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ENABLING IT SELF-LEADERSHIP IN ONLINE EDUCATION

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ABSTRACT

Aim/Purpose	This paper investigates the factors contributing to student IT self-leadership in online education using an exploratory study. Specifically, our goal was to understand whether the instructors' transformational IT leadership and the students' personal innovativeness with IT contributed to student IT self-leadership.
Background	The study was conducted in an online course. While today's students are expected to be IT natives, they still lack the skills to find and learn technologies on their own. This is problematic for both online education and students' future careers. Directed-teaching methods are not appropriate to solve this kind of problem, a more constructivist teaching method is appropriate. We recommend that instructors adopt transformational IT leadership to set norms around technology use, to be role models in using online course technologies with utmost knowledge, and to encourage and support the students in their use of IT.
Methodology	An exploratory research is conducted with 46 students in an online management information systems course at a public university. The data were analyzed using PLS structural equation modeling technique.
Contribution	This paper introduces the unique concepts of student IT self-leadership and instructors' transformational IT leadership by adapting concepts from the self-leadership and transformational leadership theories. IT self-leadership refers to the ability to intentionally influence one's own thinking, feeling, and actions toward the use of IT to reach one's work and life goals. To increase IT self-leadership, students should try new technologies as much as possible. Instructors should set up norms about trying new technologies, troubleshooting one's own issues, and play a supportive and encouraging role, rather than employing directed-teaching methods.

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Findings	IT self-leadership skills are the ability to intentionally influence one's own thinking, feeling and actions towards the use of IT to reach one's work and life goals. The findings show that instructors' transformational IT leadership as well as students' innovativeness with IT contributes to students' IT self-leadership.
Recommendations for Practitioners	Practitioners may consider exhibiting transformational IT leadership skills including (1) giving encouragement about IT use, (2) fostering trust, (3) encouraging thinking about IT problems in new ways, (4) being clear about their values about IT by practicing what they preach in their IT use, and (5) inspiring students by being highly competent in IT. Potential ways that the instructors can exhibit these skills are discussed in the paper.
Recommendations for Researchers	Researchers are recommended to include IT-self leadership of both students and instructors in their investigations on learning success. Furthermore, the inclusion of transformational IT leadership in new studies of teaching and learning success is recommended.
Impact on Society	This paper includes students as part of the solution to challenges students face in online courses rather than treating them like passive recipients of educational changes. Thereby, it helps teachers and students to work together for a better solution to educational disruptions.
Future Research	Studies should be conducted to determine other antecedents and outcomes of IT self-leadership. Research is needed on specific ways practitioners can increase their IT transformational leadership. While this paper introduced how the instructor of the exploratory study provided transformational IT leadership, more than one way of reaching each goal was practiced. Future research should test the connection between each transformational IT leadership behavior presented here and its outcome.
Keywords	transformational IT leadership, IT self-leadership, personal innovativeness with IT, constructivism

INTRODUCTION

Today's students and soon to be employees are expected to be digital natives, who are able to figure out how to use various technologies without much instruction (Prensky, 2001). There are so many information technologies, many of which are freely available, that can help today's students and employees be more effective and efficient in achieving their work and life goals. Every day, new software, mobile applications and information systems are developed for increased effectiveness and efficiency. Yet, directed teaching all of these novel information technologies to students is virtually impossible. Instead, instructors can equip students with important skills, such as IT self-leadership, that will enable them to find and use various information technologies towards their study/work and life goals. IT self-leadership is the ***ability to intentionally influence one's own thinking, feeling, and actions towards the use of IT to reach one's work and life goals***. This definition of IT self-leadership is adapted from the self-leadership definition of Bryant and Kazan (2012). How can instructors and students work towards increasing students' IT self-leadership?

In terms of what instructors can do to develop student IT self-leadership, there are two approaches: directed-instruction methods and more student-centered, constructivist instruction methods. IT self-leadership is difficult to teach with directed-instruction methods, because the information technologies that may meet the needs of each student may not be the same and may not be known (Hannafin & Land, 1997). As opposed to directed-instruction, technology-enhanced, student-centered online

learning promotes sampling technologies, discovering, manipulating, and investigating new information technologies (Hannafin & Land, 1997, p. 175). Imagine an instructor who themselves provide transformational IT leadership by setting information technology norms such as trying new technologies. Imagine an instructor who provides support and encouragement about IT use, rather than teaching a number of information technologies step-by-step. Imagine an instructor who is a role model in using information technologies for online teaching in advanced and highly competent ways, thereby inspiring students to do the same. Imagine an instructor who does these and inspires students to go above and beyond specific course goals in students' IT use. Such an instructor is providing transformational IT leadership to their students.

In student-centered teaching methods, instructors and students are a team. Learning is not something that only the instructors take charge of. Therefore, we suggest that students can increase their IT self-leadership, simply by trying new technologies, experimenting with new information technologies and being the first one among their peer group to try out new information technologies. This is called personal innovativeness with information technologies.

