The importance of the school principals’ role in the digital transformation of the education sector

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Abstract

Purpose – This study examines the critical elements that contribute to the effective adoption of educational digital resources (EDRs) in schools, with a focus on school principals and their leadership, from a strategic pedagogical standpoint.

Design/methodology/approach – Using survey data from 200 school principals, measurement and structure models are tested through structural equation modeling to quantify the impact between constructs.

Findings – The findings indicate that the most important factor influencing how effectively schools are transforming digitally is how beneficial school principals believe EDRs to be. Other important elements include the environment of the school, the technical assistance and service provided for the EDRs, and the professional and personal background of the principal.

Practical implications – Principals should be a fundamental component of educational plans for digital transformation, considering things like their age, leadership and teaching experience. Other components include contextual elements like school size, complexity and digital culture. A school principal’s ability to promote an open dialogue – that enables educational communities to view the integration of EDRs into pedagogical models as an opportunity to improve outcomes – can assist a digital culture transition, rather than via the principal’s authority or bureaucratic influence.

Originality/value – This research is among the pioneer to study the role of school principals in the UAE towards understanding the direction for digital transformation.

Keywords Digital transformation, Educational digital resources (EDRs), Technology innovation, Educational

Paper type Research paper

Introduction

Digital transformation (DT) has recently emerged as one of the main goals of most educational institutions. DT, including artificial intelligence, big data analytics, cloud computing, and the Internet of Things, has brought previously unheard-of changes in society, business, and organizations, including education institutions (Feroz et al., 2021). Several researchers have attempted to define the concept of DT (Alenezi, 2021; García-Peñalvo, 2021). Oztemel and Gursev (2020), and others have defined DT, in the education field, as a

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transformation induced by digital technology to improve the overall performance and productivity of students, teachers, and principals. DT in the education sector has been described as the integration of sustainable management to adjust to the changes enforced by new technologies (Abad-Segura et al., 2020).

The DT of schools has received considerable attention, and its integration into schools and educational centers is accelerating (Said-Metwaly et al., 2021). Customized learning experiences, due to the integration of educational digital resources (EDRs), result in richer, more varied e-learning content, which has become an important part of the class experience for students (El-Sabagh and Hamed, 2020; Kaisara and Bwalya, 2021). For instance, e-learning supports positive learning outcomes by enabling students to actively engage in learning whenever and wherever they want (Sandybayev, 2020).

Some research has focused on the influence of teachers (Almanthari et al., 2020; Falloon, 2020) in relation to the use of EDRs in schools (Almanthari et al., 2020; Dube, 2020) and the application of technological school analytics approaches in decision-making by school leadership (Mandinach and Schildkamp, 2021; Navaridas-Nalda et al., 2020). However, only a few studies have examined the impact of principal leadership on DT. The leadership of any educational institute is the center of decision-making regarding the integration of EDRs in the curriculum, and the acceleration of DT in the school; thus, it is important to investigate further the role of principals in implementing DT in schools (Karakose et al., 2021).

The influence of a school principal’s leadership on learning has been widely studied, but there is a lack of research analyzing the influence of school principals’ leadership on the transformative integration of EDRs (Francisco, 2020; Navaridas-Nalda et al., 2020). The principals’ personal construct of their roles may be translated into actions, including EDR integration in schools (Jusslin and Østern, 2020; Xie et al., 2021). Therefore, research on the role of school leaders in the integration of digital materials is warranted. This study constructed a research model based on elements connected to the educational process, educational outcomes, and precursor aspects, to assess their involvement, especially in the transformational integration of EDRs. Moreover, there is a lack of research examining the impact of school principal leadership on the transformative integration of EDRs (Navaridas-Nalda et al., 2020), although the impact on learning has been studied extensively (Karakose et al., 2021; Wu et al., 2020). Principals may transform their conceptions of their roles into actions such as implementing EDR in their schools (Rasmitadila et al., 2020). It is, therefore, important to investigate how school principals contribute to the integration of digital materials into schools. Hence, the following research questions are proposed:

RQ1. To what extent does the leadership of school principals influence DT integration, represented by EDRs in the schools?

RQ2. What factors influence school principals’ decisions to use DT, represented by EDRs in the schools?

