The Influence Of Transformational IT Leadership On The IT Leadership Of Followers

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Abstract

Investments in information technology (IT) are underutilized, thus a key topic of IT Leadership is the enablement of IT utilization and increasing innovation through IT use. Most research about IT leadership focuses on the top-down leadership from the C-suite. As organizational hierarchy flattens, and teamwork becomes the new way of working, the IT leadership of team leaders and members becomes key to IT-use and IT-based innovation. In this study, we conceptualize IT leadership, building on the concepts of IT self-leadership and personal innovativeness in IT. We investigate the relationship between team leaders' transformational IT leadership and team members' IT leadership. Further, we investigate whether team leaders' and members' IT leadership increase team members' job satisfaction. We conduct an empirical study across seven European countries and seven industries with 130 employees from various teams. Our findings reveal that transformational IT leadership of team leaders is positively related to IT leadership of team members. We found a relationship between IT leadership and job satisfaction only for individuals between 19 and 33 years old.

Keywords

Transformational IT leadership, transformational information technology leadership, IT leadership, IT self-leadership, job satisfaction, age

Introduction

This study investigates the role of team managers' transformational information technology (IT) leadership on team members' IT leadership. Transformational IT leadership (Eseryel, 2020) can be defined as inspiring followers to go above and beyond in their Information Technology (IT) use to increase their own (i.e., the followers') work efficiency and effectiveness. We further investigate whether the team members' IT leadership, that results from a team's transformational IT leadership behavior influences team members' job satisfaction.

Since most organizational processes are enabled by information technology (Jasperson, Carter & Zmud, 2005), IT plays an important role in the business world (Afshari, Bakar, & Luan, 2009; Devine et. al, 1999). Yet, investments in information technology (IT) are underutilized (Li & Hsieh, 2007; Jasperson, Carter, & Zmud, 2005). The underutilization of information technologies by users has received considerable attention (Wang, Li, & Hsieh, 2013; Hsieh & Wang, 2007; Jasperson, Carter & Zmud, 2005). Depending on the industry, 'proper' IT use may even be "vital to create and sustain competitive advantage" (Li & Hsieh, 2007, p. 15). Research shows that information technologies are far from saturation (Bjorn-Andersen & Raymond,

2014). According to Bjorn-Andersen & Raymond (2014) and Afshari, Bakar & Luan (2009), the implementation and use of IT is related to organizational change, which requires strong IT leadership. The term 'IT Leadership' in extant research typically refers to the IT leadership of the C-suite, or the leadership of IT directors or managers. For example, Jasperson, Carter & Zmud (2005) suggests that the potential of IT lies in the management's hands by developing strategies, which encourage the use of IT in new and innovative ways (Jasperson, Carter & Zmud, 2005) that go beyond the minimum requirements of IT use (Li & Hsieh, 2007) to improve task performance (Kim, Malhotra, & Narasimhan, 2005).

While most of executive's IT leadership focus on adopting new and innovative IT, most IT-use benefits arise from increasing the utilization of IT after its adoption (Jasperson, Carter & Zmud, 2005). This could take the form of individuals using IT to set and achieve performance goals or innovating with IT individually or in their teamwork. Since organizations increasingly become less hierarchical, and teamwork becomes the new norm of collaboration, IT leadership of individuals for their own work, and for their collaboration with their team members is key to increasing IT utilization. Yet, little research has been done in the post-adoptive phase, even though this is the longest phase and where most benefits accrue for the firm (Jasperson, Carter & Zmud, 2005). Although researchers agree that managerial support is essential for innovative IT use (Jasperson, Carter & Zmud, 2005; Bassellier, Benbasat & Reich, 2003), research has yet not explicitly addressed the influence of team leaders in stimulating IT leadership within their teams. To fill this gap, we ask the following general research question:

What is the influence of transformational IT leadership of team leaders on the IT leadership and job satisfaction of team members?

Theoretical Framework

This section introduces the conceptual development on IT self-leadership, IT leadership and transformational IT leadership. In the remainder of this article, the term 'follower' and 'employee' are used interchangeably to refer to a member of a team, who is not perceived by the team members as the team leader.

IT Self-Leadership Construct Development

Our efforts to develop IT Leadership started by developing IT self-leadership scale. IT self-leadership was defined as "the ability to intentionally influence one's thinking, feeling and actions towards the use of IT to reach one's (work) goals" (Eseryel, 2020, p. 124). In this paper, we improve our definition by incorporating the voluntariness of IT use, which is captured by the first component of IT self-leadership. As a result ***IT self-leadership***'s improved definition is ***the ability to intentionally influence one's thinking, and feeling toward IT use, and using IT voluntarily to reach one's goals.*** Eseryel et al. (2014) found that IT self-leadership influences innovative behavior by enhancing communication, feedback, brainstorming, networking, sharing knowledge, visualization, and adaptive behavior (p. 95).

While IT self-leadership term finds its source from the self-leadership concept in organizational theory, it extends the meaning of the term in multiple ways: (1) The term does not relate to the managerial control, in fact IT self-leadership can be exhibited bottom up, (2) The term is relevant to IT use, regardless of what context or field one works in, (3) While self-leadership is focused on getting oneself to do a task, IT leadership refers to using IT (even voluntarily) to do a task, and (4) IT-use exhibited in IT self-leadership refers to use of IT that is not required by one's job or task description.

