the potential of data used with ethical consequences of the technologies in mind.

It’s a really hard question because of course we want to take advantage of the tools, we want to use them to our benefit, we want to improve educational access right, we want to improve student performance.

When asked about what education means to her, she said: “[w]ell, education, I mean it means everything to me. I think that education is life.” F8 added that social technologies have the potential to harm education and her belief in the resilience and need to protect education surfaced in the conversation:

Social media and media in general you know all that stuff we learn new things every day, whether we want to or not. So, it’s just it’s just part of our life, I think, you know it’s tremendously important that we preserve education.

When discussing the effect of technology on the future of education, she related an incident that technology not considered to be education technology could also influence the choices made:

Basically, where students are allowed and to some extent, I would say encouraged to carry weapons to campus. I mean certain buildings are prohibited but basically, sometimes when I’m
teaching, I have to kind of wonder, does anyone in this room have a gun’?

She added that when given a choice:

I was asked to change a class to a different time, and I was given the option to pick an online option, rather than keep teaching and face-to-face, they said you could take make it an online class. And what seriously played into my decision to make it an online class was to like not have to deal with that concept as often of campus carry like thinking about do these students have a gun.

Carrying forward the online theme:

I think its online schooling allows you to be educated alongside people who are not near you. Right or maybe not even at the same time as you. I think it’s as if it was a natural direction for the technology to go.

F8 also noted the asymmetrical benefits of online education:

I like how they create their own spaces with technology. It allows students to form their own learning communities and do what they want to do. So, I think it’s very empowering how it works today.

When considering how educational technology is influenced from external stakeholders, F8 said:

Well, I’m not sure but it seems to me like educational technology has really followed the same trajectory as I guess you would call it business technology.

Data becomes the most important resource for education. She cited an Economist headline\(^\text{13}\) from a couple of years ago saying that data is more valuable than oil “so I think we need to reinvigorate the human aspect of teaching.” She said that although she was not against using AI technology in education, she thought that there should be:

\[
\text{…a really humanistic use of data that absolutely involves a person and it’s very personalised in terms of seeing the full picture of the human right, not just seeing a bunch of data points and dollar signs, the same person on the other side.}
\]

\(^{13}\) The Economist, May 6, 2017, Edition https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data
Finally, focusing in on future technologies she opened a conversation on biohacking as the frontier of ToL:

It’s not like what I’m excited about but it’s what I’m thinking about is, I guess you would, would, what do they call it like chemical education, taking a pill, you know it’s back to that transhumanism.

She suggested that education could be pharmacologically managed:

sort of like all this cognitive science stuff that we’re learning, and I am excited about it’s cool it’s interesting, but … I mean, that kind of excites me middle so terrifies me at the same time. So, I don’t know if that’s learning but it’s like tapping into our deepest mental, whatever you would call it powers.

6.1.9. Futurist 9

Interviews with the remaining two futurist participants were conducted by email, resulting in no intra-active element to the narrative creation process. Their responses are presented abridged to meet the research format's needs.

F9’s response to the question of what technology meant was: “I once heard somebody define technology as ‘anything invented after you were born’.” She said that, like most people that they do not think of a ‘pencil as educational “technology,” even though it certainly is,’ commenting on the fact that the:

- tools used in ‘traditional’ education settings (chairs and tables/desks, blackboard, chalk, textbooks, notebooks, teacher’s diary where the grades are entered, building, electricity used in buildings, even the school fences)

were also in the definition of ToL.

For F9, technology was defined as “a science or knowledge put into practical use to solve problems or invent useful tools”. She, however, added the image of technology she saw “what pops up in my mind is a bunch of wires!”

When F9 considered the question of what education meant, she said that she saw it as a means to develop as an individual:

It is expanding one’s mind. Learning about the world and understanding other people and events and making order out of chaos. Sometimes, depending on the context, the word education evokes images of ‘schooling’ or ‘skilling’ as well.
When she considered technology’s place in education, the entanglement of the two featured heavily in her email:

Education cannot exist separately from society. So only if society would abandon all technological tools, including sticks used (once upon a time) for making fire.

She added, "I am not sure how education could be separate from technology, even imaginable.

When questioned about education and technology being futures-based, most interviewees did not answer directly, often shifting to other areas of interest. However, F9 refreshingly addressed the question head-on:

Yes, though I think the futures dimension is more explicit in technology development. With the development of technology, there is experimentation (multiple futures) and a goal (problem to be solved), and even a very explicit vision (i.e., flying objects such as airplanes, flying cars, drones, etc.).

Her belief about formal education was more based on the past, in that it “is often used to maintain status quo.” She invoked Foucault and his belief that education is an instrument of social control, agreeing that education is used to train workers for the industrial economy and keep social hierarchies firmly in place. She saw technology as being used to ‘colonise’ the other, the native (i.e., education systems intrinsic to colonialism and post-colonialism) and impose dominant modes of thinking on professions and social groups – those in power.

‘Touch the future – educate!’ is a common metaphor and inspiration meme for teachers. However, F9 saw technologies that support education as a means to constrain and “conceptualising [the] future in such ways is disempowering and allows education to be vulnerable to economic and technological determinism”.

Her experience as a futurist working with various individuals, groups in educational settings and institutions in universities, informal workshops and consultancy with education ministries led her to reveal: “I was utterly disappointed with the continual insistence to educate for the past or, alternatively, ‘more of the same’ future.”

When asked how technologies might impact education, F9 replied: “I worry about emergent technologies being used to continue turning us into uber post-
industrial hyper workers, feeling our minds have already been colonised to a particular mode of thinking by “social media, short-content ‘fast thinking’ stimulations and never being ‘good enough’ in our line of work”, adding that there is continuous pressure for ‘upskilling’ and ‘reskilling’, as a lifelong process which is imposed from the world of work rather than the need for better citizens. F9, when questioned about the effect of dominant narratives and other forms of technology discussion on the independence of educational technology research, responded by addressing the potential of the images colonising our vision of the future. She replied:

I think the public press, popular media and sci-fiction colonise our minds with very narrow images of the future... In most of those futures, imagined future is something that ‘happens to us,’ something we need to adapt to, adjust to or mitigate, rather than something we consciously create.

F9 continued her discussion of colonisation of our images of the future by noting that technical solutions are:

rarely collectively designed. Instead, they are commonly a result of a brilliant, often rogue, but almost always male, scientific/genius outcast. This is not what scientific and technological research or development of ToL looks like in ‘real life. And it is even less likely that this is how it will look in the future.

She went on to give an example from the movies where the time to learn is reduced by technology:

I often think of an image from the Matrix Trilogy14 when the leading actor learns ‘how to fly a helicopter. His learning is almost instantaneous; a program downloaded straight into his brain. I’ve worked with educators and education ministries looking for the next ‘magic bullet’ or ‘magic mushroom’ – something easy to adopt, use and disseminate. There is less and less patience for 1. learning takes time, 2. is ‘in-depth’ rather than at the surface level and 3. about knowledge/wisdom rather than mostly about ‘doing’.

F9 added to her thoughts on the issue of technology and education with the reply:

We live in a very divided world; creators of learning technology are common amongst the top 1% of the world populace (wealth and knowledge-wise). It is to be expected that their research will inevitably reflect their interests and how they see the world.

When asked if our reliance on data was affecting education technology decisions, she replied, “we have entered ‘neo-Taylorism on steroids’ era.” She continued her response: “I agree but [I’m] not sure it is a good thing; I would think quite the opposite.”

The response from F9 on the question of whether technology can teach humans, she saw the issue as a three-party interaction:

So, I would think of teaching via technology as a three-party involvement: those that use technology to learn, those that use technology to teach and previous people who helped create that same technology.

She flipped the question slightly and continued the answer with: “I think pertinent to this question is the argument that in many ways the main focus in education is to improve learning technologies.” She considered education technology as being reduced to an “instrument of economic policy, teaching about progress without limits, rights without responsibilities and technology without cost.”

F9 then turned her attention to what be the heart of the matter that is hidden in our deeper layers of ways of knowing, suggesting it was not a technology/humanism/relationship question as much it was a “question of who controls the power in the system and learning technologies serve the institutions with vested interest”.

The final questions dealt with the resilience of the schoolhouse metaphor and allowed F9 to reinforce the concepts of colonisation of ideas and thoughts:

Hegemonic futures visions, such as the metaphor of the ‘schoolhouse,’ eliminate alternatives not by contesting them or making them illegal, immoral, or unpopular.

F9 also indicated that the Schoolhouse metaphor was resilient to change:
We also know that this process is never complete and dominant visions, and some alternatives modes of thinking must challenge metaphors.

6.1.10. Futurist 10

F10’s email responses to the questions were answered in bullet form, so to adapt the responses to the summary, they are given contextually and edited into paragraphs.

His take on technology was in line with others who said technology is an enabler and tool:

Technology is an enabler of an impactful action – teaching, writing, and content production. It’s not the focus. It’s the tool.

The follow-on question about what education means to him focused on the collaboration and community:

It means an individual path to growth using collective information and experiences. It means community and conversation. It means constant feedback.

When answering the question of whether education can exist without technology, he saw his definition of technology to be more inclusive:

Not really. Any communication device, paper or otherwise, is technology. Technology does not define education unless it’s the subject of learning.

F10’s understanding of education and technology’s effect on the future was different from several of the other futurists because he sees both education and technology as activities that are rooted in the past:

It’s way more present than that. It’s empirical. Education is backwards looking. Foresight and futures-based activities are exactly that. Activities that happen today with a view to the future are defined by the past, present and hypothetical questions about the future.

Like most of the participants, F10 saw AI as one of the foremost influencers on the future of education and the resistance to change in education as one of the limiting factors to allowing AI to have a full effect:

The most significant impact will be access to data and machine learning on an individual’s learning experience. Firstly, the
individual and the teachers can create personalised learning independent of a strict curriculum.

In response to what worries him, he replied:

Worry? Suppose we deliver technological solutions using old philosophies and processes. In that case, we are bound to fail in delivering advancements' adding 'old process + new tech = expensive old process ...We have to be in constant evolution.

When he addressed the question of the effect of the media, press and sci-fi, he was one of the few interviewees that separated their relative effects, feeling each had an impact of its own. He suggested the public media and press are less than helpful:

Media spreading fear, uncertainty, and doubt on technologies are not useful (for example – AI and the idea that it will put 100m+ people out of work or be used to kill humans).

F10 saw the potential of the stories and narratives of sci-fi to be more helpful: “[w]hen used well sci-fi can feed bigger ideas and speculative futures”. He added that there needs to be a collective effort to understand the consequences of the future of technology in education:

We can start to think about the future state of the world and have a proactive plan to evolve curriculum, learning tools and suchlike.

F10 saw the education system as: “[t]he modern world is an educational 'sausage factory’” through technology. In response to whether there is a growing danger of reductionism/determinism in our decision-making concerning research, pedagogy, and curriculum choices, he wrote that it was neither good nor bad but “part of the holistic process.” But the follow-on answers did help fill in the questions about the holistic process, adding:

[w]e has to bring everyone along in the new 4th Industrial Revolution. Now more than ever we have the opportunity to rise above all of these restrictions. We need passionate stakeholders and participants to take up the reigns and drive the future-forward. I believe most stakeholders should be women and girls that push forward with an agenda of empathy and love.

When answering the question on whether technology can teach people, he saw this as not binary, answering:

Yes, but they are not mutually exclusive today … I can make an instructional YouTube video for a skill, upload it, and email it to
many people. Some can watch and learn using smartphones, tablets, and computers. Technology has a role – accessibility, convenience, shareability... much access via technology. It’s about efficiency in this form.

When asked about the future of education and technology, he saw the ebbing of power and relevance in the educational institutions:

I see a time when the institution as we see it today disappears, and the learner takes complete control. Institutions will be education platforms, and personalised learning will have gained prominence partly because kids can learn anything independent of the institution. It’s a shift in power.... The whole idea of ‘schoolhouse, teachers or whatever is being challenged today.... [This was a] holistic relationship between government, parents, children, solution providers and information brokers.

6.2. Futurist litany layer

Like the practitioners, the futurists’ litany of the narratives invoked the separation of technology from the human and, in one case, placed technology as a material thing that was less than art. F8 saw technology as a lesser human creation: “technology is different from art because we make art to make something beautiful … something inspiring to praise”.

The futurists had different interpretations of the interview questions from the academic participants. However, the underlying dispositions remained similar to those of the academics, except for the practitioners’ concerns with the speed of technological change.

The following sections provide a deeper look into each of the causal layers of the futurist narratives, beginning with the litany of technology as an external tool.

6.2.1. Technology as a tool

The concept of tools and technology being external to the human was a strong theme in the litany of the futurist participants (Table 15). The article occurred in the invocations of six of the ten futurist participants and emphasised the support of the separation between human and machine. As F1 observed with confidence: “I mean, technology doesn’t have anything like intentionality...it [is] inanimate, technology doesn’t want anything… [like]…a symbiotic relationship”.
When technology is a tool, it embodies the humanist concept of being external to the human. This instrumental view situates ToL as a means to an end, not an end in itself. It promotes a belief that the human aspect of educational goals and learning should drive the understanding of the technology of learning (Webster, 2016).

Table 15. Technology as a tool

<table>
<thead>
<tr>
<th>Participant</th>
<th>Technology is a tool</th>
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</thead>
<tbody>
<tr>
<td>F1</td>
<td>“I think that this piece of [education] technology can be viewed as a tool... and then there are various tools, devices, etc, that support that [education].”</td>
</tr>
<tr>
<td>F2</td>
<td>“I know my etymologies enough to know technology is any tool and basically, it’s what...allowed us to descend from the trees.”</td>
</tr>
<tr>
<td>F4</td>
<td>“</td>
</tr>
<tr>
<td>F8</td>
<td>“We want to take advantages of the tools.”</td>
</tr>
<tr>
<td>F9</td>
<td>[defines technology] “a science or knowledge put into practical use to solve problems or invent useful tools.”</td>
</tr>
<tr>
<td>F10</td>
<td>“We want to take advantages of the tools, we want to use them to our benefit, we want to improve educational access right.”</td>
</tr>
</tbody>
</table>

The litany of the futurists saw technology as something external to humans (Table 16), a tool and the cornerstone of thought that reveals technology as a habitus. As an extension of our body, the possibilities for the technology are constrained by their understanding of the technologies as anything other than a learning tool (Steinert, 2016). F9 saw this external relationship as “[e]ducation cannot exist separately from society ... only if society would abandon all technological tools”.

Table 16. Technology as an extension of the body and mind

<table>
<thead>
<tr>
<th>Participant</th>
<th>Technology as an extension of body and mind</th>
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<tbody>
<tr>
<td>F1</td>
<td>“…technology can be viewed as a tool, but it’s also an extension of my capacity.”</td>
</tr>
<tr>
<td>F2</td>
<td>“[Technology] allowed us to descend from the trees and start doing things with anything other than our hands.”</td>
</tr>
<tr>
<td>F6</td>
<td>“These artificial agents become extensions of ourselves, as we query a world.”</td>
</tr>
<tr>
<td>F8</td>
<td>“…of course, we want to take advantages of the tools, we want to use them to our benefit...’</td>
</tr>
<tr>
<td>F9</td>
<td>“Education cannot exist separately from society...only if society would abandon all technological tools...”</td>
</tr>
</tbody>
</table>
Instrumentalist views of technology are components of the Philosophy of Technology, positioning technology as extensions of the body, mind, and physical space to solve educational, social, or environmental problems. Nevertheless, this relationship between humanism and technology is rarely acknowledged leaving open the question of which of our human faculties and capabilities should be extended, who decides, and who is not included in the discussion (Knievel, 2006; Feenberg, 2012). F6 was sensitive to these unexamined questions in technology when wondered if technology was approaching a position of distributed agency: “these artificial agents become extensions of ourselves, as we query a world…we have now with sort of the distributed agency”.