Literature review and hypothesis development
In recent years, the aim of instructional technology integration has changed substantially (Francom, 2020; Khatoony and Nezhadmehr, 2020; Szymkowiak et al., 2021). After decades of focusing on the availability of hardware and software resources, emphasis has shifted significantly to teaching and learning with and about technology (Rapanta et al., 2020) thus accelerating the process of DT in education. Furthermore, DT in education is intended to solve the issues of society’s, fostering both digital literacy and 21st century skills of teachers, students, and principals (Falloon, 2020; Tejedor et al., 2020). Digital transformation extends much beyond the provision of hardware and software resources, to include goal alignment with organizational structures, technology tools, and workforce capacity training, so that the overall shift is regarded as smooth and meaningful (Pollock, 2020). Similar ideas have been
proposed for school-based technological leadership (Ruloff and Petko, 2021). Prior to other steps of implementation, such as adapting the curriculum, convincing and empowering teachers to adjust their teaching accordingly, and providing appropriate support, professional development opportunities, and infrastructure, school leaders are expected to clarify the underlying goals (Ruloff and Petko, 2021; Shamir-Inbal and Blau, 2021).

Despite the undeniable focus on the role of the school principal’s leadership in technology integration in education, there are only broad recommendations for implementing and maintaining the transition process (Bosevska and Kriewaldt, 2020). The literature on school leadership frequently distinguishes between top-down approaches, such as instructional and transactional leadership, and bottom-up approaches, such as transformational and distributed leadership (Ruloff and Petko, 2021). For a smooth transition, into more integration of technological resources in the education system in the schools, it is important that the participants in the educational system (the students, teachers, and principals) are able to utilize digital technology, manage technology-based professional development, support digital learning culture, and develop digital leadership capabilities (Karakose et al., 2021). The administration’s leadership, and the construction of a digital culture and environment, aid in the DT of schools (Navaridas-Nalda et al., 2020).

Perceived usefulness of EDRs is another factor that affects the transition process for principals. If students and teachers have positive thoughts about using EDRs in class – especially if they believe the EDRs stimulate a better learning experience for both students and teachers – then DT will go more smoothly. Moreover, the school’s administration having positive expectations for EDRs in the classroom was found to have an even greater positive effect on the process. Therefore, the role of school principals is crucial in this regard. The impact of this factor was especially apparent after school lockdowns began in the COVID-19 pandemic, as the perceived usefulness of technology completely changed (Alhumaid et al., 2020; Muhaisen et al., 2020).

School principals have a crucial role as pedagogical leaders who have an impact on others in various positions at their schools (Samancioglu et al., 2020). Research is increasingly demonstrating that leadership impacts student learning and school performance (Hallinger et al., 2020). The methods used by teachers in their schools are impacted by the leadership styles of the principals (Paletta et al., 2020). To effectively manage the technological transformation needed to improve learning, principals’ perceptions and ideas about specific school environment conditions, such as community demands or potential opportunities, are a great and valuable source of information (Shamir-Inbal and Blau, 2021). Their perspectives can be utilized to predict and explain the desire to use EDRs for teaching and learning at schools because of their expertise and influence (Navaridas-Nalda et al., 2020). From the views of both principals and teachers, there is a correlation between principal leadership and academic results (Karakose et al., 2021). Based on these studies, principals interact with perceived contextual factors while incorporating their interpretation of the school reality into their interactions, and their interpretation of that reality has a significant impact on the behaviors and practices that the members of the educational community adopt (Navaridas-Nalda et al., 2020). Currently, global, digital, intercultural, and changing societies pose multiple educational challenges (Adedoyin and Soykan, 2023). School principals play a crucial role in the educational transformation required to meet the demands of the digital world (Ali, 2020). School principals are the first movers and main agents to promote and manage the digital revolution (Clarke and Kocak, 2020). They must balance the needs, motivation, and expectations of teachers, learners, families, and the community, considering the requirements of the education system and the specificities of their school environment (Navaridas-Nalda et al., 2020). Thus, principals are responsible for integrating information and communications technology (ICT) into the teaching process and supervising the procurement, creation, and production of digital materials that meet students’ learning needs (Gudmundsdottir et al., 2020).
No educational process implemented using ICT can be completed without EDRs (Navaridas-Nalda et al., 2020). This is because EDRs provide structure, meaning, and value to all plausible communication activities or situations connected to digital learning that occur in the classroom (Calzolaio et al., 2020). Because of the diversity in their educational and technological natures, EDRs are a widespread notion (McKenney and Reeves, 2021). EDRs can be classified according to a variety of characteristics, such as the product type or price model (Xie et al., 2021). Any type of content or interactive resource that is included in a readable digital format as an iconic, visual, audible, or audiovisual element is referred to as an EDR (e.g. websites, data files, databases, e-books, digital images, digital video, or video games). Teachers can use EDRs to meet their instructional requirements by creating, viewing, sharing, modifying, and storing them (Basilai et al., 2020; Jaiswal, 2020). EDRs give students the opportunity to investigate, develop, and change information as part of their knowledge-building process. They enable students to further their education using digital information in imaginative, alluring, and cooperative ways (Zhang et al., 2020). EDRs refer to any digital resource (DR) type with a clear educational aim, moving beyond the conceptual discussion of their definition (Falloon, 2020; Hylén, 2021). These materials serve as priceless aids in the teaching and learning processes that help students learn and build their knowledge (Falloon, 2020; Hylén, 2021). Several researchers (e.g. Sancho-Gil et al., 2020; Turgut and Aslan, 2021) have emphasized the pedagogical potential of EDRs to expedite the learning process and underline the instructional function of these tools. Additionally, using animation and 3D images, digital materials may meet students’ emotional needs, while promoting cognitive learning and encoding (e.g. search and browse applications).

