Philosophy of Technology Assumptions in Educational Technology Leadership

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(Submitted September 6, 2015; Revised February 24, 2016; Accepted April 15, 2016)

ABSTRACT

A qualitative study using grounded theory methods was conducted to (a) examine what philosophy of technology assumptions are present in the thinking of K-12 technology leaders, (b) investigate how the assumptions may influence technology decision making, and (c) explore whether technological determinist assumptions are present. Subjects involved technology directors and instructional technology specialists from school districts, and data collection involved interviews and a written questionnaire. Three broad philosophy of technology views were widely held by participants, including an instrumental view of technology, technological optimism, and a technological determinist perspective that sees technological change as inevitable. Technology leaders were guided by two main approaches to technology decision making in cognitive dissonance with each other, represented by the categories *Educational goals and curriculum should drive technology*, and *Keep up with Technology (or be left behind)*. The researcher concluded that as leaders deal with their perceived experience of the inevitability of technological change, and their concern for preparing students for a technological future, the core category *Keep up with technology (or be left behind)* is given the greater weight in technology decision making. A risk is that this can on occasion mean a quickness to adopt technology for the sake of technology, without aligning the technology implementation with educational goals.

Keywords

Educational technology leadership, Philosophy of technology, Instrumental view of technology, Technological determinism, Technological imperative, Technological optimism

Introduction

Philosophy of technology is a branch of philosophy that involves examining the underlying assumptions of how technologies impact and transform human society in ways that are philosophically relevant (Kaplan, 2009). Does philosophy matter? The author humorously recalls that Collier (1994) argued that proceeding without examining assumptions does not mean an absence of philosophy, but more likely, bad philosophy. Does philosophy of technology matter for educational technology leadership? Scholars have argued that philosophy of technology assumptions, especially technological determinism, may influence the thinking or discourse of educators concerning technology (Bennett & Maton, 2010; Cukier, Ngwenyama, Bauer, & Middleton, 2009; Fisher, 2006; Jones & Czerniewicz, 2010; Jones & Healing, 2010; Kanuka, 2008; Kritt & Winegar, 2010; Leonardi, 2008; Oliver, 2011; Selwyn, 2010; Strobel & Tillberg-Webb, 2009), and affect policy (Clegg, Hudson, & Steel, 2003; Cukier et al., 2009; Fisher, 2006; Wyatt, 2008). The pace of technological change presents challenges for contemplative leadership because there may be little time for considered judgment, with leaders responding in a reflexive rather than a reflective way to new information and change (Canole, 2007; Selwyn, 2010).

An important theme in the literature has involved scholarship discussing how technological determinism, a view pervasive in the popular mindset, may influence educational technology professional practice, shape interactions among stakeholders, and sometimes influence decisions. What is technological determinism? Technological determinism is the philosophical perspective that assumes that technology causes inevitable change in society (Leonardi, 2008; Leonardi, 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 determinism typically considers technology as a dominant force for social change, although there are different accounts of technological determinism.

Fisher (2006) examined discourse and rhetoric about educational transformation and observed a tendency for some discourse to be framed in technological determinist language that ascribed to technology the power to inevitably cause positive change in schools. Fisher concluded that such technological determinist assumptions are a problem because by ascribing autonomous change to technology, rather than to educators, the perspective shortchanges the hard work that educators must undertake to improve and transform education. If educators assume a commercial technology is inevitable, they tend to focus on how schools should adapt to technology, rather than shape the technology to meet curriculum requirements, and teachers' and students' needs (Jones &

Czerniewicz, 2010). In their critique of the claim that young people are digital natives who are naturally more able to use technology, with inevitable technology causing changes in students, Jones and Healing (2010) asserted that the digital native argument proceeds from a simplistic view of causality influenced by technological determinism. Kanuka (2008) argued that by examining their philosophy of technology assumptions, thoughtful practitioners with responsibilities for educational technology would be better able to make purposeful and informed decisions in selecting the right technologies for the right reasons.

Although educational technology scholars have emphasized the importance of critically examining philosophy of technology assumptions such as technological determinism, the researcher found that empirical studies within K-12 education were lacking. There was a gap in the literature concerning how technological determinist assumptions may influence the actual practice of educational technology leadership. However, philosophy of technology assumptions have been the focus of research outside of K-12 education to examine the influence of assumptions such as technological determinism on technology management and leadership. Technological determinist assumptions were found to influence the thinking of company managers, including their perceived agency in shaping technological change, affect discourse with colleagues and stakeholders, and influence the decisions that managers make on behalf of their organizations (Grant, Hall, Wailes, & Wright, 2006; Jackson & Philip, 2010; Leonardi, 2008; Leonardi & Jackson, 2004).

