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Orit Avidov-Ungar[a] (iD), Tamar Shamir-Inbal[b] (iD), and Ina Blau[b] (iD)

[a]Faculty of Education, Achva Academic College, P. M. Sikmim, Israel; [b]Department of Education and Psychology, The Open University of Israel, Ra'anana, Israel

ABSTRACT

This research explored how digital leaders, being teachers responsible for integrating technologies into teaching, envisaged their roles. Bottom-up content analysis of metaphors from 55 digital leaders revealed a typology describing them as change agents across three 'extent' and two 'depth' dimensions. Most leaders described *the extent of change* associated with their role consistently with the Islands of Innovation and Comprehensive Innovation frameworks, rather than the broader School Communities of Innovation approach. Most metaphors reflected superficial change rather than fundamental change. Although the digital leader role was created to spur innovative change, this is not how most educational practitioners envisage it.

Introduction

The knowledge society is characterized by constant and rapid changes (Priestley, 2011). Accordingly, education systems around the world are constantly adapting through systemic reforms in order to improve, innovate, and prepare students to function successfully in constantly changing environment (Day & Smethem, 2009; Fullan, 2011; Luttenberg et al., 2013). One of the systemic Israeli educational reforms relates to digitization and the need to integrate innovations in schools (Blau & Hameiri, 2017; Blau & Shamir-Inbal, 2017). The reforms resulted in a need for the professional development of educators involved in leading the change, from the national-level educational policymakers to the technology-enhanced learning (TEL) coordinators in schools, with such professional development offered in teacher professional development centers and in the education departments of local authorities (Avidov-Ungar & Shamir-Inbal, 2017).

One of the new roles established in this context of integrating innovation in education is that of **digital leader** (Ministry of Education (MoE), 2018). Since 2010, the Israeli education system has implemented a national program called "Adjustment of the Education System to the 21st Century". The program encompasses hundreds of elementary and middle schools. The purpose of this program is to integrate digital technologies to improve teaching, learning, and assessment processes in schools (MoE, 2018). In this context, digital leaders need to demonstrate knowledge and experience in the integration of technology in an educational context (Sterrett & Richardson, 2019). In Israel and in other countries digital leadership in education is mainly conducted by ICT coordinators of various types (e.g., Moreira et al., 2019; Razak et al., 2019). Namely, digital leaders

can hold a variety of positions: senior regional and national-level ICT teacher trainers and supervisors, innovative school principals, ICT coordinators in municipal education departments, and leaders of innovation centers in local community centers. Their role contains three main components: a *pedagogical component*, in relation to the curriculum and teachers they lead; a *technological component*, in relation to appropriate technology integration by these teachers; and an *organizational, managerial component*, in relation to the teachers' and principal's attitudes to change in organizations they lead (Avidov-Ungar & Shamir-Inbal, 2017; Kabugo & Kakeeto, 2019; Sterrett & Richardson, 2019).

When reforms are forced by policy-makers, they may raise resistance among the practitioners who are supposed to integrate them (Day & Smethem, 2009). The success of educational reform depends primarily on educators in middle-leadership positions, their belief that the reform is necessary, and their sense of responsibility toward achieving its outcomes (Konopasky & Reybold, 2015). Educators in middle-leadership positions need to be in contact with the educational policy-makers on the one hand and with school principals and staff, on the other hand. They hold a complex role as 'agents of change' who aim to reduce resistance and encourage a willingness to change in their organization (Avidov-Ungar & Shamir-Inbal, 2017). Crucial elements in leading positions that promote comprehensive reform are intrinsic motivation for educational improvement and teamwork (Fullan, 2011). In the context of TEL, educators holding the position of digital leaders need to take responsibility for promoting reforms effectively (Sterrett & Richardson, 2019).

Previous studies (e.g., Avidov-Ungar, 2016; Blau et al., 2018; Mahlios et al., 2010; Pinnegar et al., 2011; Tait-McCutcheon & Drake, 2016) used metaphors as a tool to examine how teachers and other educational practitioners perceive their professional identities and to shed light on their beliefs and feelings regarding teaching. In addition, several studies (e.g., Erickson & Pinnegar, 2017; Ganon-Shilon & Schechter, 2017) explored the use of metaphors to describe teachers' or school principals' roles in leading systemic change. However, it appears that metaphors have not been used to explore the unique role of educators involved in leading systemic changes. Thus, this study aimed to analyze the metaphors used by digital leaders in order to reveal hidden perspectives regarding the components and characteristics of their new role in leading innovation, based on the educational reform policy, in their schools, regions, or districts.

Frameworks and literature review

Leading innovative changes in education systems

The search for ways to integrate innovation into education leads to examining the characteristics of effective integration (Luttenberg et al., 2013). The characteristics of integrating innovation in education are related to the *extent of change*, namely, whether technological integration occurs within the teaching staff, or between teachers, students, and parents (Blau & Hameiri, 2012, 2017), and to the *depth of the change*, namely, whether the change is superficial or fundamental (Fullan, 2011).