In this study, we ask two research questions: "Does instructors' transformational IT leadership contribute to students' IT self-leadership?", and "Does students' personal innovativeness with IT contribute to students' IT self-leadership?" We answer these research questions with an exploratory study. In this study, we find that instructors' transformational IT leadership as well as students' innovativeness with IT contributes to students' IT self-leadership. We suggest the practitioners to consider exhibiting transformational IT leadership skills including (1) giving encouragement about IT use, (2) fostering trust, (3) encouraging thinking about IT problems in new ways, (4) being clear about their values about IT by practicing what they preach in their IT use, and (5) inspiring students by being highly competent in IT. Potential ways that the instructors can exhibit these skills are discussed in the paper.

LITERATURE

IT SELF-LEADERSHIP THEORY

We define IT self-leadership as the ability to intentionally influence one's own thinking, feeling and actions towards the use of IT to reach one's work and life goals. IT self-leadership concept was first introduced by Eseryel et al. (2014, 2016) in the context of team members using IT to improve team performance with regards to product and process innovation. In today's IT-dominated business world, more than ever, we need individuals who can use IT successfully to reach their goals and bring about innovation.

This concept originates from the well-known self-leadership construct from organizational behavior literature. Self-leadership is a skill for leading one-self across challenging and performing situations towards goal achievement and necessitate goal setting and goal striving (Gollwitzer, 2003; Gollwitzer et al., 1990; Manz & Neck, 2004; Neck & Houghton, 2006). Self-leadership (Manz, 1986) is a psychological construct that represents a student's capacity for high performance (in this context in online education) through a repertoire of cognitive, motivational and behavioral self-navigation strategies (Curral & Marques-Quinteiro, 2009; Manz & Neck, 2004; Neck & Houghton, 2006). The abbreviated version of the self-leadership construct measurement measures 9 dimensions (Houghton et. al, 2012). These measures and the items used in the survey are as follows: (1) Self goal setting (I establish how well I'm doing at work), (2) self-observation (I make a point to keep track of how well I'm doing at work), (3) self-goal setting (I work toward specific goals I have set for myself), (4) visualizing successful performance (I visualize myself successfully performing a task before I do it), (5) visualizing performance (Sometimes I picture in my mind a successful performance before I actually do a task), (6) self-reward (When I have successfully completed a task, I often reward myself with something I like), (7) evaluating beliefs and assumptions (Sometimes I talk to myself (out loud or in my head) to work through difficult situations), (8) self-talk (I try to mentally evaluate the accuracy of my own beliefs

about situations I am having problems with, and (9) evaluating beliefs and assumptions (I think about my own beliefs and assumptions whenever I encounter a difficult situation).

When we apply the self-leadership concept to information technology setting: Students with IT self-leadership would set for themselves the goal of successfully learning in an online class using new IT platforms; They would aim at mastering the tools and technologies needed for online learning; When they encounter difficulty during online courses, students would re-evaluate their own beliefs and assumptions, and gain the skills to overcome these difficulties such as by effectively finding information and by troubleshooting. Moreover, having IT self-leadership skills would also mean that students, who are connected to each other 24/7 through smart technologies and social media would find ways to create communities to find innovative solutions to course-related and other problems. Self-leadership significantly contributes to work role innovation (Curral & Marques-Quinteiro, 2009). Work role innovation refers to using creative ideas to effectively and significantly changing procedures concerning roles and tasks and changing the environment (Curral, 2005; Van de Ven, 1986; West, 2001).Translating this to the online learning context suggests that students with IT self-leadership could contribute creative ideas to online courses and take on leadership in their online learning to help the learning environment be more effective for themselves, rather than expecting their instructors to provide directed-learning in every aspect of the course.

While today's so-called digital natives are expected to be fluent in technology (Prensky, 2001), they are lacking many personal (Kaup et al., 2020), technological, informational (Combes, 2009, p. 8) and learning skills (Black, 2010). Because Gen Y and Gen Z were born to have access to smart-technologies and broadband access at young ages, it is generally assumed that they are highly technically savvy (Prensky, 2001; Tapscott, 1998). Yet, in reality many lack IT self-leadership skills needed to take charge of their education (Kaup et al., 2020). "[Students] are definitely not information literate. They are unable to locate, authenticate, deconstruct (make meaning from) and use information effectively or efficiently from a range of electronic sources" (Combes, 2009, p. 8). So called digital natives multitask during classes and usually do so ineffectively (Bowman et al., 2010; Ellis et al., 2010; Fox et al., 2009; Fried, 2008; Hembrooke & Gay, 2003; Kraushaar & Novak, 2010), they prefer visuals over reading (Black, 2010), they have low attention spans (Kaup et al., 2020) and they thrive on instant gratification to work (Black, 2010). These factors together result in digital natives having low IT self-leadership.

