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Examining Philosophy of Technology Using Grounded Theory Methods

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Key words: grounded theory methods; semi-structured interview; questionnaire; critical realism; philosophy of technology; technological determinism; instrumental view of technology; technological optimism; technological imperative; educational technology leadership

Abstract: A qualitative study was conducted to examine the philosophy of technology of K-12 technology leaders, and explore the influence of their thinking on technology decision making. The research design aligned with CORBIN and STRAUSS grounded theory methods, and I proceeded from a research paradigm of critical realism. The subjects were school technology directors and instructional technology specialists, and data collection consisted of interviews and a written questionnaire. Data analysis involved the use of grounded theory methods including memo writing, open and axial coding, constant comparison, the use of purposive and theoretical sampling, and theoretical saturation of categories. Three broad philosophy of technology views were widely held by participants: an instrumental view of technology, technological optimism, and a technological determinist perspective that saw technological change as inevitable. Technology leaders were guided by two main approaches to technology decision making, represented by the categories *Educational goals and curriculum should drive technology*, and *Keep up with technology (or be left behind)*. The core category and central phenomenon that emerged was that technology leaders approached technology leadership by placing greater emphasis on keeping up with technology, being influenced by an ideological orientation to technological change, and being concerned about preparing students for a technological future.

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1. Introduction

My interest in this research topic arose from my firsthand lived experience working in educational technology and wrestling with the seemingly relentless pace of technological change, and endeavoring to make wise decisions as a leader. Many scholars have emphasized the importance of critically examining philosophy of technology assumptions such as technological determinism (CARR-CHELLMAN, 2005; FISHER, 2006; HOFMANN, 2006; KANUKA, 2008; KRITT & WINEGAR, 2010; McDONALD, YANCHAR & OSGUTHORPE, 2005; OLIVER, 2011; PEARSON & YOUNG, 2002; SELWYN, 2010; SMITH, 2006; STROBEL & TILLBERG-WEBB, 2009). Technological determinism is the philosophical perspective that assumes that technology causes inevitable change in society (LEONARDI, 2008, 2009), exerting a control over human society with technology considered in some way to be an autonomous force operating outside of social control (FEENBERG, 2010; HOFMANN, 2006; LEONARDI, 2009). Technological determinist assumptions, by granting a control or determined autonomy to technology, apart from purposeful human control and direction, can present a dilemma for educational leadership by limiting human agency and responsibility for technology (FISHER, 2006; HOFMANN, 2006; JONAS, 2009, 2010; KRITT & WINEGAR, 2010; SLACK & WISE 2006; STROBEL & TILLBERG-WEBB, 2009; WYATT, 2008). [1]

A review of the literature found that previously researchers had examined philosophical assumptions of technological determinism using case study methods and discourse analysis. GRANT, HALL, WAILES and WRIGHT (2006) used a case study approach to evaluate the technological determinist rhetoric of technology vendors and its influence on the actions of stakeholders and managers in private sector organizations. JACKSON and PHILIP (2010) were concerned with how corporate and higher education leaders manage technological change, and used case study methods to assess the relative effectiveness of three approaches, including technological determinism, that leaders use in managing techno-change. LEONARDI and JACKSON (2004) analyzed discourse surrounding corporate mergers to examine the effects of technological determinist rhetoric and how it was used to justify the actions of managers. CLEGG, HUDSON and STEEL (2003) used discourse analysis to examine higher education policy documents and the influence of rhetoric characterized by technological determinism. FISHER (2006) examined discourse and rhetoric present in advertising from technology vendors, discourse in educational policy documents, and public comments from educational officials, and observed a tendency for discourse to be framed in technological determinist language. [2]

While many educational technology scholars have emphasized the importance of questioning whether technological determinist are influential in thinking or decisions about technology, I found that empirical research was missing, and there was a gap in the literature concerning how technological determinist assumptions may influence the actual practice of educational technology leadership. No research could be found where grounded theory methods had been used to investigate philosophy of technology. Therefore, an important goal for my research was to develop a conceptual theory derived from the data that better explained the influence of philosophy of technology assumptions in educational technology leadership, while being open to the influence of technological determinist assumptions. [3]

1.1 Overview of Article's Sections

After this introduction's summary of the research problem, purpose, questions, and design, Section 2 will discuss the research paradigm of critical realism from which I proceeded in conducting the research. Section 3 will discuss my reasoning for considering grounded theory methods as appropriate for this qualitative study, noting some of the advantages that I saw in this approach. Next I turn to exploring the research methodology employed, with Section 4 largely serving as the heart of the article and its examination of philosophy of technology using grounded theory methods. Section 4 will describe the study's participants, the sampling methods used, and the data collection methods that combined a semi-structured interview protocol with a written questionnaire. I will also cover the data analysis methods I used that included memo writing, open and axial coding, constant comparative analysis, and theoretical saturation of categories. Section 5 will summarize the research findings and describe the core category that emerged from the data analysis. That section will present an abridged treatment of findings, but not an exhaustive coverage of the results. Finally, Section 6 will present conclusions including a substantive theory, with a graphical figure to show how the core category is given the greater weight in technology decision making. A substantive theory in the grounded theory tradition is a theory generated from empirical data and qualitative analysis that is derived from the substantive area (CORBIN & STRAUSS, 2008), and applies to the data while being independent of it (URQUHART, LEHMANN & MYERS, 2010). [4]

1.2 Research Purpose, Questions, and Design

The substantive area, or the area of inquiry for research and literature review (LEMPERT, 2007; URQUHART et al., 2010) for this study involved educational technology leaders working in K-12 education. K-12 education in the United State includes primary and secondary education, kindergarten through twelfth grade. This article describes the core category and central phenomenon that emerged, that Virginia K-12 educational technology leaders approach technology leadership through a practice of *Keep up with technology (or be left behind)*. [5]

The purpose of the qualitative study was to 1. examine what philosophical assumptions about technology are present in the thinking of K-12 technology leaders, 2. investigate how the assumptions may influence technology decision making, and 3. explore whether technological determinist assumptions are present. The study was guided by the work of STROBEL and TILLBERG-WEBB (2009), who presented a critical and humanizing framework for educational technology highlighting, as a starting point, that educators examine their philosophical assumptions and ideological perspectives about technology. They argued that beliefs and ways of thinking about technology, including assumptions of technological determinism, might influence professional discourse, and affect the actions of decision makers [6]

In conducting the research, I proceeded from a paradigm of critical realism. BOUCHER (2011) recommended critical realism as a research paradigm for resolving issues in the debate between technological determinism vs. social determinism. Three research questions were defined for the study:

- Q1: What broad philosophy of technology assumptions are present in the thinking of K-12 technology directors and instructional technology specialists?
- Q2: How do philosophy of technology assumptions influence the decisions that leaders make about educational technology?
- Q3: What assumptions characterized by technological determinism are present in leaders' thinking or decision making? [7]

To guard against any potential researcher bias, I framed the first question broadly so that the study would be open to any philosophical assumptions about technology present in the thinking of technology leaders. The second research question moved beyond examining what assumptions were present, to investigate how assumptions influence decision making about technology. The third research question focused on questioning whether or not assumptions of technological determinism were present in leaders' thinking and decision making. [8]

Participants for the study involved technology directors and instructional technology specialists working in K-12 education in the state of Virginia, USA. A total of 31 subjects participated in the study, from 19 school districts from different geographic areas throughout Virginia. Data collection instruments consisted of semi-structured interviews along with a written questionnaire with open-ended questions. The research design aligned with CORBIN and STRAUSS's (2008) methods for qualitative data analysis presented in their book, "Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory." Their methodology emphasizes a structured and procedure oriented approach, and it is accommodating of institutional requirements for research questions, literature review prior to research, and a theoretical framework. While the study did not employ classic grounded theory methods, CORBIN and STRAUSS methods include traditional grounded theory techniques such as theoretical sampling, constant comparison, and theoretical saturation of categories to generate a theory were used. Because at the time I was in my tenth year of working as a school district technology director, I considered it a priority to emphasize objectivity as much as possible during the study, through deliberately bracketing out or setting aside of prior assumptions and practical interests, to minimize their influence on theoretical considerations. As explained in Section 4.3.5 below, it should be noted that bracketing out prior assumptions proved to be more difficult than I expected. [9]

2. Research Paradigm of Critical Realism

The qualitative study was guided by the STROBEL and TILLBERG-WEBB (2009) critical and humanizing framework for educational technology which highlights as a starting point that educators should question whether technological determinism or social determinism influence their thinking about technology. In other words, educators should question whether technology is seen as driving social change, or whether social factors are seen as driving technological change. SMITH (2006) held that theoretical debate between positions such as technological determinism, and opposing positions that emphasize the role of social factors in causing technological change, requires the rethinking of philosophical assumptions. In order to advance theory and research, SMITH asserted that research from the perspective of critical realism would help to move past theoretical dichotomy and alleviate theory-practice inconsistencies. BOUCHER (2011) recommended critical realism as a research paradigm for resolving issues in the debate between technological determinism vs. social determinism. [10]