The extent of the change

There have been an increasing number of educational technology-integration projects in the educational system, with these projects employing two main models: the Islands of Innovation model and the Comprehensive Innovation model. According to the *Islands of Innovation model*, technological innovation is integrated on a small scale within an organization. In many cases, the integration is conducted as a pilot project among a selected group, such as a particular age group, a curricular topic, schools in a certain community, or a particular instruction method. Thus, the

innovation is implemented only by a small fraction of the educational staff and is usually focused on a particular content area or a particular task (Avidov-Ungar & Eshet-Alkalai, 2011). The Islands of Innovation model usually leads to more superficial changes, which mainly involve minor changes in behavior, without significant changes in organizational culture, norms, and basic assumptions (Fullan, 2011; Shamir-Inbal et al., 2009).

In contrast, in the *Comprehensive Innovation model*, the technology is integrated into all levels of the organization. It is adopted by most of its members and involves most of the organizational components (Blau & Hameiri, 2017). The comprehensive model derives from the assumption that the successful integration of innovations requires fundamental, radical changes in basic organizational assumptions and the adoption of new paradigms and perspectives (Genlott et al., 2019). In the comprehensive model, innovations are integrated at all organizational levels. In a school context, this would involve systemic changes, such as changes in the school structure and the role of teachers. Thus, the comprehensive innovation model leads to more fundamental changes, which affect core values and basic assumptions in the organization (Blau & Shamir-Inbal, 2017).

In some cases, comprehensive integration of innovation in an entire educational organization may not be sufficient, and, in addition to technology integration among the teaching staff, successful change in schools requires the involvement of all stakeholders. The ultimate goal of each educational change is improving the learning and educational outcomes of students. Therefore, fundamental change should include not only teaching staff, but also involve students, their parents, and/or a school community (Blau & Hameiri, 2017). This approach, called *School Community of Innovation model*, was empirically tested in the context of school-related communication through large-sample comparisons between the adoption of an online school database by teaching staff and its adoption by teachers, students and their parents (Blau & Hameiri, 2010, 2012). The findings revealed that the adoption of the database by teachers *and* families, (i.e., a School Community of Innovation) leads to a higher level of pedagogical data exchange and more animated e-communication among teaching staff, compared with exchanging data among teachers only (i.e., the Comprehensive Innovation model).

The depth of the change

To generate a significant change, it is important to consider how it affects different aspects of organizational culture (Ahrne & Brunsson, 2019; Elsmore, 2017). Integration of innovations in educational organizations is often supported by facilitators whose role is to help the education system, in general, and schools, in particular, translate the change into practices, work routines, pedagogy, and assessment (Avidov-Ungar & Hanin-Itzak, 2017; Kabugo & Kakeeto, 2019).

In this context, two levels of change are usually distinguished. The first level is superficial change (Pardo del Val & Martínez Fuentes, 2003) or 'first order change', (Genlott et al., 2019) meaning change in parts of the organization or among some individuals. Such change is expressed as an improvement in existing practices without changing the essence or characteristics of the organization. This change usually reflects small alterations and takes place through tools that already exist in the organization.

The second type of change is fundamental, radical change (Pardo del Val & Martínez Fuentes, 2003) or 'second order change' (Genlott et al., 2019). This change affects the system as a whole and not just some of its components (Pardo del Val & Martínez Fuentes, 2003). It includes supervised pre-determined steps aimed at producing a substantial transition in the organization's structure, roles, or basic assumptions (Fullan, 2011; Shamir-Inbal et al., 2009). To reach a deeper and more integrated understanding of the processes taking place in organizations, researchers may use metaphors that express people's perspectives (Amin, 2015; Bardakci & Ünver, 2020).

Metaphors to explore the pedagogical, technological, and organizational aspects in educational organizations

Metaphors constitute not just elements of speech, but an essential mechanism of the mind that allows the elaboration of previous experiences (Zhao et al., 2010) as well as filtering and making sense of new experiences (Blau et al., 2018). They are mental constructs that lie beneath the service of a person's awareness and use analogies to frame and define experiences in order to construct meaning (Erickson & Pinnegar, 2017; Konopasky & Reybold, 2015). Importantly, metaphors provide insights into ideas that are not explicit or consciously held (Amin, 2015). They link the projection of one schema to another to organize thinking, structure the way people perceive situations, and influence their behavior (Mahlios et al., 2010; Pinnegar et al., 2011; Seung et al., 2011). Thus, metaphors can be understood as psychological models that lead to new forms of conceptual insights (Zhao et al., 2010).

In an educational context, metaphors allow researchers and practitioners to make concepts more concrete by associating them with something familiar (Linn et al., 2007). Importantly, the use of metaphors narrows the gap between tacit and explicit knowledge about teaching and learning processes (Mahlios et al., 2010). Moreover, metaphors can also be useful for analyzing integration of TEL and understanding the perspective of those who lead these processes (Bardakci & Ünver, 2020; Blau & Shamir-Inbal, 2017; Shamir-Inbal & Blau, 2016).