Manz coined the term self-leadership as constituting "the core of the management process" because it complements managers' role by initiating an additional control mechanism, which "exists within each person" (Manz, 1991, p. 88). Self-leadership was the antecedent of self-management, which was defined as an approach for managers to "address self-regulation or higher level control standards" (Manz & Sims, 1980, p. 366) for followers to work more independently by using self-observation, self-goal-setting, cueing strategies, self-reinforcement, self-punishment and rehearsal (Manz, 1986). Self-management guides people to perform tasks because there is a necessity to do them and/or there is an extrinsic reward linked to their performance (Manz, 1986). Later, Manz augmented the self-leadership term, by including self-regulation related to intrinsically motivating tasks. By late 80's he defined self-leadership as "leading oneself toward performance of naturally motivating tasks as well as managing oneself to do work that must be done but is not naturally motivating" (Manz 1986). Currently, self-leadership term goes beyond self-management, by focusing on

behavioral reinforcement, intrinsic motivation, and constructive thinking to enhance individuals' self-regulation and self-direction (Neck and Houghton 2006).

While the importance of self-leadership is established in organizational leadership literature (Houghton and Neck 2002), how individuals exhibit leadership with information technologies is not (Eseryel, Bakker, Eseryel, 2014). Therefore, we adapt Manz's (1986) reasoning to the IT context to develop IT self-leadership. According to this, IT self-leadership has three categories of components:

Components of IT Self-Leadership

(1) Voluntary IT Use for Goals & Performance
The first component of IT Self-Leadership is the adaptation of the category called "behavior focused strategies (Georgianna, 2007; Neck & Houghton, 2006) or "behavior awareness & volition" (Houghton, et al., 2012). In the self-leadership context, this category referred to individuals setting and keeping track of goals and their performance with respect to these goals.

In the IT self-leadership context, this category was adapted to capture two things: (a) individual using IT to set goals and measure their own performance with respect to these goals, (b) voluntariness aspect, i.e., individual doing all these with IT, even though they are not required by their job description. The behaviors that fall into this category refer to IT-enabled self-goal setting, and IT-enabled self-observation behaviors. One hopes that these behaviors will be followed by self-rewards, and self-correcting, although these two types of behaviors are not captured, and rather the voluntary IT-use that may cause these behaviors is captured.

(2) IT-Use Motivators
The next component of Self-Leadership is referred to as "motivational strategies" (Georgianna, 2007) or as "Task motivation" (Houghton, Dawley & DiLiello, 2012), which lists triggers that enhance motivation such as feelings of competence, self-control, the sense of purpose (Konradt, Andreßen & Ellwart, 2009), and self-reward.

For IT self-leadership concept, we adapt this category to refer to the strategies that individuals use to motivate themselves to use IT for their tasks. One element of this component is visualizing oneself doing a task successfully with IT before attempting the task. The other component is rewarding oneself when one masters an IT tool. Both visualizing success with IT and rewarding oneself are motivators for IT-use.

(3) Constructive Thought Strategies (Metacognitive Efforts) to Motivate IT Use
The last component of self-leadership is 'constructive thought strategies' (Georgianna, 2007; Neck & Houghton, 2006), also called "Constructive Cognition" (Houghton, et al., 2012). This component relates to observing one's own mental processes to assess the accuracy of one's own (negative) beliefs about a difficult task or using self-talks to keep working on challenging tasks (Georgianna, 2007).

We refer to this last component of IT as "constructive thought strategies to motivate IT use". This component includes a person questioning their potentially negative thoughts of IT, when they have difficulties using IT for a task. It further includes a person using self-talk strategies when they run into challenges using IT for a task. This component can also be called Metacognitive Efforts to Motivate IT Use because metacognition refers to a person observing how they think about ideas and how they cognitively construct meaning.

Development of the IT Leadership Construct

In the preceding section, we described the elements of IT self-leadership and how this concept was operationalized based on adaptation of organizational self-leadership theory. Self-leadership refers to a person affecting one's own behavior. In IT self-leadership, the person who leads and the person who follows are the same person. When we use the word 'lead', without the word 'self', we indicate that there is a person who leads, and there are one or more other people who follow the person who leads. Therefore, IT Leadership construct needs to be different than IT self-leadership.

We define ***IT leadership*** as ***leading self and others in effective, efficient, and innovative IT-use to work and collaborate to achieve goals.*** In this definition, 'others may refer to members of one's team, department, unit, company/organization, an alliance of organizations, country, or a number of countries. Therefore, 'goals' may be the goals of one's team, department, unit, company/organization, an alliance of organizations, a country, or a number of countries. Our definition of IT leadership does not restrict who a leader is. A leader does not need

to be a manager, director, a CIO, CEO, or the president of a company/organization/country. IT leaders can just as easily be at the bottom, or middle of a unit as they can be at the top. They may or may not have a title that equals a position of power or status. Therefore, IT leadership allows for bottom-up leadership, top-down leadership, and leadership of peers.

We operationalize IT leadership by combining the elements of (1) IT self-leadership, (2) personal innovativeness with IT and (3) innovating with IT for collaboration (Figure 22). The personal innovativeness with IT (PIIT) was measured by three items developed by Agarwal and Prasad (1998) and also used by Wang, Li, & Hsieh (2011). We developed another five questions, inspired by PIIT, to measure innovating with IT for team collaboration.

> IT Leadership= IT self-leadership + personal innovativeness with IT+ innovate with IT for collaboration.

Figure 2. Components of IT Leadership

Transformational IT Leadership

Northouse's (2019) book provides a systematic overview of leadership theories. The commonality across many leadership theories is that they are transactional in nature: The leader's goal is to motivate and/or support the followers to accomplish the goals that the leaders laid out for them. The leader in return, rewards the followers for achieving these goals. The rewards are generally tangible in the form positive reviews, raises, and bonuses. Thus, there is an expectation of a transaction where the followers achieve the leader's goals, and in return they get financial and motivational rewards. Transformational leaders differ from transactional theories in that leaders inspire followers to go above and beyond what is expected of them (Podsakoff et al., 1990).The field of Information Systems is highly dynamic and is constantly transformed and revolutionized (Elrod et al., 2022). Therefore, working with information technologies requires individuals to overcome many challenges and go through many changes, which may be professionally and personally trying. As a result, transformational leadership is a better fit than transactional leadership theories for leaders who deal with information technologies.