In online learning, students' low IT self-leadership becomes visible in their low technology self-efficacy (Johnson et al., 2018). Students struggle with online platforms, and with basic IT troubleshooting, finding assignment-related information, and with submitting their assignments. As a college freshman put it "***Remote learning could be made better if everyone had had more knowledge and guidance on how to use it, on how to effectively use the platforms,… from the professors to students"*** (Lytle & Lundy, 2020). Online learning poses challenges for many students who may not have the technology skills (Gonzales et al., 2020; Kaup et al., 2020), focus (Kaup et al., 2020) digital information literacy (Combes, 2009), or motivation (Lepp et al., 2019) to troubleshoot issues they face when using information technologies. We propose investing in students' IT self-leadership in order to better prepare students for effective online learning.

How to Enable IT Self-leadership

Instructors' IT Use in Online Instruction

How can we deal with these issues about students' technological skills? Direct instruction approaches emphasize instructional strategies such as teaching content, objective-relevant questioning, feedback and assessment (e.g., Dick & Carey, 1990; Gagne et al., 1988). As opposed to direct instruction approaches, in student centered-approaches, instructors allow learner choice and control (Chung & Reigeluth, 1992) on which technologies to use. In this paper, in line with student-centered instruction, we suggest that instructors move from traditional direct instruction approaches: We suggest that

the instructors become role models in helping students in online courses, take on leadership of their own learning and contribute to the instructors' efforts for an effective online learning experience.

There is a need for further research on the link between instructors' information technology use and student instruction (Cuban, 2001). In spite of the apparent commitment to technology of some schools, many instructors use information technologies to support their current traditional teaching practices rather than as a tool to promote more innovative practices (Cuban, 2001). The teachers' knowledge, beliefs, and actions about information technologies affect the success of the students when it comes to technology use (Gilakjani et al., 2013). The teacher should become one of the resources that the student may learn from. The instructor should become a role-model in terms of technology use in online courses. Furthermore, the instructor should engage students in experiences that challenge previous conceptions of their existing knowledge (Gilakjani et al., 2013). Instructors should encourage and accept student autonomy and initiative when it comes to information technology use (Gilakjani et al., 2013). These recommendations toward instructors are examples of instructors' transformational IT leadership. When instructors integrate technology well into the classroom, they can set up a constructive learning environment (Reeves, 1998) which helps learners to work together and support each other as they use information technologies to achieve learning goals (Rakes, 2006). In order for technology to positively affect teaching methods-and therefore student learning-teachers must possess the technology-related skills needed to use technology and must actively use these tools in their classrooms (Iding et al., 2002). Lack of instructor knowledge and skills (Hew & Brush, 2006; Rashid & Elahi, 2012) and negative teacher attitudes and beliefs towards information technology hamper successful technology integration (Hew & Brush, 2006).

Transformational Instructors with respect to IT Leadership

Yun et al. (2006) showed that effective self-leadership development and manifestation is strongly dependent on instructors' leadership style. While there are many theories of leadership that may affect students, the complete review of the literature is beyond the scope of this article. A thorough classification and presentation of the leadership literature is provided by Northouse (2007). Instructors who adopt directed-teaching methods reward students for repeating the learned knowledge in examinations, and in class. Directed-teaching methods are effective in enabling the students to achieve clear and non-complex learning goals, yet may fail when the learning goals are complex and all components of the learning goals are not knowable or definable.

Transformational leadership can be seen as a constructivist teaching method, rather than directed teaching. Transformational leadership basically involves inspiring students to go above and beyond (Podsakoff et al., 1990). It is more likely to enable students' IT self-leadership because of the following. Transformational instructors take risks to try new ways of teaching, change existing methods and try new information technologies for achieving long-term learning benefits (Pearce & Ensley, 2004). They inspire students to increase their creative initiatives, improve their problem-solving and analytical abilities (Sosik et al., 1998). Transformational instructors help students tackle challenging goals (Whittington et al., 2004), encourage their learning (Gong et al., 2009) and idea implementation by encouraging them to think out of the box solutions to learning problems (Afsar et al., 2014). They do so by providing encouragement, fostering trust, and providing intellectual stimulation (Afsar et al., 2014). Therefore, when instructors exhibit transformational behaviors in their teaching and how they treat students, this may contribute to developing students' self-leadership.

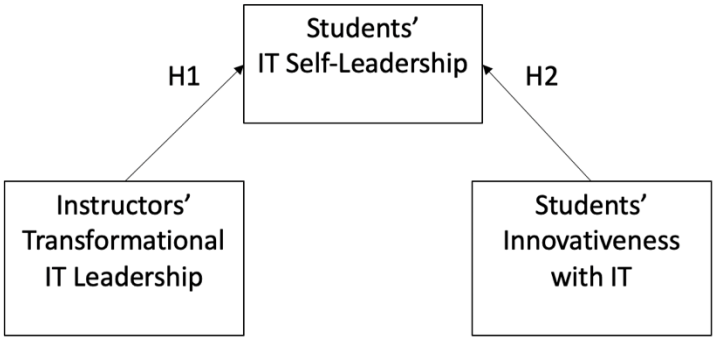

Figure 1: The Role of Transformational IT Leadership and Innovativeness with IT on IT Self-Leadership