In the context of TEL, Shamir-Inbal and Blau (2016) expanded the typology of digital learning metaphors previously suggested by Carenzio and colleagues (Carenzio et al., 2014). Shamir-Inbal and Blau's typology consists of five *metaphors of digital learning* used by teachers in descriptions of TEL activities. (a) The *toolbox* metaphor describes the use of apps appropriate for achieving learning goals. (b) The *active player* metaphor refers to the potential of technology to enhance the active participation of students in the learning process. (c) The *creative mind* metaphor describes learning processes and outcomes in which students use technologies to express their ideas in creative ways. (d) The *shared desktop* metaphor refers to the use of digital tools for either technology-enhanced face-to-face or online collaborative learning in teams. (e) The *inter-connected world* metaphor describes the digital connection of the classroom to the world for interactions with experts or peers. This bottom-up typology of digital learning metaphors was further replicated in a top-down coding of the pedagogical perspectives and practices of ICT leaders (Blau et al., 2018).

In educational leadership literature, metaphors have been used to describe characteristics and types of leadership (Singh, 2010). Metaphors can explain policy-makers' understanding regarding leadership and how it unfolds in the context of a reform (Ganon-Shilon & Schechter, 2017). For example, Lumby and English (2010) identified seven metaphors for educational leadership: machinery, accounting, war, sports, theater, religion, and lunacy. Each of these seven metaphors has been used in the policy discourse to frame different dimensions of leadership. Reitzug et al. (2008) described how metaphors have changed over time in response to the high accountability currently required of the education system. Consistent with these requirements, leaders have adopted a more bureaucratic, scientific management approach, perceiving themselves more as "inspectors" rather than as "facilitators of teacher growth" (Luttenberg et al., 2013).

To the best of our knowledge, despite the promise of metaphor analysis, only a few studies have used this methodology to explore educators' perspectives on teaching-learning processes (e.g., Farrell, 2016; Shamir-Inbal & Blau, 2016), teacher professional development (e.g., Tait-McCutcheon & Drake, 2016), and especially, the integration of educational reforms, in general, and in reforms related to TEL, in particular. Thus, the aim of this study was to analyze metaphors in order to reveal digital leaders' perceptions of their role in integrating innovative TEL as a part of educational reforms.

The Israeli context for integrating technologies in the education system

As mentioned before, ten years ago the Israeli education system implemented a national program called "Adjustment of the Education System to the 21st Century" (MoE, 2018). The program

encompasses hundreds of elementary and middle schools that constitute approximately 50% of Israeli educational institutions. This program promotes the integration of digital technologies to improve teaching, learning, and assessment processes in schools through digital leaders. The program focuses on pedagogical, technological, and organizational aspects and relies on support and resources from national and local-level authorities. To convert schools into digital organizations, the program aimed at integrating technologies into the curricula, developing the digital literacy of teachers and students, and using technology to foster independent learning and teamwork rather than whole-class instruction. Additionally, the program includes the integration of advanced teaching practices, such as technology-enabled collaboration within and between schools, digital communication within the school community and beyond, and the promotion of digital communication with school principals, teaching staff, students, and parents (Blau et al., 2018; Shamir-Inbal et al., 2009). These teaching practices created a link between classroom and homework activities through class digital environments. Finally, it includes an educational focus on ethical issues in technology-enhanced learning and assessment (Blau & Eshet-Alkalai, 2017; Ministry of Education (MoE), 2018; Sidi et al., 2019).

Digital leaders are agents of change in this national program. Their role is to lead integration of innovative technology into the educational system and to cope with the resistance typically inherent in organizational changes. Digital leadership requires up-to-date pedagogical-technological and organizational knowledge (Avidov-Ungar & Shamir-Inbal, 2017). In order to meet the demands for this role, digital leaders need to be self-confident, independent, and proactive, and be able to suggest strategies for integrating technologies into the teaching-learning processes (Sheninger, 2019). Consequently, digital leaders need to be involved in decision-making processes and form part of a professional learning community (Shepherd, 2019).

Preparing digital leaders requires a special kind of professional development (Kabugo & Kakeeto, 2019). Thus, in 2018 the Israeli MoE (2018) designed a professional development program for outstanding digital leaders who are eager to lead educational innovations and to exert influence in the areas of their responsibility (see details in the Method section).

Research goals and questions

The purpose of this study was to examine the role of educational practitioners who hold the responsibility of leading this systemic change, namely, digital leaders, consistently with the top-down policy of integrating innovations in the education system. It focused on those regarded by the MoE as outstanding practitioners. We explored how leadership characteristics were reflected in the metaphors the digital leaders used during professional development to describe their role and actions.

Previous studies that analyzed teacher metaphors focused mainly on three areas: (a) identification and conceptualization of teachers' metaphors; (b) associations between teachers' metaphors, their beliefs, and professional knowledge; and (c) the consistency of the metaphors with teaching practice (Amin, 2015; Erickson & Pinnegar, 2017). There is a shortage of studies that use metaphor analysis to examine the role and characteristics of leaders in educational reforms in general and digital leaders in particular. In this context, our study aimed to explore the following research questions:

1. What are the characteristics of digital leaders as agents of change?
2. Which types of metaphors do digital leaders use to describe their role?
3. What types of digital leadership emerge from metaphorical representations of their role as leaders of change and their practices in educational technology integration?

Methods

To understand the role of digital leaders, this research employed a qualitative methodology in accordance with the principles of the Grounded Theory (Corbin & Strauss, 2014), which extracts data from the participants' narratives. This methodology draws on the participants' descriptions of their experiences and their interpretation of these experiences, which can enable researchers to understand phenomena in the context in which they occur. Moreover, to understand the hidden beliefs of the participants, we analyzed metaphors they used to describe their role, perspectives, and practices.