The integration of digital content is crucial in this transition process. Thus, an analysis of the variables affecting their integration and use in schools is required. EDR integration is difficult, and depends, amongst other things, on instructors’ views and technological expertise (Coman et al., 2020). Therefore, school principals play a crucial role in this process as leaders in charge; of guiding DT in schools (Hai et al., 2021; Karakose et al., 2021). To comprehend and enhance educational reality, it is essential to examine principals’ visions based on their leadership positions. Principals play a “central role” since they are the most knowledgeable individuals at the institution (Lang, 2021). They become the “center of gravity” of the school, communicating the expectations, interests, and requirements of the entire educational community (Harju and Niemi, 2020).

In this area of research – about the integration of ICT and EDRs in the learning process – Biggs’ 3P model (Biggs, 2006, p. 38), as illustrated in Figure 1, is one of the most often used. The model that provides a flexible framework for analysis which may be enhanced by the inclusion of new variables and factors (such as school principals characteristics, school profile, education context and etc.); and it allows for an accurate representation of the relationships between the variables of this research. The model is based on elements connected to the educational process, educational outcomes, and precursor aspects, to assess the involvement, especially in the transformational integration of EDRs.

The suggested model is a comprehensive schema that illustrates the organizational and structural aspects of teaching and learning in connection with three Ps: Presage, Product, and Process. The educational process will be predicted based on the elements of the presage dimension. A product that comes from the process may be established when it is combined with activities occurring in the process stage. Depending on the model version being utilized, there are several interactions among the present, process, and product aspects that can go either way. The suggested model includes two presage factor types:

1. Factors that rely on the principal characteristics, such as age and teaching experience; the present model includes principals’ profile characteristics (age, years of experience, ability to use technology), school profiles (educational stages in the school and
number of teachers) and the perceived usefulness of EDRs (whether school principals think EDRs are useful for better class experiences for students) and

(2) Factors that depend on the educational situation; this study will focus on digital culture.

The process elements of the model were developed based on research that demonstrated the effects of the presage variables on the intention of using EDRs in the school. Therefore, this study suggests that principals’ perceptions (Presage dimension) affect the school’s current and future intentions to employ EDRs (Product dimension). The effects of Process variables, such as the activities used in the learning process, learning approaches, or the attitudes of people involved in the educational process, including teachers, students, and their families, are to blame for the influence of the presage dimension on the product dimension. Additionally, all process variables communicate with each other.

EDRs are a crucial resource for educational transformation in an emerging knowledge society. Understanding principals’ roles and the factors influencing decisions regarding the integration of digital content will have important consequences for both education policy and school leadership practices. It is apparent that the principals’ background and experience in both teaching and management could influence the education process with EDRs. This suggestion describes the rationale behind including the principal’s profile as a factor to study. Moreover, school identity could either hinder or accelerate the integration of EDRs in the educational process depending on the stages and the number of teachers. Additionally, younger principals use more technologies in their work than older principals (Taghizadeh et al., 2020).

Another presage factor that depends on the principal profile is “perceived usefulness,” which can be defined as the degree to which the use of DT resources can increase the quality of the education a school provides. Navaridas-Nalda et al. (2020) have shown that this perspective could influence the educational process. Hence, the following hypothesis was proposed:

H1. Presage factors that depend on the principal’s profile influence the education process.
Digital culture could influence the educational process. For example, if there is a very limited digital culture among school principal, that would be reflected in the educational process. Furthermore, the higher the digital culture of the school principal, the higher the tendency of the entire school to accept the integration of new EDRs (Navaridas-Nalda et al., 2020). Moreover, the use of DT in a school may be affected by both the construction of a digital culture and administration leadership (Karakose et al., 2021). Hence, the following hypothesis was proposed:

**H2.** Presage factors perceived by the principal regarding the educational context influence the educational process.

The profile of the school principal is believed to have an impact on how EDRs are seen, which may affect the intent to use EDRs at all. It was shown that younger principals have a better perception about EDRs and how useful they can be in the school (Taghizadeh and Hasani Yourdshahi, 2021). The predicted results from implanting EDRs could improve the perceived usefulness of DT in schools, thus increasing the readiness to accept this transformation (Navaridas-Nalda et al., 2020). Based on the previous discussion, the following hypothesis was proposed.