Eseryel (2020) adapted the transformational leadership theory to theorize about leaders within any field, who understand the need to use IT in differentiating their business. ***Transformational IT leadership*** (Eseryel, 2020) can be ***defined as inspiring followers to go above and beyond in their Information Technology (IT) use to increase the followers' work efficiency and effectiveness.*** In that sense, transformational IT leadership is quite different that transformational leadership. To operationalize transformational IT leadership, Eseryel (2020) adapted Carless et al.'s (2000) brief transformational leadership instrument. We will follow a similar approach but use the full transformational leadership instrument (Podsakoff, MacKenzie, & Bommer,1996) to cover all relevant aspects of transformational IT leadership. When Podsakoff, et al.'s (1996) approach is used, transformational IT leadership has six important components that we discuss below.

Components of Transformational IT Leadership

(1) Articulating an innovative IT vision

This component refers to transformational IT leader (TITL) having a vision of using IT innovatively and intensively to achieve strategic goals of their team, unit, department, or organization. The transformational IT leader would look for new ways to use IT, looks for how IT use can be increased to increase the effectiveness and efficiency of processes and inspires others in their team, unit, department, or organization to adopt the same vision. Articulating a vision is a key characteristic of transformational leadership and crucial to encourage followers to work harder by establishing cognitive models that they can envision (Sun, Xu & Shang, 2014).

(2) Role modeling IT use

The second component of transformational IT leadership is *Role modeling IT use.* This refers to the leader not only talking about a certain IT vision, but showing the others that they really believe in IT by making use of IT innovatively themselves. By providing an appropriate model, a transformational IT leader is expected to behave as an exemplary user themselves. Role modeling IT use helps increase followers' performance, their degree of IT leadership (Avolio & Gibbons, 1988) and employees' job satisfaction (Podsakoff, MacKenzie & Bommer, 1996). Yukl (2012) pointed out that leaders must be able to communicate with their followers

about technical matters, and information technology is a very important technical matter relevant to all users of IT.

(3) Fostering collaboration through IT

The third component of transformational IT leadership is *fostering collaboration through IT.* This component refers to both leaders' abilities to define common goals, enhance collaboration and alignment of followers' interests (Li & Hsieh, 2007) and to enable and ease collaboration between different parties with appropriate information technologies. IT can support clarification and facilitation of goal setting (Kark, Shamir & Chen, 2003) and increase employee empowerment by assigning expertise to followers (Zhang & Bartol, 2010).

(4) Expectations of high IT-use performance

Expectations of high IT use performance is the fourth component of transformational IT leadership. Transformational leaders have high performance expectations from their followers (Podsakoff, MacKenzie & Bommer, 1996). Transformational IT leaders may be leading various different organizations or teams, where followers job descriptions are non-technical such as being a marketing analyst. A transformational IT leader would expect the followers to use the best relevant information technology to ensure that organization as a whole can be a leader in the industry. For example, marketing analysts could use the appropriate marketing analytics tools and/or artificial intelligence technology to benefit from the novel capabilities that information technology affords the field. The transformational IT leaders further would expect followers to develop strong IT skills so that they can use cutting edge technology in the most effective way that helps ensure the best job performance.

(5) Individualized Support

The fifth component of transformational IT leadership is *Individualized Support.* This component refers to the TITL acting with respect and thoughtfulness to each follower's feelings. We kept this component the same as that in the general transformational leadership theory. This is because many individuals, especially those whose training and main jobs are non-technical may have developed anxieties regarding their ability to successfully use information technologies. Others may not be aware of the most appropriate IT that would help improve their performance. The fifth component refers to transformational IT leads taking into consideration the feelings and personal needs of individuals in encouraging them in general. Bass (1994) mentions the importance of individual consideration in developing transformational leadership. This factor is concerned with the leaders' ability to filter out individual wants and needs (Choi, 2006), show appreciation and involve their input in decision-making (Choi, 2006). Individualized support helps develop followers fulfill their potential (Lee, 2005). Choi (2006) identified that this component has a significant impact on job satisfaction of followers. Sun, Xu & Shang (2014) stated that, when leaders show interest and appreciation for their followers, team performance is affected positively.

(6) Stimulation to innovate with IT

Last component of transformational IT leadership is *stimulation to innovate with IT.* Intellectual stimulation is an important component of transformational leadership (Bass, 1994). Intellectual stimulation refers to thinking about alternative views, learning, questioning, and looking for new processes and approaches to solve problems. By encouraging self-awareness and creativity, followers are stimulated to rethink visions and thinking patterns to arrive at new ways to "analyze and solve different kinds of problems" (Sun, Xu & Shang, 2014, p. 130). Transformational IT leaders stimulate creative thinking about IT use to solve business problems. The transformational IT leader helps followers view IT in a different way. They motivate followers to consider how various IT could be used to solve business problems. A leader that encourages 'out of the box' thinking is likely to increase the chance of effective IT use as employees are self-motivated to experiment with the technology and are not anxious to try out unconventional approaches.

In this section, we discussed the components of transformational IT leadership. In the next sections, we discuss the expected relationships between the concepts discussed above to answer our research question: *What is the influence of transformational IT leadership of team leaders on the IT leadership and job satisfaction of team members?*

Transformational IT Leadership and Job Satisfaction

The literature on the six components that relate to transformational IT leadership points to a relationship between transformational IT leadership and job satisfaction of the followers.

For example, the second key behavior used by TITL is role modeling IT use. Role modeling (IT use) helps increase followers' performance (using IT) (Avolio & Gibbons, 1988), which makes followers feel good about their work. Further, when the TITL leads by doing and leads by example, this increases followers' job satisfaction (Podsakoff, MacKenzie & Bommer, 1996).