I proceeded from a research paradigm of critical realism, which provides a philosophical structure for pursuing research that recognizes the fallible character of scientific knowledge, but insists on the objective existence of natural and social realities (ELGER, 2009). Critical realism holds that although scientific knowledge of the world is fallible and theories may require revision, objective knowledge about a real world is attainable (COBERN & LOVING, 2008; ELGER, 2009; TROCHIM & DONNELLY, 2008). I recognized that the study's research questions dealt with assumptions concerning the connection between technology and society, and involved philosophical issues including causality. MILLER and TSANG (2011) held that research to study causality and identify causal mechanisms can benefit from qualitative research designs from a critical realist perspective. [11]

Unlike positivism that tends to view the research setting as a closed system, critical realism is more open and can better recognize the larger social reality that affects teachers and students, in matters such as technology integration (HODGKINSON-WILLIAMS, 2006). Critical realism rejects the polarized debate between positivism and constructivism (ELGER, 2009), can help a researcher to remain critically reflective, and the perspective allows for theory to emerge from research that investigates a phenomenon and its mechanisms at a deep level (CRAWFORD & WRIGHT, 2010). [12]

Critical realism remains committed to moving ever closer to a truthful understanding of reality (TROCHIM & DONNELLY, 2008), and this can involve revising, changing, or discarding theory over time (COBERN & LOVING, 2008). It is my hope that the substantive theory that emerged from this particular qualitative study will be considered in future studies by other researchers, and adapted, modified, or revised where appropriate based on new data and analysis. [13]

3. Appropriateness of Grounded Theory Methods for the Study

In considering how to study the research problem, a quantitative approach was first considered, but no validated instrument could be found suitable for measuring philosophical assumptions about technology. Within her discussion of qualitative research in the context of leadership, OSPINA (2004) wrote that a key reason to use qualitative research is to explore a phenomenon that has not been previously investigated, and which may be examined subsequently through quantitative research. I decided to pursue a qualitative study, and hoped that the richness of the data might be used in the future to inform quantitative research. [14]

At first I considered pursuing a phenomenological study, reasoning that its emphasis on bracketing out one's bias and prior assumptions would enhance objectivity. However, a research design more conducive to generating theory was desirable, and it became apparent that research from the grounded theory tradition would provide a greater theoretical sensitivity, and interpretive insight concerned with building theory (SUDDABY, 2006). Besides, some scholars (COPE, 2005; LUCKERHOFF & GUILLEMETTE, 2011; STARKS & TRINIDAD, 2007) have asserted that grounded theory methods incorporate in an implicit way the phenomenological technique of bracketing in its concern that the researcher must recognize his or her own prior theoretical assumptions in order to better proceed with an open mind (URQUHART et al., 2010). [15]

During data analysis using grounded theory methods, the use of comparisons presses researchers to examine their own bias and assumptions, and those of participants (CORBIN & STRAUSS, 2008). I was attracted to grounded theory methodology, believing that it could be used to reduce the impact of bias and subjectivity through the use of its memo technique, in which the researcher writes about and analyzes data, while reflecting on his or her own bias (ELLIOT & LAZENBATT, 2005; LUCKERHOFF & GUILLEMETTE, 2011). Grounded theory methodology was selected because of its emphasis on proceeding with an open mind (URQUHART et al., 2010) to investigate philosophy of technology assumptions of educational technology leaders, and to generate an explanatory conceptual theory. It was also reasoned that grounded theory methods would be appropriate for investigating philosophical assumptions pertaining to technology. Researchers had used grounded theory methods to examine philosophical beliefs and assumptions such as the axiological beliefs and ethical reasoning important for nursing practice (CALLISTER, LUTHY, THOMPSON & MEMMOTT, 2009), ethical beliefs influential in organizational leadership (ARDICHVILI, MITCHELL & JONDLE, 2009), and spiritual beliefs important for business leadership (FERNANDO, BEALE & GEROY, 2009). [16]

4. Research Methodology

Subjects were educational technology leaders working in Virginia school districts, including K-12 technology directors and instructional technology specialists. Virginia technology directors are the chief technology officers for their school districts. They work closely with school administrators, faculty, and stakeholders, and provide professional leadership and vision for educational technology in support of school district goals. In Virginia, instructional technology specialists generally serve as instructional technology resource teachers, a state mandated position that provides leadership for instructional technology integration, including collaborating with and training teachers to integrate technology and software effectively. [17]

4.1 Purposive sampling and theoretical sampling

The process for selecting and recruiting participants focused on identifying technology directors and technology specialists who had been involved with planning or implementing educational technology initiatives requiring strategic reflection about a variety of key issues, including possible questioning of philosophical or ethical issues. To identify such technology leaders, I consulted technology conference publications, school district technology plans, school district and educational technology websites, professional blogs, and minutes from consortium meetings. [18]

At time of the study, I was working as a Virginia school district technology director, and was fortunate to be able to leverage professional relationships forged through educational technology conferences and consortia. Participants were recruited through e-mail and over the telephone. A script for each approach was used that avoided undue pressure on potential participants, promoted informed consent, and emphasized that participating in the study would be voluntary. A recruiting adjustment made early in the study involved a shift to placing greater emphasis on telephone recruiting, since recruiting or scheduling interviews through e-mail often did not garner a response. [19]

Data collection involved both purposive and theoretical sampling, methods that researchers have found can complement each other (BRECKENRIDGE & JONES, 2009; KENEALY & CARTWRIGHT, 2007). Research can begin with a purposeful selection of the initial sample, and then shift to theoretical sampling later during data analysis to develop abstract concepts (BRECKENRIDGE & JONES, 2009; KENEALY & CARTWRIGHT, 2007). My research began with purposive sampling to select twenty participants who worked in educational technology leadership. The participants were selected in a nonrandom way, in order to purposefully select participants who have been involved with notable technology initiatives. Half of the initial participants were technology directors, so that a strong sample of district-wide technology leadership would be included in the study. The other half of the initial participants were instructional technology resource teachers who provided leadership for technology integration, collaborated with teachers, and delivered technology professional development. [20]

As data collection and analysis progressed, the sampling process shifted to theoretical sampling to develop the conceptual categories and emerging theory (CHARMAZ & HENWOOD, 2008; STERN, 2007). Researchers can use theoretical sampling to seek out participants who have had particular experiences, or in whom particular concepts appear significant (MORSE, 2007), in order to gather data related to conceptual categories and their properties (CORBIN & STRAUSS, 2008). During data analysis, the emerging theory prompted me to pursue interviewing additional subjects to build the abstract concepts. The data analysis led to additional data collection, to seek out data from other sources that might be conceptually relevant. [21]

Data collection continued until theoretical saturation had been reached, and 31 subjects had participated in the study: 15 technology directors and 16 instructional technology specialists. Among the 31 participants, there were 17 men and 14 women, from 19 school districts from different geographic areas of the state. Both city and county school districts were included, and districts from 13 rural and 6 urban areas. The U.S. Census Bureau's definition of urban was used, which defines it as a population density of 1,000 or more persons per square mile, or incorporated places with a population of 2,500 or more (BUREAU OF THE CENSUS, 2011). [22]

4.2 Data collection

My study utilized a semi-structured interview protocol (AYRES, 2008; HARRELL & BRADLEY, 2009; LAHMAN & GEIST, 2008) that took a funnel approach by beginning with a broad open-ended question, followed by more focused questions to elicit further information and clarify responses (HARRELL & BRADLEY, 2009). This mostly standardized but still open approach to interviews was used because it provided consistency from one interview to the next, while accommodating probing questions (AYRES, 2008), and allowing participants to provide as much information or details as they felt comfortable sharing (TURNER, 2010). While following the semi-structured interview protocol, I remained mindful of how CORBIN and STRAUSS (2008) recommended that allowing a participant to tell their story openly can result in the most data dense interviews (please see Appendix 1 for the interview questions and protocol). [23]

The interviews began by inviting participants to speak openly to describe their philosophy of technology in their own words. This broad opening interview question served to provide data pertaining to the study's first research question, concerned with the broad philosophy of technology assumptions present in the thinking of technology leaders. The ensuing interview questions followed an open-ended approach to interviewing (TURNER, 2010) that involved asking each participant the same structured, open-ended interview questions. I used probing strategies, such as asking for clarification, specificity, or elaboration on responses, to elicit thoughtful and complete responses (AYRES, 2008; HARRELL & BRADLEY, 2009; PERSAUD, 2010). Concluding the interviews and bringing closure to the process included allowing time for participants to clarify any response, winding things down in a courteous manner, and thanking the participant (PERSAUD, 2010). [24]