6.2.2. Analytics are in control

The ‘datafication’ of ToL serves external stakeholders and reflects the inevitability of progress driven by technology rather than being researcher-driven (Hall, 2016; de Freitas and Dixon-Román, 2017).

This solution-driven approach serves to emphasise the belief in a commensalism interaction between education and technology and supports F9’s view “I’ve worked with educators and education ministries that are similarly looking for the next ‘magic bullet’ or ‘magic mushroom’”. Table 17 gives examples from the seven futurist narratives on their observation analytics in ToL field.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Analytics are in control</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>“…as the surveillance begins to impact on my capacity to grow and develop and do things… it’s at that point that they’ve [analytics have] crossed the line.”</td>
</tr>
<tr>
<td>F2</td>
<td>“There are some technologies out there that are feeding on data…I suspect there are ways in which once machine learning takes off, it’s out of people’s hands.”</td>
</tr>
<tr>
<td>F3</td>
<td>“If you want to convince people and the most effective way of lying is to imply that there is data and that there are numbers [to back it]…”</td>
</tr>
<tr>
<td>F6</td>
<td>“So, the power of the distributed ledger will really be unleashed the moment we stop trying to link it with currency.”</td>
</tr>
</tbody>
</table>
A key driver in the narratives was the image of success being defined through data and this image was similar to the practitioner narratives. The narratives place the discussion as external to them as an individual and as a professional. It was framed as a force outside their control and as a competing influence that created openings to discuss technological power over their field of endeavour (Hall, 2016). F2 saw data’s most significant effect was the loss of agency and control:

There are some technologies out there that are feeding on data … I suspect there are ways in which once machine learning takes off, it is out of people’s hands.

F9 took the concept further in seeing external and truth through their data as means of colonising:

I personally worry about emergent technologies being used to continue turning us into uber post-industrial hyper workers. [We need] a really humanistic use of data that absolutely involves a person.

### 6.2.3. Humans should not be replaced by technology

The question primarily responsible for part of the analysis was concerned with the statement “technology does not teach people, people teach people.” The futurists’ responses did not challenge that assumption, placing caveats to soften the problem as a binary ‘us or it’ argument. There was a trend to maintain the separation of human and technology, leaving open the possibility that culturally we may change in the possible futures, as suggested by (Weaver and Snaza, 2017).

F1 saw the issue through the lens of economic divisions:

You know, as this [personalised digital assistant] becomes more affordable … 50 years from now it’ll only be the people who are poor, who are educated in a classroom, with a teacher or probably by their robot tutor.

Table 18 gives examples from the seven futurist narratives on their observation human-technology relationship in ToL field.
Continuing with the futures-based theme, F10 saw the AI already deconstructing the schoolhouse metaphor, “It is a shift in power... The whole idea of ‘school’ – house, teachers or whatever is being challenged today.” Looking further into the future of ToL, F10 added, “I see a time when the institution as we see it today disappears and the learner takes full control”.

In defence of the humanist notions were narratives of humans providing that human-to-human contact or empathy; F2 believing “I think a teacher can be the reason why the student learns”, qualifying that belief with “…then we are going to have a very different society, people are not going to be socialised at all...”.

Which F5 took even further “…very dramatic and sort of future visions? Like, yeah, hologram teachers and things like that’?

6.2.4. Technology funding

The futurist narratives emphasised the funding effect and the dispositions and agency more than the practitioners in the discussion. They considered funding in the educational system as competitive and predatory and structured ToL as a means to benefit the institution rather than the learner (Edwards and Roy, 2017).

According to F1:

The technology has to benefit the institution and produce some kind of tangible return to the institution. And hopefully, if we’re lucky, [it] may also result in some real benefit to the student.
But it is not a requirement, and the prospects for technology for education from an entrepreneurial perspective are bleak:

I think that it is sad that people who have an idea ... like technology as an educational tool ... they can’t ... probably wouldn’t be able to get the funding necessarily.

Table 19 gives examples from the seven futurist narratives on their observation on funding concerns in the ToL field.

Table 19. Funding concerns

<table>
<thead>
<tr>
<th>Participant</th>
<th>Funding concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>“The technology has to benefit the institution, has to produce some kind of tangible return to the institution. And hopefully, if we’re lucky, [it] may also result in some tangible benefit to the student. But that’s not a requirement.”</td>
</tr>
<tr>
<td>F2</td>
<td>“Funding seems to shape it…automation is required in order to teach more students with less money every day.”</td>
</tr>
<tr>
<td>F3</td>
<td>“Most of the academic institutions are effectively bankrupt. Therefore, their primary objective is to get funding for research.”</td>
</tr>
<tr>
<td>F5</td>
<td>“I think that it is sad that people who have an idea…like technology as an educational tool…they can’t, probably wouldn’t, be able to get the funding necessarily.”</td>
</tr>
<tr>
<td>F7</td>
<td>“I think money is a big factor in this [technology]…Why aren’t we just taking what’s [technology] in society and then looking at it in education’?</td>
</tr>
<tr>
<td>F8</td>
<td>“Not just seeing a bunch of data points and dollar signs, [but seeing the] person on the other side.”</td>
</tr>
</tbody>
</table>

The funding streams also affect what technologies get identified as ToL. As F5 and F7 cautioned, “[funding] shape[s] the way in which the technology comes about [and what is developed]”. The structuring effect of funding is to normalise the need to chase funding, resulting in less time gathering and thinking about the effect of ToL on the future of education. F8 saw the chase as forgetting the person in the competition for funding “not just seeing a bunch of data points and dollar signs, [but seeing the] person on the other side”. As Edwards and Roy (2016) commented the ‘perverse’ result was often the overselling of positive results and downplayed of the negative.

6.3. Futurist social and systemic layer

This layer connects individuals’ social behaviours to the everyday rules and conventions that govern how we view technology and use it in private and public spaces. The futurist participants’ social and systemic views expressed
concerns with the issues of funding and the lack of agency associated with the dependency of external agencies.

The social and systemic layer looks into our behaviours and the relationship people have with technology, social systems, professional structures, and their world (Breen, Dzidic and Bishop, 2015a). It was noticeably less prominent in the futurists’ narrative; as a profession, they seemed less constrained by organisational pressure and appeared to be driven by customer constraints. The expected structuring of the social and system layer instead seemed to be developed by the academic expectations of ToL or, in some academic cases, avoiding dealing with the technological advances. F1 positioned himself at the far end of the discussion: “companies don’t compete with each other based on whether they educate, they compete with each other on the basis of whether they make money most efficient’, believing that the dominant narratives about ToL were used to justify the need for education to be profitable, not make world-ready citizens.

F2 considered the academic structures to be part of the problem. Creating a system that used ToL as a social and cultural process that suffered from the highly rigid system of professionalism, technical knowledge and expertise made it inflexible and resistant to change. His comments reflect the avoidance and possible feelings of lack of agency:

I think they are sometimes oblivious to this narrative [effects of technology]. And sometimes, they are just resisting it. When I ask staff and faculty on campuses, what their attitude is towards AI, their preferred response is always I hope I retire before it’s an issue.

Further deconstruction of the narratives of the futurists revealed discussions of technology as a tool and as a commodity with an emphasis on the structural controls placed on ToL in the education system (Farrow, 2019). F4 saw this as being shaped by those that controlled the marketing: “I think democratisation of technologies is lost and not [lost] on the people behind the curtain”. Table 20 outlines the futurist social and systemic layer narrative comments.

Table 20. Futurist social and systemic layer

<table>
<thead>
<tr>
<th>Participant</th>
<th>Social and systemic layer</th>
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171
| F1       | “…companies don’t compete with each other on the basis of whether they educate, they compete with each other on the basis of whether they make money most efficient.” |
| F2       | “I think they are sometimes oblivious to this narrative [effects of technology]. And sometimes they are just resisting it. When I ask staff and faculty on campuses, what their attitude is towards AI, their preferred response is always I hope I retire before it’s an issue.” |
| F3       | The next thing is that if that research is being funded in that manner, generally, people are not interested in a period [long-term], a window of time when they’re not going to be around.” |
| F4       | “I think democratisation of technologies that was like [is lost] and not [lost] on the people behind the curtain.” |
| F5       | “[Funding] shapes the way in which the technology comes about [and what is developed].” |
| F7       | “I think money is a big factor in this … Because I’ll go back to the purpose of education…if we’re preparing them for the real world…” |
| F8       | “I’m not sure but it seems to me like educational technology has really followed the same trajectory as I guess you would call it business technology…” |
| F8       | “I would say encouraged to carry weapons to campus. I mean certain buildings are prohibited but basically, sometimes when I’m teaching, I have to kind of wonder, does anyone in this room have a gun”? |
| F9       | “That conceptualising futures in such ways [schoolhouse metaphor] is disempowering and allows education to be vulnerable to forces of economic and technological determinism.” |
| F10      | “I see a time when the institution as we see it today disappears and the learner takes full control.” |

F8’s story of the ‘gun in the classroom’ is included in the social and systemic, although its influences are from the US view of guns. Her narrative saw the technology of the gun become, in effect, an education technology that could influence curriculum choices, recounting that “students are allowed and to some extent... encouraged to carry weapons to campus.” The inclusion of the gun on campus affects her agency, forcing the choice of an online means of teaching rather than be confronted with the possibility of a gun in the classroom.

For the futurists, the litany of the stakeholders created structural constraints in their social and systemic layers of analysis. F10 saw the problem as critical: “[i]f we deliver technological solutions using old philosophies and processes, then we are bound to fail in delivering advancements’ to the future of ToL”.

The social and systemic layer is still informed by the worldview layer of the futurists and gives voice to the shared beliefs, which provide a framework.
through which the social and systemic layer operates (MacGill, 2015) and is influenced by the worldview layer.

6.4. Futurist worldview layer

The worldview/discourse layer represents the symbols of our profession, culture, and society; often, these symbols are embodied throughout our education system (Inayatullah, 2009b).

The worldview layer can be described as the shared, commonly held beliefs that influence the litany and social layers working to contribute to the foundations of a Habitus of Technology (Bourdieu, 1977; Sterne, 2003; MacGill, 2015).

The dominant worldview expressed by the majority of the futurist participants is one of instrumentalism and a separate from the domain of ToL (Turnbull, 2006). F7 supported this assessment by saying: “No, no, I only think the human element cannot be removed anyway and the values at this point in time, the values and what we bring the human element that we bring is irreplaceable [in education]”. Employing a somewhat human-centric metaphor ‘brain work’, F1 separated the human activity of learning, “learning can exist without technology and always has, your brain is a thing that works’, from the technological implication of education, to where “education is technology”.

However, the worldview was challenged by some dissenters who saw technology as entangled in our identity: F6 said he? saw technology become a form of proprioception saying, “It’s plausible that at a certain point, there are sensors in the ocean and a child with the right enhancements can actually feel that ocean, can feel what’s happening’.

Table 21 outlines the futurist Worldview layer narrative comments.

Table 21. Futurist worldview layer

<table>
<thead>
<tr>
<th>Participant</th>
<th>Separation of technology and learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>“So, learning can exist without technology and always has, your brain is a thing that works. In fact, that’s [its] only function…”</td>
</tr>
<tr>
<td>F2</td>
<td>“Then we’re going to have a very different society, people are not going to be socialised at all, for face-to-face interaction …I guess I believe”</td>
</tr>
</tbody>
</table>
people teach themselves and that’s the only way you will learn anything.”

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<tbody>
<tr>
<td>F4</td>
<td>“So that’s kind of how I see technology being a tool to help augment those conversations. So [helping] people find, learn more about the reality around them [in] this complex world.”</td>
</tr>
<tr>
<td>F5</td>
<td>“But I think for education, education purposes, like education can exist independently of technology.”</td>
</tr>
<tr>
<td>F7</td>
<td>“[technology] as very separate from learning.” “The values and what we bring the human element that we bring is irreplaceable.”</td>
</tr>
</tbody>
</table>

Separation of Technology and Humans.

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<tbody>
<tr>
<td>F1</td>
<td>“AI is one of these technologies like the spoon that extends our capacity…I mean, the real question is, what do we bring to this equation.”</td>
</tr>
<tr>
<td>F2</td>
<td>“Then we’re going to have a very different society, people are not going to be socialised at all, for face-to-face interaction …”</td>
</tr>
<tr>
<td>F4</td>
<td>“I believe that the technology is beholden to us. And to the next generation, I see technology…as tools and maybe I have a traditional view of technology, I see technology as our servants.”</td>
</tr>
<tr>
<td>F7</td>
<td>“The values and what we bring the human element that we bring is irreplaceable.”</td>
</tr>
<tr>
<td>F8</td>
<td>“a really humanistic use of data that absolutely involves a person…in terms of seeing the full picture of the human right, not just seeing a bunch of data points and dollar signs, the same person on the other side.”</td>
</tr>
</tbody>
</table>

Alternate futures did not feature strongly in any of the layers of the futurists’ analysis. F1 saw AI as our replacement, questioning only how we would work alongside the AI. F8 saw a dystopian future for education where ‘chemical education, [was] taking a pill, [like] transhumanism” F9 saw the accepted future ‘[as] disempowering’ and allowing “education to be vulnerable to forces of economic and technological determinism”.

The lack of futures vision by the futurists might have been constrained by the humanist ideology, limiting new and alternative ways to envision ToL. The participant narratives uncovered in the litany and social layers, as suggested by (Fan and Nee Wey Khng, 2014), are threads of the knowledge with their roots in the participants’ worldviews.

6.5. Futurist myth and metaphor layer

The myth and metaphor layer reflects the emotive beliefs used to make sense of the world and provide the building blocks for the litany, social and worldview layers. It guides the participant narratives through deeply ingrained personal
ideologies, philosophies and collective social stories that are their assumptions of the Habitus of Technology (Inayatullah, 1990a).

The futurists expressed a metaphor that could be described in this research as ‘human before machine’ that results in dystopian futures and utopian lifestyles mingling with the metaphors of technologies as tools and extensions of learning to create the collective archetypes and the unquestioning acceptance of humanist metaphors of technology. F9 saw the relationship as human-dominated, leaning towards the dystopian “we have entered ‘neo-Taylorism on steroids’ era... [I’m] not sure if it is a good thing, I would think quite the opposite.”

F2 saw educational technology as handicapping the sixth human sense or the reverse of F6’s view of the proprioception example of humans and technology. F2 commented on personal technologies in the classroom “you can call it asking them to use one less sense, tying a hand behind their back’ to describe how educational structures human activity limit the scope and use of ToL. F10 looked to the future of ToL and saw a shift in power from technologies in institutions to one in personal use:

I see a time when the institution as we see it today disappears and the learner takes full control. Partly because kids can learn anything independent of the institution, it’s a shift in power... The whole idea of ‘school’ – house, teachers or whatever are being challenged today.