Participants and context

The study was conducted in the context of a teacher professional development program designed for outstanding digital leaders who were chosen by the MoE after examining their suitability for this program. Fifty-five educators, 12 men and 43 women, senior instructors from all over the country, were chosen to participate in the program. In addition to being geographically dispersed, the participants were culturally diverse, including secular and religious, Hebrew-speaking and Arabic-speaking instructors. Among these digital leaders were ICT coordinators in the education departments of municipal authorities, senior regional and national-level ICT teacher trainers and supervisors, innovative school principals, and leaders of innovation centers in local community centers. Such a diverse and representative sample added generalizability to our findings with a national-level sample of digital leaders. The participants were aged 35–57 years. Their average years of teaching experience was 16 years and their experience in training teachers was, on average, 10 years.

The program deals with defining the role of the digital leader as the one who leads change processes related to technology-enhanced learning, teaching, and training. The goals of the teacher professional development program were: (1) to define the personal and organizational aspects of the digital leader's role, (2) to experience independent and collaborative learning and peer-teaching on subjects related to technological-pedagogical and organizational innovations, and (3) to plan and deliver an innovative project that put into practice ideas learned in the program.

The program of 120 annual academic hours was conducted in an Israeli higher education institution in a hybrid manner, combining distance synchronous and asynchronous learning with face-to-face meetings. An example of an asynchronous activity is self-presentation through designing and publishing online a digital business card that describes their role as digital leaders. Synchronous sessions were conducted via *Zoom* videoconferencing, which is adopted by the MoE for synchronous training. The *Zoom* application uses a digital camera and headphones and enables optimal spontaneous interactions by all the participants, screen sharing, and assigning a group of learners to different virtual 'rooms' to facilitate teamwork and interactions between the lecturers and teams (Blau et al., 2017; Weiser et al., 2018). The face-to-face meetings in the classroom were used for presentations by leading academic and professional guest-lecturers, to conduct discussions, for peer learning and teaching, and for final project planning. In addition, the program included three field trips to innovative organizations.

Instruments

The research employed the analysis of artifacts designed by the participants and documents openly published by them on the web. We analyzed: (a) digital business cards (N = 55), designed by the participants, in which they described their role and practices as digital leaders. The cards included the participant's perception of 'what it means to me to be a digital leader' and 'what I

consider a success in my job as a digital leader.' Some of the participants (N = 33) added explanations and metaphorical representations illustrating their leadership. In addition, (b) the participants wrote reflections (N = 55) describing their role, detailing their practices and activities they conducted, as well as reflecting on the opportunities and challenges that digital leadership involves in the educational context.

Procedure

The analysis of statements and the collected metaphors were grouped into categories that created common themes that allowed the researchers to understand the role of the digital leader. Data analysis included open bottom-up coding to define and characterize the phenomenon according to the typology emerged from the data (Strauss & Corbin, 1994). The collection of metaphors served as a trigger for thematic analysis (Inbar, 1991). Relying on the conceptual framework for the representation of Planning Metaphors (Inbar, 1996), we suggested a typology that describes the different practices adopted by digital leaders to integrate digital technologies in schools. This was based on the metaphors that they used to describe their role and practices using two different lenses, the extent and the depth of the change. The extent of the change was measured by the levels in which the innovations were integrated in the organization. The depth of the change was distinguished by two levels: first (superficial change) or second degree (fundamental, radical change). These metaphors and representative citations are presented in Table 1 in the Results. Note that Hebrew is a highly gendered language, and the translation retains the gender used by the speaker.

The analysis unit was a participant (not a statement). A research assistant trained by the researchers conducted the coding. To ensure the reliability of the coding, 25% of the statements were re-coded by three additional raters and a few disagreements were discussed until consensus was reached. The coding presented in the next section is the consensus coding of the four raters.

Results

This section describes the use of metaphors by the digital leaders to describe their functioning and, through that, to glimpse their perceptions of their role. In line with the research questions, the findings are organized in three sub-sections: (a) the characteristics of the digital leaders' as agents of change; (b) the types of metaphors digital leaders used to describe their role; and (c) the types of digital leadership and their practices.

The characteristics of the digital leaders' role

The narratives of the digital leaders related to two main dimensions of the description of their role: the extent and the depth of the intended innovative change.

The extent of the intended change

The three components were described by the participants when they envisaged the extent of possible changes detailed below: island of innovation; comprehensive innovation; and community of innovation. Fewer than half of the digital leaders (14/33; 42%) spoke about changes at the level of the teachers and the curriculum, with this categorized as a local change that is an *island of innovation*, consistently with participants' descriptions of the innovation as local and taking place in a specific area. Such change does not spread and does not affect the entire organization and certainly does not have any effect outside the organization. For example, one of the digital leaders noted:

Table 1. Metaphors Describing Digital Leaders' Roles and Representative Quotes.