Seminal research by Leonardi and Jackson (2004) involving technology managers in the private sector found that discourse characterized by technological determinism, and the inevitability of technology, served as a powerful narrative to justify the actions of organizational leaders. Leonardi (2008) concluded that a "discourse of inevitability" created an ideological orientation toward technological change (p. 975). When technology managers employed technological determinist discourse, the tendency was to make the indeterminate state of things appear to be determined because of the perceived inevitability of technological change (Leonardi, 2008). Rhetoric characterized by assumptions of technological determinism can be a powerful discursive strategy for advancing interests and marginalizing dissenting opinions (Cukier et al., 2009; Leonardi, 2008; Leonardi & Jackson, 2004).

Oliver (2011) and Selwyn (2010) argued that research is necessary within education that critically questions technological determinist assumptions, and seeks to consider alternate ways of thinking about technology and learning that recognizes the agency of human actors, and the social factors involved with using technology in education. In responding to this research problem, the author pursued an empirical study guided by the work of Strobel and Tillberg-Webb (2009) who proposed a framework for educational technology that emphasizes a critical and humanistic approach to technology integration, and the importance of educators questioning their philosophical belief systems and values concerning technology. The starting point for the Strobel and Tillberg-Webb (2009) framework involves educators examining whether technological determinist assumptions influence thinking about educational technology.

The purpose of the study was to (a) examine what philosophical assumptions about technology are present in the thinking of K-12 technology leaders, (b) investigate how the assumptions may influence technology decision making, and (c) explore whether technological determinist assumptions are present.

Three research questions guided the qualitative study:

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

The first research question was framed broadly so that the study would be open to any philosophical assumptions about technology. The second research question moved from examining thinking, to investigate how assumptions may influence decision making about technology. The third research question focused on examining any assumptions characterized by technological determinism.

Research design and methods

The research design aligned with Corbin and Strauss (2008) methods for analyzing data and developing grounded theory. Participants included school district technology directors, and instructional technology

specialists, and were selected through purposive and theoretical sampling. Data collection initially proceeded with purposive sampling to select 20 participants who work in educational technology leadership, with half of them school district technology directors and half instructional technology specialists. After the purposive sampling, the sampling shifted to theoretical sampling to develop the conceptual categories and emerging theory. Data collection continued until theoretical saturation had been reached, at which point 31 subjects had participated in the study, including 15 technology directors and 16 instructional technology specialists. Among the 31 total participants were 17 men and 14 women, from 19 school districts from different geographic areas throughout Virginia, including both city and county school districts.

In order to enhance the validity and reliability of the qualitative study, triangulation of data was pursued using interviews followed by a written questionnaire. The interviews used a semi-structured protocol, with most interviews conducted over the telephone. The written questionnaire with open-ended questions was completed by participants after the interview, and was emailed to them, completed, and then returned via email. Written questionnaires were returned by all 31 participants. Data collection resulted in a total of 31 interview transcripts and 31 written questionnaires, so that a total of 62 documents were analyzed.

The data analysis employed Corbin and Strauss (2008) grounded theory methods, based on the research guide *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. This article focuses on presenting the implications of the study for educational technology, while providing only a summary of the grounded theory methods used, as a full treatment of the research methods was previously published (Webster, 2016). The methodology employed many traditional grounded theory methods including constant comparative analysis, open and axial coding, use of the Corbin and Strauss coding paradigm, and theoretical saturation of categories. However, it should be noted that Corbin and Strauss methodology does not follow the classic grounded theory emphasis, in the Glaser tradition, of having no predetermined research problem. Corbin and Strauss (2008) methods for qualitative data analysis are accommodating of institutional requirements for research questions, literature review prior to research, and a theoretical framework. The author utilized the software application MAXQDA 11 to import transcripts, code conceptual categories, properties, and dimensions, to write memos while thinking critically about the data, and to refine conceptual theory.

Findings and implications for research question 1

Research Question 1 asked, "What broad philosophy of technology assumptions are present in the thinking of K-12 technology directors and instructional technology specialists?" The findings showed that three categories representing broad philosophy of technology views were prevalent among the educational technology leaders, including *Technology is a tool*, *Technological change is inevitable*, and *Technological optimism*. One category, *Technology raises questions of human values*, while not as prevalent as the other three, was associated with a majority of participants.

Participants often described how their philosophy of technology was characterized by viewing technology as a tool. For example, Technology Specialist 7 stated, "One philosophical belief of mine, shared by many of my educator acquaintances, is that technology is nothing more than a tool." The 203 code instances for this category were distributed among 40 of the 62 documents, with coding instances from 27 of the 31 participants. The category *Technology is a tool* was interpreted as aligning with the instrumental view of technology, a philosophical view that considers technology as a tool, as means put to use by users for their purposeful ends (Berger, 2011; Feenberg, 1991; Heidegger, 2009). The implication is that this overarching philosophical perspective prevalent among the subjects is in alignment with what scholars and philosophers have argued is a popular and widely held philosophy of technology (Franssen, Lokhorst, & van de Poel, 2013; Jackson, 2010). The category *Technology is a tool* was found to be directly linked to the category *Educational goals and curriculum should drive technology* (explained below in the implications for Research Question 2).