Table 22. Futurist myth and metaphor

<table>
<thead>
<tr>
<th>Participant</th>
<th>Myth/metaphor</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>“Education is a technology.”</td>
</tr>
<tr>
<td>F2</td>
<td>“Funding seems to shape it.”</td>
</tr>
<tr>
<td>F3</td>
<td>“The unintended consequences of technology...they’ve been so intertwined in both personal and professional life.”</td>
</tr>
<tr>
<td>F4</td>
<td>“I think it’s just how you teach people and give them the tools to understand how to learn with technology.”</td>
</tr>
<tr>
<td>F9</td>
<td>“Teaching via technology as a three-party involvement: those that use technology to learn, those that use technology to teach and previous people who helped create that very technology.”</td>
</tr>
<tr>
<td>F9</td>
<td>“We have entered ‘neo-Taylorism on steroids’ era.”</td>
</tr>
<tr>
<td>F10</td>
<td>“Media spreading fear, uncertainty and doubt on technologies is not useful... When used well sci-fi can feed bigger ideas and speculative futures.”</td>
</tr>
</tbody>
</table>
The metaphor of technology stories appears in F10’s thoughts: “[m]edia spreading fear, uncertainty and doubt on technologies is not useful … When used well, sci-fi can feed bigger ideas and speculative futures.” F1 saw a significant part of technology development based on “what they call user stories. Used to be use cases, but now it’s user stories as a means to describe the technology. F1 believed he “prefer to think less in terms of stories and more in terms of afforded says”. In this part of the narrative, we see how the metaphor of ‘story about technology’ begins a level of prescription of use to the role.

In this case as a servant, the metaphor ‘human before the machine’ was described by F4, who said:

I see technology as our servants. And so, I feel like when it comes to the overarching goal of education, it is to for the students to figure out what am I going to do with my life.

While giving technology the status of a servant, F4 still placed the sole burden of learning clearly on the human.

The tension in the metaphors shows the binary struggle to confine technology to be external to the human while acknowledging the influences technology has on agency, which possibly acknowledged a more pliable notion of habitus (Silva, 2016b).

Metaphors are privileged in CLA, but not at all costs; each of the layers influences the beliefs, assumptions and behaviours of the participants and the adjacent layers. As each of the higher layers become impacted with a societal, technological, or emergent idea, the stories, narratives, accepted beliefs change (Farrow, 2019).

6.6. Futurist emergent ideas

This section explores the emergent ideas expressed by two futurists that did not align with the remaining participants.

Through the process of the CLA, unique and insightful concepts might foreshadow how our relationship with technology emerged from the participant
narratives. The stories challenged the structure of the emerging Habitus of Technology recorded for the final analysis. While not expressed by most participants, they open new pathways to explore the causal layers.

While they represent the participants’ that challenged the status quo, they also exhibited the tensions of the ingrained separation of technology and people when P1 said:

Now we know, more or less, because we have some technologies of the future already. They just have to be put together, but the brain is not an information processor.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Emergent Idea</th>
</tr>
</thead>
<tbody>
<tr>
<td>F4</td>
<td>“You need actually, you need some ‘mothers over 40’ [in technology development]”</td>
</tr>
<tr>
<td>F5</td>
<td>“I think that’s a weird question. Because technology is like an integral part of everyday life and is an integral part of society as well. And I think that to say, to try and separate, its effect, well effect is very, very difficult.”</td>
</tr>
<tr>
<td>F6</td>
<td>“…we’re entangled in things…and so, you know, language in tech and culture, our technologies, are what made us human.”</td>
</tr>
<tr>
<td>F8</td>
<td>“… when I’m teaching, I have to kind of wonder, does anyone in this [classroom] room have a gun?”</td>
</tr>
</tbody>
</table>

Emergent ideas provide the tension and disruption that can become the catalyst for change. The decision to capture the participants’ litanies as an emergent idea stemmed from their full departure from the other narratives and the opening of possibilities to view the narratives from a different epistemological and ontological point of view.

The concept of entanglement was introduced by F6 in his vision of how humans interact with technology when he said “we are entangled in things’, referring to Hodder’s (2014, 2016) work on how humans have dependencies on things and things have dependencies on humans.

F6 saw the relationship from a more holistic point of view with technology as an “integral part of everyday life and is an integral part of society as well”. Both speak to a symbiosis between technology and humans that takes tentative steps towards the notion of posthumanism.

F4 speaks to the biases that are developed into technology as part of the design and programming. She challenges the instrumentalist and humanist concepts
of technology not being neutral and entangled with human bias and beliefs. This appears in her description of Silicon Valley software and hardware developers being young, white, male, and libertarian, adding that a balance needs to be maintained in the technology development with the comment “you need some mothers over 40”.

F8 highlights those technologies that influence education and learning are not always the technologies defined as educational technology. Her experiences point to the need for a broader definition like the one used in this thesis, that of ToL. While her loss of agency aptly illustrates the entangled nature of technology with the learners, teachers, and environment when she said, “when I’m teaching, I have to kind of wonder, does anyone in this [classroom] have a gun?” The experience resulted in F8 moving her classes online to avoid the effect of the technology of guns in the classroom. A similar concern about the “proliferation of firearms in the US will encourage parents to keep their children safe at home so that students will be schooled at home, but thankfully because of technology, will not be home-schooled” was mentioned in a recent PEW centre report (Rainie and Anderson, 2020 p.34).

6.7. Futurist participants: conclusion

This chapter has focused on understanding and presenting a clear picture of the futurist participants’ narratives through the synopsis of the individual interviews and then through CLA, deconstructing the narratives into the constituent layers.

Two of the futurists did take tentative steps to discard the dualistic boundaries between technology and humans in what could be described as an emergent posthumanist perspective (Barad, 2007; Ferrando, 2019). Words such as ‘intertwined,’ ‘integral’ and ‘entangled’ with the human were used as relationship descriptors in these two emergent cases in Section 6.7.

Nonetheless, most of the futurists’ narratives followed the common habitus constraint that confined technology to ‘new’ technologies, with F2 commenting that “technology [is what] we experienced before the age of 30’, whereas, after the age of 30, technology was “the work of the devil or something”. Underlying
this folksy litany from F2 is the deeper structure that keeps society focused on new technological development and discards the old as no longer worth considering (Beard and Gunn, 2002). The final section of this chapter highlighted the emergent ideas of a closer relationship with technology and the cultural influences that the worldviews of a country have on the human-technology relationship.
Chapter 7. Discussion

7.1. Introduction

The problem statement (Section 1.3) asks how existing beliefs, assumptions, professional structures, and world views work to influence behaviours and practices – to constrain the collective understanding of the possibilities of the ToL. The thesis primarily investigates if there is enough evidence of a Habitus of Technology and describes the dispositions and dependencies. The thesis then considers if the Habitus of Technology is common between groups, what are the differences and limitations to thinking that might result and then presents an alternative way to conceptualise the Habitus of Technology.

The findings identified commonalities between the futurists and practitioners’ expressed dispositions and dependencies, confirming a common Habitus of Technology between the two. The finding of commonalities between the two professional groups contradicts the researcher’s initial assumption that practitioners and futurists would exhibit differing beliefs and expectations about ToL due to their respective professional roles. The only significant divergence between the two groups was the practitioner’s world view of being unable to keep up with the technological changes in ToL.

The focus of the study and the examination of the Habitus of Technology was achieved by analysing the dispositions, structure and dependencies that enable the participants to have a ‘sense of the game’ (Medina, 2003; Croce, 2015). Habitus, in this instance, gives form to the participant’s orientation toward technology, the social world and the professional field as the first step in understanding the dispositions and structures that shape an individual’s Habitus of Technology (Sterne, 2003). Habitus also offers a vantage point to reflect on how individuals position themselves in the world and how the world, in turn, situates those individuals (Silva, 2016a).

To support and operationalise the research process, this thesis employed CLA (section 3.5.3) as a research method to peel back the layers of cultural beliefs from four increasingly deep, epistemological vantage points in the research participants’ narratives. By understanding which of the four layers the knowledge is centred, we then can form a perspective on the Habitus of
Technology and understand if the dispositions and dependencies result from institutional, economic, social, and philosophical influences?

In the research methodology, the role of CLA is to connect the research interview data to the research question and provide evidence that can support the concept of the Habitus of Technology. From a practical analysis perspective, the CLA researcher should start with a very clear understanding of the area of research, from the individuals being interviewed to the worldviews and metaphors that will eventually be exposed in the litany of the participants.

There is a vertical flow to the CLA layers where a metaphor of technology change waits for no one, is felt through the layers as technologies rate exponential change at the worldview layer and when the individual has limited agency in the social/systemic layers of the organization in relation to technology use, and selection becomes the litany of I can’t keep up to technology change. IT is not enough to measure what we believe, to change there has to be an understanding of why an individual habitus prevents them from accepting different beliefs.

Through the deconstruction of narratives, individual beliefs and assumptions point to the existence of the Habitus of Technology and how the structures, worldviews and foundation myths and metaphors might constrain and make the present problematic?

Identifying the constraints that form the Habitus of Technology provides the ability to undo the influence of the dispositions and dependencies in the present. The process provides the posthumanist reading focal points to make the present unfamiliar, to contest the instrumentalist tendency of the ToL and provides distance to decenter the human in the human-technology relationship.

The following section addresses the research questions in turn. Section 7.5 presents the overall reflections.

7.2. Research question one

The first research question asks, ‘Do practitioners and futurists working in the field known broadly as the technology of learning have a common habitus?’
The answer to that research question based on the analysis of the participant narratives is a clear ‘yes.’

To explain how the research arrived at that conclusion, it is helpful to remember that for a habitus of any sort to exist; it should act as a structuring force in which individuals place on themselves constraints that encourages group thinking and cohesion of behaviour (Bourdieu, 1984; Reay, 2004). Structuring forces in this research are the foundational humanist and instrumentalist assumptions that guide the Philosophy of Technology (section 2.4.2), which indirectly create metaphors capable of driving an individual’s mode of knowing (Ihde, 2004; Facer, 2011). As an ideology, it affects technology by centring the human as the measure of all things and positioning technology as a neutral tool and autonomous in a world where people have lost control of technology (Feenberg, 2000).

The role of CLA is to peel back the layers of humanist and instrumental assumptions that hide in the interview data by appearing self-evident, ordinary, everyday, expected, and accepted. By following the layers of ideas offered by the interviews, the study aims to go beyond normal boundaries to explore their construction through the telling, reflecting and intra-acting with the memory of the lived experiences, practices and assumptions embedded in the words of the narratives about the technologies of learning (Barad, 2010; Costa, 2015; Hodder, 2016).

The theoretical framework (Section 3.3) positions both the interviewee and the researcher responsible for the co-constituted meaning that emerges in the interview phenomena (Marn and Wolgemuth, 2017). The research process began with the interviews of the participants, which were transcribed into the data that CLA deconstructed for analysis and discussion. The cycle ended with the final reconstruction as part of the posthumanist reading. Findings from this study will enable practitioners in this field to the impact of their beliefs and organisational practices that constrain the potential of ToL to validate that view of the future of ToL (Gomes and Moqaddemerad, 2016).

Habitus as a conceptual framework is operationalised through employing CLA to investigate the interviews and identify old and familiar narratives that
sustained the Habitus of Technology. Doing so offers a means to reflect on the limitations of that mode of thinking while revealing new possibilities for the narratives of the future (Halford, 2021).

The analysis of the interview data demonstrated clear findings that supported the existence of a common Habitus of Technology between both participant groups. The dominant expression of the two groups at the litany layer saw technology as a tool. The strength of which is both a common-sense litany and an instrumental influence trickling down from the myth-metaphor layer. The affirmation of the separation of education and learning put into words the humanist worldview of learning being the essence of being human. Biesta (2015) positioned the heart of the human as something that is located ‘inside’ the human and needs to be brought out through education. Concerns over the stakeholder-driven consumerism of technology of learning adoption are a social-systemic layer under the influences of the neo-liberal worldviews (Breines and Gallagher, 2020).

The data frames the tension between two humanist myths/metaphors: the instrumentalist culture of technology as a tool and the consumerism of technology for a better life, contrasting the fear of technology displacing humans in most traditional roles (Biesta, 2014, 2015; Bayne, 2015a). Metaphors matter. Our assumptions and concepts about ToL are embodied in metaphors; to see technology as a tool is to put oneself in control (Nardi and O'Day, 2000). When we look at the educational challenge from this perspective, the present constraints on the future of the ToL seem untenable (Popenici and Kerr, 2017; Bayne and Gallagher, 2020).

Webster's research (2017) found support for the narrative of technology as a tool (instrumental view of technology) and keeping up with technology was robust assumptions in K12 leaders. The research itself did not look beyond the narrative to explore more profound layers of influence. However, Webster's (2017) research concluded that the Philosophy of Technology assumptions matters and shape technology decision-making. By understanding these dispositions, we are better able to make purposeful and informed decisions (Bayne, 2015b).
The single point of divergence is interesting, the practitioner’s concept of speed of change. Carlson (2007) suggests that a simple binary positioning of humans and technology is insufficient to approach the relationships, patterns, effects, and outcomes that emerge at the juncture of humans and ‘their’ technology. The complexity and speed of technological development change may erode the dispositions that support habitat at an accelerated rate (Crossley, 2001). Tensions that only exist in practitioners may indicate that the Habitus of Technology warrants further examination to explore the social structuring of temporality differences with the futurist, and the need to conceive of technology-human relationships in novel ways to cope with the changes in the social world (Atkinson, 2019).

The primary dispositions common between the practitioners and futurist participants and form a common habitus are listed in Table 24.

**Table 24. Common Habitus of Technology**

<table>
<thead>
<tr>
<th>Common dispositions</th>
<th>Narrative description.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Technology as a tool</strong></td>
<td>Technology is referred to as a tool to accomplish tasks or extension of the human abilities.</td>
</tr>
<tr>
<td><strong>Separation of education and learning</strong></td>
<td>In the narratives human are exclusively seen to be the learner, technology forms the education structure and enhancements.</td>
</tr>
<tr>
<td><strong>Stakeholder driven</strong></td>
<td>The narratives of the participants identified stakeholders as a source of influence in ToL.</td>
</tr>
<tr>
<td><strong>Dominance of technology narratives</strong></td>
<td>The narrative becomes the medium of transmission of these beliefs throughout the habitus.</td>
</tr>
<tr>
<td><strong>Divergent Disposition</strong></td>
<td><strong>Narrative description.</strong></td>
</tr>
<tr>
<td><strong>Speed of Change</strong></td>
<td>The influence of funding, industry, and media dispositional caused the practitioners to express that technology was advancing at a great rate than they could keep up.</td>
</tr>
</tbody>
</table>
7.2.1. Technology as a Tool

The participants of both groups represented technology as a tool in their narratives. Eight out of the ten practitioners and seven out of the ten futurists identified ‘technology as a tool’ in their narratives. P6 saw technology as a ‘means to support the delivery of education’ and F10 echoed the idea: “[technology] is an enabler of an impactful action – teaching, writing, content production”. These findings bear similarities to those of Webster (2016), where the concept of ‘technology as a tool’ is the third strongest theme for K12 educational leaders when relating their personal understanding of the Philosophy of Technology in an academic setting.

Technologies through this instrumentalist lens are used to accomplish the assigned tasks in the policies that govern their use. The relationship between participant and technology became separate and incidental rather than required (An and Oliver, 2020). Means and ends in this vision are separated, and the technologies are not expected or encouraged to have unintended uses in the learning process (Pietarinen, 2020).