Category	Metaphors	Representative quotes
Metaphors emphasizing digital leader's guidance and leadership role	ship's captain	The captain of a ship 'is a leader who guides the voyage, and leads the organization to a safe haven.'
	Moses the leader (Biblical figure)	'I see the digital leader as Moses leading his people in the desert after leaving Egypt. Like Moses, the digital leader encounters difficulties and resistance and needs to find creative solutions. Moses is the trail breaker but also he is a leader who speaks as an equal.'
	Dorothy (a figure from The Wizard of Oz)	'For me, being a digital leader means following a path like Dorothy from the 'Wizard of Oz'. It means going on a wonderful journey, to an unfamiliar place beyond the rainbow, coping with difficulties, collecting and leading new friends on the way to the goal.'
Metaphors describing creativity, exploration, and searching	discovering new lands	'A digital leader is like someone discovering new lands, whose purpose is to conquer sites that have not yet been conquered … a Columbus of education, who sees beyond the horizon … .'
	artist	'A digital leader is like being an artist who paints the same object from several viewpoints, deconstructing and reconstructing the existing information on the same object – and in this way the digital leader is also required to have several viewpoints and the ability to deconstruct and reconstruct their hidden knowledge and to adapt it to the field.'
	jigsaw puzzle maker	'A digital leader is one who knows how to compose a puzzle with many pieces and knows how to put each piece in exactly the appropriate place.'
	member of space team	'A team member on the Enterprise spacecraft: optimistic, curious, proactive, searching, discovering, offering new connections between topics, combining different technologies. Someone who needs to escape from local life into space.'
	octopus as flexible-leadership-hub	'A digital leader is like an octopus: each arm is connected to another, each arm has different support systems, each arm requires a different type of professionalism, each arm requires a different kind of consideration, and to be sufficiently flexible in order to lead change.'
	writer of a fantasy novel	'To be a digital leader is like writing a fantasy novel, a person who can think 'outside the box', creates and builds new worlds'
Metaphors of movement and showing the way	flying a drone	'Being a digital leader is like flying a drone, it's an opportunity to perceive the overview, to observe the work in my organization from a broader perspective.'
	lighthouse	'To be a digital leader is like being a lighthouse. Although it is located on the land, it stands high looking out at what is to come and continually searching for new ships. It constitutes a ray of light for those who hesitate to come close and offers a haven for new promises that arrive from near and afar. It stands up straight even in a storm, determined to help and to bring new ways close and to gather them to a safe harbor … connecting, observing, the first to accept and lead. Looking out at what is to come and continually innovating, constituting a ray of light.'
	cog-as-first-mover	'To be a digital leader is like a small cogwheel that moves an entire system of cogwheels in a machine, to move an entire system forward.'
	engine	'To be a digital leader is to be an engine that changes the way of learning'
	way-signs	'For me being a digital leader is like way signs on the trail to effective digital teaching and learning.'
	dance instructor	'Being a digital leader is like being a dance instructor, demonstrating and explaining while moving and enjoying himself together with the dancers.'

"The digital leader is someone from whom we learn. His/her role is to talk to teachers and their students about a certain subject-matter, but also to rely on his/her own perceptions and experiences."

Some of the digital leaders (12/33; 36%) demonstrated wider changes at the organizational level. These changes involved connecting several islands of innovation or several initiatives and therefore influenced the entire organizational culture. This was an organizational change in the level of *comprehensive innovation*. Thus, for example, one of the leaders remarked, 'Digital leaders bring innovations in diverse learning contexts into the school. He leads improvement of teaching and learning processes and use his pedagogical and technological skills and promotes changes in the school's learning culture.'

A smaller proportion of the digital leaders (6/33; 18%) spoke about *changes at the level of the community* outside the school organizational space. These changes included, for example, leadership of a municipal project that involved a variety of organizations or teamwork that included the participation of stakeholders outside the educational organization. These changes extend beyond the boundaries of the organization into a community space, and thus constitute School Communities of Innovation. Thus, for example, one of the digital leaders explained, 'Leading municipal projects can include, for example; organizing a seminar for school principals in the region, guiding staff in designing teaching activities that include inter-school collaboration, or reinforcing a community of digital leaders in the region.'

The depth of the intended change

The digital leaders described the characteristics of the change and the process of integrating innovation as either superficial or fundamental. Most of the digital leaders (23/32; 72%) saw the change as occurring mainly at the level of behavior, language, and symbols, that is, a superficial, *first order change*. The level of risk the leaders were willing to take was relatively low and the steps for advancement and integration of the change were limited. Thus, for example one of the digital leaders noted:

"A digital leader understands the process of digital transformation in educational contexts. S/he has the initiative and is able to lead changes in teaching through technology integration in a balanced and incremental manner, tailored to the level of different teachers."

Fewer respondents (10/32; 30%) viewed their role from a top-down perspective, that is, they considered that all participants involved in the change were required to change their views, norms, and values. This change was defined as a *second order change*, a fundamental, radical change in which the perception of teaching was completely altered due to the use of appropriate technologies. Thus, for example, one digital leader remarked: 'Digital leaders are change agents that lead digital innovation and learning that breaks frontiers of time-and-place. They encourage advanced, innovative and entrepreneurial thinking.'