Interviews can be conducted over the telephone or face-to-face (HARRELL & BRADLEY, 2009; LAHMAN & GEIST, 2008), and because the participants were located across a wide geographic area throughout the state of Virginia, most interviews were conducted over the telephone. For participants within a reasonable driving distance, an in-person interview was an option, and two of the 31 interviews were conducted in person. If participants gave written permission on the informed consent form to record the interview, interviews were audio recorded with an iPod, to aid with transcription. To record telephone interviews, an iPod was connected to an iPhone via a splitter, which allowed both the headset and iPod to receive the audio signal. The recordings were kept secure using a passcode on the iPod, and then the audio files were transferred to a password protected computer. The recordings were deleted after data analysis was complete. [25]

To enhance the validity and reliability of the qualitative study, triangulation of data was pursued through conducting the semi-structured interviews followed by administering a written questionnaire with open-ended questions (see Appendix 2). Triangulation of data is advantageous for qualitative research because using different data sources can increase insight into the phenomenon under study and develop a more comprehensive understanding, while reducing potential bias (KITTO, CHESTERS & GRBICH, 2008; KUPER, LINGARD & LEVINSON, 2008). [26]

After the conclusion of their interview, the written questionnaire, in the form of a word processing document, was delivered to the interviewees via e-mail. After they completed the written questionnaire participants could simply attach the file and return it via e-mail. The written questionnaire began with a broad question to allow the participants to share any philosophy of technology in their own words. Additional open-ended questions followed that were different from the interview questions, but still aligned with the research questions. Completed written questionnaires were received from all 31 participants, so data collection resulted in a total of 31 interview transcripts and 31 written questionnaires. [27]

4.3 Data analysis

Computers cannot intelligently formulate concepts (HOLTON, 2007; PATTON, 2002), but data analysis software can help to remove some of the drudgery from data analysis, and can be useful for organizing, managing, searching, and coding data (CORBIN & STRAUSS, 2008; PATTON, 2002). I used the qualitative data analysis software program MAXQDA 11 (recommended by CORBIN and STRAUSS in their research guide) to import transcripts, write memos, code conceptual categories, properties, and dimensions from the data, conduct data analysis, and refine conceptual theory. [28]

Using the interview protocol document, I typed participant responses during the interviews, which expedited the transcription process. In some cases, all that became necessary after the interviews was correcting spelling or grammar errors. In some cases, listening to the audio recordings was beneficial for filling out nuances of the interview previously missed. On rare occasions, listening to the recordings slowly, while pausing and rewinding, was even critical for capturing all of the richness of the responses. [29]

After completing the interview transcriptions, and receiving the written questionnaires back from the participants, I saved the Microsoft Word documents in Rich Text Format, and imported them into MAXQDA. A document set was created in MAXQDA for each participant, named using the pseudonym for that participant. The personal identifiers from each of the documents including the name, title, and school district were cut from the documents, so that they would not be referenced in any codes or exported reports, and were moved to hidden document memos within the database. [30]

4.3.1 Memo writing

Data analysis emphasized the technique of writing memos to write about and think critically about the emerging data, and engage in an internal dialogue with it (CORBIN & STRAUSS, 2008; GROUNDED THEORY INSTITUTE, 2009). Through writing memos, I was able to engage with the data to ask questions of it, and integrate relevant material from the literature to support the theoretical integration (GROUNDED THEORY INSTITUTE, 2009; LEMPERT, 2007). Memo writing is an essential component of engaging with the data, allowing emerging patterns and concepts to be transformed into theory (LEMPERT, 2007). Figure 1 shows a code memo related to the emerging concept of *Technological optimism* that was emerging as important for theory (WEBSTER, 2013, p.139).

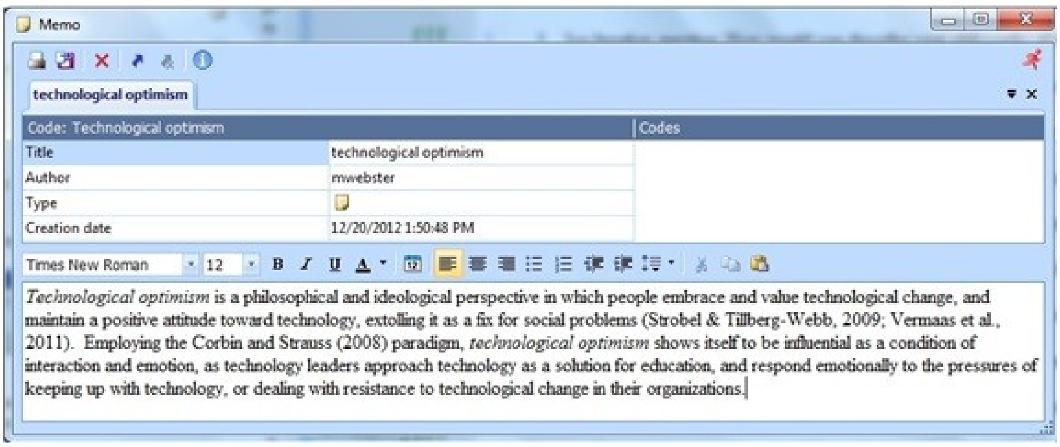

Figure 1: Example of a code memo in MAXQDA [31]

Memos can serve as the analytical building blocks for what may become theory (ELLIOT & LAZENBATT, 2005), and I leveraged the code memos and document memos when writing up the research findings and conclusions. I also used memo writing in the effort to reduce the impact of subjectivity, by analyzing data while reflecting on and bracketing out my own bias in order to become aware of it, and transcend it as much as possible (ibid., see also LUCKERHOFF & GUILLEMETTE, 2011). In addition to creating written memos, I created visual diagrams during data analysis, first on paper, and then using Microsoft Visio, to engage visually with the data and depict relationships between concepts. [32]

4.3.2 Open and axial coding

In grounded theory methodology, data collection and analysis can work in a circling spiral manner, with alternating episodes of data collection followed by analysis (GLASER, 2001; LUCKERHOFF & GUILLEMETTE, 2011). I began coding soon after data collection began, immediately after the first interview, and continued this spiral process of data collection followed by analysis during the remainder of the study. The coding process used featured open and axial coding, which are distinct yet closely related methods (CORBIN & STRAUSS, 2008). [33]

During open coding, I analyzed the data from the interviews and questionnaires by going through transcripts line by line, and breaking them apart into segments or incidents to delineate the concepts, called categories, that represented raw blocks of data (ibid.; see also SHANNAK & ALDHMOUR, 2009). The segments of data delineated during open coding were typically short phrases, a sentence or two, or paragraphs (SHANNAK & ALDHMOUR, 2009). During open coding, the work involved qualifying the conceptual categories by defining properties, which are characteristics that describe the concepts, and identifying dimensions, which are variations within properties that provide specificity (CORBIN & STRAUSS, 2008). [34]

Axial coding was then used to reintegrate the data by relating concepts to each other (CHARMAZ & HENWOOD, 2008; CORBIN & STRAUSS, 2008). During axial coding, I selected the concept that appeared to have the greatest explanatory relevance, placed it at the center of an axis, and related and connected other concepts to it (ibid.). [35]

During data analysis, I used the CORBIN and STRAUSS (2008) coding paradigm to analyze data for context, or the circumstances to which participants respond, and then identify important causal conditions and consequences. I found that this was particularly important in analyzing the data to find answers to the second research question concerned with how philosophy of technology assumptions influenced the decisions that leaders make about educational technology. A discussion of how the coding paradigm was used is provided in Section 5.2.2. [36]

CORBIN and STRAUSS (2008) asserted that open and axial coding are so closely related that the distinction between the two is somewhat artificial. In performing data analysis, I first broke open the data in open coding to define the concepts, and this was followed by axial coding to put the data back together by relating concepts to each other (ibid.). In my research experience, I certainly found that coding was a fluid and evolving process, as gradually certain concepts emerged as primary concepts, were placed at the center of an axis, and then secondary concepts were related to the more primary concepts. [37]

4.3.3 Constant comparative analysis and abductive logic

The work of data analysis was guided by constant comparison to compare incidents in the data with other incidents, find similarities and differences between concepts, and find plausible relationships between concepts (ibid., see also SCHRAM, 2006). The use of comparisons can press the researcher to examine his or her own bias and assumptions and those of participants (CORBIN & STRAUSS, 2008). I found that the constant comparison process is a valuable research technique for examining philosophy of technology assumptions. [38]