**H3.** Presage factors that influence the intention to use of EDRs depend on the principal’s profile.

Digital culture has a strong relationship with EDRs; more readiness to use EDRs in the curriculum means more intention to use EDRs, and vice versa (Navaridas-Nalda et al., 2020). The predicted results of using EDRs in the classroom could influence how school principals promote a higher digital culture among teachers and students (Xie et al., 2021). Hence, the following hypothesis was proposed.

**H4.** Presage factors perceived by the principal regarding the educational context influence their intention to use EDRs.

The way the educational process is planned and executed, with the supervision of the school leadership, could affect the intention to use EDRs in classroom activities and learning (Rajagopal et al., 2020). Moreover, the better the results, after using EDRs in the educational process, the more EDRs usage will be welcomed in the school by principals (Navaridas-Nalda et al., 2020). Hence, the following hypothesis was proposed:

**H5.** The educational process positively influences the intention to use EDRs.

The proposed conceptual model and how the variables interact with each other are summarized in Figure 2.

**Research methodology**

**Sample and data collection procedures**

This cross-sectional study was conducted to gather data through the administration of a questionnaire. The study employed a non-probability purposive sampling strategy, specifically targeting principals of national, international, and mixed schools in the United Arab Emirates (UAE). The purposive sampling technique was employed in this study in order to ensure the fairness and accuracy of the data collection process. According to the UAE Ministry of Education (2020), a national school is defined as an educational institution that adheres to the national curriculum. The national curriculum encompasses a comprehensive array of subjects and standards that are implemented within primary and secondary public educational institutions under the guidance of the Ministry. International schools typically implement international curricula, such as the International Baccalaureate (IB) and the International General Certificate of Secondary Education (IGCSE), with the objective of cultivating global citizens. In contrast, mixed schools adopt a combination of national and international curricula.
Participants were recruited through an email list because there is no publicly accessible official registration of national, international, and mixed schools in the UAE. This list had a nationwide reach and covered UAE school principals who had experience with digital transformation and considered EDR as an “object or artifacts” for teaching and learning. The data was collected in English between January–April 2023. The principal’s decision to participate in this study is entirely voluntary. They also ensure anonymity once they have granted their permission to take part in this survey. To increase the response rate, two reminders were sent to non-responding participants. The participants were advised to carefully read the questions because the survey was divided into the four sections, on which the model was based, namely: the educational process, the influence on the intention to employ EDRs, and presage variables affecting school principal leadership and contextual elements, as perceived by principals.

A total of 600 questionnaires were disseminated, out of which 251 were retrieved. Fifty-one responses were excluded from the final sample due to incomplete data. Thus, the data indicates a response rate of 33% (200 valid responses). The present investigation aimed to ensure a sufficient sample size to mitigate the potential for sample bias, a phenomenon that has been frequently reported in previous studies on education (e.g., Ajayan and Balasubramaniam, 2020).

The study’s findings indicate that a significant proportion of the respondents were male, comprising 76% of the sample. Regarding the age distribution, a majority of 78% fell within the 45–55 age range, while 22% were aged 56 and above. Regarding educational attainment, the majority of individuals, specifically 89%, held a master’s degree. The data also reveals that the majority of participants, 56.6%, possessed work experience ranging from 6 to 10 years. The majority of participants are from Abu Dhabi (33%), followed by Dubai (24.55) and Sharjah (14%) with 56% were the national school principals. Table 1 tabulates the number of schools participated in the study.

**Instrument design and measurement**

This research investigates and measures the construct of presage, educational process and product based on Biggs’ 3P teaching and learning model (2005). Then the developed items
validated to evaluate the influence of presage on educational process and results (product). The process of validation is of utmost importance in ensuring a robust parsimony model through the psychometric reliability of measurements. In line with previous study in the field of education, this study employed an exploratory mixed method design by employing qualitative data to confirm the constructs that were derived from the existing literature followed by quantitative study to confirm and validate the constructs.