While many researchers wrote about transformational leadership, they all share the common perspective. According to this, effective transformational instructors "transform or change the basic values, beliefs, and attitudes of followers so that [the students] are willing to perform beyond the minimum levels specified by the [university]." (Podsakoff et al., 1990). Transformational leadership of instructors does not really require the use of technology, or affect IT related values, beliefs or attitudes. In order to enable IT self-leadership, we need to transform the IT values, beliefs and attitudes of students, who may have the attitude that "IT is difficult" or "I don't know much about technical stuff". This way, students can be open to learning about technologies through active experimentation and use. IT self-leadership requires a student to deal with challenging IT tasks that extend beyond their immediate knowledge. For an instructor to be a role model with respect to IT-related values requires the instructor to develop their own high values with respect to IT and also to practice these values by being competent in IT themselves. Furthermore, an instructor who is a transformational IT leader thinks about their own IT problems and challenges in new ways. We call this transformational IT leadership of instructors, adapting the well-known transformational leadership theory to the IT context (Avolio & Bass, 1988; Avolio et al., 1999; Podsakoff et al., 1996; Podsakoff et al., 1990; Purvanova & Bono, 2009; Tichy & DeVanna, 1986). We suggest that developing students' IT self-leadership requires instructors to exhibit transformational IT leadership in their teaching and how they deal with IT in their lives (Figure 1). Therefore, we propose:

H1: *Instructors' transformational IT leadership contributes to students' IT self-leadership.*

Students' (Personal) Innovativeness with IT

Student-centered online instruction is an instructional approach in which students influence the content, activities, materials and pace of learning in online education (Collins & O'Brien, 2003). Student-centered instruction can lead to increased motivation to learn, greater retention of knowledge, deeper understanding, and more positive attitudes towards the subject being taught (Collins & O'Brien, 2003). In line with student-centered instruction methods, technology is often employed as a tool functioning as cognitive tools for experimentation, manipulation and generation of ideas (Land & Hannafin, 1998, p. 239). Achieving positive results with technology means that students augment their thinking, and build meaning upon their self-driven actions (Salomon et al., 1991). However, achieving such positive results require that learners interact positively with technologies, and that they are able to overcome the technological challenges they face.

With IT self-leadership skills, the students take control of their own IT use. The students take charge of which information technologies to choose to reach their own goals. Technology-enhanced, student-centered online learning environments promote sampling technologies, discovering, manipulating, and investigating new information technologies (Hannafin & Land, 1997, p. 175). The individual must reason before acting, assess what needs to be understood, which technologies can help them,

and then practice various approaches to use these technologies. Technology-enhanced, student-centered online learning environments create contexts within which knowledge and skill are authentically anchored and provide a range of tools and information technology functionalities with which to navigate and manipulate (Hannafin et al., 1994). They afford opportunities to seek rather than to comply, to experiment rather than to accept, to evaluate rather than to accumulate, and to interpret rather than to adopt.

A student's (personal) innovativeness with IT identifies the degree to which a student is willing to try out any new information technologies (Agarwal & Prasad, 1998). Wang et al. (2011) measure this concept with three items: (1) If I heard about a new information technology, I would look for ways to experiment with it, (2) among my peers, I am usually the first one to try out new information technologies, and (3) I like to experiment with new information technologies. Innovativeness with IT is associated with more positive beliefs about technology use (Wang et al., 2008). Students with higher innovativeness with IT are more likely to have positive perceptions about novel information technologies (Wang et al., 2008). Therefore, we expect that when those students face difficulties with IT, they would be more likely to evaluate the correctness of their beliefs and assumptions, a self-leadership behavior. Students who are more innovative with IT are sensitive to new information and would therefore collect more novel information that provides inspiration for novel behaviors (Hirschman, 1980). Therefore, it would be expected that students with higher level of innovativeness with IT may be more willing to take risks and may better tolerate the uncertainty that information technologies bring (Wang et al., 2011).

Students who are personally innovative with IT, meaning those who experiment with new information technologies (Agarwal & Prasad, 1998) are likely to show high IT self-leadership. This is because when students practice working with various new technologies, they develop their self-confidence and effectiveness with IT. Therefore, we propose that:

H2: *Students' innovativeness with IT contributes to students' IT self-leadership* (Figure 1)

In the next section, we present a study conducted at an online management information systems course, to illustrate how to enable students' IT self-leadership through the transformational IT leadership manifested by the instructor.

METHODOLOGY

A quantitative data analysis method is selected to answer the question "Which factors contribute to students' IT self-leadership skills?". The factors to be tested, namely instructor's transformational IT leadership and students' innovativeness with IT were identified based on the literature review. We conducted an exploratory study with a single introductory online course. An introductory online course is selected because it is taken by all college majors in the college of business, thereby it does not discriminate among students who may be more or less apt to use technology. Due to the exploratory nature of the study and due to the small sample size, PLS structural equation modeling is used in the data analysis. PLS structural equation modeling is a non-parametric method that does not require that the data meet certain distributional assumptions, thereby it is an appropriate analysis method for this study.