Types of metaphors to describe the digital leader's role

The analysis of the metaphors used by the digital leaders to describe their role revealed three main areas: (1) metaphors describing *guidance and leadership*; (2) metaphors of *creativity, exploration, and searching*, and (3) metaphors of *movement and showing the way*, as described in Table 1. The participants themselves suggested all the metaphors presented in this table.

Types of digital leaders that emerged from the participants' metaphors

The typology described in Table 2 shows six digital leader types with respect to their functioning to integrate technologies in their organization. We characterized the types by metaphors used by the digital leaders themselves.

The first type of digital leader: cog-as-first-mover

Leaders of this type perceive their responsibility as integrating the digital change in the local area. The cogwheel metaphor represents the movement and energy needed to motivate others. However, it brings no shift in direction and the energy is enough only to move nearby wheels. The change does not include large circles of the organization's members, thus the cogwheel represents an island of innovation within the organizational landscape. Consequently, the depth of change they integrate is a first order change, involving the alteration of behaviors through motivating and cooperating with the people involved in the change.

The second type of digital leader: ship's captain

These are role-holders who assume personal responsibility for the change involved in integrating technology within their organization. The change is comprehensive and encompasses a number of subsystems within the organization. This type of digital leader indicates a desire and willingness to lead a change that is a sort of overall innovation in the entire "ship", thus, it is a systemic and comprehensive change.

> "For me to be a digital leader is to be a ship captain who looks at the horizon and navigates the passengers safely in the great oceans of technology and information and help the fearful to overcome the difficulties on their way. A digital leader brings technology into learning in diverse, up-to-date and interesting ways. He is a leader who guides the voyage, and leads the organization to a safe haven. He develops pedagogical and technological skills of teachers in order to improve learning."

However, this description does not include dimensions that could define the change as a fundamental, second order change. It is still a superficial change in the behaviors and working style of the organization's members. This type of digital leadership illustrates the dissonance between the desire to a lead change that constitutes comprehensive organizational change and the limited depth of the change.

The third type: the octopus- as-flexible-leadership-hub

These leaders envisage their role as assuming responsibility for the integration of the change within their community. The arms of the octopus represent the desire to go beyond the organization and the aspiration to break through the boundaries of local space. The extent of this change goes beyond the boundaries of the organization, just as an octopus spreads its arms to touch several different areas. However, it is still a first order, superficial change, rather than radical change, in that the innovation relates to what is expected and does not involves fundamental changes.

The fourth type of digital leader: the space crew member

These are the leaders who assume that the change, for which they are responsible, should be conducted in the local environment, in a certain, clearly defined space, in a small part of their organization, often as a pilot. Nevertheless, the pilot or island of innovation experiences intense, second order change, which involves fundamental changes in values and assumptions. This type again, contains a dissonance between the relatively revolutionary changes planned and the narrow place of change.

The fifth type of digital leader: flying a drone

These are leaders who assume their responsibility for the implementation of technological changes within the organizational space, which is a comprehensive innovation type, so that the extent of change is relatively broad. In terms of depth of innovation, this is a radical, second order change, which, as noted, involves a change in values and in the organization's basic

Table 2. A Typology of the Roles of Digital Leaders with Example Metaphors that Describe the Various Types.

| | | Extent of the change metaphors | | |
		Islands of Innovations	Comprehensive Innovation	Communities of Innovation
Depth of the change	**First order change**	cog-as-first-mover	ship's captain	octopus-as-flexible-leadership-hub
	Second order change	member of space team	flying a drone	writer of a fantasy novel

assumptions. Like drone fliers, these leaders observe their organization from a higher perspective and seem to dream about a systemic change. As one of them described it: 'For me, being a digital leader means attempting to undermine the existing order and to create a picture with colors, materials and methods that we did not use before.'

The sixth type of digital leader: writer of a fantasy novel

This appears to be the most revolutionary type. The digital leaders that adopt this style of change described it in the community space beyond the constraints of their organization, while the intensity of change was a second order, radical change. Like writers of a fantasy novel, they allowed themselves to create a new vision of the world. For example, one of these leaders noted: 'For me to be a digital leader is promoting digital innovation in the education system, improving processes and interactions through technology, narrowing knowledge and social gaps by providing equal opportunities for large populations, creating innovative online space for a global vision.'

Discussion

This study aimed to identify the characteristics of the role of digital leaders responsible for leading innovative changes in the education system. Similarly to previous studies (Amin, 2015; Erickson & Pinnegar, 2017; Konopasky & Reybold, 2015), we analyzed metaphors used by the participants to examined the characteristics of the digital leaders' role .

The first research question related to the characteristics of digital leaders as agents of change. The related findings were analyzed based on the literature (Day & Smethem, 2009; Fullan, 2011; Luttenberg et al.., 2013). Two dimensions emerged from the participants' descriptions of their role and educational practices, namely, the extent of change and the depth of change. The three literature-based levels of the *extent of change dimension* were present in our data. As reported and illustrated in the Results section, nearly half of digital leaders described their role as having a local impact, consistently with the Islands of Innovation framework. About a third of digital leaders described their role as having an organizational impact, consistently with the Comprehensive Innovation framework. For nearly a fifth of participants, the digital leader role involved change impacting inside and outside the organization, consistently with the School Communities of Innovation approach. With regard to the extent of the change, previous studies demonstrated the advantages of Comprehensive Innovation over Islands of Innovation (Avidov-Ungar, 2010; Avidov-Ungar & Eshet-Alkalai, 2011), as well as the advantages of School Communities of Innovation over Comprehensive Innovation (Blau & Hameiri, 2010, 2012, 2017). Nevertheless, most of the participants led change that was an Island of Innovation, meaning a specific local change rather than a comprehensive and system-wide change or a community innovation. The low percent of community innovation cases in this study is similar to previous studies conducted among ICT leaders (Blau & Shamir-Inbal, 2017; Blau et al., 2018), but still surprising, since our sample contained digital leaders considered outstanding and who were highly educated and carefully chosen by the Ministry of Education.