Firstly, the study employed expert review as prioritization analysis techniques of the model structure, dimensions, and items for their fit with the research goals, precision, and legibility, as well as for any other suggestions to correct, or improve it, to ensure both theoretical and content validity (Gómez et al., 2013, p. 204). A total of ten experts were involved, with five possessing extensive experience of over 2 decades in the educational fields of digital and information technology. The remaining five experts were distinguished senior academics whose research primarily revolved around digital and information technology in education contexts. The findings from expert review revealed a total of 38 statements divided into four blocks:

1. Presage factors regarding the principal’s school leadership: questions about the principal’s profile (age and teaching experience), professional and leadership profiles (management experience, motivation to become a principal), and perceived usefulness of EDRs (external motivation to integrate and use them at schools).

2. Presage factors related to the educational context: school identity (public/private/ mixed, size, educational stages offered), school’s digital culture (collective values and beliefs regarding availability, uses, attitudes, and habits related to ICTs).


4. Product factors related to digital content: results regarding the intention to use EDRs and the current approach to DRS at school.

After implementing these procedures, a total of 38 items in four variables undergo further examination. The utilization of the scale-refinement methodology in this research yielded findings that align with the theoretical frameworks of Biggs’ 3P teaching and learning model, such as literature-based analysis, as well as the perspectives of practitioners and experts, as evidenced by the empirical assessment conducted through a survey. Hence, a total of 38 items were identified as the constituent elements in this study developed using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), indicating their level of agreement or disagreement with each statement of the survey.

Secondly, in order to refine and validate the scale, this study employed the quantitative techniques of confirmatory factor analysis (CFA) to test for variables’ convergent and

<table>
<thead>
<tr>
<th>Emirate</th>
<th>Number of schools</th>
<th>National</th>
<th>International</th>
<th>Mixed school</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abu Dhabi</td>
<td>66</td>
<td>50</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Dubai</td>
<td>49</td>
<td>20</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
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<td>28</td>
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<td>11</td>
<td>6</td>
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<tr>
<td>Ajman</td>
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<td>8</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Um Al Quwain</td>
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<td>4</td>
<td>7</td>
<td>1</td>
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<tr>
<td>Ras Al Khaimah</td>
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<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Al Fujairah</td>
<td>16</td>
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<td>2</td>
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<td>Total</td>
<td>200</td>
<td>112</td>
<td>55</td>
<td>33</td>
</tr>
</tbody>
</table>

Table 1. Number of schools that participated in the study based on Emirate in the UAE

Source(s): Created by authors
discriminant validity. Convergent validity analyzes the degree of confidence, and the construct is well measured by its indicators. It is usually assessed using Cronbach alpha (CA), composite reliability (CR) and the average variance extracted (AVE) (Shrestha, 2021). The second method is discriminant validity analysis, which is used to ensure that the strongest relationships of a reflective construct have on their own indicators (Anis et al., 2020). Finally, the proposed hypotheses were tested using Structural Equation Modeling (SEM-PLS).

Results and discussion

Confirmatory factor analysis

Table 2 shows the factor loading for each item. The factor loading for each item is greater than 0.70, which is an acceptable value, except for the first item of digital culture (DC1 = 0.625); this item was therefore removed from the model.

Table 3 reports the CA, CR and AVEs of the variables. The acceptability of the AVEs ≥ 0.05 and CAs and CRs ≥ 0.70 was observed (Yu et al., 2019; Shrestha, 2021). All CAs and CRs are well above 0.70, while AVEs were satisfactorily meeting the threshold. This finding provides evidence in favor of sufficient discriminant validity. Hence, the presence of multicollinearity was not observed in the context of this study. For instance, AVE for digital culture is 0.863, the educational process is 0.924, intention to use EDRs is 0.926, perceived usefulness is 0.944, and principal professional profile is 0.888.

The Fornell–Larcker criterion test is used to test the discriminant validity of the data collected through a survey questionnaire. The discriminant validity test shows that the data

<table>
<thead>
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<th>Variable</th>
<th>Item</th>
<th>Loading</th>
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<tbody>
<tr>
<td>Digital culture</td>
<td>DC1</td>
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<tr>
<td></td>
<td>DC2</td>
<td>0.721</td>
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<tr>
<td></td>
<td>DC3</td>
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<tr>
<td></td>
<td>DC4</td>
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<tr>
<td></td>
<td>DC5</td>
<td>0.815</td>
</tr>
<tr>
<td>Educational process</td>
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</tr>
<tr>
<td></td>
<td>EP2</td>
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<td></td>
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<td></td>
<td>EP5</td>
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</tr>
<tr>
<td></td>
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<tr>
<td>Perceived usefulness</td>
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<td>PU8</td>
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<td>Intention to use EDRs</td>
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<td></td>
<td>RPP2</td>
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<td></td>
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<tr>
<td></td>
<td>RPP5</td>
<td>0.823</td>
</tr>
</tbody>
</table>