In the remainder of this section, we present the data and discuss the steps the instructor took to exhibit transformational IT leadership.

DATA

The data used in our study is collected at the end of an online management information systems course, which is a required course in the business curriculum at a public American university. The students were offered bonus points for participating in the survey. The students were informed that other bonus point options were available if they chose to opt out of this survey. 46 students in the

course participated in the survey, which constitutes 95% of the class participants. This high response rate is probably due to the ease of responding to survey questions rather than doing another assignment. Table 1 presents a summary of the student profiles.

Table 1: Summary of Participant Profiles

Year	Freshman (2); Sophomore (9); Junior (31); Transfer (2)
Gender	Male (27); Female (19); Other (0)
Average GPA	3.09
Range of GPA	2.4-4.0
Ethnic Background	Caucasian (34); African American (5); Hispanic American (4); Asian (2); Middle Eastern (1)

The technology used for this study included Canvas learning management system for most asynchronous course activities and WebEx for all synchronous course activities. Asynchronous course activities included watching course videos posted by the instructor, participating in online discussions with other students either by posting written comments or by posting video-comments, downloading group assignments and uploading their finished assignments. While most students are familiar with WebEx, Canvas was a new system for the students. Most students were used to using Blackboard, which used to be the standard learning management system for the college. Canvas presented the students with a different navigation system than the one students were used to, which posed a challenge to students. Canvas learning management system and the WebEx virtual meeting application are the information technologies which the instructor used to exhibit transformational IT leadership, and which presented the opportunity for students to exhibit IT self-leadership.

Table 2 shows the items used to estimate the predictor latent constructs. A seven-point Likert scale with anchors of strongly disagree to strongly agree was used to measure each item. The IT Transformational Leadership scale is adapted from the short form of the transformational leadership scale (Carless et al., 2000) through discussions with several master's students who have tested the scale in their masters' theses. The items' wordings were discussed multiple times with the team of students and revised based on pilot studies. Two items were removed during the factor analysis. These were specifically about vision (communicating a clear and positive vision of the future with IT use), and student development (treating students as individuals, supporting and encouraging their development in the IT area). These two items were removed due to their weak loading with their respective factors. These two items are *reflective* of the construct, meaning that the direction of causality moves from the constructs to the item. When the items are reflective, adding or dropping items does not change the nature of the construct (El-Den et al., 2020, p. 327).

The IT Self-Leadership scale is adapted from Houghton et al. (2012) abbreviated IT self-leadership survey instrument. Four items were removed from IT self-leadership scale during the factor analysis. Specifically, we removed items on self-observation with IT, self-goal setting with IT, visualizing successful performance with IT, evaluating IT beliefs and assumptions due to weak loading with their respective factors.

Personal Innovativeness with IT scale (Agarwal & Prasad, 1998) has been adopted from (Wang et al., 2011). Table 2 presents the items used for all three constructs.

Table 2: Predictor Latent Construct Items

Transformational IT Leadership (IT-TL)
IT-TL1 Gives encouragement and recognition to students about IT use
IT-TL2 Fosters trust, involvement and cooperation among students in IT projects
IT-TL3 Encourages thinking about IT problems in new ways and questions assumptions
IT-TL4 It's clear about their values about IT and practices what they preach with their IT use
IT-TL5 Instills pride and respect in others and inspires me by being highly competent in IT
IT Self Leadership (ITSL)
ITSL1 I establish specific performance goals for myself with the help of IT
ITSL2 Sometimes I picture in my mind a successful performance with IT before I actually use IT
ITSL3 When I have mastered at IT tool, I often reward myself
ITSL4 I try mentally to evaluate the accuracy of my own beliefs about challenging IT tools
ITSL5 I think about my own beliefs and assumptions whenever I encounter difficulty when using IT
Personal Innovativeness with IT (PIIT)
PIIT1 Among my peers, I am usually the first to try out new IT tools
PIIT2 If I hear about a new IT, I would look for ways to experiment with it
PIIT3 I like to experiment with new IT tools

To exhibit transformational IT leadership, the instructor paid particular attention to (1) incorporating into the course a main intervention that enabled her to exhibit transformational IT leadership where possible, and (2) repeating the IT transformational leadership behaviors with small interventions throughout the course. These two types of interventions are provided in Table 3. For the main interventions, mostly small group projects called "Group Participation Assignment (GPA)" were used. The group participation assignments were small assignments that the students could complete by meeting online among themselves for an hour, and which require minimal or no extra work beyond that meeting. These assignments can be taught of an equivalent of in-class group assignments that are used to teach a specific subject matter. The small interventions were the comments that the instructor made to students in video responses to student discussions, or responses to student emails. The instructor also included these comments in general announcements to the students using Canvas system's announcement feature. These interventions should not be thought of as a firm recipe, rather they can be used by the reader as guidelines as to the numerous ways instructors can exhibit transformational IT leadership for their students.