While qualitative research and grounded theory methods designed to discover connections between concepts originating from data is often described (GLASER, 2009; SUTER, 2012) as an inductive process, CORBIN and STRAUSS (2008) argued that the method also uses deduction. They held that analysis is inductive because findings are derived from data, but a researcher in interpreting the data employs deductive logic. [39]

However, some scholars have also argued that data analysis in the grounded theory tradition employs the logical inference of abduction (REICHERTZ, 2010; SHANNAK & ALDHMOUR, 2009), and this particular researcher discovered this to be the case. I found constant comparison to sometimes be about detective work, and asking "what if" questions of the data. During constant comparative analysis I used theoretical comparisons to deal with unexplained incidents in the data that required wrestling with it to identify the significance and meaning of the unexplained (CORBIN & STRAUSS, 2008). Theoretical comparisons are an analytical tool to stimulate logical thinking by comparing the properties and dimensions of concepts (ibid.). In order to deal with surprising phenomenon, the methodology counts on abductive reasoning to explain the unexplained (REICHERTZ, 2010). Abductive reasoning attempts to close the gap by conjecturing a hypothesis, that if it were true, would cause the surprising phenomenon as a matter of course, and thereby explain it (WUISMAN, 2005). [40]

Research findings pertaining to the core category, *Keep up with technology (or be left behind)*, are presented in Section 5.2.1, and this study's substantive theory is presented in Section 6. I employed abductive logic by doing detective work in pondering the apparent tension technology leaders experience between the competing philosophies *Educational goals and curriculum should drive technology*, and *Keep up with technology (or be left behind)*. In conjecturing a hypothesis that would explain how technology leaders succumb to pressure to pursue technology for the sake of technology, despite having an instrumental view of technology, I concluded that weighted priority is placed by technology leaders on the pressures they often experience to keep up with technological change. The analytical process of integrating conceptual categories continued as I refined theory, checked for gaps in logic, and reworked the categories. Many codes and pieces of data were moved around in MAXQDA as the relationships between concepts became more apparent. [41]

4.3.4 Theoretical saturation of categories

A movement from description to conceptualization characterizes the process of integrating categories around a core category (CORBIN & STRAUSS, 2008). The goal of the data analysis was theoretical saturation, when the categories were well developed so that no new properties or dimensions emerged, meaning that each concept was theoretically saturated (ibid., see also GLASER, 2007). As explained later in Section 5.2.1, the category *Keep up with technology (or be left behind)* emerged as the core category. This concept emerged early in data collection and analysis, and continued to grow in explanatory relevance. As data analysis progressed I linked concepts around the core category, and the process moved toward achieving theoretical integration, when abstract and interrelated concepts had general applicability to the different cases in the study, and explained the variations and differences in the cases (CORBIN & STRAUSS, 2008). [42]

During data analysis I considered theories from the literature, because theoretical integration should place theory within the context of other theories (URQUHART et al., 2010). Data collection and analysis continued until the point of theoretical saturation, when the properties, dimensions, and variations of all conceptual categories were well developed (CORBIN & STRAUSS, 2008). It seemed evident after collecting and analyzing data from 31 participants that theoretical saturation had been reached. [43]

4.3.5 Theoretical sensitivity and the difficulty of bracketing out bias

Theoretical sensitivity concerns the researcher's ability to see relevant data through his or her theoretical insights in the area of research, while remaining attentive to subtleties of meaning and being open to relevant data and conceptual emergence (GLASER & HOLTON, 2004; GLASER & STRAUSS, 1967; SUDDABY, 2006). SCHRAM (2006) explained that the strategic concern for fieldwork of positioning involves being in a position to understand and make use of data, and figure out how things connect together and to the big picture. My experience working as a technology director and instructional technology specialist contributed toward the strategic consideration of positioning, helped with theoretical sensitivity, and provided insight for discerning concepts and theory pertaining to philosophy of technology assumptions in leadership. I tried to maintain analytic distance (GLASER & HOLTON, 2004), while being open to new and unexpected interpretations of data, and striving to be skillful in combining literature, data, and experience (SUDDABY, 2006). [44]

Unfortunately, the benefits afforded by theoretical sensitivity were complicated by the fact that bracketing out prior assumptions proved to be more difficult than I had imagined. The methodological technique of bracketing originated with phenomenology (HUSSERL, 1965 [1935]), and involves setting aside, without abandoning, one's own prior assumptions, practical interests, and bias (BEYER, 2015; HUSSERL, 1965 [1935]; STARKS & TRINIDAD, 2007; WILLIG, 2008). Although I tried earnestly to maintain an objective openness to the data, I feel my efforts with bracketing were only partially successful. Because grounded theory methodology involves data collection and analysis working in a spiral fashion manner, and constantly asking questions of the data, I found that deference to theoretical sensitivity tends to be given priority over a rigid adherence to bracketing. [45]

5. Summary of Research Findings

Thirty one interview transcripts and 31 written questionnaires were imported into MAXQDA, organized into document sets corresponding to each participant, with document sets and documents named using pseudonyms. The documents were carefully coded and analyzed using open and axial coding. I used in-vivo codes in some instances, creating codes using the actual words of participants. In other cases, as constant comparative analysis was used to compare incidents in the data to find those that were conceptually similar, I created codes for categories, properties, or dimensions to raise the data to a conceptual level. Coding resulted in 377 conceptual codes involving 2,109 coding instances from the transcripts. There were 19 overall conceptual categories in the code system. Table 1 displays the conceptual categories and their coding frequencies.

Category	**Coding Frequency**
Keep up with technology (or be left behind)	393
Make an informed decision about technology—other considerations outside of philosophy of technology	351
Educational goals and curriculum should drive technology	235
Technology is a tool	203
Technological change is inevitable	149
Technological optimism	137
Consider ethical factors associated with technology	121
Technology causes unintended consequences	117
Technology raises questions of human values	86
Both technology causes social change and social factors shape technology	69
Philosophy of technology influenced by philosophy of education	59
Technology causes social change	58
Consider philosophy of instructional technology	40
Technology is integral to our lives	23
Technological optimism and pessimism (both present)	19
Social factors shape technology	15
Technological pessimism	14

Category	**Coding Frequency**
Philosophy of technology for 21st century skills is influential	10
Optimistic about life in general	5

Table 1: Conceptual categories and coding frequency sorted by frequency [46]

5.1 Findings for Research Question 1

The first research question was framed broadly so that the study would be open to any philosophical assumptions about technology present in the thinking of technology leaders. For Research Question 1, three categories were prevalent, including *Technology is a tool*, *Technological change is inevitable*, and *Technological optimism*. While not as prevalent as the other three, the category *Technology raises questions of human values* was associated with a majority of participants. [47]

5.1.1 Technology is a tool

The results show that the perspective *Technology is a tool* was a prevalent philosophy of technology. The 203 code instances for this category were distributed among 40 of the 62 documents, with coding instances from 27 of the 31 participants. Participants often described how their philosophy of technology was characterized by an instrumental view of technology as a tool. For example, Technology Director 4, in responding to the first interview question responded with "I look at technology as a tool to get the job done, not as an entity by itself." The category *Technology is a tool* was interpreted as aligning with the widely held philosophy of technology known as the instrumental view of technology. The instrumental view of technology considers technology as a tool, as means put to use by users for their purposeful ends (BERGER, 2011; FEENBERG, 1991; HEIDEGGER, 2009 [1977]). Properties for this category included *technology is an instructional tool or tool for learning*, *technology is a productivity tool*, *technology is value neutral*, *technology is a tool or medium for communication*, *technology is a resource for information*, *philosophy of technology as a tool influences practice or decisions*, and *technology is a means to an end*. [48]

5.1.2 Technological change is inevitable

The philosophy of technology assumption *Technological change is inevitable* was also prevalent, and present in the thinking of 30 out of the 31 participants. There were 149 coding instances for this category distributed among 36 of 62 documents. An example of a coding instance is that one technology directory stated, "Technological change is inevitable and we should not resist it. That is my philosophy! We've gone through more change because of technology than anything else in the last 150 years." [49]

5.1.3 Technological optimism

Technological optimism was a prevalent philosophy of technology, present in 28 out of the 31 participants, with 137 coding instances distributed among 38 of 62 documents. For example, a technology director expressed technological optimism in stating, "A favorite saying of mine is that whatever the ill might be, technology will save the world!" Within this category, one of the more significant properties included technology advocacy which consisted of 28 coding instances from 17 documents and 14 participants. For example, an instructional technology specialist responded in the written questionnaire with, "I try to stay optimistic and attempt to be proactive in encouraging my colleagues to use technologies." [50]