A surprising finding of the study was that while the instrumental view of technology was prevalent, a philosophical position normally associated with the instrumental view, the neutrality thesis, was only associated with eight participants. The neutrality thesis considers technology as neutral with regard to values and assumes there are no inherent moral implications in using technology (Vermaas et al., 2011). On the other hand, the category *Technology raises questions of human values* was associated with a majority of the participants, 22 of 31. For example, Technology Director 10 stated, "Nowadays there's a greater need to understand the ethical implications of using technology," and gave the example of the need to honor ownership of digital property as an ethical consideration important for students and researchers. This subject asserted the opinion that free availability of information has desensitized some people to ownership of intellectual property.

The researcher interpreted the philosophical view represented by this category to be in alignment with Hofmann's theory that technology is value laden, meaning it raises questions of values and has ethical consequences (Hofmann, 2006). Hofmann's position does not mean differentiating between good technology and bad technology, rather the emphasis 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 (Hofmann, 2006). The data showed that the technology leaders described that technology, particularly in the context of K-12 education, raises questions of values as it relates to concerns such as Internet safety, personal privacy, equitable access to technology, copyright compliance, and environmental sustainability.

The surprising finding that the instrumental view of technology was a prevalent perspective, but the neutrality thesis normally associated with it was only associated with eight participants, might be interpreted as a possible case of cognitive dissonance between *technology is value neutral* and *Technology raises questions of human values*. Festinger's theory of cognitive dissonance posits that persons experience discomfort or unease when they encounter new information that contradicts their previously held assumptions or beliefs (Sullivan, 2009). When a person considers two views that are inconsistent with each other, cognitive dissonance posits that the person weighs the importance of the cognitions, and may add or subtract from the alternatives to reduce the inconsistency (Harmon-Jones, 2009). Figure 1 displays the relationship between the contrasting philosophical perspectives *Technology is value neutral* and *Technology raises questions of human values*, and the greater weight given to the latter (Webster, 2013).

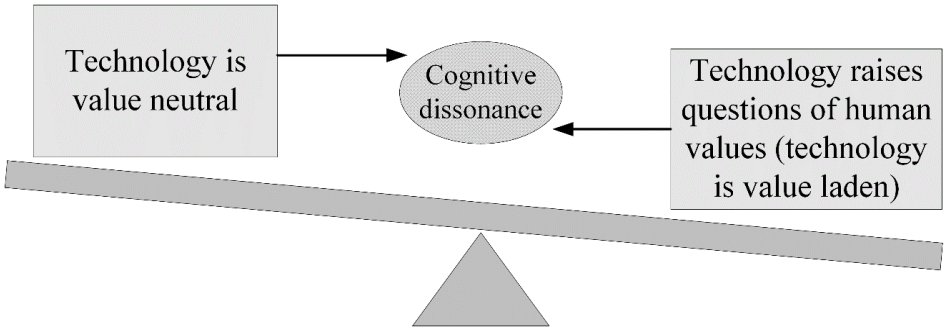

Figure 1. Technology is value neutral vs. Technology raises questions of human values

Discourse about the inevitability of technological change was a consistent refrain in the data. The philosophy of technology assumption *Technological change is inevitable* was prevalent and associated with 30 participants, with 149 coding instances distributed among 36 of the 62 documents. An example of a coding instance for this category is that Technology Specialist 2 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." Within the broader category, properties or dimensions that had relatively high coding frequency included *BYOD is or seems inevitable*, *we should not resist technological change*, and *we should embrace technological change*.

Leonardi (2008) found from a study of technology managers that a "discourse of inevitability created an ideological orientation toward technological change" (p. 975). A similar phenomenon of an ideological orientation toward technological change is evident in this study of educational technology leaders. The philosophical view that technology causes inevitable change in society is an assumption associated with technological determinism (Leonardi, 2008; Leonardi, 2009). Discussion of research findings and implications pertaining to technological determinism are presented below in the section for Research Question 3.

The technology leaders participating in the study were generally optimistic about the potential for technology to improve education and the world, and they embraced its possibilities. Technological optimism was found to be a prevalent philosophy of technology, associated with 28 of 31 participants, with 137 coding instances distributed among 38 of the 62 documents. For example, Technology Director 15 stated, "A favorite saying of mine is that whatever the ill might be, technology will save the world!"

The Strobel and Tillberg-Webb (2009) humanizing framework for educational technology emphasizes the importance of critically analyzing whether assumptions about technology may correspond to viewpoints in the dichotomy of technological utopianism or dystopianism. Technological utopianism embraces the promise of technology, and is an optimistic position that presents technological innovation as something for the better (Kritt & Winegar, 2010; Strobel & Tillberg-Webb, 2009; Vermaas, Kroes, van de Poel, Franssen, & Houkes, 2011). The

contrasting perspective, technological dystopianism is a pessimistic position generally not open to technological innovation that resists technological change (Kritt & Winegar, 2010; Strobel & Tillberg-Webb, 2009; Vermaas et al., 2011). The category *Technological optimism* was interpreted by the researcher as aligning with the perspective of technological utopianism. The category *Technological pessimism*, interpreted to be aligned with technological dystopianism, involved 14 coding instances from 6 documents and 6 participants.