Table 3: Instructor's Transformational IT Leadership Interventions

	Main Intervention	Ongoing Small Interventions
IT-TL-1 Gives encouragement and recognition to students about IT use.	One group participation assignment was specifically focused on group-level information technologies, in line with the course material. The assignment specifically asked the students to set up mobile and web-based technologies to collaborate together. The students were prompted to think outside the box and think of as many technologies as possible to collaborate. These two criteria were also reflected in the grading of the assignment.	• Compliment students specifically about using technology in unique ways. • Compliment students when they are able to solve IT-related problems, such as when their computer is stuck and they can resolve the issue.
IT-TL-2 Fosters trust, involvement and cooperation among students in IT projects	The first group participation assignment focused on team building, where the team was asked to get to know each other, their hobbies, their work styles, how to accommodate each other, and set norms around how to give each other constructive feedback, when a member is not contributing as expected.	• Remind the students several times throughout the class that we are a team, and we must work together. • Incorporate into an appropriate lecture rules about how to best work together, and how to best give critical feedback in a gentle way. • When students complain about other students, instruct them on how to give critical feedback using email or using synchronous technologies.
IT-TL-3 Encourages thinking about IT problems in new ways and questions assumptions	• Part of the course required learning technologies (such as Excel or business analytics). • The instructor questioned students' assumptions that they should know technology features by heart to properly use the technology. • The instructor had a 15-minute discussion on students' general attitude towards technology which is often voiced by students as "I am not good with technology". She emphasized that similar to many things in life (sports, playing instrument, art), being good at technology is not a gift, it is a skill that is learned and improved with practice.	• Repeatedly remind the students to use Google to find out various functionalities. • Illustrate how to use Google search to find out functionalities when the students cannot answer questions on features, or when they are having problems while doing their assignments. • Inform the students that you (the instructor) do not memorize functionality, that you also search the web to troubleshoot IT problems. • Remind the students several times that the goal in class is not to get the students to memorize software functionality, but to be able to solve business problems when they come up.

	Main Intervention	Ongoing Small Interventions
IT-TL-4 Is clear about their values about IT and practices what they preach with their IT use	At the beginning of the course, the instructor set up course norms that include the following: • Not to multitask with technologies (such as mobile phone) during the coursework, • To use information technologies as innovatively as possible to collaborate effectively • To treat all students in the class as team members • To treat this class as a learning environment where making mistakes are okay	• Abide by all the norms you set for students. • Turn your phone off (by stating explicitly what you are doing) at the beginning of WebEx sessions, to be a role model to students. • If you forget to turn the phone off, and it rings or makes noise, apologize for breaking the rule and turn your phone off immediately by explicitly stating what you are doing, thereby role modeling to the students. • Give examples during the course where you used IT innovatively to solve the business problem that is relevant to the course topic. • Use various functionalities of Canvas that are not commonly used by other instructors, e.g.: Sending video comments to students, or incorporating quiz questions into videos. • Call on the students during synchronous video lectures and when they cannot answer correctly, gently and without punishing them, correct their mistakes.
IT-TL-5 Instills pride and respect in others and inspires me by being highly competent in IT	The instructor attended multiple training sessions on Canvas learning management system to increase her competency. The instructor took time to practice features of WebEx synchronous meeting tool to ensure competency.	• Put in extra time to learn Canvas functions well. • Put different new features of Canvas to use. • Never make apologetic comments about technology when facing technological issues during teaching, rather stay calm and try to resolve issues with patience and by trying different methods. • Treat all students kindly, and when students make mistakes, treat them with light humor as you would like to be treated.

Analysis

The research model of Figure 1 was analyzed using Smart-PLS (version 3.3.2), a PLS structural equation modeling tool (Ringle et al., 2015). Smart-PLS assesses the psychometric properties of the measurement model and estimates the parameters of the structural model. However, the parametric significance tests cannot be applied to test whether coefficients such as outer weights, outer loadings and path coefficients are significant. Instead, PLS-SEM relies on a nonparametric bootstrap procedure (Davison & Hinkley, 1997) to test the significance of various results such as path coefficients, Cronbach's alpha, and R^2 values. In bootstrapping, subsamples are randomly drawn observations from the original set of data (with replacement). The subsample is then used to estimate the PLS path model. This process is repeated until a large number of random subsamples has been created (1,000 in this study). The estimations from the bootstrap subsamples are used to derive standard errors for the PLS structural equation modeling results, which help calculate the t-values, p-values, and confidence intervals to assess the significance of the PLS structural equation modeling results that are reported below. While extensive discussion of bootstrapping beyond our context here, this information is provided by Hair et al. (2017).

Findings

The Structural Model

Figure 2 shows the structural model results. All beta path coefficients are positive (i.e. in the expected direction) and statistically significant ($p < 0.0001$).