The third key TITL behavior is fostering collaboration through IT. Increased collaboration enables teams and organizations to increase their feeling of membership to the team or organization. Further, IT can support goal-clarification and facilitation (Kark, Shamir & Chen, 2003) and increase employee empowerment (Zhang & Bartol, 2010). Empowered employees feel more valued by the organization. They develop higher connection to their organization. Further their relationships with their colleagues improve. For these reasons, empowerment increases employee satisfaction (Go, Monachello, & Baum, 1996).

Individualized Support refers to the degree of attention that the TITL pays to the followers on a more personal basis. This factor is concerned with the leaders' ability to filter out individual wants and needs (Choi, 2006), show appreciation and involve their input in decision-making (Choi, 2006). Further it relates to the leaders' attention towards employees' feelings and emotions to ultimately develop them beyond their potential (Lee, 2005). By showing respect and considering their followers' feelings (Podsakoff, MacKenzie & Bommer, 1996), leaders can increase intrinsic motivation which in turn could make the use of IT to be enjoyable in its own right (Davis, Bagozzi & Warshaw, 1992). We expect that when one enjoys what they are doing at work, that would increase their job satisfaction.

Wang, Li & Hsieh (2011), suggest that employees should be encouraged to have satisfying experiences with IT, which might be accomplished by intellectual stimulations of leaders for innovating with IT. Having satisfying experiences with IT would contribute to the job satisfaction of an employee, who often uses IT for their job.

Therefore, we propose the following hypothesis:
> *H1: Transformational IT leadership of team leaders contribute to the job satisfaction of team members.*

Transformational IT Leadership of Team Leaders and IT Leadership of Team Members
While followers are invited to take responsibility and work independently (Houghton & Yoho, 2005), leaders are nevertheless essential to reinforce self-leading behavior (Manz & Sims, 1987). Those leaders are then taking a coaching role in the development of the follower (Stewart, Courtright & Manz, 2011) rather than a directing role, which can be undertaken by a transformational IT leader. IT self-leadership can be stimulated in a number of ways, amongst others by a transformational IT leader (Eseryel, 2020).

A high degree of behavior-focused strategies increases self-leadership abilities and should be supported by a leader who provides coaching and support (Andreßen, Konradt & Neck, 2012). Next to inspiration and visioning, transformational (IT) leadership can influence (IT) self-leadership practices (Andreßen, Konradt & Neck, 2012; Sun, Xu & Shang, 2014).

The first behavior exhibit by TITL is providing an IT vision. With IT vision, TITL provide their followers with the opportunity to innovate and explore ways that "go beyond routine use", which can unleash the "potential of the system" (Li & Hsieh, 2007, p. 3). Moreover, providing followers with an IT vision could improve the followers' motivation to engage more with IT and thus increase team members' IT leadership.

There's a strong link between transformational (IT) leadership and empowerment (Choi, 2006; Jung, Chow & Wu, 2003; Kark, Shamir & Chen, 2003). For example, by fostering collaboration through IT, TITL's increased use of IT may enable goal clarification and increase employee empowerment (Zhang & Bartol, 2010). Follower empowerment, in turn, provides the basis for self-leadership (Bass, 1999; Avolio & Gibbons, 1988). Therefore, we expect that transformational IT leaders' empowerment of followers with regard to IT use should increase the followers' IT self-leadership.

Konradt, Andreßen & Ellwart (2009) uncovered that self-leadership can be learned and that employees who receive training in self-leadership, show increased mental performance, higher job satisfaction (Stewart, Courtright & Manz, 2011) and express fewer negative emotions. It can be assumed that a transformational

leader should therefore be able to facilitate through IT the employees to learn more IT leadership. Based on these arguments, we propose the following hypothesis:

> **H2: Transformational IT leadership by team leaders increase IT leadership of team members**

Sun, Xu & Shang (2014) and Choi (2006), attributed transformational leadership to a positive link to self-leadership and job satisfaction. Therefore, we propose:

> **H3: IT leadership mediates transformational IT leadership and job satisfaction.**

The hypothesized relationships are summarized in the conceptual model below (Figure 2).

Figure 2. Conceptual Model

Research Method

This study was conducted using an online survey (Appendix A). This section describes survey participants, data collection, survey instrument adaptation, pre-testing & refinement, and measurement.

Survey Participants

This study was conducted among larger European firms (those with higher than 50 employees) whose employees utilize IT on a daily basis. In order to test the concepts of transformational IT leadership and IT leadership, the research was conducted across industries, as can be seen in Table 1. The sample comprised of 130 employees (N=130) from different teams and firms in which one employee per team was represented to ensure that each survey relates to a different (team) leader and accounts for team-level analysis.

Industries	Share	Industries	Share
Financial services	42%	Production	13%
Legal services	6%	Health care services	7%
Public services	8%	Energy services	12%
Other services	13%	**Total**	100%

Table 1. Distribution of teams per industry

The survey was sent out to 100 companies, which resulted in a response rate of 44% with regard to number of firms. In general, every company participated with an average of 3.38 teams in this study. The sample consisted of 58% male and 42% female participants with a mean age of 35 years. 70 participants (54%) came from the Netherlands, 40 participants (31%) from Germany and 20 participants (15%) from organizations in Poland, India, USA, Canada, and Bulgaria.

Data Collection

Prior to sending out the survey link to 100 companies, all companies were contacted with a short description of the survey. This notification included information that the findings would be confidential, and the data would only be presented in an aggregated form and not be attributed to individual persons or teams. This email also informed companies about the starting date of the data collection. Two weeks after the email, the online survey link was distributed via e-mail. Participants were able to select one of the three languages (English, German, or Dutch). Once a participant started the survey, they had seven days to complete the survey. Those that were not completed within seven days were discarded. Companies, who have not responded to the notification, or the survey were sent a reminder after two weeks. In total, the survey was accessible for six weeks.