An important implication of *Technological optimism* is that it inclines technology leaders to be advocates and promoters for new applications of technology. A notable property of *Technological optimism* was *technology advocacy*. Technology Specialist 10 stated, "I try to stay optimistic and attempt to be proactive in encouraging my colleagues to use technologies." Technological optimism also appears to be a strong factor in the leaders' ideological orientation to technological change previously discussed. For example, Technology Specialist 9 expressed an optimistic feeling about technology in saying, "it's a wonderful thing, and I have good feelings about technology." In the same discussion, the technology leader described an orientation to technological change by sharing, "I think that technology is a wonderful thing that's ever changing, it's vital to have in education. It's something that impacts our daily lives, I have really embraced it throughout my career."

Findings and implications for research question 2

Research Question 2 asked, "How do philosophy of technology assumptions influence the decisions that leaders make about educational technology?" 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.

Three categories related to technology decision making were found to be prevalent, *Educational goals and curriculum drive technology*, *Keep up with technology (or be left behind)*, and *Consider ethical factors associated with technology*. *Educational goals and curriculum should drive technology* emerged as a widespread approach to technology decision making, involving 235 coding instances from 56 documents and 30 out of 31 participants. For example, Technology Director 8 stated, "There are no such things as technology initiatives! There are business of education projects designed to meet goals and objectives of student achievement through the use of technology."

The approach to decision making represented by the category *Educational goals and curriculum drive technology* was found to be linked with the philosophy *Technology is a tool*, and an instrumental view of technology focused on considering technology as means put to use by users for purposeful ends (Berger, 2011; Feenberg, 1991; Heidegger, 2009). Such an instrumental approach to viewing technology education would accord with the views of scholars such as Jones and Czerniewicz (2010) who asserted that leaders should shape technology to suit educational needs and requirements. With the close link in the data between *Educational goals and curriculum drive technology* and the philosophy *Technology is a tool*, the implication is the instrumental view of technology leads to a corresponding approach to decision making that logically follows from the parent philosophy.

Participants also articulated the principle that technology should not be pursued for the sake of technology. Technology Director 4 explained, "I'm not a fan of technology for its own sake, and as a decision maker I like to see reasons for implementing technology." A related property was *curriculum should drive technology, rather than technology drive curriculum*. For example, Technology Director 12 asserted,

You should not have the technology as the center of attention, but rather what it's able to do, and allows your students to do. So I think the instructional component needs to be the focus, and how can we use the technology to make that happen.

An implication of the findings is that this perspective appears to be in alignment with what might be described as the textbook definition of appropriate technology integration, whereby curriculum drives technology integration (Shelly, Cashman, Gunter, & Gunter, 2008). Figure 2 depicts the instrumental view of technology as an overarching philosophy of technology, and its relationship to the decision making practice *Educational goals and curriculum should drive technology* (Webster, 2013).

Although *Educational goals and curriculum should drive technology* was a prevalent approach to technology decision making, the core category and central phenomenon that emerged from the study was that technology leaders approach technology leadership through a practice of *Keep up with technology (or be left behind)*. This

category emerged early in data analysis, continued to grow in explanatory relevance, and reappeared in-vivo in transcript narratives in various forms, often expressed in those words, or variations of them. For example, Technology Specialist 11 stated, “As fast as technology changes, in education we should keep up with it or be one step ahead, but we’re usually one step behind.” Technology Director 3 shared, “Technology is always changing and you must change with it or you will be left behind.”