5.1.4 Technology raises questions of human values

The philosophy of technology represented by the category *Technology raises questions of human values* was held by a majority of the participants, 22 out of 31, with 86 coding instances distributed among 26 of the 62 documents. The philosophical view represented by this category was interpreted as aligning with HOFMANN's theory that technology is value laden. The position that technology is value laden, rather than value neutral, does not mean differentiating between good technology and bad technology (HOFMANN, 2006). The emphasis rather is that technology raises questions of human values, either through promoting particular values, or because the employment of technology has ethical consequences, whether intended or unintended (ibid.). In arguing that educational technology is value laden, AMIEL and REEVES (2008) asserted that often people have a limited view of educational technology focused on specific technological devices, rather than a broader representation of technology as a process and value laden system. They held that neither education nor technology are value neutral, but rather educational technologies are interconnected with agendas, economics, and social needs and consequences. [51]

5.2 Findings for Research Question 2

The second research question shifted from examining what philosophy of technology assumptions were present to examining how assumptions influenced the decisions that educational technology leaders made. To obtain data pertinent to this research question, technology leaders were asked specific questions during the interview, and also in the written questionnaire, designed to connect philosophical thinking about technology to educational technology leadership or technology decision making. Five philosophies of technology emerged that were influential in decision making about educational technology. Three categories were prevalent, including *Keep up with technology (or be left behind)*, *Educational goals and curriculum drive technology, and Consider ethical factors associated with technology*. [52]

5.2.1 Core category

The category *Keep up with technology (or be left behind)* emerged as the core category, with the greatest explanatory relevance, was associated with all 31 participants, with 393 coding instances from 58 of the 61 documents. This concept appeared at the beginning of the process of data collection and analysis, and continued to grow in explanatory power as the study progressed. In the written questionnaire, Technology Director 2 stated, "My goal is to get more and more technology in the hands of our staff and students," and concluded "Technology is always changing and you must change with it or you will be left behind." In describing the process for identifying the core category, LAHMAN and GEIST (2008) asserted: "The researcher identifies a central phenomenon, explores occurrences, emotions, or beliefs that influence the phenomenon, and examines the results of the phenomenon" (p.360). In analyzing the data, it was evident that the core category had a strong connection to the emotions of technology leaders, and was operative in the actions of leaders. Technology Specialist 3 stated: "There is no stopping technology, if we embrace it for what it can do for education, everybody will be happier all around. All the time you have to keep up with technology, it's a constant challenge." [53]

The core category, *Keep up with technology (or be left behind)*, had two major properties, *pressure to keep up with technology*, and the *resistance to technological change* leaders described encountering in their schools, and these properties were found to be in conflict with each other. The approach to technology decision making represented by the core category, *Keep up with technology (or be left behind)*, arose out of the parent philosophical perspective *Technological change is inevitable*. Figure 2 depicts *Keep up with technology (or be left behind)* and its properties, as a technological imperative following from the philosophy of technology assumption *Technological change is inevitable* (WEBSTER, 2013, p.244).

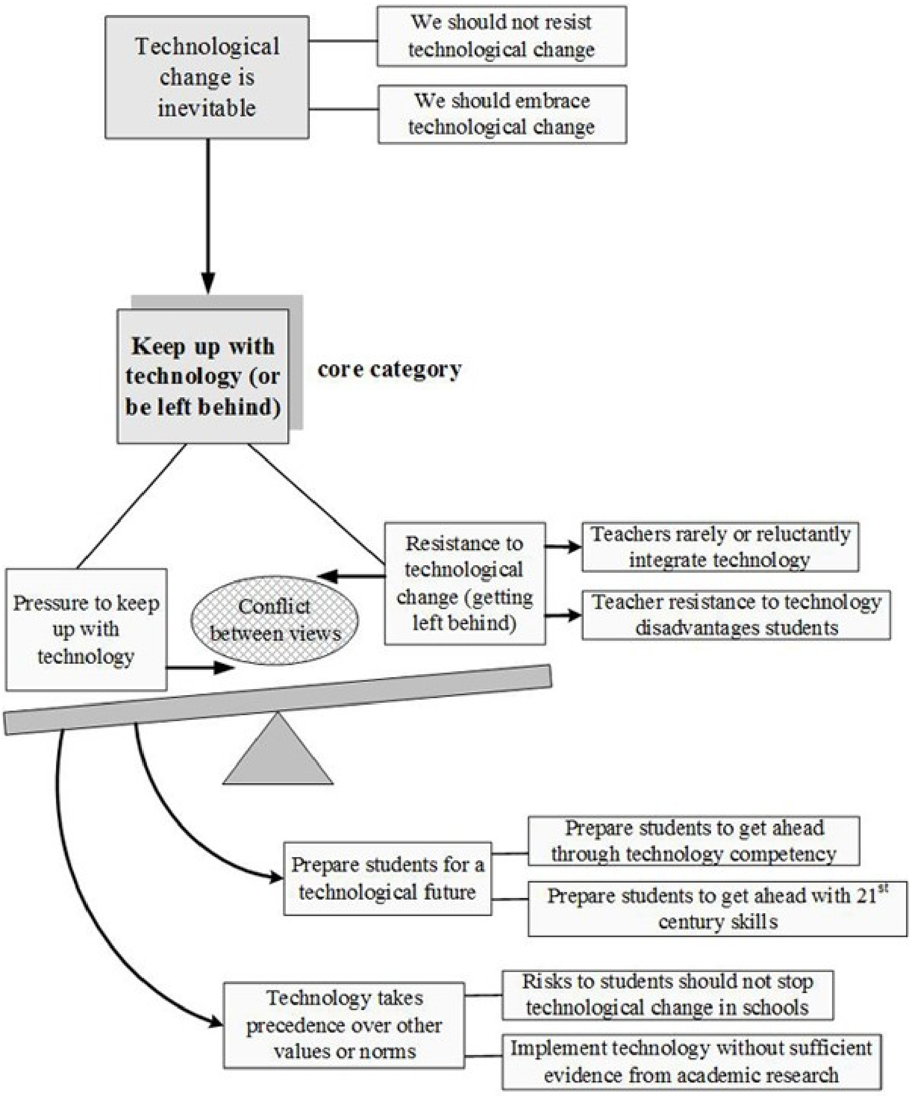

Figure 2: The core category *Keep up with technology (or be left behind)* and its properties, following from the assumption *Technological change is inevitable* [54]

Weighted priority is placed by educational technology leaders on the pressures they experience to keep up with technology, as they struggle with resistance to technological change in their organizations. [55]

5.2.2 CORBIN and STRAUSS's coding paradigm

The philosophy represented by *Educational goals and curriculum should drive technology* is similar to what many scholars have argued is the appropriate role for educational technology, and was found to be connected with holding an instrumental view of technology. *Educational goals and curriculum should drive technology* had 235 coding instances from 56 documents and 30 out of 31 participants. The category had two major properties, *consider the intended educational goals for technology*, and *don't pursue technology for the sake of technology*. [56]

During data analysis, the CORBIN and STRAUSS (2008) coding paradigm was used to analyze data for context, or the circumstances to which participants respond, and then to identify important causal conditions and consequences. The coding paradigm was useful during data analysis to link philosophical thinking about technology, with how leaders responded in terms of decision making about educational technology. Early in the process of data analysis, I first treated *Educational goals and curriculum should drive technology* as a property of *Technology is a tool*. However, later *Technology is a tool* was treated as a macro level context, because it showed itself to be a broad philosophical perspective from which technology leaders often think and respond. *Educational goals and curriculum should drive technology* then emerged as a category and approach to technology decision making arising from the philosophy *Technology is a tool*. The results showed these two categories are closely linked. For example, in the case of Technology Director 12, this leader expressed at the beginning of the interview the philosophy that technology is a tool:

> "We just had a discussion the other day about our iPad initiative that we recently launched in high schools. The initiative shouldn't be about the device or the thing, rather it's about using that as a tool as a resource for instruction." [57]

He also explained that educational goals and curriculum should drive technology, by stating:

> "The driving force for technology should be the educational needs of the school or division. Technology should be another resource to accomplish the goals for student achievement. Otherwise, technology is being implemented and then everyone has to figure out how to make it work to support division and school needs." [58]

The category *Consider ethical factors associated with technology* was also a prevalent category linking philosophical thinking to decision making. There were 125 coding instances for *Consider ethical factors associated with technology*, from 42 documents and 29 of the 31 participants. Technology leaders described how ethical considerations pertaining to technology were taken into account in making decisions about technology. Technology Specialist 9 explained, "Being in education, there are many things that we consider in terms of acceptable use policy, understanding age appropriate use of technology, parental permission, and ensuring safeguards." [59]