Survey Instrument pre-testing and refinement

Transformational IT leadership questionnaire was developed by adapting the 22 item transformational leadership survey of Podsakoff, et al. (1996) to fit the description of transformational IT leadership. The job satisfaction survey of Warner (1973) was adapted to account for the IT context. Two researchers adapted the questionnaires through many rounds of discussion with a third researcher. During the adaptation and pilot testing of the survey, we found that the individualized support questions lost their face value, and became irrelevant to what we wanted to measure, namely the leader's ability to create a shared vision around IT. Therefore, this component has been removed.

In order to ensure comprehension of the questions, the adapted survey was pre-tested with three native speakers of each respective language. Understanding was checked by elaborating on each question with a pilot sample. A final check was performed with two researchers to arrive at a more reliable survey. In order to account for any biases, two information systems professors were asked to control the questions for logic and understanding again. Nonetheless, to account for deviations across the three languages, a question concerning the chosen language was included to control for deviations in interpretation across languages. The pilot revealed that understanding of the question was clear.

Measures

Apart from the demographic information asked in the beginning of the survey, all questions had to be answered on a seven-point Likert scale ranging from 'strongly disagree' to 'strongly agree'. Initially, the measurement instruments, which will be described below, have utilized a five-point Likert scale. According to Lozano, Garcia-Cueto & Muniz (2008), an increase of the items on the Likert scale increases reliability and validity of the data. Consequently, the number of items was increased to a seven-point scale. The concepts with their respective components and questions are described below. Likewise, the Cronbach alpha coefficients for the respective measures are presented.

Transformational IT Leadership Survey Development

Inspired by the work of Podsakoff, MacKenzie & Bommer (1996), the authors' 22 question survey to measure transformational leadership was adapted to fit the transformational IT leadership definition. Thereby the questions were rephrased in a way to measure how employees perceive their leaders' ability to stimulate IT use. As explained in the literature review, the concept evolved around five dimensions: (1) Articulating an innovative IT-vision (abbreviated as *TITL_V*) (5 items, e.g. "The leader is always seeking new ways in which IT can be used for the team"; $\alpha = 0.836$), (2) Role modeling IT-use (abbreviated as *TITL_RM*) (3 items, e.g. "The leader actively uses the IT that s/he advocates"; $\alpha = 0.846$), (3) Fostering collaboration through IT (abbreviated *TITL_FC*) (4 items, e.g. "The leader encourages employees to use IT to collaborate as a team"; $\alpha = 0.843$), (4) Expecting High IT-Use Performance (abbreviated as *TITL_EX*) (3 items, e.g. "The leader expects employees to develop strong IT skills so that they can increase work performance"; $\alpha = 0.792$), (5) Stimulating to innovate with IT (abbreviated as TITL_STI) (4 items, e.g. "The leader has provided me with new ways of looking at IT, something that used to be a puzzle for me"; $\alpha = 0.814$).

IT self-leadership survey development

IT self-leadership was measured by adapting the self-leadership survey of Houghton, et al. (2012) into the IT context. Three components of IT-self leadership, consisting of 9-items are described as follows (1) Voluntary IT-use for goals and performance (abbrev. *ITSL_VOL*) (3 items, e.g. "I establish specific performance goals for myself with the help of IT"; $\alpha = 0.806$), (2) IT use motivators (abbrev. *ITSL_MOT*) (3 items, e.g. "I visualize myself successfully performing a task using IT before I actually do the task"; $\alpha = 0.762$), (3) Constructive Thought Strategies (or Metacognitive Efforts) to Motivate IT Use (abbrev. *ITSL_TH*) (3 items, e.g. "Sometimes I talk to myself (out loud or in my head) to work through difficult IT situations"; $\alpha = 0.778$).

IT Leadership Survey Development

IT leadership was operationalized by combining IT self-leadership, personal innovativeness with IT, and innovating with IT for the team.

To the IT-self leadership measurement instrument above, we added (1) three questions that measure personal innovativeness with IT (abbreviated in this study as PIIT) (Agarwal and Prasad, 1998; Wang et al., 2011) (3 items, e.g. "If I hear about a new information technology, I would look for ways to experiment with it"; $\alpha =$

0.879). We developed another five questions, inspired by personal innovativeness with IT, to measure innovating with IT for team collaboration (abbreviated as IITC) (5 items, e.g. "When I see possibilities in the use of IT to make my job more efficient, I share this with my teammates "; α = 0.782)

Job satisfaction. In order to measure job satisfaction, the general job satisfaction survey from Warner (1973) was used. The basis for this survey has been established by Brayfield & Rothe (1951). The purpose with regard to the research was to measure the "general satisfaction with the work role in an organization" (Warner, 1973). The instrument has been used because it has proven to be a valid and reliable index of overall job satisfaction (Warner, 1973).

Before participants were asked to answer general job satisfaction questions, it was explicitly mentioned that they should relate the questions to their work in the team that they have referred to with regard to the transformational leader. The survey contained 14-items (abbrev. *JS1-JS14*) of which 8-items were negatively phrased to ensure that participants read the questions attentively (e.g. "I am disappointed that I ever took this job"). The overall reliability of the survey instrument was (α = 0.915).