When things are reduced to tools, they serve our needs and become external objects; as P5 saw it, “for me, technology is essentially a set of tools with which we were basically trying to achieve certain goals or certain objectives”. The collective understanding of technologies as tools external to the individual comes with dependencies and dispositions. Technology in this context needs management and regulation to articulate the relationship between humans and other technology. P2 saw the constraints as the “formularisation and a government system [of] measuring” in education. According to Orlikowski and Scott (2008) and Hodder (2016), the system becomes both enabling and constraining, drawing both technology and users into the acceptable structures of operation and behaviours. P7 saw that structure as denying teacher agency in the school system because of “what you call habitus, so the environment in which they work makes them even more mediocre”.

This relationship between humans and technology is full of conflict. Tools can be bought, sold, and cast aside without regard to the effect on the social fabric or world around them (Rousell, 2016). P4 expressed this as:
Where people look at the latest new technologies that’s grabbed, got to get up before my competitors do and then they buy the damn thing.

Technical disciplines are organised around the idea of functionality and efficiency. This common view of learning technologies is about efficiencies and control driven by technological developments and funding (Feenberg, 1999). F1 saw functionality and efficiency as the primary purpose of ToL: “the technology has to benefit the institution, has to produce some kind of tangible return to the institution”.

The establishment of ToL as just a tool provides the pathway for the separation of human and technology into a consumer item, the hammer to the education system’s nail. However, instrumentalism is not the sole philosophical ideology appearing in the narratives. Other philosophies of technology archetypes of substantivism or essentialism or even determinism appear in the narratives (Feenberg, 2008; Kruger-Ross, 2013; Pietarinen, 2020); the most common worldview was instrumentalism.

The defining debate should not be about how much or even if a particular part of the narrative could be linked to alternate philosophical stances; what is essential to understand is that they stem from the humanism ideological separation of technology and the human (see Section 2.2.2).

Technology-as-tool implies a narrative of industrial progress where new technologies continually replace old ones, compelling reorganisations of social structures, values, and priorities. The technological character of new technologies highlights the problems of the old which it may replace, which removes it from its social discussions (McOmber, 1999). The litany and metaphor of technology as a tool embodies the humanist concept of technology being external or an extension to the human, serving to separate technology from the human identity.

The separation allows technology to move at a different rate to our understanding of it. It is the cornerstone of thought that starts the process of revealing technology as a habitus. As F1 notes, “technology can be viewed as a tool, but it’s also an extension of my capacity”. This mode of thinking becomes
a vital force or disposition that shapes the participant’s perception of technology and the possible opportunities that lie before it in the future.

### 7.2.2. Separation of education and learning

The participants were asked whether technology could teach humans. Most of the participants framed it as a win-and-lose contest where the battle was between technology and the essence of learning as a human activity. The replies echo the instrumentalist vision of technology as separate from the human and a neutral tool to be used. P5 saw this separation as technology to be just a tool: “you get an axe… just like you get a knife…. [Technology] doesn’t necessarily belong into what being a human is.”

The focus was on the challenges that technology, in general, introduces into human learning, positioning it as a binary battle placing the essence of human learning at the centre and at odds with the idea of AI leading a post-teacher world of education. F7 voices some of the concerns:

> I’ve always said, you know, the role of education was to prepare people for the workplace…so if you take that {the human} out of education, you’re literally creating this false sense of life and its security and learning and engagement and employment that doesn’t reflect the real world.

Even the small group that saw technology as able to replace humans in the role of teaching remained in the zero-sum game of winners and losers. None of the participants found a way to envision the question as an opportunity, and a few took refuge in avoidance. P7 positioned the battle between AI and the role of the human teacher in the future of education:

> For the sake of teaching, [the human teacher] won’t be necessary anymore... The AI robot will be able to do [a] much, much better job than the best teacher would have been able to do because they can follow any student is [at] any moment.

F2 considered much of the resistance from internal members and often fully considered the effect of AI on their profession:

> preferred response is always I hope I retire before it’s an issue ... And they’re all just hoping to sort of make it to the end of their career without having to radically transform what they do, when I think, you know, you can call that denial.
Several looked forward to emerging technologies with a dystopian approach. F8 lamented:

> It’s not like what I’m excited about but it’s what I’m thinking about is, I guess you would. What do they call it? Like chemical education, taking a pill, you know it’s back to that transhumanism [thing],

adding that education could be pharmacologically managed.

F9 commented on the desire to find a simple solution to the education issue:

> I’ve worked with educators and education ministries that are similarly looking for the next ‘magic bullet’ or ‘magic mushroom’ – something easy to adopt, use and disseminate.

Lastly, P3 added a dystopian view that:

> can’t [yet] technologize, the brain and the cognitive processes until we actually get into you know, truly cybernetic type of activities. And boy, I hope I’m not alive for that.

The literature that positions technology as enhancements to learning extends links to the philosophies of transhumanism, cognitive enhancement technologies and gene-altering technologies, to name but a few (Ferrando, 2013; Mauthner, 2019). The unchallenged humanistic and instrumental beliefs leave a gap in the fields of technology study that will leave many of the questions of use and ethics in the education system unanswered (Bayne, 2015b; Van Den Eede, 2015b).

The structures created by dependence on technology as a tool through humanist ideologies was voiced by P5:

> I see it essentially, to me learning as a human activity, humanists in the human being sense, right, whereas technology to is just a tool, to just like, you get an axe, just let you get a razor, just like you get a knife, whatever, right? [Technology] doesn’t necessarily belong into what being a human is.

The focus on conflict clouded the possibilities that other narratives might exist, limiting participants' ability to perceive different futures.
7.2.3. Stakeholder-driven

The narratives of the participants identified stakeholders as a source of influence in ToL, as F5 cautioned that funding is used “to shape the way in which the technology comes about”.

Technology-as-tool implies a narrative of industrial progress where new technologies continually replace old ones, compelling the field of technology in education to focus on the structures, values and priorities that made this possible. P4 agreed, “new technology is always better... got to get up before my competitors do and then they buy the damn thing”. P3 said, “I think educational technology as a bucket is a great market spin and people are capitalising on that and earning a living from it”.

The metaphor of ‘working smarter’ through technology provides the world view that powers the narrative that gives the stakeholders power and control of technology funding in the education system (Swartz et al., 2019). According to the thinking of these institutions, this funding relationship establishes modes of exploitation of peoples’ agency through the internalisation of acceptable discourses or ways of thinking that rewards govern themselves (Han, 2020).

The technological character of new technologies highlights the problems of the old which it may replace, critiquing its historical situation of efficient or useful, which also removes it from its social discussions (McOmber, 1999). The litany and metaphor of technology as a tool embodies the humanist concept of technology being external or an extension to the human, serving to separate technology from human identity. This allows technology to move at a different rate to our understanding of it and becomes the cornerstone of thought that starts the process of revealing technology as a habitus. As F1 notes, “technology can be viewed as a tool, but it’s also an extension of my capacity”.

The effect of stakeholder involvement is to make the case for funding commonplace and competitive, resulting in less time gathering and thinking about the effect of ToL on the future of education. F8 saw the chase as forgetting the person in the competition for funding “not just seeing a bunch of data points and dollar signs, [without seeing the] person on the other side”.
7.2.4. The dominance of technology narratives

The analysis of participant narratives gave insight into their lived experiences and expectations for the future. Therefore, the narrative became the primary source of data to understand the layers of beliefs and assumptions created from the social structures, dominant worldviews and underlying myths and metaphors that guide the participant’s actions and behaviours.

Narratives about technologies do not simplify the understanding of the participant narratives. Technology brings its own pre-constructed stories, forcing the participant to create narratives that encompass the affordances and dependencies that technologies demand.

The narrative accompanying a technological object of study is pre-constructed by a “socially organised field of choices” (Sterne, 2003, p. 368) and directly influences how the participants think about technology or research. They become the producer of understanding for ToL and the user. This entanglement of human intentions and desires with technological dispositions and dependencies often produces tensions between human authority and user submission (Romele, 2020).

The narratives of both participant groups showed a level of frustration about the established practice of the stakeholders of embracing new technology without question as a kind of technological trust (Deagon, 2021). As F9 saw it:

I think public press, popular media and sci-fiction colonise our minds with very narrow images of the future... In most of those futures imaginings’ future is something that ‘happens to us,’ rather than something consciously created but re-enforced through the narratives of the Habitus of Technology.

The narratives often appeared to soften the effect of change and simplified how to implement new technology (Dawson and Buchanan, 2005; Pentland and Feldman, 2007), making the habitus easier to accept. F9 voiced concern about the dominance and influence of the narratives:

...like most narratives of emerging tech, are presenting themselves [as the inevitable future for education] ... there’s no way around [it], this is going to happen.
The participants’ history and experiences create the perception of the social world around them which they shared in their narratives. If shared by individuals with similar professional backgrounds and experiences, these perceptions become the framework of a habitus as a representation of the way group culture and personal experiences shape their actions and assumptions (Hilgers, 2009); thus, it shapes behaviours, assumptions, and social actions. In this line of reasoning, habitus is an expression of how a group, culture and personal history shape beliefs and behaviours. The narrative becomes the medium of transmission of these beliefs throughout the habitus.

7.3. Research question 2

7.3.1. Technology speed of change

The second research question asked, ‘What beliefs and structures constitute the differences between the two groups of participants?’

The analysis identified only one identifiable divergence between the practitioner and futurist participants: the pace of technological change that affected the practitioners. Many practitioners voiced the concern of being unable to keep up and spoke of concerns about the inability to keep pace with the speed of technological development driving ToL purchasing, funding and research (Apreda et al., 2016; Hirst, 2019).

Five of the ten practitioners directly referenced the speed of change as hard to keep up with. P3 referred to this effect when he said: “[t]heir tools are happening now to make our lives easier, but the pace of change is so rapid that it’s hard to it’s hard to keep up”.

Toffler (1970) called too much change in too short a time ‘future shock,’ and McLuhan (1980) saw threats from the speed of change to an individual’s profession, causing people to be content with just keeping pace. While none of the futurists referred to the speed of change in their narratives, it might be associated with technology not impacting the daily performance of their profession and thus making it easier to keep up with change.
While P10 expected the speed of change to increase if human resistance decreased, “it’s not about the technology, it’s about the administration. And when we start looking at why learning technology doesn’t move as fast as it could.” As the formation of humanism relies on a structured hierarchical ontology, this Cartesian dualism provides the pathway for separating humans and technology into different streams of advancement (McCarthy and Wright, 2004; Vaccari, 2013).

P2 described the separation as “we have this tendency to, either or, like humans or the technology”. F5 separated the human as the learner from the technologies that support education: “[b]ut I think for education, education purposes, like education can exist independently of technology”. The narrative of speed is introduced through technology and becomes a constraint to the personal agency with the Habitus of Technology. Consumerism and the inevitability of technological advancement are all messages that resonated with both participant groups; the pace of change became the most identifiable diversion point between the two groups.

Hauer (2014) notes that the technical images of the speed of change become overriding cognitive metaphors of society and culture being reconstructed with the speed of change creation, upgrades, and consumption demonstrate that the speed of dominant narrative changes their perception, litany, assumptions, and modes of thinking. The narratives and images of ‘speed of change’ are human created; they explain the relationship individuals believe they have to technology, often becoming the dominant belief structures that create the dispositions and dependencies that constrain their thinking to the images of technology society creates (Hauer, 2014).

Putting names to the constraints that form the Habitus of Technology provides the ability to undo the influence of the dispositions and dependencies in the present. Technology is expressed as moving faster than one can keep up and is a worldview that became unchallenged in the practitioner narratives, skipped over in everyday litany. Our concepts about technology are often embodied in highly packed metaphors. When the narrative describes technology as a tool,
the participant is expressing that they at some level have control, when expression of loss of control through the speed of change, the practitioners see themselves caught up inside the system and structures of the field of study (Nardi and O'Day, 2000).

7.4. Research question 3

This section examines research question three: what are the constraints associated with the current modes of thinking in both participant groups, and what are the possible alternative ways of thinking emerging from the research data?

7.4.1. Constraints

To address the first portion of the RQ3, there is a need to look at how the Habitus of Technology is formed and how the dispositions and dependencies position the participants thinking.

The first consideration is that habitus, by nature constrains and creates socially learned narratives and expectations of behaviours, which act as the template for the beliefs supporting ToL (Jackson, 2008). Habitus is a ‘way of being’ and ensures that, in general, divergent thinking and behaviours are resisted and discriminated against (Costa, Burke and Murphy, 2019). Therefore, if the Habitus of Technology exists, behaviours, narratives and expectations of the future are shared across the participants.

The second issue that constrains thinking in the Habitus of Technology is our belief that it positions technology as merely a tool. There is an air of utopianism to this mode of thinking. Humans build technology to serve; each iteration is better than the last, and the tool is built in the image of our human needs (Omotoyinbo and Omotoyinbo, 2016; Mäkelä, 2017).

P4 added the dominant views that new technologies are necessary and better a “where people look at the latest new technologies that are grabbed, got to get up before my competitors”.

The belief in technology being external to the human obscures our vision of much of the potential available by privileging one specific mode of thinking over
another, asking “what, will technology allow us to do” rather than “how will that technology affect our future lives” (Hendren, 2014). P1 expressed this mindset “like we shouldn’t oppose, like, we have to live this way or that way” adding that the only escape was to “imagine a future where there’s no technology”.

As a constraining force, humanism as an ideology was described by Weaver and Snaza (2017) as narrowing scholarly modes of thinking to dominant institutional and disciplinary approaches to the exclusion of new forms of knowledge. The evaluations of technology under the humanist modes of thinking are concerned with whether ToL diminishes or enhances the educational process. The human as the learner and technology as the enhancement is treated as a constant and remains unquestioned (Ivanišin, 2008). F1 saw this as:

So, learning can exist without technology and always has, your brain is a thing that works… I think that this piece of [education] technology can be viewed as a tool, but it’s also an extension of my capacity.

The humanist critiques of ToL have less to do with technology and more to do with entrenching their methodological views of human values resisting the changes that might be introduced by new technologies (Ivanišin, 2008; De Pagter, 2020). The literature review (Chapter 2) suggests tension in our beliefs resulting in our inability to conceive of humans as anything but separate from the material world. The dualism associated with humanism conflicts with the emerging realisation in technology research that technology is the object humans use to define themselves (Van Den Eede, Goeminne and Van den Bossche, 2017). As P4 observed, being first was important “where people look at the latest new technologies that are grabbed, got to get up before my competitors do and then they buy the damn thing”.

The boundaries between humans and technology re-enforce our beliefs on technology consumerism, technology solutionism and constrained the potential of technologies in the present and obscuring the future of education (Benko, 2005; Ivanišin, 2008). If philosophically, technology remains a tool, positioned as a servant or competitor, it becomes a constraint to new avenues of research into the ToL. P4 echoed this constraining dualism saying:
I believe that technology is beholden to us. And to the next generation, I see technology...as tools and maybe I have a traditional view of technology, I see technology as our servants...it’s focusing on the wrong thing, is kind of turning kids into robots doing things that technology is much better at doing.

F2 expressed both the tensions, constraints, and dualism through a series of observations:

Then we’re going to have a very different society, people are not going to be socialised at all, for face-to-face interaction ... but I don’t think a teacher is the reason why I don’t think a teacher teaches the student. But I think a teacher can be the reason why the student learns.