5.3 Findings for Research Question 3

Because this article focuses on qualitative research methodology, rather than extensive philosophical discussion, the findings for research question 3, concerned with whether assumptions of technological determinism were found to be present, are summarized without delving deeply into the philosophical nuances. As mentioned earlier in Section 5.1.2, the philosophy of technology assumption *Technological change is inevitable* was prevalent, present in the thinking of 30 out of the 31 participants. The key factor to be emphasized in our present discussion is that *Technological change is inevitable* was interpreted as being a manifestation of the philosophical assumption of the technological imperative, described by some scholars as associated with technological determinism (CHANDLER, 1995; CUKIER, NGWENYAMA, BAUER & MIDDLETON, 2009). The technological imperative involves rhetoric and underlying assumptions that technology has a controlling influence (HOFMANN, 2006) that is inevitable and unstoppable (CHANDLER, 1995; CUKIER et al., 2009; LEONARDI, 2008) and creates an imperative to keep up with technological developments (STROBEL & TILLBERG-WEBB, 2009). An example from the transcripts is that Technology Specialist 8 asserted, "My philosophy is that technology is imperative for today's schools and for other sectors, it's growing in leaps and bounds. Not all technology is good, but it's an unstoppable force, and it has to be used and harnessed properly." Discourse characterized by the technological imperative and the inevitability of technology can be employed to persuade others, with the rhetoric creating an ideological orientation in a culture toward technological change (CUKIER et al., 2009; LEONARDI, 2008). Philosophical debate on technological determinism has generally focused on how technology might be properly understood to have its own autonomy in causing social change. Participants' concerns surrounding an imperative to keep up with technology appeared to not be motivated primarily by a perception that technology was in control, but rather participants' concern for keeping up with technology in order to benefit students. [60]

6. Substantive Theory and Conclusion

As previously described, the instrumental view of technology and viewing technology as a tool for education is an overarching philosophy of technology widespread among participants. Under the instrumental view of technology, technology is employed as a means to an end, not an end itself, and not for its own sake. The approach to decision making *Educational goals and curriculum should drive technology*, connected with the instrumental view of technology, was a prevalent philosophy of technology. However, it is evident from the data that schools and technology leaders are under pressure to keep up with the latest technology. This pressure to keep up with technology can result in procuring and implementing technology without aligning technology with clear educational goals. As they experience the seemingly relentless pace of technological change, educational technology leaders can feel pressure to keep up with technology for its own sake. For example, Technology Specialist 15 observed, "It seems like in the ever-evolving technology world, folks are fast to jump on the bandwagon for the latest and greatest gadget or piece of software without first considering its instructional impact." I concluded that the core category is effectively an ideological orientation to technological change, similar to what LEONARDI (2008) found in a study of technology managers in the private sector. *Keep up with technology (or be left behind)* was found to essentially be a technological imperative following from the philosophy of technology assumption *Technological change is inevitable*, and oriented toward a concern for helping prepare students for a technological future. Figure 3 (WEBSTER, 2013, p.267) depicts a substantive theory focused on the core category *Keep up with technology (or be left behind)*.

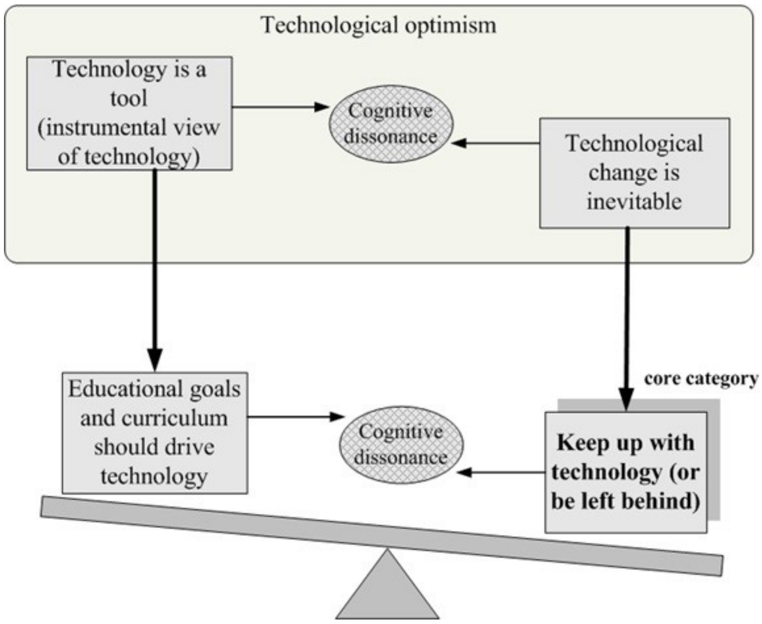

Figure 3: Substantive theory—*Keep up with technology (or be left behind)* is given the greatest weight in technology decision making [61]

The figure depicts two broad philosophy of technology perspectives, *Technology is a tool* (instrumental view of technology, and *Technological change is inevitable*, in conflict with each other, and situated within the perspective *Technological optimism*. Similarly, the two approaches to educational technology decision making are shown in conflict with each other, and linked with their respective parent philosophy. The core category *Keep up with technology (or be left behind shows)* emerges as the primary concern of leaders as they deal with their perceived experience of the inevitability of technological change, and is often given the greater weight in technology decision making. [62]

The study showed that philosophy of technology assumptions do matter, and the assumptions shape educational technology leaders' approaches to technology decision making. As noted earlier, the study was guided by the work of STROBEL and TILLBERG-WEBB (2009) who proposed a critical and humanistic framework for educational technology. The fact that *Keep up with technology (or be left behind)* emerged as the core category supports STROBEL and TILLBERG-WEBB's concern for critically analyzing technological determinist assumptions in educational technology. Grounded theory methods for qualitative data analysis, especially constant comparison, and theoretical saturation of categories, proved to be valuable for examining philosophy of technology and its influence on decision making. [63]

Appendix 1: Interview Questions and Protocol

Philosophy of technology assumptions in educational technology leadership: Questioning technological determinism

Date: ___________________________________

Participant name: ____

School or district: ____

Job title: ____

Interviewer name: ____

<u>Introductory protocol</u>

To assist with my data collection and interview note taking, I would like to audio record your interview. I am the only person who will listen to the recording, and the audio file will be kept safeguarded on a password protected device. After completing my note taking and data analysis the recording will be deleted.

You had previously signed a release form that meets the human subject requirements for Northcentral University. There is no intent to inflict harm, and the research does not involve more than minimal risk to participants. In reporting the results of my study, no personally identifiable data such as name, school, or district will be reported that might connect the data to a participant. Your participation in this study is voluntary and you can opt to withdraw from the study at any time. You may choose not to answer any question during the interview.

My dissertation research focuses on examining philosophy of technology assumptions in educational technology leadership, and how these assumptions influence decision making and leadership. Participants for this study include educational technology leaders such as yourself from Virginia school districts, including technology directors and instructional technology specialists. The interview will include a series of open-ended questions, and the interview is expected to take approximately 30 minutes. Thank you for agreeing to participate in this research study.

<u>Interview questions</u>

1. Ice-breaker question: How would you describe your philosophy of technology?
2. Follow-up probing question: Does what you describe as your philosophy of technology have implications for your work as an educational technology leader?
3. When you think back to your leadership decisions about educational technology, what informed your thinking or influenced your decisions?
4. Do you have any thoughts on the idea that technological change is inevitable, and that schools should not resist such change?
5. What do you think, does technology cause social change, or do social factors shape technology? Please explain.

6. What do you think is the connection between technology and values? Does technology raise questions relating to values or ethical considerations?
7. If you imagine futuristic technology and its potential impact on society or schools perhaps in twenty years, are you inclined to be an optimist, a pessimist, neither, or some combination of the two? Please explain.

<u>Conclusion of interview</u>

Thank you so much for taking the time to share with me your responses to the interview questions. I would be happy to answer any question you may have about the study, so please feel free to contact me. When my dissertation research is complete, I will be happy to provide you with information about its findings.

Appendix 2: Written Questionnaire

Philosophy of technology assumptions in educational technology leadership: Questioning technological determinism

Date: ___________________________________

Participant name: ____

School or district: ____

Job title: ____

You had previously signed a release form that meets the human subject requirements for Northcentral University. There is no intent to inflict harm, and the research does not involve more than minimal risk to participants. In reporting the results of my study, no personally identifiable data such as name, school, or district will be reported that might connect the data to a participant. Your participation in this study is voluntary and you can opt to withdraw from the study at any time. You may choose not to answer any question in this questionnaire.

My dissertation research focuses on examining philosophy of technology assumptions in educational technology leadership, and how these assumptions influence decision making and leadership. The questionnaire is expected to take approximately 30 minutes. The data from the questionnaire will supplement the data from the interview, in order to enhance the validity of the study. Thank you for agreeing to participate in this research study.