Results

Procedure and Assumption Testing

Before starting the analysis, the survey output was checked for missing data. Surveys with missing data were discarded. This allowed 130 responses to be processed further. The KMO tests (tables 2 and 3) show that both transformational IT leadership and IT leadership meet linearity criteria of the principal component analysis. Further, Bartlett's Test of Sphericity was performed, the null-hypothesis (*p<0.05*) was rejected, and this allows for variable reduction using component analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.926
	Approx. Chi-Square	1787.204
Bartlett's Test of Sphericity	df	153
	Sig.	.000

Table 2. KMO Measure for Transformational IT Leadership

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.795
	Approx. Chi-Square	874.544
Bartlett's Test of Sphericity	df	78
	Sig.	.000

Table 3. KMO Measure for IT Leadership

Principal component analysis

The variance explained by the scree plot (Figure 3) and the Eigenvalue (Table 4) suggested extracting three to four components describing transformational IT leadership (Figure 7 and 8).
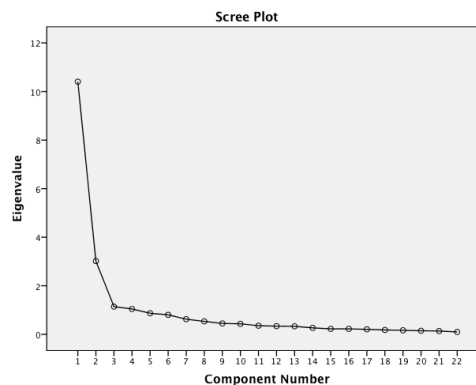

Figure 3. Scree plot for Transformational IT Leadership

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	10.405	47.297	47.297
2	3.016	13.710	61.007
3	1.141	5.188	66.196
4	1.044	4.745	70.940
5	.870	3.953	74.894

Table 4. Eigenvalues for Transformational IT Leadership

However, even within these components, strong cross-loadings existed which demanded significant transformations. As outlined before, the component *TL_IS,* relating to *Individualized support* showed low correlations. As most variables loaded on multiple components with higher values than 0.3, we decided to remove the component *TL_IS.* However, the removal of *TL_IS* reduced the number of recommended components from three to two components. Ultimately, we decided to use Transformational IT leadership as one component including *TITL_V, TITL_RM, TITL_FC, TITL_EX* and *TITL_STI* which was named *TransITLeadership.* The reason being the separation into two components, as suggested by the screeplot, did not reveal a separation that showed a logical allocation of variables. The component *TransITLeadership* explained 55.96% of the total variance.

With regard to IT leadership, the component analysis, using *Direct Oblimin* rotation, suggested that we maintain four components. These four components explain 72.78% of the total variance. Initially, some cross-loadings existed, however three to five questions loaded clearly on one of the components with loadings above 0.60. Removing one question from *ITSL_MOT*, namely *ITSL_MOT1*, strengthened the loadings and reduced cross-loading in the rotated component matrix. After some rotations, content of the questions which loaded on the same components was analyzed and upon that, further questions were removed, namely *ITSL_TH3, IITC3* and *IITC5.* As a result, we identified four components of IT leadership (Table 5).

As can be seen, *PIIT, IITC* and *ITSL_VOL* load on one component only. The fourth component consists of questions relating to *ITSL_MOT* and *ITSL_TH*. Given their context relating to task motivation and constructive IT cognition, it was rephrased to *IT-Use Enablers* (abbrev. *SL_IUE*), which describes the eagerness to do tasks because an individual feels that s/he possesses the appropriate skills to perform beyond expectations using IT. For further data analysis, IT leadership construct was renamed to *ITLeadership.*

Pattern Matrix[a]

	Component			
	1	2	3	4
PIIT2	**.906**	.064	-.005	.053
PIIT3	**.901**	-.055	.088	.032
PIIT1	**.602**	.098	.136	.205
ITSL_TH2	.191	**.829**	.048	-.147
ITSL_TH1	-.069	**.821**	.104	-.074
ITSL_MOT3	-.148	**.763**	-.012	.111
ITSL_MOT2	.163	**.555**	-.114	.177
IITC4	.144	.019	**.899**	-.186
IITC2	-.162	.023	**.878**	.211
IITC1	.145	.021	**.752**	.101
ITSL_VOL2	-.106	.054	.126	**.883**
ITSL_VOL3	.193	-.088	.011	**.790**
ITSL_VOL1	.197	.114	-.022	**.647**

Table 5. The Four Components of IT Leadership

Regression analysis

The regression analysis, revealed that only one of three hypothesized relationships is significant:

> **H2: Transformational IT leadership has a positive impact on IT leadership with F(1,126) = 44,892, at p < .00.**

The other two hypotheses, which are displayed below, did not show significant results, as will be explained below. Further, the results will be presented commonly as the result of *H1* impact the results of the analysis of *H3*.

> **H1: Transformational IT leadership has a positive impact on job satisfaction**

> **H3: IT leadership mediates transformational IT leadership and job satisfaction.**

With regard to *H1*, the regression analysis revealed that *TransITLeadership* is not significantly related to *Jobsatisfaction*, $F(1,126) = 1.587, p > .05$. In their publication, Baron & Kenny (1986) discuss three conditions for mediating variables to be tested. Given that *H1* was not significant, the mediating effect of IT leadership cannot hold. The requirement for a mediating relationship to be tested, according to Baron & Kenny (1986), is that there is a significant relationship between the independent (*TransITLeadership*) and dependent variable (*Jobsatisfaction)*, which is not the case here. Moreover, the moderating effect of *ITLeadership* can and must be neglected as well, given that there is no zero-order correlation between two other variables (Baron & Kenny, 1986), namely *TransITLeadership* and *Jobsatisfaction.* The findings are provided in Figure 10.

Figure 4. Findings

Control variables

A number of control variables were used to improve the validity and reliability of the results. Control variables were used for gender, age, type of industry and survey language. The control variables for gender and age were proposed by Warner (1973), whereas industry and survey language were considered to be appropriate control variables by the researcher to account for differences across industries and ensure that survey questions were translated coherently.