Source(s): Created by authors

Table 2. Factor loadings for each factor item
is valid (Table 4) because the first value for each variable is greater than the other values in the same column and row, such as, the value of educational process 0.842 is greater than 0.712, 0.657, and 0.678, intention to use EDRs 0.845 is greater than 0.735 and 0.606. However, there is a minor issue with the digital culture factor, such as, 0.782 is lower than 0.786 and 0.793. Thus, Variance Inflationary Factor (VIF) was applied to check whether the items of the variables under study are correlated, which causes the multicollinearity issue. The results of VIF are reported in Table 5. The results show that the values for all the items are under the acceptable range (>5); thus, the data has no validity issue.

Hypotheses testing

Figure 3 shows the path coefficients, and Figure 4 shows the $t$-statistics of path coefficients, while Table 6 reported the results of regression to support or reject the hypotheses of the study. The results show that the principal professional profile has a positive influence on the educational process (0.235), which is statistically significant at a 5% significance level; because the $t$-value is greater than 1.96 ($t$-statistics = 2.953) and the $p$-value is less than 0.05 (0.003 < 0.05). The results support the first hypothesis that Presages factors that depend on the principal’s profile influence the education process. Less digital educational content was employed in the teaching and learning activities at the school as the principal aged and gained more teaching experience. These results are consistent with those of previous research, such as Wang et al. (2019) examination of rural secondary schools or Sánchez-Mena et al. (2019) demonstration that age and experience are associated with ICT usage in instructional processes in the classroom. It is also consistent with the findings of Navaridas-Nalda et al. (2020), who investigated the role of Spanish school principals in employing EDRs in the school curriculum. The findings of Akour et al. (2020), Aguilera-Hermida et al. (2021)
and Papadakis et al. (2021) are consistent with one another, showing a negative correlation between age and teaching experience and the use of technology in teaching and learning activities.

The results revealed a negative impact of “principal professional profile” on “intention to use EDRs” (coefficient = −0.05); although the association is not statistically significant, as the t-statistic is less than 1.96 (t = 0.699), and the p-value is greater than 0.05 (p = 0.484). Thus, this study has sufficient evidence to reject the H3 (presages factors influencing the intention to use EDRs depend on the principal profile). This result suggests that the integration of EDRs depends on the principal’s digital competence, not the principal’s professional profile, which is consistent with Navaridas-Nalda et al. (2020). However, these findings seem contrary to the results of other studies that indicate a significant positive influence of (the principal’s) years of experience on educational outcomes in schools (Cheng et al., 2019; Rafiola et al., 2020).

The perceived usefulness has a positive impact on the educational process, which is statistically insignificant because the t-statistics are less than 1.95 (t = 0.573) and the p-value is greater than 0.05 (p = 0.567). Whereas perceived usefulness has a positive and significant impact on intention to use EDRs. Moreover, “digital culture used for factors depends on the educational context perceived by the principals” positively influenced the educational process as well as intention to use EDRs. This can be seen because the coefficients are positive (Educational β = 0.591 with t-statistics 6.404 and p = 0.00) (intentions to use EDRs β = 0.438 with t = 4.422 and p-value = 0.000) which are both statistically significant, as their t-statistics are greater than 1.96 and p-values are less than 0.05. H2 and H4 are supported by

<table>
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<th>Variable</th>
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<td></td>
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</table>

Source(s): Created by authors
these results. Digital content was used more frequently the stronger the school's digital culture, as measured by the principal's perceptions of shared digital values, the usage of DRs, and attitudes toward technology-based innovation initiatives. This is in line with other research' results that culture has a significant role in how well technology are integrated into the educational process (Abdel-Basset et al., 2019; Karakose et al., 2021). Ifinedo et al. (2020) note that teachers' judgments on integrating technology are not entirely their own but are impacted by their culture and the social environment of the schools where they work. Due to the influence of digital culture on the intention to use EDRs in the educational process – and the current use of EDRs on the ongoing educational process – principals believe that the more EDRs are employed, the larger the perceived pedagogical benefits they have (such as better student competency learning, increased levels of student attention and motivation in the classroom, and learning-based evaluations). This may be crucial for the DT of schools that is becoming more prominent in the recent years (Abad-Segura et al., 2020). Núñez-Canal et al. (2022) found that EDRs can be particularly effective in encouraging instructors to adopt a student-centered learning approach, and in fostering the digital competence that teachers need to function effectively in a complex and linked society. This is also in line with what Navaridas-Nalda et al. (2020).