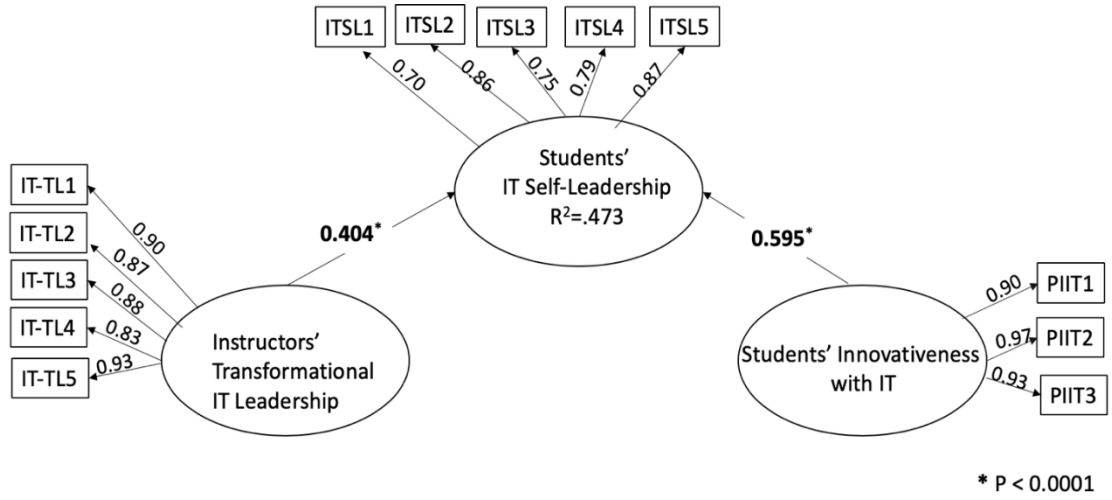

Figure 2: Structural model results

Our study showed that the instructors' transformational IT leadership contributed to students' IT self-leadership, therefore our first hypothesis was confirmed. Secondly students' innovativeness with IT contributed to students' IT self-leadership, therefore our second hypothesis was also confirmed.

Transformational IT leadership of the instructor had a positive influence on the IT self-leadership of the students (beta = 0.404, $p < 0.0001$). Students' personal innovativeness with IT values had a significant influence (beta = 0.595, $p < 0.0001$) on students' IT self-leadership. The model explains 47.3% of the variance in IT self-leadership behaviors of students.

The Measurement Model

Reliability results are given in Table 4. The data indicates that the measures were robust in terms of their internal consistency reliability as indexed by the composite reliability. The composite reliabilities of the different measures ranged from 0.90 to 0.95, which exceeded the recommended threshold

value of 0.70 (Nunnally, 1978). Moreover, consistent with the guidelines of Fornell and Larcker (1981), the average variance extracted (AVE) for each measure exceeded 0.50 indicating convergent reliability. Table 5 reports the results of testing the discriminant validity of the measure scales. The elements in the matrix diagonals, representing the square roots of average variance extracted, are greater in all cases than the off-diagonal elements in their corresponding row and column, supporting the discriminant validity of our scales.

Table 4: Assessment of the Measurement Model

Variable Constructs	Composite Reliability[(a)]	Average Variance Extracted[(b)]	Cronbach's Alpha[(c)]
Transformational IT Leadership	0.95	0.78	0.93
IT Self-Leadership	0.90	0.64	0.86
Personal Innovativeness with IT	0.95	0.87	0.92

a. All composite reliability (CR)>0.7 indicates internal consistency (Gefen et al., 2000)

b. All average variance extracted (AVE)>0.5 indicates convergent reliability (Bagozzi, & Yi, 1988; Fornell & Larker, 1981)

c. All Cronbach's alpha > 0.7 indicates indicator reliability (Nunnally, 1978)

Table 5: Discriminant Validity (Inter-correlations) of Variable Constructs

Latent Variables	1	2	3
Transformational IT Leadership	0.88		
IT Self-Leadership	0.35	0.08	
Personal Innovativeness with IT	-0.09	0.56	0.93

Convergent validity was tested by extracting the factor and cross loadings of all indicator items to their respective latent constructs. These results, presented in Table 6, indicated that all items loaded on their respective construct from a lower bound of 0.70 to an upper bound of 0.97, and more highly on their respective construct than on any other. Moreover, 13 items' factor loading on its respective construct was highly significant at ($p < 0.0001$). These were indicated by the T-statistics of the outer model loadings in the Smart-PLS graph output. These values ranged from 27.94 to 94.62. The constructs' items' loadings and cross loadings presented in Table 6, and the highly significant T-statistic for individual item loadings both confirmed the convergent validity of these indicators as representing distinct latent constructs.