The second area that appeared in the perceptions of digital leaders related to the *depth of change* in the integration of technology in an educational context. The digital leaders referred to two levels of *depth of change*. A clear majority described a relatively low level of change that expresses a first order change, with less than a third describing a high level that expresses a second order change. Despite holding the position of digital leaders, it appeared that most of the participants (72%) perceived their role as leaders of a first-order, relatively superficial change (Ahrne & Brunsson, 2019). The prevalence of superficial rather than fundamental change found in descriptions of outstanding, carefully chosen digital leaders who hold important positions in the education system, is even more surprising than the relatively limited extent of change. It may be that a highly centralized education system, such as in case of this study, significantly limits the vision of change held by people in middle-level leadership positions.

The second research question tried to trace the unique new role of the digital leaders through analysis of the types of metaphors they used to describe their role. Research literature encourages the examination of roles, especially new ones, through the use of metaphors, as a tool to identify the essence of the role and its characteristics (Ganon-Shilon & Schechter, 2017; Singh, 2010). The use of metaphors makes it possible to explore how digital leaders perceive their role and, based on this, to understand at what level of change they will operate and what other factors they will engage to create a broader change. Metaphor is a tool that is indirect and therefore helps to characterize the people designated for certain roles. It allows researchers to understand the hidden perspectives of the participants regarding their role and their willingness to accept leadership and responsibility in conducting the work in the future. The use of metaphors is very important in times of change within the educational system as metaphors offer deeper meanings than regular verbal expressions. Apart from the apparent meaning, a metaphor carries additional meanings that uncover the real intentions and hidden areas of the biggest picture (Inbar, 1996).

Three groups of metaphors emerged from bottom-up coding of digital leaders' role descriptions. First, there were *metaphors describing guidance and leadership*, such as 'ship's captain,' biblical 'Moses the leader,' and 'Dorothy' (from the Wizard of Oz). Second, there were *metaphors of creativity, exploration, and searching*, such as 'discovering new lands,' 'artist', 'jigsaw puzzle maker', 'octopus-as-flexible-leadership-hub', and 'writer of a fantasy novel'. These metaphors of creativity describe digital leadership as a process of searching for new ways of using technologies and implementing new ideas in flexible and creative ways.

Finally, some participants used *metaphors of movement and showing the way*, such as 'flying a drone,' 'dance instructor,' 'lighthouse,' 'cog-as-first-mover,' 'engine,' and 'way-signs.' Analysis of the different types of metaphors indicated the lack of a clearly defined role perception. Since this role is a new one, in the absence of an agreed definition, it seems that those who actually hold this position give it different meanings and offer personal interpretations of their role. Whereas some of the participants perceived leadership and guidance as the essence of their role, others emphasized their role as creative leaders responsible for leading change and exploring new directions, or staying in constant movement and helping other to find their way to the target change. It therefore seems that, on the one hand, the metaphors demonstrate multi-faceted dimensions of the digital leaders' roles but, on the other hand, reflect an absence of a ground-breaking understanding of the role that might be expected for an innovative role such as this.

Previous research (Lumby & English, 2010) has identified seven metaphors for educational leadership reflecting its different dimensions: machinery, accounting, war, sports, theater, religion, and lunacy. The metaphor of biblical "Moses the leader", one of the metaphors describing guidance and leadership in our study, is consistent with the religion dimension in the previous study, whereas metaphors of movement and showing the way, such as 'flying a drone,' 'cog-as-first-mover,' and 'engine' in our study are similar to the machinery metaphor dimension found by Lumby and English.

In the context of TEL, metaphors may enable scholars to explore more realistic perspectives regarding how technologies are integrated into educational practice (Bardakci & Ünver, 2020). Previous studies (Blau et al., 2018; Shamir-Inbal & Blau, 2016) presented and empirically tested a typology of digital learning metaphors that consisted of five metaphors of digital learning used by teachers in descriptions of TEL activities: toolbox, active player, creative mind, shared desktop, and inter-connected world metaphors. Most of the metaphors of digital leaders that emerged in our study differed from the metaphors of teachers in previous studies. It seems that different roles (digital leaders versus teachers) in technology-enhanced classrooms were reflected in different types of metaphorical representations. The only similarity between the studies is that the 'creativity, exploration, and searching' category of metaphors in this study is similar to the 'creative mind' category in previous studies. Interestingly, digital leaders were more sophisticated in the 'creative mind' category and included in it additional dimensions of exploration and searching. This category of creativity seems to be the launching point between digital leaders and mainstream teachers implementing TEL in the classroom.