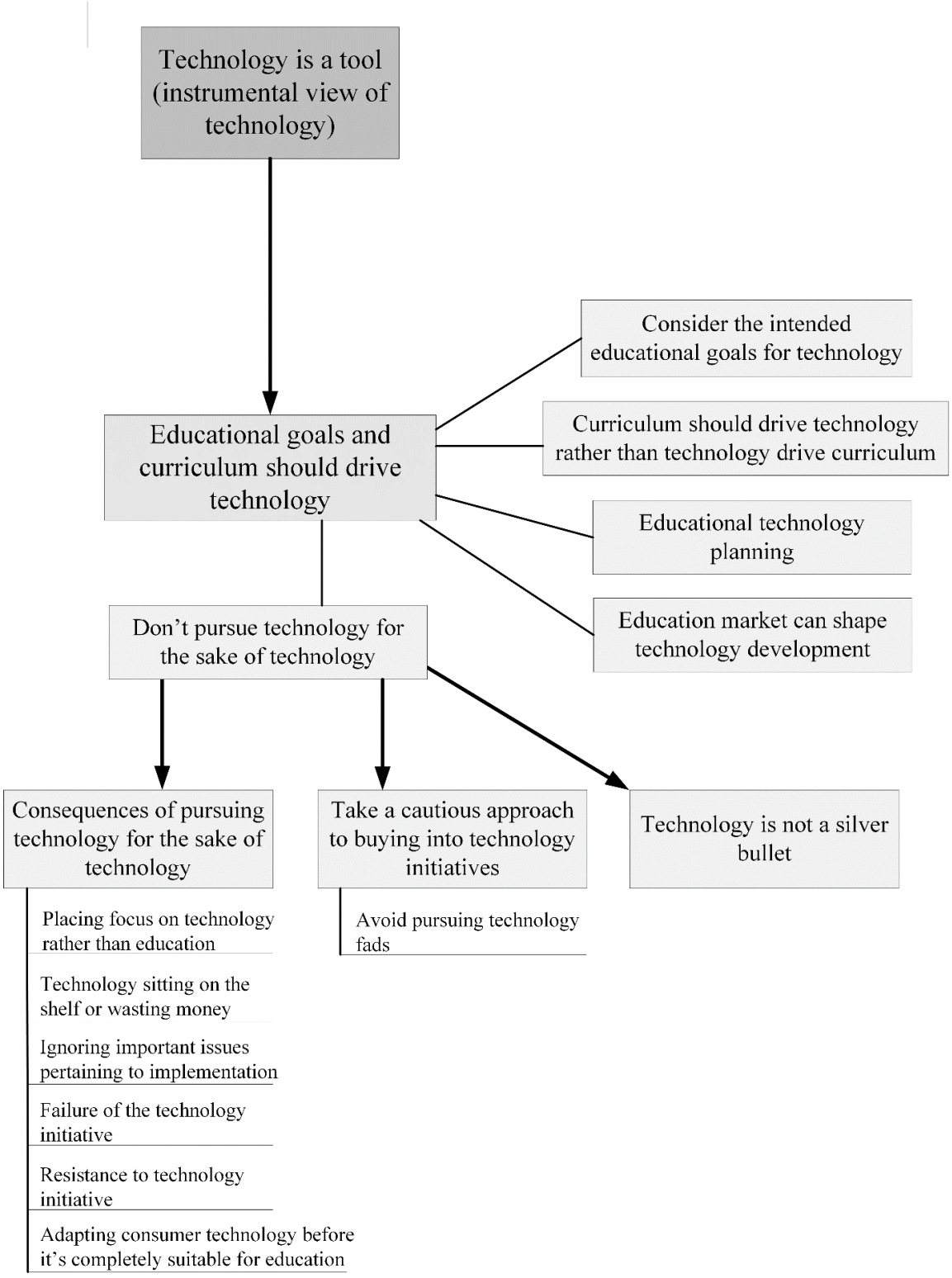

Figure 2. Instrumental view of technology and its relationship to the decision making practice Educational goals and curriculum should drive technology

The core category was closely linked in the data with the category *Technological change is inevitable*, and a perceived imperative for schools to keep up with technological change. For example, Technology Specialist 8 stated, "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." The core category was interpreted as a manifestation of a philosophy of technology perspective called the technological imperative, described by some scholars as associated with technological determinism (Chandler, 1995; Cukier et al., 2009; Hofmann, 2006). 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). The evidence indicates that the philosophy *Keep up with technology (or be left behind)* influences leaders by essentially functioning as an ideological orientation toward technological change. As mentioned earlier, this ideological orientation appears similar to what Leonardi (2008) found in a study of technology managers in the private sector.

Pressure to keep up with technology was the most frequent property of *Keep up with technology (or be left behind)*, with 107 coding instances from 38 documents, and 26 of the 31 participants. Technology leaders often described how they felt pressured to keep up with technological change and the challenges that this presented for their work as educational technology leaders. The data suggests this pressure has a strong emotional interaction in the experience of many technology leaders. For example, Technology Specialist 9, who worked in a smaller school district with limited resources, stated about technology, "You have to always keep up with it. If you let any time go buy you'll get behind and be lost." The subject observed that a dilemma of keeping pace with technological change with fewer resources meant, "things move more slowly," and lamented that "sometimes when we are ready to proceed forward, we're already behind, but we do a good job trying to keep up."

Another property associated with the core category was *resistance to technological change*, which involved 76 coding instances, from 29 documents and 23 participants. A majority of participants described how the phenomenon of resistance to technological change was present in their school district. Technology Director 12 asserted education "tends to be very, very resistant to change, you've got a lot of folks who are not as comfortable with technology as the kids are, and that's a big divide there, and that holds us back." Like the core category itself, this property associated with it emerged at the beginning of data collection and analysis. The first participant interviewed, Technology Specialist 1, stated, "There can be a resistance to change in schools," and asserted "resistance to technological change will keep us behind."

The core category had two main properties in conflict with each other, *pressure to keep up with technology*, and the *resistance to technological change* they encounter in schools. The study's results, showing pressure to implement technology occurring alongside resistance, appears to lend support to Rogers' model of technological innovation, which theorizes that technological innovation proceeds alongside resistance from users in varying degrees (Friesen, 2008). The theme of resistance to technological change emerging from this study is similar to the resistance to change theme found by Cukier et al. (2009) in their qualitative study that used critical analysis to examine media discourse surrounding a technology initiative at a Canadian university.