The educational process shows a positive influence on intention to use EDRs as the coefficient is 0.202, suggesting that the “educational process” enhances “intention to use EDRs,” which is statistically significant; the t-statistics of the coefficient is 2.119, and the p-value is 0.03, less than 0.05 significance level. The results support H5, which posited that the educational process influences the intention to use EDRs. The more EDRs are used in the
educational process, the greater the present or future desire to employ them. Hassan and Mirza (2021) found that digital content cannot be successfully incorporated into school curriculum based merely on superficial usage of the content at very low cognitive levels as a detached resource (i.e. not as part of a student-centered learning method). Successful integration requires a strategic approach to a completely digitalized environment wherein students employ EDRs at a high degree of cognitive engagement, as well as shared accountability and interaction among all educational actors participating in the learning process. These findings suggest that school principal have significant impacts on the educational process, including the usage of DRs, such as digital material, which is consistent with the findings of Kalkan et al. (2020). Due to the principal’s educational effect on teachers’
methods of learning and teaching, any integration of digital material at a school should think about how to digitalize the educational process under their guidance (Iivari et al., 2020; Siddiq et al., 2016). In summary, the results of the study support the hypotheses H1, H2, H4, and H5. However, the H3 is rejected, based on the results.

$R^2$ is the coefficient of determination, which is used to measure how well a statistical model predicts an outcome. The value of the $R^2$ shows the variations in dependent variables explained by independent variables. The results in Table 7 show that variations, in 64% of variations in the educational process, are explained by variations in the principal’s professional profile, perceived usefulness, and digital culture, while 68% of the variations in intention to use EDRs are explained by variations in the principle’s professional profile, perceived usefulness, digital culture, and educational process.

### Discussion and conclusion

Digital content is crucial to the success of schools’ DT, which is a priority in education. The influence of administrators is essential in effectively embracing and employing EDRs that align with learning objectives. Thus, both students and instructors will need to build digital competence. Principals serve as a cornerstone for the development of DT – which is based on the integration of high-quality digital material – since they are familiar with the educational setting and have the authority to affect the pedagogical approach employed in schools (Ruloff and Petko). Studies suggest DT aid school principals in their efforts to effectively lead their schools through the DT process (Aas and Paulsen, 2019; Greenhow et al., 2021), while ensuring that students and teachers are able to keep up with the changes and maintain the ongoing educational process (Haleem et al., 2022). McLay and Reyes (2019) comparative studies in Australia and Singapore also consider leadership role as crucial to school principals for planning how the DT should be approached and implemented. Therefore, the current study provides novel insights into the perspectives of school principals in the context of examining EDRs in the UAE education. These insights could help guide school principals, formulate educational policies on DT, and define strategies for school digitalization, based on successful digital content integration. In summary, the findings clarify which elements influence school principals’ intentions to employ planned and current EDRs.

Kamarudin and Adams (2023) argue that policy makers should consider school principals’ professional and personal profiles when defining educational policy and creating school plans for DT and EDR integration. In addition, Ruloff and Petko, 2021 describes how age, and years of teaching experience, influence school principals’ intentions to employ digital content in Switzerland. For example, age and experience are inversely related to the degree to which a principal intends to use EDRs – the more time they have spent teaching and greater their age, the less intent they are on using EDRs at their schools. Notably, regarding their background in school principal leadership, their tenure and experience as a school principal, and ambition to inhabit the role, have no discernible impact on their intention to utilize and integrate EDRs at schools. Also, their intent to integrate DT is not influenced by their school principal leadership qualities. Consistent to Fan and Liu (2020), it can be inferred that having a principal with leadership experience does not guarantee a school is more or less likely to have high DT integration. Studies suggest that educational policies should consider the connection between

| Table 7. | $R^2$ – how well the statistical model predicts the outcome | | $R^2$ |
|---|---|---|
| Educational process | 0.643 |
| Intention to use EDRs | 0.685 |

Source(s): Created by authors
encouraging experience principals, who have gained extensive expertise through years of teaching to participate in training programs on DT (Ruloff and Petko, 2021). This is crucial based on the belief that they will demonstrate enthusiasm in addressing DT. Nevertheless, the implementation of such training activities has the potential to enhance the digital competence of principals, encompassing both educational and leadership aspects. This would enable them to address any disparities resulting from ingrained biases developed over time due to their reliance on traditional, non-digital pedagogical and leadership practices.