Adding to the limiting views of what may be possible:

Well, yeah, I don’t think life exists without technology ... We use it to entertain ourselves. We use it to educate ourselves. I yeah, I don’t think there’s any way you can take technology out of education.

The use of Habitus of Technology to describe dispositions and dependencies points to an interesting gap in our knowledge about how narratives form into ideologies (Shepherd, Inch and Marshall, 2020) and how these narratives influence the consumer relationship humans have with technology and the future of education (Kozinets, 2008).

The social bonds formed through narratives can be seen as constraining behaviours and have a transformative effect on individuals’ practices (Hayes and Jandrić, 2014). Individuals assimilate the viewpoints and conventions associated with the groups (habitus) to which they belong (Costa, 2013). P3 saw the imbedded narratives as reinforcing “preconceived notions...without actually doing, you know, any kind of research and or the gap analysis to say, ‘Hey, does this work’?”. P4 also seemed to feel the limiting effects of dominant narratives “I think those kinds of dominant narratives, those kinds of discourses are really driving people in the wrong direction”.

The stories embedded with technology reflect the images of associated possibilities of the dominant institutional narrative, drowning out the stories from underrepresented voices (Orlikowski, 1992; Odell and Mccarthy, 2017).
7.4.2. Emergent voices

The emergent ideas exposed in the interviews offered unique and insightful concepts that might foreshadow things to come. The possible alternative modes of thinking emerging from the research data establish an origin point for part of RQ3. P7 possibly unknowingly cast the Habitus of Technology into the metaphor of a shield when he commented that the:

... education systems had adopted some kind of shield against everything that goes against their interests or threatens them, and certain autonomous agents certainly threaten them.

The method of posthumanism reading (Section 4.1.3) of the Habitus of Technology is not about contrasting with the assumptions of humanism, but a process of challenging how beliefs and assumptions is expressed (Inayatullah, 1998b).

CLA exposed that ‘shield’ as the humanist, dualistic ideologies dominated by the narratives embedded in mainstream worldviews of technology. The metaphor of a shield defines present modes of thinking expressed by the practitioner and futurist participants and, by extension, the probable trajectory of the future of ToL.

The emergent ideas expressed in the research offer a way to envision a future that bypasses that shield by challenging the present Habitus of Technology. For example, P1 (Section 5.5.7) voiced a view of technology as pervasive and that anti-dualistic when she said, “omnipresent like it’s ubiquitous...I don’t see any more any dichotomy in technology”. The ubiquitous presents an image of technology beyond our grasp, no longer tool-like, but with the agency of an omnipresent object. In choosing the word dichotomy, P1 might be voicing a posthumanism idea where the boundaries of dualism begin to break down and new relationships with technology can start to form.

Posthumanism sees technology as a trait of being human but not the primary focus (Ferrando, 2019) allows research to move past the confines of the techno-centric academic methodologies (Barad, 2007; de Freitas, 2017a; Ferrando, 2019).
P1 saw that boundary becoming non-existent, with the human dependency on technology as conflicting with several of the structures and dispositions of the Habitus of Technology when she said, “[w]e cannot exist without it [technology]”.

F6 (Section 6.6.7) stretched the ideas of deconstructing humanist boundaries between humans and technology when he voiced the belief that “our technologies are what made us human’ and echoed the posthumanism concept of being entangled with our technologies, “we’re entangled in things…and so, you know, language in tech and culture” invoking Ferrando’s (2019) philosophical vision of entanglement and Hodder’s (2014) dependencies of entanglement.

F6 expressed the messiness of technology and our relationship with it when he said, “[a]nd it changes in ways that I can’t necessarily predict. In fact, you can’t predict, right?” Ferrando’s (2019) posthumanism offers an epistemological position that exemplifies ‘becoming aware’ of our implicit and explicit biases, privileges, structures, and the Habitus of Technology, which, left unexamined, constrain our perception of the future of ToL.

Hodder speaks to entanglement in a more practical sense, focusing on power and authority, identity, perception and mutual need between technology and people. Barad (2007), by contrast, explains entanglements of human/technology as reconfigurations of imaginations, agency, our understanding of institutions and an inextricable part of the research phenomenon.

The posthumanist theoretical framework guiding this research suggests a reading of the discussion to investigate how emergent voices might open new understandings of ToL and their place in the future of education.

The practice of posthumanist reading, in essence, the question asked what the Habitus of Technology, which was the by-product of the CLA process, could look like if it was shaped through the participant emergent voices. The process of posthumanist reading presents an opportunity to re-consider the consequences of the continuation of current thinking about technology and, in
that process, created new possibilities for the futures of ToL (Bridges-Rhoads and Van Cleave, 2017).

While CLA concentrates on understanding how knowledge is centred in the four layers so we can form a perspective on the Habitus of Technology. Posthumanism is used as a reading method to change how the human-technology relationship is framed—drawing attention to the idea that technologies have always been a part of culture and society litanies and are essential to our self-formation (Peters, 2006). Posthumanism finds alternative ways of examining the human-technology relationship (Herbrechter, 2015) and works to engage with CLA data to examine research question 3 critically.

In this research, a posthumanist re-reading deconstructs the CLA layers of the Habitus of Technology represented through the RQ1 and RQ2. The following tenets were adapted for use to aid understanding the process and suggest focal points for the posthumanist reading.

1. For Posthumanism the process is not about “technology,” but challenging the dispositions and dependencies that support the current Habitus of Technology,

2. The assumptions of everyday practices, structures, stakeholders, and dualism represented in technology as tools or resources warrants particular attention,

3. Social and structural frames and metaphors/myths exposed in the CLA layers are the navigations aids of humanist ideology: they are obstacles to a new understanding of human-technology relationships.

4. A posthumanist methodology does not recognise the primacy of the written text; it is aware that Posthumanism can be performed in many ways that look for articulation points outside a necessarily human-centred discourse like the humanism (Ferrando, 2021).

5. Although technology and other cultural artefacts while not part of the biological body, they become entangled within human life, as human traits and thinking structures (Kravchenko and Kyzymenko, 2019)
From a methods approach, the posthumanist reading focused on elements of the relationship with technology that are expressed as common sense or acceptable practice and the areas that would have been skipped over in everyday research. These mundane expressions should attract the interest and consideration in this process, inquiring who benefits, who is given a voice and what voices are disavowed.

The reading’s final intent is to offer a glimpse into what a posthumanist Habitus of Technology would look like as an opportunity to change the knowledge and structures supporting the human-centred view discovered in the CLA portion of the research.

Philosophically, posthumanism supports awareness of the limitations of humanism with its anthropocentric and dualistic assumptions (Ferrando, 2019). Thus, the literature review and the emergent ideas of participant F6 exposed the research and the researcher to the philosophical position of posthumanism, offering a mode of thinking about technologies that addressed the consequences of our choices on the future of education, society, and the planet.

7.4.3. Technology as intra-active

During the interviews, P1 was asked if the human-technology relationship was collaborative; she first replied, “I don’t think anybody has an answer to that. It’s, it’s a complex topic, we don’t know, we haven’t experienced it [yet]”. When the interviewer followed up by saying:

What about the conversation I’m having with you? My handheld AI is doing real-time audio to text transcription for me right now as we talk?

P1 responded:

Well, actually, you’re right. We are already cooperating. It’s not like it’s a future. You’re right because I’m already relying on my technology to do things for me. Yeah. I rely on Google Maps instead of my sense of orientation. I don’t just drop that. I just don’t use my mental abilities or my mental energy to really remember where I’m going so much, unless it’s really, really automated, from home to work, this kind of thing.

The conversation had become intra-active expanding and deepening because of the interview relationship.
While the exchange may seem trivial, the follow-up question generates a new perspective and knowledge, but this growth of ideas would probably not have happened if the interview was in email format where there was no spontaneous intra-action between the participant and the interviewer. New knowledge was co-constituted by the interaction and expressed in the response by P1:

I’m already relying on my technology to do things for me... I rely on Google Maps instead of my sense of orientation... I just don’t use my mental abilities or my mental energy to really remember where I’m going so much.

She realises that this would not exist without that moment of unplanned intra-action.

Intra-action is relevant to the research for the effect the concept has on meaning and knowledge construction. It “signifies the mutual constitution of entangled agencies,’ which may seem overly vague. What is most important to this research is the difference between interactions and intra-actions with ToL. Intra-action offers a means to traverse the gap between the structure and power of the habitus of technologies to the posthumanism philosophy of the entangled relationship between humans and technology.

In the case of ‘interaction,’ ToL are assumed to be external and separate from human agency, meaning and knowledge creation that exists prior, during and after interaction with other humans, technology, and the environment.

New intra-actions during the interview created narratives that appeared to change the direction of previously held ideas, similar to F8 when the interviewer asked if she felt that online learning only exists because of the technology we have now. Her reply indicated she was focused on existing technologies:

Um, well, I am not sure I understand. I mean, since we have the technology, we can do it. Previously we could learn with people who weren’t around. I mean, I think it’s created. Yeah, I mean, I think it’s online schooling that allows you to be educated alongside people who are not near you. Right or maybe not even at the same time as you. I think it was a natural direction for the technology to go. It makes most sense that we would use the internet and communications technology to educate people.

When the interviewer asked if radio programmes and mail correspondence systems that deliver education to remote learners was significantly different
from online learning, F8 created a new narrative based on the intra-action, saying:

That’s a great question. I didn’t even think about that; of course, there were correspondence classes and I remember the TV classes they used to show on public channels and stuff.

New knowledge can only be created during the intra-actions of the interviewer, the participant and the technologies used to create the space for the interview (Sauzet, 2018). When the interviewer introduced that radios and mail correspondence systems were used to deliver education, inquiring if what was happening now was significantly different.

Intra-actions upend the conceptual firmness of the human tool separation of traditional research by acknowledging that new agency, knowledge, and meaning are co-constituted at the moment of intra-action. Thus, intra-actions become the performative and conceptual link between the Habitus of Technology, the research methods, and the participants as a conceptual framework.

The principle is that objectivity, while not ignored, should not be constrained by a traditional ontology; instead, objectivity is a collateral effect of intra-actions and entanglement theories.

This philosophical turn from technology as ‘external to humans’ to a relationship that is entangled becomes significant when considering the possibilities for intra-actions opening new concepts of technology, education, research methodologies and methods (Barad, 2010; Pedersen and Pini, 2017).

Entanglement frees the researchers from the humanistic ontological dualism of the human-technology relationship. The creation of entanglement that results at the moment of intra-action, re-enforces the inseparability of measured and measurer; knowing is no longer reserved for humans, not simply because we use technology but because knowing co-constituted in the intra-action (Barad, 2007). We do not obtain new knowledge by standing separate from technology; it is created because, as P6 said, “technology is the most human part of us”.

Intra-action is conceptually complicated, but practically it can be as simple as the unplanned question in an interview, where new ideas emerge from the
dialogue. Neither the participant nor the interviewer came into the interview with the knowledge it was contingent on the interview situation.

For the Habitus of Technology, intra-actions allow for an ongoing reconfiguration of knowledge and structural boundaries emerging from rather than preceding, the intra-action that produces them (Barad, 2007).

7.4.4. Posthumanism Reading

Narratives create a temporal structure for past, present and future actions that did not exist when the events happened. Thus, narratives mediate our understanding of technology across the past, present and future, making choices, action, and strategy possible (Milojević and Inayatullah, 2015).

The process of posthumanism reading is the means of critically reflecting on the Habitus of Technology and the negative effect on all facets of technology development in the educational infrastructure. Posthumanism as philosophy also alters the common understanding of humanism contesting the acceptance of human exceptionalism and replacing it with a posthumanism accountable for the role we play in the world, society and chosen profession (Barad, 2007; Ferrando, 2019).

Posthumanism rejects the humanist dualism between the human, nature, culture, and technology allowing an escape from boundaries P4 described as: “[s]o we actually use the technology in a way that separates us from the power and also makes her dumber, in a way”. P4’s comments are probably an unconscious rejection of human-technology boundaries that separate this research from the traditional Philosophy of Technology methods like post-phenomenology to probe and analyse the role of technologies in social, personal, and cultural life (Ihde, 1995).

Understanding technology as a ‘human trait’ (Ferrando, 2019, p.67) frees technology from being guarded against or the source of all solutions. The break to posthumanism allows for the understanding of the research phenomenon as specific intra-action of (in this research) the participant (object) and the interviewer (measuring agencies), where the narratives emerge from the intra-
action that produces them, whereas narratives might be pre-constructed in
technology. F1 noted:

We hear the story about; national productivity is based on science
and technology. We hear the story ... where [technology]
innovation is a change ... that realises greater benefits for lower
expenditures.

Habitus then is something not natural, a set of assumptions and characteristics
which are the product of their profession and a common vocabulary to the
people in that habitus (Bourdieu, 1990). Habitus of Technology is a product of
history that has evolved from social experience and education and may be
changed through new social experiences, education, and training (Bourdieu,
1990). Perceptions, assumptions, and experiences affect our actions as
professionals, shaping the form of the environment (Bourdieu, 1990).

The dominant narratives of technology have a powerful grip on contemporary
thought and behaviour. Posthumanism alters that story to represent the intra-
actions of the technology, where partitioners are part of and recognise
themselves in the narratives. The intra-active narratives re-align the Habitus of
Technology as a story of mutual co-constitution (Bouzanis and Kemp, 2020).

P9 may have been looking for the means to alter the narratives and habitus of
technologies when she said:

Technology is always unstoppable. And we just need to learn how
to manage it and manage people’s behaviour towards [to]
encourage positive behaviour, I guess.

From this perspective, narratives offer the individuals in a habitus a means to
understand what is happening ‘out there’ in the social world and how they
should evaluate it and react to it (Bouzanis and Kemp, 2020).

7.5. Reflections

The establishment of the Habitus of Technology gives insight into the patterns
of beliefs used to create the research approaches and expectations. The social
structure, narratives and norms that reinforce the Habitus of Technology as
acceptable become visible for examination through CLA.
Posthumanism as an alternative approach offers modes of experimentation in research to propel research practices. It provides a method of critiquing and altering the field of education and technology. The move away from the collective safety of the common-sense assumptions that have held the human and technology so securely apart is collapsed under the posthumanism vision. The path from the present humanism methods of examining ToL to the future posthumanism approaches will be a messy process (Taylor, 2016).

The deconstructionists Foucault and Bourdieu saw humanism ideology negatively, using the metaphor of colonisation to describe how humanism narrows human understanding, meaning making and knowledge both physically and intellectually (Robbins, 2002; Pithouse, 2003a).

The humanistic and instrumentalist traits that provided the foundation of the Habitus of Technology were evident in both interview groups. The narratives exhibited the constraints of discourse limiting technology to a tool, a consumer item and an object that is under a stakeholder-driven technology cycle control, reducing individual agency in their profession.

The posthumanist reading of the Habitus of Technology presented a whole new set of opportunities and challenges to understanding the human relationship to ToL. Posthumanism as a philosophy does not focus on technology but acknowledges the entangled role technology plays in our everyday lives. From this perspective, technology is continually intra-acting with humans and the environment to create new experiences and knowledge. In the posthumanism narrative, technology is a ‘trait of the human’ more than a thing or a tool (Ferrando, 2013). The removal of technology as the tool for obtaining efficiency, cost-effectiveness, or even F8’s expression of chemical learning as a form of transhumanist learning, opens the possibilities for the conversation to be reframed.