Figure 3 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). It shows the tension between *pressure to keep up with technology* and *resistance to technological change*. An implication of the findings is that the property *Resistance to technological change* had consequences, including *teachers rarely or reluctantly integrate technology*, and *teacher resistance to technology disadvantages students*. *Pressure to keep up with technology* was found to lead to an emphasis on preparing students for a technological future, but can lead to technology taking precedence over other values or norms (examples shown in figure). Weighted priority is placed by educational technology leaders on *pressure to keep up with technology*, as they struggle with resistance to technological change in their organizations.

Another finding pertaining to how philosophy of technology assumptions influence the decisions that leaders make about educational technology involves the category *Consider ethical factors associated with technology*, which involved coding instances from 29 participants. Technology leaders described how ethical considerations pertaining to technology were taken into account in making decisions about technology. For example, Technology Specialist 10 stated, "I often make technology decisions based on ethics, especially with teaching at the elementary level." Technology Director 7 stated, "I believe as leaders we have an overall responsibility to consider ethics in our decision making." 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." Of the specific ethical considerations taken into account by the

technology leaders, one property emerged from a majority of the participants, *consider Internet safety for students*, with 53 coding instances from 25 documents, and 20 participants. An implication of the findings is that the philosophical perspective associated with this category is similar to the approach to technology and values taken in the national framework for K-12 educational technology leadership (Consortium for School Networking, 2011). The technology leaders in the study were concerned with ethical considerations pertaining to technology leadership similar to those issues defined in the Consortium for School Networking's leadership framework.

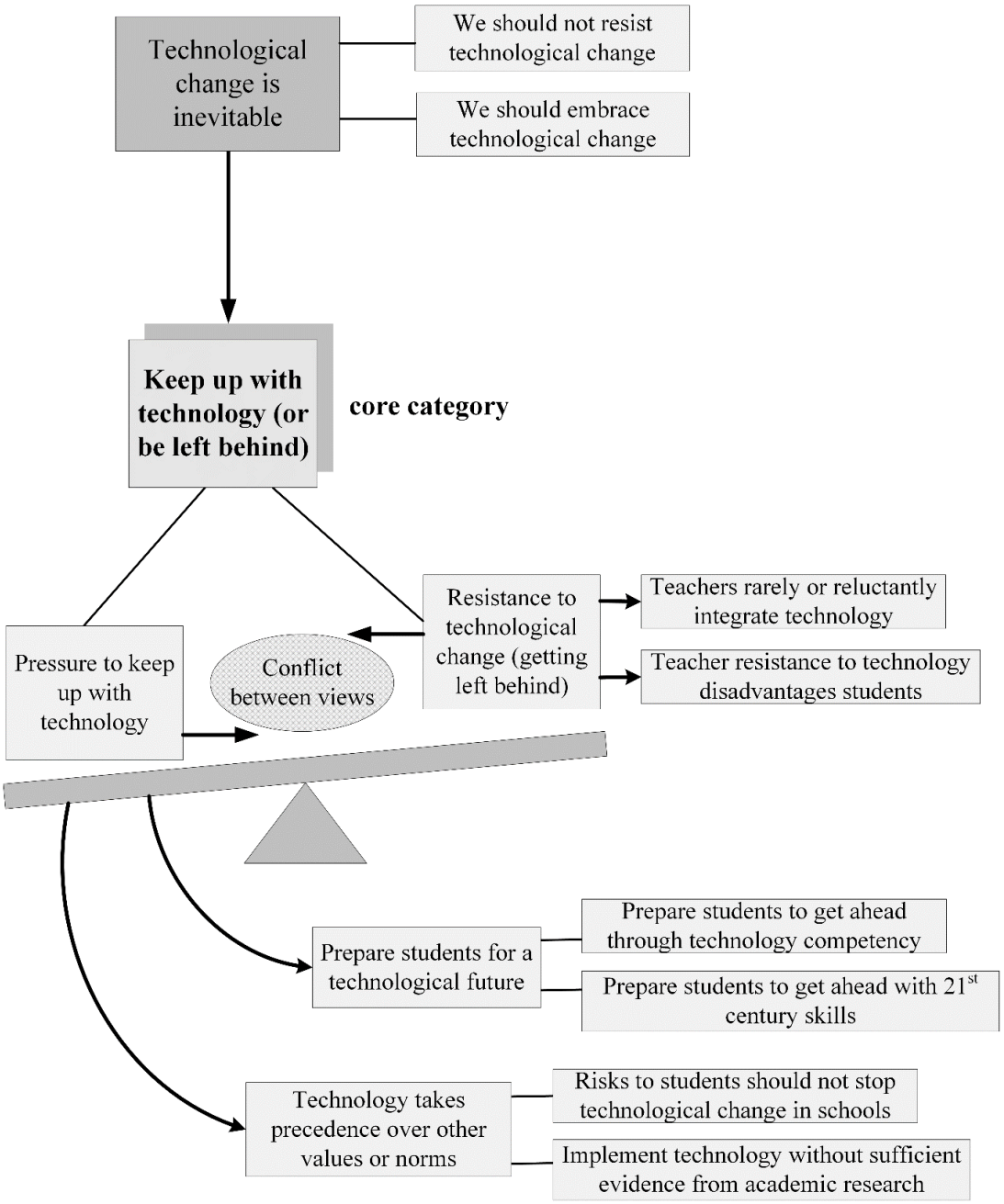

Figure 3. The imperative keep up with technology (or be left behind) and its properties, following from the assumption technological change is inevitable