1. Do you ever engage in dialogue or debate with educational colleagues about any philosophical issues pertaining to technology? If so, please explain.
2. Should schools adapt to broader technological trends, or should schools shape technology to align with educational needs? Please explain.
3. Are there any notable ethical considerations that in your judgment might influence your thinking in making decisions about particular technologies? If so, please describe them.

4. In your practice as a technology leader, what influences your thinking about adopting technology initiatives?
5. In your practice as a technology leader, how does your thinking influence your advocacy or decisions pertaining to technology initiatives?

Thank you so much for taking the time to share with me your responses to this questionnaire. I would be happy to answer any question you may have about the study, so please feel free to contact me. When my dissertation research is complete, I will be happy to provide you with information about its findings.

References

Amiel, Tel & Reeves, Thomas C. (2008). Design-based research and educational technology: Rethinking technology and the research agenda. *Educational Technology & Society*, *11*(4), 29-40, http://www.ifets.info/journals/11_4/3.pdf [Accessed: January 30, 2016].

Ardichvili, Alexandre; Mitchell, James A. & Jondle, Douglas (2009). Characteristics of ethical business cultures. *Journal of Business Ethics*, *85(4),* 445-451, http://files.eric.ed.gov/fulltext/ED501640.pdf [Accessed: January 30, 2016].

Ayres, Lioness (2008). Semi-structured interview. In Lisa M. Given (Ed.), *The Sage encyclopedia of qualitative research methods* (pp.811-813). Thousand Oaks, CA: Sage.

Berger, Jim I. (2011). Perceived neutrality of technology and its potential impact: Recontextualizing technology into adult learning settings using a cultural studies approach. In Victor C. Wang (Ed.), *Encyclopedia of information communication technologies and adult education integration* (pp.810-823). Hershey, PA: IGI Global.

Beyer, Christian (2015). Edmund Husserl. In Edward N. Zalta (Ed.), *The Stanford encyclopedia of philosophy*. *Summer 2015 edition*, http://plato.stanford.edu/archives/sum2015/entries/husserl/ [Accessed: January 28, 2016].

Boucher, Philip (2011). What next after determinism in the ontology of technology? Distributing responsibility in the biofuel debate. *Science and Engineering Ethics*, *17*(3), 525-538.

Breckenridge, Jenna & Jones, Derek (2009). Demystifying theoretical sampling in grounded theory research. *The Grounded Theory Review*, *8*(2), 113-126, http://groundedtheoryreview.com/2009/06/30/847/ [Accessed: January 30, 2016].

Bureau of the Census (2011). Urban area criteria for the 2010 census. *Federal Register*, *76*(164), 53030-53043.

Callister, Lynn Clark; Luthy, Karlen E.; Thompson, Pam & Memmott, Rae Jeanne (2009). Ethical reasoning in baccalaureate nursing students. *Nursing Ethics*, *16*(4), 499-510. doi:10.1177/0969733009104612.

Carr-Chellman, Alison A. (2005). *Global perspectives on e-learning: Rhetoric and reality*. Thousand Oaks, CA: Sage.

Chandler, Daniel (1995). *Technological or media determinism*. Aberystwyth: MCS, http://visual-memory.co.uk/daniel/Documents/tecdet/ [Accessed: January 28, 2016].

Charmaz, Kathy & Henwood, Karen (2008). Grounded theory. In Carla Willig & Wendy Stainton-Rogers (Eds.), *The Sage handbook of qualitative research in psychology* (pp.240-259). Thousand Oaks, CA: Sage.

Clegg, Sue; Hudson, Alison & Steel, John (2003). The emperor's new clothes: Globalisation and e-learning in higher education. *British Journal of Sociology of Education*, *24*(1), 39-53.

Cobern, William W. & Loving, Cathleen C. (2008). An essay for educators: Epistemological realism really is common sense. *Science & Education*, *17*(4), 425-447. doi:10.1007/s11191-007-9095-5.

Cope, Jason (2005). Researching entrepreneurship through phenomenological inquiry: Philosophical and methodological issues. *International Small Business Journal*, *23*(2), 163-189.

Corbin, Juliet & Strauss, Anselm (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Thousand Oaks, CA: Sage.

Crawford, Karin & Wright, Jenny (2010). From "wickedity" to tameness? Reflections on the application of critical realism to researching higher education. *Paper presented at the Fifth Higher Education Close-Up Conference, Lancaster University, UK, July 20-22, 2010*, http://eprints.lincoln.ac.uk/3213/3/Wickedity.pdf [Accessed: January 28, 2016].

Cukier, Wendy; Ngwenyama, Ojelanki; Bauer, Robert & Middleton, Catherine (2009). A critical analysis of media discourse on information technology: Preliminary results of a proposed method for critical discourse analysis. *Information Systems Journal*, *19*(2), 175-196.

Elger, Tony (2009). Critical realism. In Albert J. Mills, Gabrielle Durepos & Elden Wiebe (Eds.), *Encyclopedia of case study research* (pp.253-256). Thousand Oaks, CA: Sage.

Elliot, Naomi & Lazenbatt, Anne (2005). How to recognize a quality grounded theory research study. *Australian Journal of Advanced Nursing*, *22*(3), 48-52, http://www.ajan.com.au/Vol22/Vol22.3-8.pdf [Accessed: January 30, 2016].

Feenberg, Andrew (1991). *Critical theory of technology*. New York: Oxford University Press.

Feenberg, Andrew (2010). Democratic rationalization: Technology, power, and freedom. In David M. Kaplan (Ed.), *Readings in the philosophy of technology* (pp.139-155). Lanham, MD: Rowman and Littlefield.

Fernando, Mario; Beale, Frederick & Geroy, Gary D. (2009). The spiritual dimension in leadership at Dilmah Tea. *Leadership & Organization Development Journal*, *30*(6), 522-539.

Fisher, Tony (2006). Educational transformation: Is it, like "beauty", in the eye of the beholder, or will we know it when we see it? *Education and Information Technologies*, *11*, 293-303.

Glaser, Barney G. (2001). *The grounded theory perspective: Conceptualization contrasted with description*. Mill Valley, CA: Sociology Press.

Glaser, Barney G. (2007). All is data. *The Grounded Theory Review*, *6*(2), 1-22, http://groundedtheoryreview.com/2007/03/30/1194/ [Accessed: January 28, 2016].

Glaser, Barney G. (2009). Jargonizing: The use of the grounded theory vocabulary. *The Grounded Theory Review*, *8*(1), 1-15, http://groundedtheoryreview.com/2009/03/30/992/ [Accessed: January 30, 2016].

Glaser, Barney G. & Holton, Judith (2004). Remodeling grounded theory. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, *5*(2), Art. 4, http://nbn-resolving.de/urn:nbn:de:0114-fqs040245 [Accessed: January 28, 2016].

Glaser, Barney G. & Strauss, Anselm L. (1967). *Discovery of grounded theory*. Mill Valley, CA: Sociology Press.

Grant, David; Hall, Richard; Wailes, Nick & Wright, Christopher (2006). The false promise of technological determinism: The case of enterprise resource planning systems. *New Technology, Work and Employment*, *21*(1), 2-15.

Grounded Theory Institute (2009). *What is grounded theory?*, http://www.groundedtheory.com/what-is-gt.aspx [Accessed: January 28, 2016].

Harrell, Margaret C. & Bradley, Melissa A. (2009). *Data collection methods: Semi-structured interviews and focus groups*. Santa Monica, CA: RAND National Defense Research Institute, http://www.rand.org/content/dam/rand/pubs/technical_reports/2009/RAND_TR718.pdf [Accessed: January 30, 2016].

Heidegger, Martin (2009 [1977]). The question concerning technology. In David M. Kaplan (Ed.), *Readings in the philosophy of technology* (pp.9-24). Lanham, MD: Rowman and Littlefield.

Hodgkinson-Williams, Cheryl (2006). Revisiting the concept of ICTs as "tools": Exploring the epistemological and ontological underpinnings of a conceptual framework. *Paper presented at ITFORUM, University of Georgia, Athens, GA, USA, March 13-17, 2006*, http://eprints.lincoln.ac.uk/3213/3/Wickedity.pdf [Accessed: January 28, 2016].

Hofmann, Bjørn (2006). When means become ends: Technology producing values. *Seminar.net: Media, Technology, & Lifelong Learning*, *2*(2), 1-12, http://www.seminar.net/images/stories/vol2-issue2/bjorn_hofmann.pdf [Accessed: January 30, 2016].

Holton, Judith A. (2007). The coding process and its challenges. In Antony Bryant & Kathy Charmaz (Eds.), *The Sage handbook of grounded theory* (pp.265-289). Thousand Oaks, CA: Sage.