Table 6: Factor Loadings (Bolded) and Cross Loadings

	Transformational IT Leadership	IT Self-Leadership	Personal Innovativeness with IT
IT-TL1	**0.90**	0.31	-0.05
IT-TL2	**0.89**	0.28	-0.12
IT-TL3	**0.88**	0.31	-0.13
IT-TL4	**0.83**	0.29	-0.02
IT-TL5	**0.93**	0.37	-0.08
ITSL1	0.30	**0.70**	0.44
ITSL2	0.23	**0.86**	0.55
ITSL3	0.27	**0.75**	0.41
ITSL4	0.35	**0.79**	0.34
ITSL5	0.25	**0.87**	0.46
PIIT1	-0.14	0.53	**0.90**
PIIT2	-0.04	0.53	**0.97**
PIIT3	-0.08	0.50	**0.93**

DISCUSSION AND CONCLUSION

Online teaching is becoming more and more common. What we have seen so far is the ineffectiveness of the sole use of directed teaching (i.e., rewarding student conformity to expected behaviors with grades). This is evidenced by many recent studies and surveys conducted after students moved from face-to-face to online teaching (see, for instance, Kim et al., 2020; Lytle & Lundy, 2020; Marinoni et al., 2020). The students disliked learning online so much that it was reported that 48% of students intended to defer enrollment or look for a different college if their colleges offer online learning only in the fall 2020 semester (Kim et al., 2020).

Effective online education depends on using many technologies seamlessly, whereas the students have not been effective users of technology in complex learning settings. This exploratory study was conducted when the instructor moved to a new technology platform for online education, which exposed the need for students to have IT self-leadership skills. Ever more urgently the students were forced to learn new IT platforms and technologies to accomplish their learning goals.

In this paper, we proposed that students' IT self-leadership is crucial to the success of online learning. IT self-leadership skills refer to the ability to intentionally influence one's own thinking, feeling and actions towards the use of IT to reach one's work and life goals. In this study, we answered the research questions "Does instructors' transformational IT leadership contribute to students' IT self-leadership?", and "Does students' personal innovativeness with IT contribute to students' IT self-leadership?". We proposed that two factors contribute to students' IT self-leadership. First, self-leadership development is strongly dependent on instructors' leadership style (Yun et al., 2006). Therefore, we argued that developing students' IT self-leadership requires instructors to act as transformational IT leaders in their teaching and how they treat students. Second, students who are personally innovative with IT, meaning those who experiment with new information technologies (Agarwal &

Prasad, 1998) are likely to show high IT self-leadership. We illustrated these two points with an exploratory study, which showed that and instructors' transformational IT leadership and students' personal innovativeness with IT explain 47.3% of students' IT self-leadership. Computer self-efficacy, IT playfulness, and general interest in information technologies are some of the factors that may explain the remaining 52.7% that is unexplained by our model. Future research should test these factors to increase the explanatory power of this study.

Below, we discuss the contribution of our study to theory and practice as well as recommended future research.

Contribution to Theory

The unique contribution of this exploratory study is the adaptation of self-leadership and transformational leadership theories to the informational technology field to develop the IT self-leadership and transformational IT leadership concepts as being relevant to constructivist learning theories. Transformational IT leadership is a student-centered approach where instructors allow learner choice and control (Chung & Reigeluth, 1992) specifically on which technologies to use and how to use them.

With this research, we respond to the call by Cuban (2001) for further research on the link between instructors' information technology use and student instruction and contribute to the development of this research stream. We specifically find that when the instructors use online education technology successfully, and when they set up explicit norms about trying new technologies, the students take charge of their thoughts, emotions, and actions towards IT use. Seeing the instructor as a supportive person, rather than one who gives step-by step instructions further helps students take charge of their IT use. Thereby, this study constitutes an example of teachers' use of technology to support student-centered instruction, which is rare (Judson, 2006; Palak & Walls, 2009). In this study, the instructor believed that the students should be able to independently troubleshoot basic information technology navigation issues, and encouraged the students to take charge of their information technology use by motivating the students to learn technologies on their own and supporting student troubleshooting by demonstrating it in synchronous videos. In that sense, the suggestion in (Gilakjani et al., 2013) that teachers' knowledge, beliefs and actions affects student success is confirmed when it comes to information technology use in online courses. This study also emphasized the role of the instructor as a role model to students (Gilakjani et al., 2013). This exploratory study showed that when students perceived the instructor to be highly competent in information technology, their own IT self-leadership had increased. This is also in line with (Iding et al., 2002), who suggested that in order for technology to positively affect student learning, teachers must possess technology-related skills needed to use technology, and must actively use these tools in their classrooms.

Contribution to Practice

Our study shows that part of the instructors' course preparation for online teaching is their investment in their own transformational IT leadership. When instructors contribute to their students' IT self-leadership this investment will pay back: The students will become active participants in their education. Then the students will be able to actively incorporate technology into their strategizing and tactical initiatives during their careers. Developing students' IT self-leadership will make the online courses more impactful for our students' and influence our students' future careers.

Future Research

Future research is recommended to test our findings from the exploratory study with larger sample sizes and at different courses and institutions. Researchers are recommended to include IT-self leadership of both students and instructors in their investigations on learning success. Furthermore, the inclusion of transformational IT leadership in new studies of teaching and learning success is recom-

mended. Studies should be conducted to determine other antecedents and outcomes of IT self-leadership. Research is needed on specific ways practitioners can increase their IT transformational leadership. Lastly, it is needed to conduct research in business settings to extend this study to organizational learning environments.

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