Findings and implications for research question 3

Research Question 3 asked, "What assumptions characterized by technological determinism may be present in leaders' thinking or decision making?" Most notably, the prevalent philosophical view *Technological change is inevitable* is an assumption related to technological determinism (Leonardi, 2008; Leonardi, 2009). The core

category, *Keep up with technology (or be left behind*), was linked in the data with viewing technological change as inevitable, and a perceived imperative within schools to keep up with this technological change. For example, Technology Specialist 8 stated:

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.

As explained previously, the core category was interpreted to be a manifestation of the technological imperative, a philosophical assumption associated with technological determinism (Chandler, 1995, Cukier et al., 2009; Hofmann, 2006). The technological imperative assumes that once technological development is inevitably underway, users should learn to cope with it (Chandler, 1995) because they cannot help but use technology (Leonardi, 2008), and should keep pace with technological change (Strobel & Tillberg-Webb, 2009).

An implication of the findings is that the phenomenon of the core category, *Keep up with technology (or be left behind)*, as a manifestation of the technological imperative, is similar to what was found in a qualitative study conducted by Cukier et al. (2009). Using content analysis techniques, Cukier et al. (2009) examined media discourse surrounding an instructional technology initiative at a university in Canada, and found that a technological determinist viewpoint was present in both academic and non-academic literature. In that study, rhetoric of the technological imperative was a dominant metaphor surrounding the technology initiative (Cukier et al., 2009). 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). The findings from this study suggest that rhetoric surrounding *Keep up with technology (or be left behind*), creates a "discourse of inevitability" (Leonardi, 2008, p. 975) in schools, and contributes to promoting an ideological orientation to technology within K-12 culture. For example, in describing discourse with colleagues in their schools, Technology Director 9 stated, "Often we discuss the inevitable rise of BYOD," and Technology Director 7 stated, "We discuss the inevitable rise of eBooks to replace paper textbooks."

Conclusions and recommendations

The research findings led to a somewhat surprising substantive theory. As previously discussed, two dominant philosophical approaches were found to be important for educational technology leadership and decision making, *Educational goals and curriculum should drive technology*, and *Keep up with technology (or be left behind)*. The two approaches to technology decision making follow from their respective parent philosophy. *Educational goals and curriculum should drive* technology proceeds out of the broader philosophy *Technology is a tool* (instrumental view of technology), and from the perspective that technology is not an end in itself, but rather is a tool, a means to achieve educational goals and ends. *Keep up with technology (or be left behind)* proceeds out of a technological determinist perspective focused on the view *Technological change is inevitable*. Both of these parent philosophies are situated within *Technological optimism*. The irony is that these two philosophical approaches to technology decision making, were often held by the same technology leader, at the same time. The researcher concludes that as educational technology leaders respond to their perceived experience of the inevitability of technological change, and their concern for preparing students for a technological future, *Keep up with technology (or be left behind)* emerges as the primary of concern of leaders, and is given the greater weight in technology decision making. Figure 4 depicts the substantive theory that emerged from this study (Webster, 2013).

In shedding light on the philosophical tension between the two dominant approaches to technology decision making, it's important to point out that 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. In contrast, when viewed from the perspective of inevitable technology, participants described how we should not resist, but should embrace technological change, and there can be a quickness to adopt technology for the sake of technology. A conclusion is that the pressures leaders experience to keep up with technology can result in procuring and implementing technology without aligning technology with clear educational goals, and essentially adopting technology for its own sake. A consequence of *Keep up with technology (or be left behind* was well expressed by Technology Director 12 who observed that when technology is adopted for its own sake, "Everyone has to figure out how to make it work to support division and school needs. In most cases, this leads to resistance from teachers and usually dooms the technology to failure." 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."

The budgetary dilemma for technology leaders feeling pressured to keep up with technology was well summarized by Technology Specialist 15, "You're never going to be able to keep up with technological change in education because of our numbers of students and the cost." Schrum and Levin (2009) advised that educators should wait for research demonstrating educational benefits before pursuing extensive technology investments. Besides the monetary consequences of extensive technology investments, there is the risk of quick technology adoptions being pursued without waiting for educational research to make an informed decision. Technology Specialist 2 wrote:

I would like to say that it is solid research that influences me, but I don't need research to see students get excited using response systems, iPads, and interactive whiteboards. The game has changed and research cannot keep up with the changing tide, and I don't want my students left behind.