Although controlling for those variables did not change the results considerably, some findings deviate from the overall outcome. The sample was divided into three age-groups. In the age group of 19-33 years, transformational IT leadership and job satisfaction showed a positive relationship of $F(1,70) = 4.186, p < .05$. According to Baron & Kenny (1986), all conditions for a partial mediating effect of IT leadership hold within this control variable. This is an important finding given that 56% of the sample is categorized within this age group.

Limitations

One research choice that we made in the adaptation of transformational IT leadership process was to keep the "individualized support" the same as that in the general transformational leadership. Our thought process was that an attention to individuals' feelings and related thoughtfulness would be relevant regardless of the focus of the leader on IT. The statistical analysis resulted in removal of this construct.

We would recommend researchers to include this construct in their TITL measurements, but to adapt the individualized support construct with a different verbiage, to specifically address individuals' feelings, fears, and anxieties about information technologies.

A second limitation of this study is the treatment of gender as a binary value (male, female). Future studies should allow for a more nuanced survey questions to capture gender in the workforce that includes more than CIS men and CIS women. Further, the role of gender in the perception of transformational IT leadership should be investigated.

Conclusions

The aim of the study was to answer the following research question: What is the influence of transformational IT leadership of team leaders on the IT leadership and job satisfaction of team members?

We did find a clear relationship between transformational IT leadership of team leaders and the IT leadership of team members. In organizational studies showed that transformational leadership of leaders were related to self-leadership of followers (Houghton & Yoho, 2005; Jung, Chow & Wu, 2003). This relationship repeated itself in one study with respect to transformational IT leadership: Eseryel (2020) found that for instructors implementing interventions to exhibit transformational IT leadership in an online IT course increased the IT self-leadership of the students. That study had taken place in the United States. In this study, we showed that a similar relationship holds in real-life teams that use IT frequently across numerous industries: As transformational IT leadership of team leaders increases, IT leadership of the team members increase. And this study took place in large European Companies.

We could not find a general relationship between transformational IT leadership and job satisfaction of the followers. Yet, we found that this relationship between TITL and job satisfaction of the followers held for younger employees (19-33 years). This seems to be in line with the Unified Theory of Acceptance and Use of Technology (UTAUT) of Venkatesh, Morris, Davis & Davis (2003), who found that age is the single moderating variable among three others, namely gender, experience and voluntariness, that moderates all four components of their model (performance expectancy, effort expectancy, social influence, facilitating conditions).

Combining the findings of this research with the work of Venkatesh, Morris, Davis & Davis (2003), it is conceivable that younger employees see the use of IT as an opportunity and an enabler of efficient work, and thereby experience higher levels of job satisfaction. Moreover, the regression analysis for that control group indicated that IT leadership mediates the relation of transformational IT leadership and job satisfaction partially, which strengthens the claim that younger employees appreciate the empowerment through IT usage more than their older colleagues.

While we hypothesized that transformational IT leadership would have a positive impact on job satisfaction, we could not find similar results to those who found a relationship between transformational leadership and job satisfaction (Cho, Park & Michel, 2011; Choi, 2006).

Contributions to theory

This study develops three specific leadership types relevant to the information systems field, namely (1) transformational IT leadership, (2) IT self-leadership, and (3) IT leadership. Moreover, we developed a detailed survey tools for each of the leadership types. Therefore, this study contributes both to the leadership literature, and to the Information Systems field. Most IS leadership theories focus on the leadership of managers, directors, or that of the C-suite members. The conceptualization of these IT self-leadership, IT leadership, and transformational IT leadership describe a leadership influence mechanism, that is not limited to a top-down approach. They can be used to refer to leadership influence that works bottom-up, peer-to-peer, or top-down. Thus, we contribute to leadership theories that may be valid in today's flattened organizations, and in different types of collaborative environments.

In organizational research a relationship was identified between transformational leadership and self-leadership (Sun, Xu & Shang, 2014; Andreßen, Konradt & Neck, 2012). While Eseryel (2020) found the same relationship between transformational IT leadership and IT self-leadership, this was in an educational context, with students in the United States. We were able to replicate the study of Eseryel (2020), using a more detailed transformational IT leadership instrument, and with data collected from real team members from large European companies.

Similarly in organizational research, Gundersen, Hellesoy & Raeder, (2012) found that that the construct of transformational leadership holds across different cultural contexts. Similarly, we were able to find that the transformational leadership construct holds across different cultures, and even across industries.

Our study identified the importance of team member age, when investigating the impact of transformational IT leadership on individuals' job satisfaction. Thus, age should be considered when investigating the relationship of TITL to other variables.

Contributions to practice

Researchers argue that companies underutilize their IT (Li & Hsieh, 2007; Jasperson, Carter & Zmud 2005). One of the practical goals of this study was to illustrate that large IT investments are not the only way to get more out of IT, and to increase performance in the face of global competition.

IT investments can be fully utilized, and the ROI on IT investments can be improved when employees possess higher IT self-leadership, and IT leadership skills. One way to do that is to invest in the development of these two types of leadership, since self-leadership can be learned (Konradt, et al., 2009). A second approach would be to hire transformational IT leaders, and/or train existing employees, managers, and directors in TITL. This would increase transformational IT leadership, as well as employee's IT self-leadership and IT leadership.

As a result of this finding, businesses should select managers who have a high understanding of IT and possess transformational IT leadership skills, to increase the IT self-leadership and IT leadership of all employees. Given that firms only attain 30-50% of the promised benefits (Jasperson, Carter & Zmud, 2005), while paying 178% of what they anticipated to pay (Wang, Chou & Jiang, 2005), the development of transformational IT leaders who enhance IT leadership among their followers could be a cost-effective approach to increase expected ROI from IT investments through innovative IT use.