Technology exists in the posthumanist reading as the rejection of the boundaries between humans and non-humans and ultimately the humanist belief in the separation between technology and learning (Ferrando, 2013).

For the posthumanist philosophy, the investigation of ‘trait’ or entanglement of technology with the human is an ontological and epistemological investigation
and a study of humans and the history of their technology intra-actions (Barad, 2007; Ferrando, 2019).

The repositioning of the human in the technology of learning towards a concept of entanglement makes contemporary technology of learning research problematic. For example, the object of our study is no longer the human or technology; it is the entangled phenomena of humans and technology intra-acting. Entanglement upends the separation of researcher and subject in data collection (Lather and St. Pierre, 2013).

As in the case of this study, interviewing becomes performative, the entangled narrative resulting from the intra-actions between the interviewer, participant, and the mediating technologies to create new knowledge and the resultant agency.

Posthumanism as a philosophy is not anti-human; it does not seek to create a new human but to reposition the human in a balance social, natural, and technological world (Ferrando, 2019). Philosophically challenging dualism, determinism, instrumentalism, and essentialism understanding of ToL. The traditional methods and modes of thinking about ToL brought us to this point in our educational endeavours (Weaver and Snaza, 2017). Posthumanism reveals in technology narratives the beliefs and assumptions opening avenues for exploring new philosophies of human-technology relationships.
Chapter 8. Conclusion

8.1. Research questions

The thesis originated from a desire to understand the foundational assumptions and beliefs that guided an individual when researching technologies of learning. At first scan, the available articles and publications showed that the Philosophy of Technology commented little on educational technology. A deeper review of the literature showed that large part of research into learning technologies has primarily focused on solving practical problems from an instrumental-focused view of technology (Bennett and Oliver, 2011).

The thesis addresses a gap in the reviewed literature of how existing individual beliefs, assumptions and professional structures affect the future potential of ToL is perceived. Without an understanding of the practical and mental expression of the participants’ relationship with technology, it is difficult to open new mental approaches for research into ToL. The issue with a group is its tendency to align its beliefs with each other as a form of identity; as Ramos (2020) noted, the group will tend to dampen reasonable evaluation of ideas external to the group.

As a form of group identity, the alignment of beliefs is given a research identity in this study as habitus (see Section 2.5.2). Habitus of Technology (Section 2.5.3) provides rhythm to these practices or dispositions as the mental and organisational structures of the practitioner’s professional hierarchies and processes.

8.1.1. Research question one

The first research question (Section 1.4) asked if there was structure to the assumptions and beliefs in the form of habitus and, if so, whether they were common across groups of individuals. The answer is yes. There were several similar dispositions and dependencies which demonstrate the commonalities in the Habitus of Technology found in the two groups.

The example that was the most common and represented the strongest metaphor was the image of technology as a tool. With 75% of all participants invoking the image, eight out of ten practitioners and seven out of ten futurists
identified ‘technology as a tool’ in their narratives. F4 positioned technology as a tool and servant: “I mean, I see technology, again, I see it as tools more…I see technology as our servants”. P5 saw technology as a tool and an extension of the human: “[t]echnology is essentially a set of tools ... to achieve certain goals or certain objectives”. This image of technology as a tool to accomplish tasks or as an extension of the human is a powerful one.

These findings bear similarities to the results of (Webster, 2016), where the concept of technology as a tool is the third strongest theme for K12 educational leaders when relating their understanding of the Philosophy of Technology in an educational setting. The results also align with narratives that exist outside the participant groups. For example, Rainie and Anderson (2020) reported the responses of 697 technology innovators, developers, business and policy leaders, researchers, and activists to questions on social and civic innovation difficulties in the digital age. A word search of the document found 159 instances of the word ‘tool’ and in almost all cases, the context was of technology as that tool. A deeper look finds an entrenched instrumentalist view, exemplified by the comment, “Tools are made to be used. How they are used, who uses them and what they are used for determines their impact’ (Rainie and Anderson, 2020, p.50). The human constructs the dispositions governing the use of technology and for the technologies’ part, it creates the dependencies through enhancement and extensions of the human condition (Hodder, 2016).

8.1.2. Research question two

What beliefs and structures constitute the differences between the two groups of participants?

The analysis identified only one divergence between the practitioners and futurists: the pace of technological change that affected the practitioner group. Many of the practitioners voiced the concern of being unable to keep up and spoke of the inability to keep pace with the speed of technology development driving ToL purchasing, funding and research (Apreda et al., 2016; Hirst, 2019).

Five of the ten practitioners directly referenced the speed of change as hard to keep up with. For example, P3 referred to this effect when he said: “[t]he tools
are happening now to make our lives easier, but the pace of change is so rapid that it’s hard to it’s hard to keep up”.

8.1.3. Research question three

*What are the constraints associated with the current modes of thinking in both participant groups and what are the possible alternative ways of thinking emerging from the research data?*

The first consideration is that habitus by nature constrains and creates socially learned narratives and expectations of behaviours, which act as the template for the beliefs supporting ToL (Jackson, 2008). Habitus is a ‘way of being,’ which ensures that, in general, divergent thinking and behaviours are resisted and discriminated against (Costa, Burke and Murphy, 2019). Therefore, if the Habitus of Technology exists, it follows that behaviours, narratives and expectations of the future are shared across the participants of the habitus.

The second issue is our belief that it positions technology as merely a tool. There is an air of utopianism to this mode of thinking. Humans build technology to serve; each iteration is better than the last; the tool is created in the image of our human needs (Omotoyinbo and Omotoyinbo, 2016; Mäkelä, 2017).

Technology comes with its own stories embedded in the technologies challenging the participant to create narratives that encompass the affordances and dependencies that technologies demand of the narrative. The participants’ narratives became the primary source of data to understand the layers of beliefs and assumptions. It became the medium of transmission of these beliefs throughout the Habitus of Technology.

An important aspect of reflection is establishing the ‘when’ of the Habitus of Technology and ‘what’ it tells the researcher that is different from the traditional method of examining ToL. From this study’s perspective, the Habitus of Technology, while not in conflict with the existing research methodologies, opens discussion into the beliefs that underpin the researchers’ belief networks.

The belief in technology being external to the human obscures our vision of much of the potential available. By privileging one specific mode of thinking over another, asking what technology will allow us to do rather than how will
that technology affect our future lives. P1 expressed this mindset “like we shouldn’t oppose, like, we have to live this way or that way’, adding the only escape was to “imagine a future where there’s no technology”.

As a constraining force, humanism as an ideology was described by Weaver and Snaza (2017) as narrowing scholarly modes of thinking to dominant institutional and disciplinary approaches to the exclusion of new forms of knowledge.

While offering a method of investigating the human-technology relationship in education, the posthumanist approach remains a theoretical reading of the data gathered. However, in the posthumanism reading exercise, the constraints identified in the research are presented with a conceptual and practical means to transform and transcend the humanist ideological assumptions and beliefs.

8.2. New contributions to knowledge

The contributions to new knowledge of this thesis are primarily found in the novel use of the conceptual framework of habitus and theoretical posthumanism resources to create new knowledge about the field of ToL.

The contribution to research into ToL is the novel approach for examining technology from the perspective of habitus. The investigation method of CLA provided a critical futures-based approach to ‘thicken’ our understanding of the dominant traits constraining new approaches to consider the potential of technology in educational systems.

The contribution to new knowledge is three-fold, the first being the usefulness of habitus to examine the socially constructed assumption and beliefs that form the foundation of the human-technology relationship in the field of ToL. The second is that the results demonstrate the striking similarities of the habitus traits of the practitioner and futurist participants. The final contribution is using novel methods to explore and thicken our understanding of the human-technology relationship and the social and cultural aspects that constrain that relationship.
8.2.1. Habitus as a useful concept

The first contribution is conceptual, showing the usefulness of the concept of the Habitus of Technology as a means to describe the dispositions that act as constraints to the beliefs, behaviours, and agency of the research participants (Costa, Hammond and Younie, 2019).

Habitus as a conceptual framework (Section 3.4) proved to be a successful means to examine the dispositions and dependencies that affect the participant groups’ professional and individual beliefs, assumptions, and agency. Habitus has been a practical means and vocabulary to provide a ‘thick’ description (Geertz, 1978) of the dispositions and dependencies that are socially and culturally related to ToL.

The inclusion of technology in that mediation and how technology and human relationships are commonly theorised as social interaction becomes a small step for studying habitus (Sterne, 2003; Czaja, 2011). Habitus of Technology then can be empirically viewed by asking participants how they see themselves and how they see the role of ToL in their professional and social lives (Czerniewicz and Brown, 2013).

Bourdieu called for an ‘epistemological break’ as the moment when researchers leave behind the pre-constructed habitus modes of thinking and “see their objects with a new gaze” (Sterne, 2003, p. 369). CLA became the means to operationalise the deconstructions of the interviews and identify old and familiar narratives that sustained the Habitus of Technology.

The findings build on the concept that the Habitus of Technology, while a product of our worldviews and metaphors, is not immutable (Friedman, 2016; Silva, 2016a). The research offers a means to reflect on the constraints that the habitus mode of thinking while opening up possibilities for the narratives to be changed about the future of ToL (Halford, 2021). The Habitus of Technology forces messy questions about the human-technology relationship as a social construct. The extension of habitus casts technology entangled in the inextricably physical human practice. When we resist the dualism that positions technology as ontologically separate from the human, we open opportunities to
pursue the relationship as complete constructed object of study (Sterne, 2003, 2006).

**8.2.2. Practitioners and futurists share a common habitus**

The second contribution is in establishing that a common habitus exists between two diverse groups of research participants. The commonalities reinforce the notion that there is a strong structural and social influence of the conscious and unconscious beliefs and assumptions that shape our perception of the possibilities for ToL.

The research provides new information and understanding of the Habitus of Technology and what effect that could have on ToL. The narrative analysis identified four common beliefs and assumptions that comprise a habitus associated with technology in both groups.

The most common litany was an instrumentalist view of technology as a tool or an extension of the human body. Structurally and culturally, the habitus identified the participants’ positions of the human and technology as separate entities physically and intellectually. As a result, of the dominant worldview that treated technology as a ‘thing’ the natural mode of thinking that developed was for technology to become solutions to human problems. The dualistic separation of the social and the technological is alluring, stripping away the unmeasurable to find clarity in technology as a means to enhance pre-existing personal and societal educational objectives (instrumentalism) technology assumptions (Bayne, 2015b).

The loss of agency and control of the technology agenda in the participants was created by the increase in control and power of the external stakeholders through funding and the dominant narratives that support the human cultural beliefs of the place of technology in learning.

A challenge for the habitus of technologies is the external influences that are considered beyond the control of the participants, where habitus as a concept should insulate the members of a habitus from the effect of change, as the continuous effects of emergent technologies are destabilising the habitus frameworks (Sterne, 2003; Friedman, 2016; Silva, 2016a).
Habitus of technologies provides new and novel insights and gives voice to the dispositions governing the use of technology and how technologies create dependencies through enhancement and extensions of the human condition (Orlikowski, 1992; Hodder, 2016).

To build a better, different, or alternative future for education and technology, we first must be self-aware of our relationship with technology (Feenberg and Jandric, 2015). This and further studies can open a dialogue into understanding our relationship with technology and the effect that interaction has on the future of education.

8.2.3. CLA is a useful research method

The third contribution is methodological. Using the critical futures method of CLA provides an epistemological approach to deconstructing the commonly accepted understandings of the human relationship with ToL and the associated traditional philosophies.

Each of the four layers is an ever-better epistemological vantage point to examine the dominant social, cultural, or deeply personal influencers. It is, in many ways, a reality check using the four layers as vectors to cross-check and analyse the research data.

CLA is a poststructuralist method that forms part of the theory of the critical future and thus seeks to integrate empiricist, interpretive and critical modes of knowing in a unified system of ideas (Inayatullah, 1990, 1998b). The research employed novel theoretical frameworks and methods for educational technologies through which new insights and opportunities for future research can be highlighted and offered for consideration.

CLA, by design, does not simply diagnose, but seeks to alter how things are understood and resists looking only hierarchically and accepts that layers of analysis are inherently intra-connected and mutually influential (Russo, 2010).

8.2.4. Posthumanism reading

Posthumanism reading explored the emergent narratives manifested in the participant narratives and served to address research question three that
asked, ‘what are the possible alternative modes of thinking emerging from the research data’?

Posthumanist reading advocated in this research is a synthesis of the works of philosophical posthumanism of Ferrando (2019, 2020, 2021) and the introspective work on posthumanist reading and other foundational works (Herbrechter and Callus, 2008; Herbrechter, 2012, 2021).

“Post-Humanism” indicates that philosophical posthumanism rejects humanism (Ferrando, 2019). The –“ism” at the end denotes discourse and while humanism is a discourse about making sense of human exceptionality and privilege. Posthumanism is a discourse that creates an image of what it would be like not to have the human as the centre of the story. It is an alternate path that leads away from humanist modes of thinking about technology (Herbrechter, 2018). The Habitus of Technology is built upon tension and ambiguity, the dualism, boundaries, and separations of technology from the human.

The Posthumanism reading process is not about the “technology” but rather about challenging the dispositions and dependencies that support the current Habitus of Technology. The method of reading the Habitus of Technology offers an opportunity to explore the disruptions of human-centric explanations of technologies in the domain of education. The decentring of the human in learning to be inclusive of a broader landscape of humans entangled across space and time with the material world (Peppler, Rowsell and Keune, 2020). In essence, while answering the RQs, the findings offer at a deeper level what the Habitus of Technology could look like if it interrogated posthumanist beliefs and assumptions. The posthumanist theoretical framework guiding this research provided a method to investigate how emergent voices might open new understandings of ToL and their place in the future of education.

However, the literature aided the research methodology in finding likely possibilities for the research question; however, based on the posthumanist reading tenets proposed in section 4.7, the following additional possibilities can be explored.
1. For Posthumanism, the problem is not “technology” but the humanist intentions behind the technologies. The humanist structures of the Habitus of Technology is created from tension. The litany of technology is a tool that gives voice to the struggle for control over technology embedded in the layers of CLA. Humans become measured against technologies for efficiency, cost, and accuracy. Yet, in the same humanist thought, the human controls and creates the technology that serves our needs.

There is a continued struggle in humanist thinking between human self-identity and the desire to develop technologies that extend human abilities. Embedded in the disposition of technology as a tool is the dominant narrative that voice world views on the struggle between technology and fear (and often desire) of humans to be replaced by technology.

The posthumanist reading asks what our relationship with technology looks like if we consider the human relationship entangled with technology as human traits and an essential part of the thinking structures (Kravchenko and Kyzymenko, 2019). What changes when we stop looking at ToL as something to control to something we enter into a partnership with?