As educators, our concern for preparing students for a future where technology competence is likely to be an advantage for them is certainly to be commended. Making a reasoned judgment to be an early adopter of innovative technology in schools may prove fruitful and beneficial to students. However, it can be argued that weighing *Keep up with technology (or be left behind)* too heavily over *Educational goals and curriculum should drive technology* may further disconnect technology from a focus on educational goals, and create further resistance in our organizations to technological change. With many educational concerns competing for limited fiscal resources, we have to be diligent in our efforts to ensure that our technology investments benefit administrative and academic functions in schools.

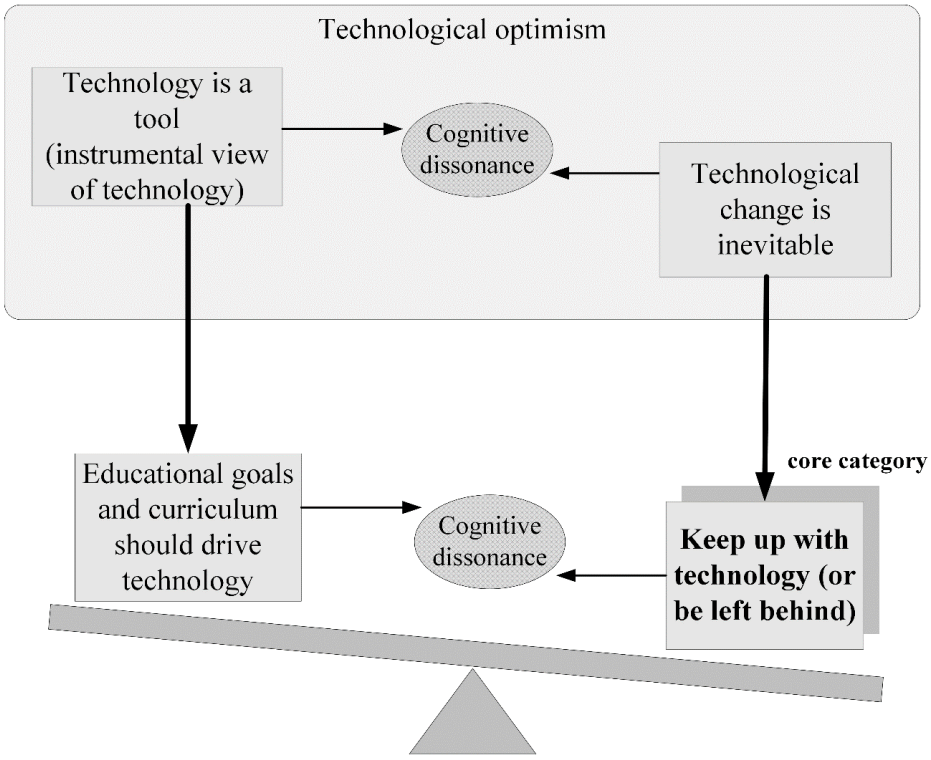

Figure 4. In competition and philosophical tension with Educational goals and curriculum should drive technology, Keep up with technology (or be left behind) is given the greater weight in technology decision making

As discussed earlier, although educational technology scholars have emphasized the importance of critically examining philosophy of technology assumptions such as technological determinism, the researcher found that empirical studies within K-12 education were lacking. It is believed that this qualitative study broke new ground by filling a gap in the literature concerning how philosophy of technology assumptions, including technological determinist assumptions, may influence the actual practice of educational technology leadership. The Strobel and Tillberg-Webb (2009) framework, which guided this study, while based on good arguments and scholarship, was not grounded in empirical research. Therefore, this study's findings and conclusions lend support to their theoretical framework. This study provides empirical evidence to support the concern of Strobel and Tillberg-

Webb that educators should critique their own beliefs and assumptions about technology, question deeper the connection between technology and human values, and engage in critical dialogue with other educators and students concerning such beliefs. This study sought to inform professional practice by contributing to what Kanuka (2008) called philosophy in practice pertaining to technology. We can conclude that philosophy of technology assumptions matter, that assumptions do shape leaders' approaches to technology decision making, and by questioning philosophy of technology assumptions, technology leaders are better able to make purposeful and informed decisions.

While technology directors and instructional technology specialists provide leadership for educational technology, a limitation of this study is that these positions are not the only K-12 educators who provide leadership for integrating technology into instruction. It is recommended that similar qualitative studies be conducted involving other groups of educators, including principals or other central office administrators. It is also recommended that similar qualitative studies be conducted involving educational technology leaders or other groups of educators in other states or nations, both in primary and secondary education, and also in higher education. Because this qualitative study broke new ground, a limitation is that as future qualitative studies are conducted in the substantive area, it may become necessary to refine the substantive theory to accommodate new data. It is also recommended that data from this or other qualitative studies be used to help develop and validate a quantitative instrument to measure philosophy of technology assumptions, for use in quantitative research.

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