Finally, the third research question explored the types of digital leadership emerging from metaphorical representations of their role as leaders of change with respect to educational technology integration. Based on the two areas detailed above–*extent of change* and *depth of change*–we suggested and empirically tested a new *two by three typology* describing the innovative role of digital leaders in education. Relying on this typology, we identified six types of role-holders who serve as digital leaders in the integration of innovative technology and pedagogy in schools: the digital leader is portrayed as 'cog-as-first-mover', a 'ship's captain,' 'octopus-as-flexible-leadership-hub,' a 'member of a spaceship crew', as 'flying a drone,' and as a 'writer of a fantasy novel.' Each of these types is represented by a different role perception among the digital leaders, which is reflected in the extent and depth of change. The different types found in the typology suggest that many digital leaders do not perceive themselves as leading wide and fundamental changes in the educational systems. Indeed, many of them do not perceive themselves as designers of radical change (Priestley, 2011), which according to Fullan (2011) is essential for the success of educational reforms.

Conclusions, implications and further directions

Our results indicate the complexity faced by educators holding leadership position as ICT leaders expected to lead the integration of innovative technology into the educational system. From a theoretical point of view, the findings of this study add an additional dimension, namely depth of change, to the literature that describes the extent of change) e.g., Avidov-Ungar, 2010; Avidov-Ungar & Eshet-Alkalai, 2011; Blau & Hameiri, 2010, 2012, 2017; Blau & Shamir-Inbal, 2017; Sheninger, 2019), so producing a two by three typology of the roles of digital leaders. Moreover, the metaphors of digital leaders found in this study were mapped to empirically test this typology. It is promising that we could identify in the data all the categories of the conceptual model. However, it was quite disappointing to find that, despite the innovativeness of their role, digital leaders tended to stick to a more traditional vision of change: they described mostly an Island of Innovation, and less as Comprehensive Innovation, with very few referring to the broadest extent of change, namely, a community of innovation. Similarly, the majority of them led more superficial first-order change, while less than a third of the leaders held a vision of fundamental, second-order change.

The role types that were identified in this study can constitute a practical tool for the characterization of candidates responsible for the integration of educational innovation and can act as a diagnostic tool for the dimension of leadership and change in the context of education. There is a growing body of literature that supports the exploration of metaphors of teachers and other position-holders to understand how they conceptualize their role (Ganon-Shilon & Schechter, 2017; Mahlios et al., 2010; Singh, 2010). The research findings also reinforce the use of metaphors

to describe complex roles in which the leaders stand at cross-roads of change or decision-making. Therefore, the research findings can increase understanding that metaphors are a useful tool for the characterization of leading role-holders involved in the integration of educational innovations, as well as a tool helping to select suitable candidates for these roles. In addition, metaphors can supply digital leaders themselves with critical information in order to empower people they lead in the educational change (Fullan, 2011; Zhao et al., 2010) and to ensure their partnership in the change process (Priestley, 2011).

This study was conducted with a large qualitative sample, comprising of a geographically dispersed and culturally diverse group of Israeli digital leaders that is generalizable on a national-level sample of digital leaders. However, its main limitation is being exclusively based on self-reported data. Future research may continue investigating digital leaders based on the proposed typology combining participants' self-report with observation of their actual functioning as digital leaders and/or the analysis of the outcomes of their trainees. We also recommend conducting a follow-up study exploring the digital leaders' interpretation of the typology that emerged from this study. It would be interesting to understand whether and how this conceptual framework can serve them as a guiding tool in their roles as leaders of innovations in educational organizations in general and in schools in particular.

Disclosure statement

The authors declare that they have no conflict of interest.

Notes on contributors

Orit Avidov-Ungar is an Associate Professor of Educational Management and the Dean of the Faculty of Education at Achva Academic College, Israel. She is also a faculty member in the Department of Education and Psychology at the Open University of Israel. Her research explores the empowerment and professional development of teachers, and leadership in organizational change, with an emphasis on the integration of innovative technologies in the education system.

Tamar Shamir-Inbal holds a Ph.D. in Technology and Science Education. She is a faculty member in the Department of Education and Psychology at the Open University of Israel and a member of the Teaching and Design (TeLTaD) research group at the University of Haifa. As a pedagogical coordinator and academic consultant for the Israeli Ministry of Education, she leads ICT professional development programs for school principals, ICT coordinators and teachers. Her research interests focus on integration of innovative technologies in K-12, teachers' professional development, and the role of design in technology-enhanced teaching and learning.

Ina Blau is an Associate Professor of Educational Technology and Cyber-Psychology. She is the Head of the Research Center for Innovation in Learning Technologies and the Head of the Graduate Program in Educational Technologies and Learning Systems at the Open University of Israel. Her research interests include integration of innovative technologies in K-12 and academia; digital literacy competencies; computational thinking, visual programing and educational robotics; social aspects of e-communication; and psychological ownership in e-collaboration.

ORCID

Orit Avidov-Ungar http://orcid.org/0000-0002-0928-9280
Tamar Shamir-Inbal http://orcid.org/0000-0002-5237-5897
Ina Blau http://orcid.org/0000-0001-5695-7221

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