2. Technology as tool implies a narrative of industrial progress where new technologies continually replace old ones, compelling the field of technology in education to focus on the structures, values and priorities that made this possible (An and Oliver, 2020). Tech as stakeholder-controlled Tools can be bought, sold, and cast aside without regard to the effect on the social fabric or world around them (Rousell, 2016). P4 expressed this as where people feel the need to be first to buy the latest new technologies before their competitors do for competitive. Industrial structures change when technology is considered a trait of the user. The narrative of concern about the speed of change changes when the technology is tied to the individual, not the institutional and stakeholder structures.
3. Social and structural frames and metaphors/myths help us navigate human existence: they can be helpful, but they can also become outdated and natural obstacles to new methods of understanding (Ferrando, 2021). The metaphor of technology as a tool for the betterment of humanity is an instrumentalist vision of control over the natural world. This anxiety in this story in the creation of ‘better than human,’ most participants framed it as a win-and-lose contest where the battle was between technology and the essence of learning as a human activity.

4. Although technology and other cultural artefacts are not part of the biological body, when they become part of human life, they also become part of the human body schema and cognitive structure (Kravchenko and Kyzymenko, 2019). Embedded in the disposition of technology as a tool is the dominant narrative that voice world views on the struggle between technology and fear (and often desire) of humans to be replaced by technology. But as Herbrechter points out (2018), our desire to enhance bodies and minds is always in tension when we lose the human essence? The Posthumanism philosophy considers technology as essential but not in conflict with the human, releasing the conversation from one of win-lose to one of intra-action.

Posthumanism is used as a reading method to change how the human-technology relationship is framed. It draws inspiration from a post-structuralist Foucauldian reading that centres on dependencies and dispositions between humans and structures (English, 2006; Herbrechter and Callus, 2008). Drawing attention to the idea that technologies have always been a part of culture and society and essential to our self-formation (Peters, 2006). Posthumanism has the scope of finding alternative ways of examining the human-technology relationship. Reading as a process (Herbrechter, 2015) works to engage with CLA data to examine research question 3 critically.

By interpreting the research findings through a lens of posthumanism reading, the process reveals how commonly accepted assumptions about humanism change when applying a different philosophy. From a practical perspective,
reading the narratives’ findings focuses on elements where the relationship with technology is expressed as common sense or acceptable practice and the areas the reader would have skipped over in everyday reading. These mundane expressions attract the interest and consideration of posthumanism, inquiring about who benefits, who is given a voice and what voices are disavowed in the human/ToL.

This process challenged my understanding of technology as I worked to understand the tensions and constraints of the participants. The reading’s final intent is to offer a response to what a posthumanist Habitus of Technology would look like and what opportunities open when the knowledge and structures that support the human-centred view are challenged (Marks, 1998; Herbrechter and Callus, 2008).

8.3. Limitations of research

There are several limitations to how this study was conceived, organised, and executed. The first area is the traditional limitation of conducting qualitative research using interviews: how many interviews are enough to address the research question. While it is always possible to do more interviews, this study matches the most common sample size for interviews in UK PhD studies, which is 20 (Mason, 2010). The interviews for this study were not capped at twenty to meet this norm; instead, they had reached a point where the research questions became visible in the data and no significant deviations in the narratives were apparent.

There are many approaches to conducting interviews with diverse questioning techniques, each appropriate in various circumstances. They all seek to understand the underlying reasons, opinions and motivations of the individual being interviewed. In this study, the interview style was semi-structured which was guided by five groupings of open-ended questions.

The use and adherence to the five-question framework (Annex C) may have limited the in-depth exploration of particular topics. The intent was not to research emergent areas of interest to the researcher in the interviews as much
as it was to allow the participant to explore their relationship and their understanding of ToL. The five areas of question selected as the approach ensured the maximum amount of similar ground was covered with each participant in the limited one-hour timeframe.

The literature review was a second area where the limitation became apparent. The literature provides the theoretical foundations for the research questions and the source of the material for citations and references to prior research studies. However, the limitation found in the literature was not that there was little written about habitus or posthumanism or about examining technology from either of those theoretical positions. Instead, the limitation was in our understanding of how assumptions and beliefs impact the future of ToL, which was amplified by the tendency not to use interviews to research technology (in Mason's (2010) examination of 2,533 PhD theses, few explored technologies using the interview method).

Significantly, there was almost nothing written about the intersection of the two fields in the realm of technology, with even less written about Habitus of Technology, CFS and posthumanism in the field of ToL. The research does not claim the idea of the Habitus of Technology as its own. However, it seems to be the first-time habitus has been used to examine technology from a human belief and assumptions perspective. While the gap in the literature presented no ready-made research to reference or emulate, it did provide an excellent opportunity to respond to the gaps, which provided the foundation for this study.

The third area of limitation stems from employing CLA. The lack of experience with the process resulted in many backtracks and restarts in the data analysis. However, the bonus of the many restarts is that I am now comfortable with the method and highly familiar with the nuances and contexts of interview data. As familiarity grew with the data and the conceptual framework, it also became apparent I had underestimated the strength and span of the Habitus of Technology. The empirical results reported in this thesis should be considered through the lens of the novelty of the approach and the exploration of an unexamined gap in understanding how an individual’s perception of ToL is shaped and constrained by the influence of a common habitus.
The fourth limitation centres on the posthumanism reading from a conceptual perspective. Again, there were few research footprints to follow or shoulders to stand on to conduct the process. The limitation was also a chance to explore ToL research theory without the boundaries of previous research.

Barad’s (2007) work on intra-action also leaves some questions unanswered. His notions of intra-action and entanglement are grounded in hard sciences and serve to form an elegant theory for new conceptions of human-technology relationships, but leave open concerns of persistence, durability, and memory. Do we remember our intra-actions? Does this memory influence the next intra-action? If not, what does this mean for agency, beliefs, culture, and the state of the Habitus of Technology? While it would be an interesting topic for future research, it seems probable that there is persistence in the form of behaviours and beliefs, but they are less durable than suggested in Bourdieu’s early work on habitus (Bourdieu, 1977; Davey, 2009).

The discussion about the concept of the Habitus of Technology and posthumanism reading of technology, at a practical level, opens large areas of research, potentially freeing technology research from the institutional pressures to think about technology only in acceptable ways (Sterne, 2003).

8.4. Further research

The future research suggestions in this section result from the research limitations identified in the previous section to expand the understanding of the Habitus of Technology.

One primary contribution of this study was identifying and analysing the constraints of the Habitus of Technology. Future research opportunities could explore its resilience and prevalence across the domains of education and external agencies.

The results addressed the gap in understanding how an individual’s existing beliefs, assumptions, professional structures, and world views affect how researchers and futurists perceive the potential of ToL. This constraint on new avenues of research presents a significant opportunity for researchers to
consider how the future ToL is shaped, directed, and constrained by humanist and instrumental beliefs.

The second area is exploring methodologies and methods of research into ToL that are not based on the separation of human and technology or the technology from learning. This shift from humanistic-driven research to other more inclusive research methods may be problematic for scholars and practitioners tied to overcoming years of engrained understanding of technology research (Bayne, 2018).

The need to examine ToL from new ontological and epistemological positions opens the door for researchers to explore future-ready, inclusive, or accountable narratives about the future of technology in education (Inayatullah, 2004a; Bussey, 2009). The principles of ‘reading’ text from a poststructuralist philosophical position, articulated in (Herbrechter and Callus’s 2008 work on ‘What is a posthumanist reading’, offers a path towards the future of ToL.

8.5. Concluding thoughts
The thesis set out a plan to examine an individual’s relationship with technology as a ‘way of being’ while acknowledging the intra-play of technology’s role in pre-constructing an individual’s habitus. In this unexplored niche, the research questions were investigated through a qualitative interview process.

Similarly, the new awareness of the structures that construct the Habitus of Technology makes it easier for practitioners to ask what needs to be changed. The use of CLA to discover the structures and habitus of the individual working and provide foresight for the field offered an alternate method to challenge the instrumentalist model of current thinking.

From a Habitus of Technology perspective, the participants’ technological and institutional change posed challenges. It produced tensions between their accepted ways of being a researcher or futurist and the external forces of change that are continually attempting to disrupt that expertise (McDonough and Polzer, 2012).

It also may be useful to ask what the effect on the durability of the Habitus of Technology was brought on by the rapid and unplanned shift to online
education during the COVID 19 pandemic. Using Bourdieu’s work on divided habitus or *habitus clivé* (Friedman, 2016) the idea of a divided or cleaved habitus offers an example of the tension between an individual’s desire to conform to their existing habitus and the external influences of change brought on by social, environmental, or technological changes, including changes to personal status forced on them by the pandemic (Friedman, 2016).

The concept of a divided habitus is a struggle between the existing structures and dependencies and the new structures and dependencies that attempt to replace it as the status, manifesting itself as the struggle to continue to act the same way, to think the same way, as a form of resilience (Bourdieu, 1984; Friedman, 2016).

The metaphor of ‘divided’ not only describes the potential conversations of the participants narrating their relationship with technology during the pandemic, but it also runs through the interview narratives of both groups. The dualistic think patterns of humans and technology may be the most robust constraint to our understanding of the possibilities of the future of education and technology.

For Davey (2009, p. 278), habitus was and is a “never-ending process of construction”, that offers the opportunity for change as individuals are confronted by the new and the unfamiliar.

For the Habitus of Technology to change or disappear as a concept, the underlying ideology of humanism and technology needs to change. This boundary disappears when philosophy shifts from humanism to posthumanism, offering multiple new paths to exploring the learning technologies relationship.

Habitus is relevant to the discussion on technology and the future of education because when you consider the diverse connections, education must embrace the non-human world as technology becomes critically relevant. The conversation can no longer be about losing, as in the case of AI replacing teachers, or winning when technology enhances the student learning, ensuring that the human is centred in the conversation (Silva, 2016b).

The historical and ontological dimensions of technology’s place in education may be apparent. What is not necessarily obvious is the critical issue of what philosophical approaches will position the field of educational technology for
success into the future or even post-pandemic. Nevertheless, the present humanism is limiting and binary thinking towards the human/technology relationship is limiting and short-sighted when considering the future.

The temporal turn towards the future as an ethical responsibility in the Philosophy of Technology is a crucial issue to properly understanding the possible futures of ToL. Often this awareness starts with discovering who and what is missing from the narrative surrounding ToL. Absent from the participant narratives was the learner, who rarely made an appearance. There is an opportunity to study why participant narratives had difficulty maintaining focus on the topic of educational technology: the participants talked of technology in holistic terms or about education but rarely referred to technology belonging to a field that could be described as ToL.

The most striking feature for me as the interviewer was the impression of the lack of enthusiasm for the educational institution’s future in the participant narratives. While some voiced their malaise in the litany, F1 saying that if we were lucky technology might benefit the student but that wasn’t its primary role making money was, F2 reported that most uncomfortable conversations about technology resulted in a fairly standard answer in his inquiries, that the person hoped they retired before changes happened, P1 say technology advances driving learning analytics not research needs, and P4 felt educational institutions were running scared of funders. The strength of this perceived response can be linked through the CLA layers exposing influences from stakeholders, dominant technology narratives and binary separation of technology and learning. There is research potential to explore the Habitus of Technology to understand if it is causing the perceived lack of engagement by the participants. This an important future research direction for TOL and education in general.

There are indications that the speed of change and the expectation of prompt research results could limit the researcher’s ability to accept that there may be many world views and voices that need to be heard in technology research. Therefore, it is important to embrace and investigate the full range of alternate methodologies in addition to those from which educational technology practice
is derived (Czerniewicz, 2008). Dualisms such as human/animal, human/machine and, more generally, human/non-human, are oppositional schemata and work to limit options to win/lose outcomes (Barad, 2007; Ferrando, 2019; Sapenko, 2019). There is a call to explore the possibility that intentionality, agency and philosophy might not be solely a human privilege and accept that technology is entangled in our learning, education, and social activities.

Being a scholar, academic, professor, lecturer or researcher comes with a responsibility. The profession is one of the few that can influence the future and bring about social change. That responsibility is to be continually uncomfortable with acceptable practices, establish modes of thinking with existing research methods and proven theories. If not, the world moves on and the field of ToL loses touch with the society it serves.
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Appendix 1: Comparison of participant litanies

The following tables show early analysis of narratives into Causal Layers and is included for reviewer reference. They provide a record of the evolving understanding of the data using Causal Layered Analysis.

Table 1. Technology as a tool

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<th>Ident</th>
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<tbody>
<tr>
<td>F1</td>
<td>“I guess, for Technology, I would say methods and processes of standardization, optimization”</td>
<td>P1</td>
<td>“[Technology] omnipresent like it’s ubiquitous, and I don’t see any more any dichotomy in Technology”</td>
</tr>
<tr>
<td>F2</td>
<td>“Technology is any tool and basically, it’s what it’s what allowed us to descend from the trees and start doing things”</td>
<td>P2</td>
<td>“So, Technology is a helping thing”</td>
</tr>
<tr>
<td>F3</td>
<td>“…we live in a time where we have to use a computer for everything, you know, like, that will be great…”</td>
<td>P3</td>
<td>“People are going to want to make things easier for ourselves…the tools are happening now to make our lives easier, but the pace of Change is so rapid that it’s hard to it’s hard to keep up”</td>
</tr>
<tr>
<td>F4</td>
<td>“I see Technology…as tools more, and maybe I have a traditional view of Technology, I see Technology as our servants.”</td>
<td>P4</td>
<td>“…it’s a very complex question. And it’s not just about Technology, Technology as a set of tools for me that the first ever tool was language, it was the first Technology.”</td>
</tr>
<tr>
<td>F5</td>
<td>“I would say that Technology is a tool to which one can shape their identity”</td>
<td>P5</td>
<td>“Well, for me, Technology is essentially a set of tools with which we basically trying to achieve certain goals or certain objectives.”</td>
</tr>
<tr>
<td>F8</td>
<td>“When I talk about Technology in my classes. I talked about how Technology is different from art because we make art for something to make something beautiful to make something inspiring to praise.”</td>
<td>P6</td>
<td>“I think it’s a little bit of both its most I look at it more as a friend servant, I say I look at it as more it helps me out that, you know, allows me to do things more efficiently.”</td>
</tr>
<tr>
<td>F9</td>
<td>“Technology is usually defined as ‘a science or knowledge put into practical use to solve problems or invent useful tools’”.</td>
<td>P7</td>
<td>“Technology is progress, progress is good, and hence, Technology is good.”</td>
</tr>
<tr>
<td>F10</td>
<td>“Technology is an enabler of an impactful action - teaching, writing, content production. It’s not the focus. It’s the tool.”</td>
<td>P10</td>
<td>“I think Technology gives you the opportunity to focus on the important things there more that gives you the opportunity to start thinking about what’s the key thing about the learning.”</td>
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Table 2. Technology as value for money

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<tbody>
<tr>
<td>F1</td>
<td>“Technology, who's going to fund that? Well, it's not going to be the individual...now, the Technology has to benefit, the institution has to produce some kind of tangible return ...hopefully, if we're lucky, may also result in some tangible benefit to the student.”</td>
<td>P1</td>
<td>“Yes. And I think that the way we have funding, I think it's everything, almost everything in the world has some economic reasons”</td>
</tr>
<tr>
<td>F2</td>
<td>“What scares me the most is that governments are getting short sighted [in funding]. They're getting protectionist, they're getting anti-intellectual. And they're reflecting populations that are doing that.”</td>
<td>P2</td>
<td>“The statement should be like, you're losing job, because your boss decided to replace you with a freer way of using the same things.”</td>
</tr>
<tr>
<td>F3</td>
<td>“[Universities are] … dependent on international students… most of the academic institutions are effectively bankrupt. Therefore, their primary objective is to get funding for research.”</td>
<td>P3</td>
<td>“We don't think about the evolution we don't think about anything other than what sits in her little comfort zone and buying tech and chasing tech.”</td>
</tr>
<tr>
<td>F4</td>
<td>“You have the users. And the people behind the curtains are becoming fewer and fewer, and they get more and more powerful”</td>
<td>P4</td>
<td>“Certain political groups, and whoever the group is the first funding, they want to know that the money is being used in a way that they approve of”</td>
</tr>
<tr>
<td>F5</td>
<td>“But I think that that, you know, market forces, sadly, … innovation is not going to be funded through people who are investing specifically in education or technology”</td>
<td>P6</td>
<td>“If somebody else is paying for it, then they there, they basically want to control your data, you know, the that's part of the equation as well.”</td>
</tr>
<tr>
<td>F9</td>
<td>futures in educational discourses are 'tacit, token and taken for granted,' conceptualising futures in such ways is disempowering and allows education to be vulnerable to forces of economic and technological determinism.</td>
<td>P8</td>
<td>“Oh, well, is it going to be wealth? Yeah. We already have that divide Now and it's getting worse and worse. Yeah. Is it going to be the financial barrier? Yeah.”</td>
</tr>
<tr>
<td>F10</td>
<td>“The modern world is an educational ‘sausage factory.’ Because of budget-based administration and grade targets on a wholesale</td>
<td>P9</td>
<td>“Ministries of education, etc, school districts, they have to be on their guard, to make sure that the company's not just in it for the money. And</td>
</tr>
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basis. Education today is one size fits all.”
sometimes to be honest, of course, they are.”