Finally, the most important factor influencing schools’ DT is how much value school principals place on EDRs (Ruloff and Petko, 2021). This research emphasizes the role of perceived utility in EDR adoption and integration. School principals, who see the advantages of factors like autonomous work, self-paced learning based on students’ individual requirements, or the ability to generate experimental learning via the use of digital content, will realize it is essential to effective integration (Ajayan and Balasubramaniam, 2020). Ongoing and planned adoption of EDRs, including the transition to a completely digitalized educational approach based on DRs, will increase in proportion to how many benefits are seen. Pedagogical methods and attitudes toward DT in schools are influenced by principals’ perceptions about EDR – integration-based DT – and those perceptions are founded on their beliefs, experience, and expertise (Litz et al., 2016). Any policy for DT should thus take school principals into account and concentrate on making the advantages of digital material for changing schools obvious and understandable to them. Additionally, programs for continuing education, outreach initiatives, and innovation networks might all be beneficial for demonstrating the pedagogical value of digital materials. Due to the ongoing development of digital technologies and EDRs, all these procedures should be regularly engaged.

Theoretical implications
There are two ways to implement the digitalization of education through school principals. Firstly, through the use of instructional-design theory to establish a framework for the transition to digital classrooms. This design-oriented study focuses on the elements that might make the design more helpful in supporting schools’ principals in leading digital transition. The study identifies factors that affects the digital transition and implementation challenges. The findings of this study provide further evidence to corroborate prior research, indicating that principals play a crucial role in facilitating the implementation of digital initiatives inside educational institutions (McLay and Reyes, 2019; Ruloff and Petko, 2021). Nevertheless, it is important to note that the effectiveness of digital transformation is not just determined by the objectives or the level of clarity in those objectives, but is also influenced by the leadership style employed (Aas and Paulsen, 2019; Greenhow et al., 2021). The leadership style exhibited by these principals is correlated with a more expeditious adoption and integration of digital technology. Moreover, the emphasis in this instance was on instructional objectives rather than the use of specific tools. The literature indicates that the implementation of transformative leadership necessitates a degree of flexibility (Kamarudin and Adams, 2023; Litz et al., 2016). In response to the implementation of a novel digital curriculum, school principals may opt to engage in conventional transactional leadership practices under pressure. Therefore, digital technology primarily functions as a supplementary component with limited overall impact. Secondly is to specify the elements of the framework required for converting a traditional school into a digital school; to provide schools with additional recommendations for overcoming specific obstacles that hinder the attainment of digitalization goals. Digital leaders are required to possess a clearly articulated and transparent plan, together with a comprehensive understanding of the distinctive attributes and requirements of their educational institution (Fan and Liu, 2020). High-level goals correspond positively with digital change. With regard to the Biggs’ 3P model,
however, the extent of digital transformation of teaching and learning does not exceed the first level and technology basically serves as a direct tool substitute without functional change (Duchatelet et al., 2022). An exception is the school with a principal oriented toward a transactional and transformational leadership style. In this school, the integration of digital technology goes beyond substitution. Recent research indicates that educators employ digital media as a means to enhance students’ educational experiences (Haleem et al., 2022; Ruloff and Petko, 2021). However, it is imperative to thoroughly investigate the actual effect of leadership activities on teacher practices and student learning through the implementation of participatory leadership activities in the context of digital education.

**Practical implications**

Principals should be a fundamental component of educational plans for digital transformation, dependent on factors such as their age, and leadership and teaching experience. They should also regard contextual elements like school size, complexity, and digital culture. School principals should help develop teachers’ digital competence, by enrolling them into personal development programs, so they can pass on what they learn to their students, supporting them in their digital learning journey. School principals’ ability to promote an open dialogue, that enables educational communities to view the integration of EDRs into pedagogical models as an opportunity to improve outcomes, can assist a digital culture transition, more than via their authority or bureaucratic influence. School principals should get to know more about digital transformation and get training about how to implement it in their schools. Furthermore, they should encourage teachers and students to use EDRs more and create a plan to train the teachers to use EDRs in their teaching, to accelerate the digital transformation process.

**Limitations and future studies**

The findings of the study are based on a single country context, which has limits, and leaves room for further research. It is important, therefore, to research other countries school principals’ roles in DT, to see if they are comparable. Likewise, this study concentrated on the characteristics and views from the principal’s context. The principals’ effect and function have been emphasized in several studies. Additionally, there are drawbacks to the study approach, as the focus was on urban schools, so rural areas are not represented in these findings. In addition, the research is limited by not including input from teachers, as they comprise an important part of the educational process.

According to the data presented herein, the research recommends future studies examine how EDRs are mirrored in educational policies implemented by other schools’ principals, as this information may help to determine their applicability. For example, additional studies should examine the role of school principals in DT in rural schools. Future studies, that compare the current findings to those of school principals of other countries, would also add value and depth to the understanding of the topic.

**References**


Further reading


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