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Appendix A. Survey Instrument

AGE= Participants age

GEN= Participants' gender

COM= Participants' company name

TSI= Participants' team size

TNA= Participants' name of the team

RESP	Respondent			
IP	IP- address			
START	Date the respondent started the survey			
END	Date the respondent completed the survey			
LANG	Language the respondent has used (control variable)			
AGE	What is your age?			
GEN	What is your gender? (control variable)	Man ❐		Woman ❐
COM	What is the name of your company?			
IND	What type of industry? (control variable)			
TSI	What is the size of your team? (number of employees)	<10 ❐	10-20 ❐	>20 ❐
TNA	What is the name of your team? (team number/team name or description) The team that you name here shall also be the team that you refer to during the survey.			

Transformational IT Leadership

TITL_V= Articulating an innovative IT- vision

TITL_RM= Role Modeling IT Use

TITL_FC=Fostering Collaboration through the use of IT

TITL_EX= Expectations of Ideal IT Use to Increase Work Performance

TL_IS= Individualized Support

TITL_STI = Stimulation for Innovating with IT

(rem.)= Removed after principal component analysis

Code	My team leader…
TITL_STI1	1. … has provided me with new ways of looking at IT, something that used to be a puzzle for me
TITL_V1	2. … is always seeking new ways in which IT can be used for the team/department/organization
TITL_STI2	3. … has ideas about specific IT, which forced me to rethink some of my own ideas about IT I have never questioned before
TITL_V2	4. … envisions a more IT-intensive future for our work
TITL_EX1	5. … expects employees to develop strong IT skills so that they can increase their work performance
TITL_FC1	6. … fosters collaboration between individuals/teams/departments through IT
TL_IS1 (rem.)	7. … acts without considering my feelings (Reverse coded)
TITL_FC2	8. … encourages employees to use IT to collaborate as a team
TITL_RM1	9. … actively uses the IT that he/she advocates
TITL_FC3	10. … gets individuals/groups/departments to work together for the same goal using IT
TITL_V3	11. … has a clear understanding of how IT should be used to get where the business wants to go
TL_IS2 (rem.)	12. … shows respect for my personal feelings
TITL_STI3	13. … has stimulated me to think about existing problems in new ways using IT
TL_IS3 (rem.)	14. … behaves in a manner that is thoughtful of my personal needs
TL_IS4 (rem.)	15. … treats me without considering my personal feelings (reverse coded)
TITL_V4	16. … inspires others with his/ her plans to use IT in the future
TITL_EX2	17. … insists on using IT to ensure best work performance
TITL_V5	18. … is able to get others committed to his/her dream of innovating with IT in the future
TITL_RM2	19. … is a role model with regard to IT use
TITL_FC4	20. … develops a positive team attitude towards IT
TITL_EX3	21. … will ask the employees not to settle for second best IT for the task/goal
TITL_RM3	22. … leads by being an exemplary IT user himself/ herself

IT leadership

IT Self-Leadership=ITSL_VOL+ITSL_MOT+ITSL_TH

ITSL_VOL= Voluntary IT Use for Goals & Performance

ITSL_MOT= IT-Use Motivators

ITSL_TH= Metacognitive Efforts to Motivate IT Use

ITSL_MOT+ITSL_TH = SL_IUE

PIIT= Personal Innovativeness with IT

IITC= Influencing one's team/department/unit to innovate with IT

(rem.)= Removed after principal component analysis

Variable	Question
Voluntary IT Use for Goals & Performance	
ITSL_VOL1	1. I establish specific performance goals for myself with the help of IT
ITSL_VOL2	2. I use IT to keep track of how well I am doing at work, although nobody requires me to do so
ITSL_VOL3	3. I use IT to reach my goals, although my task description does not require me to use IT
IT-Use Motivators	
ITSL_MOT1 (rem.)	4. I visualize myself successfully performing a task using IT before I actually do the task
ITSL_MOT2 (became part of SL_IUE)	5. Sometimes I picture in my mind a successful performance before I actually do a task with IT
ITSL_MOT3 (became part of SL_IUE)	6. When I have mastered an IT, I often reward myself.
Constructive Thought Strategies (Metacognitive Efforts) to Motivate IT Use	
ITSL_TH1 (became part of SL_IUE)	7. Sometimes I talk to myself (out load or in my head) to work through difficult IT situations
ITSL_TH2 (became part of SL_IUE)	8. I try to mentally evaluate the accuracy of my own beliefs about challenging IT
ITSL_TH3 (rem.)	9. I think about my own beliefs and assumptions about IT whenever I encounter difficulty when using IT
Personal Innovativeness with IT	
PIIT1	10. Among my peers, I am usually the first to try out new IT solutions
PIIT2	11. If I hear about a new information technology, I would look for ways to experiment with it
PIIT3	12. I like to experiment with new IT
Innovate with IT for Team Collaboration	
IITC1	1. When I see possibilities in the use of IT to make my job more efficient, I share this with my teammates
IITC2	2. When I discover new IT solutions to improve team communication, I introduce this to the team
IITC3 (rem.)	3. Most of the time I am the one introducing new IT solutions in our team
IITC4	4. When IT solutions improve my own efficiency, I share this with my team
IITC5 (rem.)	5. Because I share IT solutions in my team, my team is more innovative

Job satisfaction

Variable	Question
JS1	1. My job is usually interesting enough to keep me from getting bored.
JS2	2. It seems that my friends are more interested in their jobs.
JS3	3. I consider my job rather unpleasant.
JS4	4. I am often bored with my job.
JS5	5. I feel fairly well satisfied with my job.
JS6	6. Most of the time I have to force myself to go to work.
JS7	7. I definitely dislike my work.
JS8	8. I feel that I am happier in my work than most other people.
JS9	9. Most days I am enthusiastic about my work.
JS10	10. Each day of work seems like it will never end.
JS11	11. I like my job better than the average worker does.
JS12	12. My job is pretty uninteresting.
JS13	13. I find real enjoyment in my work.
JS14	14. I am disappointed that I ever took this job.