Table 3. Technology as media

<table>
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<tr>
<th>Ident</th>
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<tbody>
<tr>
<td>F1</td>
<td>“So, there’s dominant narratives …from the perspective of education, it really has nothing to do with education has everything to do with how companies compete… companies don’t compete with each other on the basis of whether they educate, they compete with each other on the basis of whether they make money most efficient.”</td>
<td>P1</td>
<td>“I believe so I believe that sometimes research topics are suggested by the policy makers, or the development and innovation is driven by policymakers.”</td>
</tr>
<tr>
<td>F2</td>
<td>“It's a little hard to disentangle some of these ideas about academic integrity from copyright interests</td>
<td>P2</td>
<td>“I don't like about those images is that there are so dominant, and this is something about Technology, not just the educational field, but in general, like the most narratives of emerging tech, are presenting themselves. With the future, there's no way around, this is going to happen.”</td>
</tr>
<tr>
<td>F4</td>
<td>“I think democratization of Technologies that was like, not only bifurcation, but you also have, you have the people behind the curtain. And then you have the users. And the people behind the curtains are becoming fewer and fewer, and they get more and more powerful.”</td>
<td>P3</td>
<td>“Yeah, the preconceived notions are driving the solution, somebody thinks, this is what it could look like, without actually, you know, without actually doing, you know, any kind of research and the gap analysis to say,”</td>
</tr>
<tr>
<td>F5</td>
<td>“Like how people approach talking about Technology, and how I think there’s lots of things that are wrong with how people talk about Technology, and the future.”</td>
<td>P5</td>
<td>“Well, … we should be very concerned about how the media treats Technology. But what the media are doing in terms of portraying the perils of Technology, I find it very harmful, because it’s actually helping us take a very different position”</td>
</tr>
<tr>
<td>F8</td>
<td>“When I hear things like universities abolishing majors, you know, that kind of radical thinking on education I'm very</td>
<td>P7</td>
<td>“Education systems have adopted some kind of shield against everything that goes against the”</td>
</tr>
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interested in unschooling. I would never honestly, I would never permit my own children to go to an unschooling experience, but I think it’s really cool.”

F9  “I think public press, popular media and sci-fiction colonise our minds with very narrow images of the future.

P9  “I just thought it’s not helpful to have that preconception of around Technology, especially in a in a place of learning where we’re supposed to be exploring new things. I think it’s very important to be aware of what’s happening outside of education, because at some point, it’s going to impact education.”

F10 “No. I think they feed it. Media spreading fear, uncertainty and doubt on technologies is not useful (example - artificial intelligence and the idea that it will put 100m+ people out of work or be used to kill humans).”

P10 “you’re right, it does. And what really, really annoys me is that its vendor driven. So, it’s like, the tail is wagging the dog in this respect,

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<td>F1</td>
<td>“50 years from now. It'll only be the people who are poor, who are educated in a classroom, with teacher or probably by their robot tutor.”</td>
<td>P1</td>
<td>“Technology may exist without ah, ah, education can make this without Technology, it is here, we cannot exist without it. Unless we go dystopic. And we imagine a future where there's no Technology.”</td>
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<td>F2</td>
<td>“When I when I ask staff and faculty on campuses, what their attitude is towards AI, their preferred response is always I hope I retire before it's an issue…”</td>
<td>P2</td>
<td>“Education is something where some old Normally white men decide what society should know,”</td>
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<td>F4</td>
<td>“I mean, there’s a huge the culture here in Silicon Valley is very much it’s very libertarian. Yeah, everybody are Aran fans for some reason. And Jordon Peterson fans and it’s just, it’s bad, very sort of very male. Very young. You know, you have to be under 30… Because of it. That's, that's like, you need actually, you need some mothers over 40”.</td>
<td>P3</td>
<td>Self-imposed barriers as …some people will be very specific about saying, oh, I only use my Technology for this, or say, I only use my phone for texting, or I only use my computer for email, whatever. And it’s actually pretty hard to get past those times of those kinds of biases.”</td>
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<td>F5</td>
<td>&quot;It's just very formulaic, and just looking for companies that already exists...traditional Neo liberal kind of an economic rules where we must have found like a market, yeah, [it's an] evasion.&quot;</td>
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<td>P4</td>
<td>it shows that we can learn on our own using Technology. I mean, Sugata Mitra holding the hole in the wall project.... you're using the tool that can leverage and information then you'll learn you'll learn without having teachers present&quot;</td>
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<td>F6</td>
<td>&quot;If we live in a beta world, right? Everything by the time you've created an efficient system, the system's already changing, right&quot;?</td>
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<td>P5</td>
<td>&quot;Strong sense that Technology is allowing their students to take control back of their learning processes... But the system itself is fighting for within that we don't want to give kids too much power by giving them these tools that they can play with.&quot;</td>
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<td>F7</td>
<td>&quot;So, this is going to sound very negative education to me means a production plant, and you either consider someone to be educated, or not educated.&quot;</td>
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<td>P6</td>
<td>&quot;The whole system of accreditation holds a lot of power with it...&quot;</td>
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<td>F8</td>
<td>&quot;And that's going to be a real tragedy if we do enter any kind of digital Dark Age, like let's just say we lose the Technology we lose Wikipedia we lose smartphones...I'm convinced society is going to have to relearn the card catalogue, the library, the Dewey Decimal System.&quot;</td>
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<td>P7</td>
<td>&quot;I don't care, I just want to do my job, I'm already going to retire in 10 years, and I really don't, don't care about any, any of these things&quot;.</td>
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<td>F9</td>
<td>&quot;Yes, though I think futures dimension is more explicit in Technology development... Formal education, on the other hand, is often used to maintain status quo. As argued by Foucault, it is (also) an instrument of social control.&quot;</td>
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<td>P10</td>
<td>&quot;We need to be both excited by and concerned about data is the thing that we need to be watchful of data is so important that both as a learning tool as a reflective tool for students, but also as this surveillance society, it's also something we need to educate about.&quot;</td>
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<td>F10</td>
<td>&quot;If we deliver Technological solutions using old philosophies and processes then we are bound to fail in delivering advancements. old process + new tech = expensive old process&quot;</td>
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Appendix 2: First pass of Participant interviews

Table A. Synopsis of Practitioner interview data

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<th>Causal Layers</th>
<th>Synopsis of Practitioner participant interview data</th>
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<td>Technology as a Litany</td>
<td>Litany is the layer where an individual’s feelings of helplessness and tensions are manifested through the tensions in their narratives. Words like easier, better, ubiquitous, and progress were challenged by words that denoted surveillance, and change as a financially rather than learning driven. There was an underlying narrative of loss of control and agency when discussing technology. While most of the participants saw AI as the next emergent disrupter of education, almost all saw AI as never replacing the human as the teacher. This struggle to keep the human as the centre of the discussion, was often at odds over the belief that AI would become the all-knowing education guidance system. The majority described technology as a 'tool' but did not offer or appear to have a clear concept of what defined or constituted technology or educational technology, or how technology was identified as separate from the many other material things in their daily lives. A few tried to bridge this gap by describing technology as new, digital, or emergent. The majority of the participants saw technology as moving too fast, controlled by vendors and external agencies. This view was often coupled with the indication that the narrative surrounding new technology was driving the research not educational needs.</td>
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<td>Technology as a Social/Systemic cause</td>
<td>The vast majority of the practitioner cited the pressures of the education/universities economic imperatives that constrained thinking about technology in any form than what was deemed to be “common sense” and acceptable. The majority of adoption and discussions were about technologies of administration and delivery as a means to reduce costs and extend services. This internal and external pressure imposed a structure that left little room for future considerations and research. Education culture and power distribution of retaining control over the students through new/emergent technologies while advancing the needs of the university to meet the needs of the funders. Societal expectations and the dominate dominant narrative of technology as the solutions to educations problems imposed a structural level that made breaking down of existing layers of delivery and control extremely difficult.</td>
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<td>Technology as a Worldview/Metaphor</td>
<td>The participants all demonstrate through their narrative, traits of deterministic, instrumentalist, and essentialist tendencies towards the development of educational technologies and their place within that philosophical construct. This belief system was underpinned throughout the narratives as placing the human as the centre of the educations system and having the final domain over agency within the system.</td>
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Critical examination during the interview was only provoked during the when questioned about the metaphor of the 'schoolhouse' and who was responsible for the consequences of the technologies that are being used within the education system. The strong metaphor of the schoolhouse resisted any means of conceiving education as anything other than what was in place now clouded any advocacy to change the existing worldviews surrounding education.

Secondarily the belief of the neoliberal systems of getting your money’s worth and being accountable to produce the workforce of the future. These worldviews limited the ability to find new ways of interpreting the future possibilities that might be possible or the inclusion of new voices within the conversations.

Table B. Synopsis of Futurist participant interview data

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<tr>
<th>Causal Layers</th>
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<td>Technology as a Litany</td>
<td>Litany in the futurist narratives showed wide differences between the two grouping of view, the futurists who saw technology much like the practitioners as tools and those who envision a more intra-dependent relationship. F2 positioning technology as a tool but oddly referenced as the spark of evolution “I know my etymologies enough to know technology is any tool and, basically, it's what it's what allowed us to descend from the trees and F8 saw technology different from art because is make something beautiful to inspire and to praise. At the other end of the discussion was participants like F9 who said “We create technology and then technology creates us', to paraphrase Marshall McLuhan. This creation is an interactive process, contextual, time and person dependent&quot; and F5 who saw it as “a weird question. Because technology is like an integral part of everyday life and is an integral part of society as well.”</td>
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<td>The power of data was another litany that occupied many of the futurist like F7 who saw data gathering as extending outside of the school ecosystem ““I think the value of data and how data can be engaged with to inform any teacher at any time, not just about where student maybe now, but where they've been, and also data from outside school...” and her view on privacy was concerning “I often think about what data is out there about me, but I'm a pretty straight living citizen, because I've got nothing to hide. So, I'm okay with that.&quot; However this view was echoed by F1 who “I'm pretty indifferent about surveillance, in the sense that, you know, people can see what I do in the public world as it is, anyways,...&quot; but added that “Once this information was the surveillance begins to impact on my capacity to grow and develop and do things in ways that I want to, and especially in ways that benefit me, as opposed to say, the educational institution, it’s at that point that they've crossed the line&quot;?</td>
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<td>Dualism as the Social/Systemic cause</td>
<td>The dualism of placing the human as separate from the technology was a powerful systemic mediator that limited the conversation about technology. F1 saw technology as a process of standardization, explaining the technology “I mean, technology doesn’t have anything like intentionality” later describing the relationship as symbiotic. This tension within his narrative resulted in the separating the “human act of Learning” from the technology of education. F2 place the boundaries with the social influencer of society spectrum when commenting on technology encroachment into education “then we’re going to have a very different society [if technology teaches], people are not going to be socialized at all, for face-to-face interaction.” The structural process of education became a reoccurring theme of resistance to change in the narrative of the futurists, F9 saying “Formal education, on the other hand, is often used to maintain status quo. As argued by Foucault, it is (also) an instrument of social control” and F10 hoping that “Kids can learn anything independent of the institution. It’s a shift in power… The whole idea of ‘school’ - house, teachers or whatever are being challenged today.”</td>
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<td>Worldview/Metaphor</td>
<td>F7 Continuing to drive home her point by saying “I’ve always said, you know, the role of education was to prepare people for the workplace. Now you say you prepare them for the workplace, but also to be a happy active social citizen and technologies everywhere. F9 saw the metaphor of technology as “usually defined as ‘a science or knowledge put into practical use to solve problems or invent useful tools. To me, however, the image that pops up in my mind is of a bunch of wires!”</td>
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Appendix 3: Interview Questions

The following question are the 5 themed question areas used during the interviews. Not all question were asked using the same words or asked in the same order for each participant.

Group 1

1. What does the term technology mean to you? (Not as a definition but as what meaning does it have to you as an individual learner and a professional)

2. What does education mean to you? (Same context as above)

3. Can the education (eco)system exist independent of technology?

4. Would you agree that technology and education are both inherently a futures-based activity? (The impact of their introduction is always felt more acutely into the future)

5. How do you see emergent technologies impacting the future of Post Compulsory Education (PCE), what should we worry about in the next five, fifteen or thirty years?

6. what should we be excited about technology education?

Group 2

1. Do you believe that public press, popular media, and sci-fiction adversely impact the independence of technology research and specifically technologies of learning?

2. In your opinion does the public press, technology Industry, popular media and sci-fiction adversely impact the independence of learning technology research?

3. Do you think the answers to the last groups of questions changes with class, culture, geolocation, demographics (west, east, young, old, male, female, etc)

Group 3

1. Most technology in PCE is introduced at the institutional level with the goal to increase efficiency. ‘Efficiency in delivery, efficiency in
student analysis and efficiency in administration and logistics’ and so on.

2. Would you agree, and
3. Why is learning not the primary concern?
4. Is there a growing danger of reductionism/determinism in our decision-making concerning research, pedagogy, and curriculum choices? In many senses are we abdication learning design decisions to data.
5. Do you agree, Is that a good thing?

Group 4

1. Do you agree with the statement “Technology does not teach people, people teach people”? Why/Why not?
2. Why are (is this why) learning technologies serve the institution (Group 3 Q1) and not the learner?
3. Do you see a time when technology is distributed equally between the institution and the learner? (I make the distinction here based on who owns the technology/data and has control over that data’s usage/share-ability)

Group 5

1. Do you agree that the metaphor of the “schoolhouse” remain unchallenged when we envision the future of technology in Post Compulsory Education?
2. Does this mean that (is this why) technology will always be portrayed as an enhancement to learning and not a means of re-invention?
3. Finally, who should be responsible for the long-term consequences of technologies impact on learning, education, and society? Should those considerations be included as part of the research findings and the public narratives of experts?
4. What didn’t I ask you that you believe is essential for me to consider from your perspective?