Husserl, Edmund (1965 [1935]). *Phenomenology and the crisis of philosophy* (transl. by Q. Lauer). New York: Harper and Row.

Jackson, Stephen & Philip, George (2010). A techno-cultural emergence perspective on the management of techno-change. *International Journal of Information Management*, *30*, 445-456. doi:10.1016/j.ijinfomgt.2010.01.008.

Jonas, Hans (2009). Technology and responsibility. In David M. Kaplan (Ed.), *Readings in the philosophy of technology* (pp.173-184). Lanham, MD: Rowman and Littlefield.

Jonas, Hans (2010). Toward a philosophy of technology. In Craig Hanks (Ed.), *Technology and values: Essential readings* (pp.11-25). West Sussex: Wiley-Blackwell.

Kanuka, Heather (2008). Understanding e-learning technologies-in-practice through philosophies-in-practice. In Terry Anderson (Ed.), *The theory and practice of online learning* (pp.91-120). Edmonton, AB: AU Press, Athabasca University.

Kenealy, Graham J.J. & Cartwright, Susan (2007). The temporal sensitivity accelerated work pace. A grounded theory building approach. *The Grounded Theory Review*, *6*(2), 117-145, http://groundedtheoryreview.com/2007/03/30/1128/ [Accessed: January 30, 2016].

Kitto, Simon C.; Chesters, Janice & Grbich, Carol (2008). Quality in qualitative research. *Medical Journal of Australia*, *188*(4), 243-246.

Kritt, David W. & Winegar, Lucien T. (2010). Technological determinism and human agency. In David W. Kritt & Lucien T. Winegar (Eds.), *Education and technology: Critical perspectives, possible futures* (pp.3-30). Lanham, MD: Lexington Books.

Kuper, Ayelet; Lingard, Lorelei & Levinson, Wendy (2008). Critically appraising qualitative research. *The BMJ*, *337*, 687-692, http://www.bmj.com/content/bmj/337/7671/Practice.full.pdf [Accessed: January 30, 2016].

Lahman, Maria K.E. & Geist, Monica R. (2008). Qualitative methodologies. In Frederick T. Leong (Ed.), *Encyclopedia of counseling* (pp.360-364). Thousand Oaks, CA: Sage.

Lempert, Lora B. (2007). Asking questions of the data: Memo writing in the grounded theory tradition. In Antony Bryant & Kathy Charmaz (Eds.), *The Sage handbook of grounded theory* (pp.245-264). Thousand Oaks, CA: Sage.

Leonardi, Paul M. (2008). Indeterminacy and the discourse of inevitability in international technology management. *Academy of Management Review*, *33*(4), 975-984.

Leonardi, Paul M. (2009). Crossing the implementation line: The mutual constitution of technology and organizing across development and use activities. *Communication Theory*, *19*(3), 278-310.

Leonardi, Paul M. & Jackson, Michele H. (2004). Technological determinism and discursive closure in organizational mergers. *Journal of Organizational Change Management*, *17*(6), 615-631.

Luckerhoff, Jason & Guillemette, François (2011). The conflicts between grounded theory requirements and institutional requirements for scientific research. *The Qualitative Report*, *16*(2), 396-414, http://www.nova.edu/ssss/QR/QR16-2/luckerhoff.pdf [Accessed: January 29, 2016].

McDonald, Jason K.; Yanchar, Stephen C. & Osguthorpe, Russell T. (2005). Learning from programmed instruction: Examining implications for modern instructional technology. *Educational Technology Research & Development*, *53*(2), 84-98.

Miller, Kent D. & Tsang, Eric W. K. (2011). Testing management theories: Critical realist philosophy and research methods. *Strategic Management Journal*, *32*(2), 139-158.

Morse, Janice M. (2007). Sampling in grounded theory. In Antony Bryant & Kathy Charmaz (Eds.), *The Sage handbook of grounded theory* (pp.229-244). Thousand Oaks, CA: Sage.

Oliver, Martin (2011). Technological determinism in educational technology research: Some alternative ways of thinking about the relationship between learning and technology. *Journal of Computer Assisted Instruction*, *27*(5), 373-384.

Ospina, Sonia (2004). Qualitative research. In George R. Goethals, Georgia J. Sorenson & James MacGregor Burns (Eds.), *Encyclopedia of leadership* (pp.1279-1284). Thousand Oaks, CA: Sage.

Patton, Michael Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage.

Pearson, Greg & Young, A. Thomas (Eds.) (2002). *Technically speaking: Why all Americans need to know more about technology*. Washington, D.C.: National Academy Press.

Persaud, Nadini (2010). Interviewing. In Neil J. Salkind (Ed.), *Encyclopedia of research design* (pp.633-637). Thousand Oaks, CA: Sage.

Reichertz, Jo (2010). Abduction: The logic of discovery of grounded theory. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, *11*(1), Art. 13, http://www.qualitative-research.net/index.php/fqs/article/view/1412 [Accessed: January 30, 2016].

Schram, Thomas H. (2006). *Conceptualizing and proposing qualitative research*. Upper Saddle River, NJ: Pearson Merrill Prentice Hall.

Selwyn, Neil (2010). Looking beyond learning: Notes towards the critical study of educational technology. *Journal of Computer Assisted Instruction*, *26*, 65-73.

Shannak, Rifat O. & Aldhmour, Fairouz M. (2009). Grounded theory as a methodology for theory generation in information systems research. *European Journal of Economics, Finance and Administrative Sciences*, *15*, 32-50, https://www.researchgate.net/publication/235930495_Grounded_Theory_as_a_Methodology_for_Theory_Generation_in_Information_Systems_Research [Accessed: January 30, 2016].

Slack, Jennifer D. & Wise, J. Macgregor (2006). Cultural studies and communication technology. In Leah Lievrouw & Sonia Livingstone (Eds.), *The handbook of new media* (pp.141-162). Thousand Oaks, CA: Sage.

Smith, Matthew Longshore (2006). Overcoming theory-practice inconsistencies: Critical realism and information systems research. *Information and Organization*, *16(3),* 191-211.

Starks, Helene & Trinidad, Susan Brown (2007). Choose your method: A comparison of phenomenology, discourse analysis, and grounded theory. *Qualitative Health Research*, *17*(10), 1372-1380.

Stern, Phyllis Noerager (2007). On solid ground: Essential properties for growing grounded theory. In Antony Bryant & Kathy Charmaz (Eds.), *The Sage handbook of grounded theory* (pp.114-126). Thousand Oaks, CA: Sage.

Strobel, Johannes & Tillberg-Webb, Heather (2009). Applying a critical and humanizing framework of instructional technologies to educational practice. In Leslie Moller, Jason Bond Huett & Douglas M. Harvey (Eds.), *Learning and instructional technologies for the 21st century: Visions of the future* (pp.75-93), New York: Springer.

Suddaby, Roy (2006). From the editors: What grounded theory is not. *Academy of Management Journal*, *49*(4), 633-642, https://www.researchgate.net/publication/253203051_From_the_Editors_What_Grounded_Theory_Is_Not [Accessed: January 30, 2016].

Suter, William Newton (2012). *Introduction to educational research*. Thousand Oaks, CA: Sage.

Trochim, William M.K. & Donnelly, James P. (2008). *The research methods knowledge base*. Mason, OH: Cengage Learning.

Turner, Daniel W. (2010). Qualitative interview design: A practical guide for novice investigators. *The Qualitative Report*, *15*(3), 754-760, http://www.nova.edu/ssss/QR/QR15-3/qid.pdf [Accessed: January 29, 2016].

Urquhart, Cathy; Lehmann, Hans & Myers, Michael D. (2010). Putting the "theory" back into grounded theory: Guidelines for grounded theory studies in information systems. *Information Systems Journal*, *20*(4), 357-381.

Webster, Mark David (2013). Philosophy of technology assumptions in educational technology leadership: Questioning technological determinism (UMI No. 3569909). *Ph.D. dissertation, Northcentral University, Prescott Valley, Arizona, USA, ProQuest Dissertations & Theses Global*, http://www.slideshare.net/MarkWebsterPhD/mark-d-webster-dissertationpublishedproquest-57625783 [Accessed: January 28, 2016].

Willig, Carla (2008). *Introducing qualitative research in psychology*. Berkshire: McGraw-Hill Education.

Wuisman, Jan J.J.M. (2005). The logic of scientific discovery in critical realist social scientific research. *Journal of Critical Realism*, *4(2),* 366-394.

Wyatt, Sally (2008). Technological determinism is dead: Long live technological determinism. In Edward J. Hackett, Olga Amsterdamska, Michael Lynch & Judy Wajcman (Eds.), *The handbook of science and technology studies* (pp.165-180), Cambridge, MA: The MIT Press.

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