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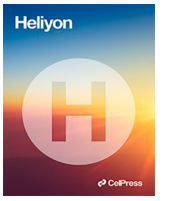

A new conceptual model to investigate the role of hospital's capabilities on sustainable learning

Sui Zhihan [a], Ali Mohammadiounotikandi [b], Saeed Ghareh Khanlooei [c], Sepideh Monjezi [d], Mekhmonov Sultonali Umaralievich [e], Ali Ehsani [f,**], Sangkeum Lee [g,*]

[a] Department of Radiation Oncology, Cancer Hospital of Shantou University Medical College, Shantou, PR China
[b] Department of Computer and IT Engineering, Faculty of Engineering, South Tehran Branch, Islamic Azad University, Tehran, Iran
[c] Islamic Azad University, Safashahr Branch, Information Technology engineering - computer networks, Safashar, Shiraz, Iran
[d] Department of Computer Information Systems, J.Mack Robinson College of Business, Georgia State University, Atlanta, GA USA
[e] Tashkent Institute of Finance, Tashkent, Uzbekistan
[f] Industrial management Department, Faculty of administrative sciences and Economics, Arak university, Arak, Iran
[g] Department of Computer Engineering, Hanbat National University, Daejeon 34158, South Korea

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ABSTRACT

The health-care industry is in a state of constant flux, with new challenges and opportunities emerging regularly. Hospitals, as the cornerstone of health-care delivery, must adapt and embrace change to provide optimal patient care. One crucial aspect that plays a significant role in the success of hospitals is sustainable learning. Sustainable learning refers to acquiring knowledge, skills, and competencies that enable health-care professionals to adapt to changes, implement best practices, and deliver high-quality care. Sustainable learning, a concept gaining prominence, emphasizes the ability of hospitals to learn from experiences and adapt to changing circumstances while maintaining quality health-care delivery. This article aims to investigate the role of hospital capabilities in sustainable learning and explore how hospitals can foster an environment that promotes continuous learning and development. Another goal of the paper is to test the relationships between cultural capabilities, structural capabilities, knowledge management capabilities, Information Technology (IT) infrastructure, top management support, application capabilities, and sustainable learning. The Partial Least-Squares (PLS) algorithm was performed using SmartPLS 3.0 to attain this goal. The results successfully support the study goals. This study verified that cultural capability, structural capabilities, knowledge management capabilities, IT infrastructure, top management support, and application capabilities positively affected sustainable learning. This investigation contributes to hospital, management, and education research by developing an integrated paradigm for sustainable learning. In conclusion, the new conceptual model presented here provides a robust framework for investigating the role of hospital capabilities in sustainable learning. By understanding and improving their capabilities, hospitals can not only adapt to change but also thrive in an ever-changing health-care landscape.

* Corresponding Author : Sangkeum Lee
** Co corresponding Author: Ali Ehsani
E-mail addresses: 20zhsui@stu.edu.cn (S. Zhihan), ali.mohammadion@gmail.com (A. Mohammadiounotikandi), Saeedkhanlo1990@gmail.com (S. Ghareh Khanlooei), smonjezi1@gsu.edu (S. Monjezi), mehmonov_s@tfi.uz (M. Sultonali Umaralievich), a-ehsani@araku.ac.ir (A. Ehsani), sangkeum@hanbat.ac.kr (S. Lee).

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1. Introduction

Sustainable human development is a procedure of transformation in which the use of resources, the direction of human advancement in technology, and institutional changes agreed upon strengthen the present and future potential to satisfy human requirements and goals [1]. The provision of fair, high-quality education and the encouragement of opportunities for lifelong learning for everyone are goals of sustainable development, according to Ukraine's 2030 sustainable development policy. It envisions providing the whole population with lifetime access to high-quality vocational and higher education. Additionally, it substantially raises the proportion of children and adults with socially essential abilities, including those for employment, decent labor, and entrepreneurial employment. All types of learning, including formal, informal, and non-formal, are supported by e-learning. People are quickly obtaining information in a variety of formats from mobile devices in almost every field [2,3]. In order to further the cause of intergenerational education for Sustainable Development (SD), this technology-assisted learning paradigm has created a ubiquitous environment for learning anytime and anywhere.

By combining education with Information Technology (IT), e-learning may be achieved. With the growing number of application zones and user groups, guaranteeing that e-learning is high quality is more important than ever. Universities, schools, and other institutions utilize those systems [4]. Superior acquisition technology is a system that constitutes and hands over online courses. E-learning is described as learning and teaching online via the network's technologies [5]. E-learning, an instructional tactic for transmitting required skills, knowledge, and tendencies in institutes, has been presented to remain. E-learning utilizes Internet technologies to elevate efficiency and knowledge. These technologies suggest learners control learning velocity and order over content, time, and media, causing them to fit their experiences to satisfy their private learning targets. The learning process is technology conveyed to developing countries. The significant procedure is the substantial factor in knowledge while learning, which appears via association with elevated trust and reliability [6]. The firms can construct tactical unions with prosperous firms to divide their knowledge and learn from each other to become advanced and original institutions and attain competitive pros [7,8]. Albeit, the request for e-learning progress is highly enhancing. Still, the necessity for investigation on capable factors influencing the adoption of e-learning, like quality, which is the main part of teaching and learning in all nations, has been evident, particularly in the field of developing countries; it certifies research into it [9,10]. Most information systems containing present projects of the ICT in progressing countries lose out partially and totally.

Although most state hospitals are improving their capabilities, further efforts are needed because healthcare suppliers in progressive nations often deny patients comprehension regarding health services [11]. E-healthcare suppliers can also offer dependable services for improved health therapies by utilizing patients' health data [12,13]. Stated hospitals invest more in fortifying their dynamic abilities to detect alterations in the settings to retain their collaborative connections, causing affirmative efficiency concepts [14]. Therefore, hospital managers' skills and IT capabilities are essential for delivering better services [15–17]. Many hospitals and corporate training have been making utilization of e-learning to validate learning and efficiency issues since many studies have investigated sustainable learning in developing countries. Existing approaches often lack comprehensive frameworks, making it challenging to understand the intricacies of this relationship. The new conceptual model aims to bridge this gap. Our research explores the relationship between sustainable learning in developing countries and hospital capabilities. Therefore, this study aims to develop hospital capabilities and sustainable learning in developing countries. Furthermore, the main contributions of this work are.

- ➢ Providing a model and framework for hospital capabilities and sustainable learning in developing countries.
- ➢ Examining the impact of hospital capabilities (cultural capabilities, structural capabilities, knowledge management capabilities, IT infrastructure, top management support, and application capabilities) on sustainable learning.
- ➢ Helping better understand sustainable learning in developing countries.
- ➢ Improving hospital capabilities in developing countries.

Related literature on developing countries' hospital capabilities and sustainable learning is provided in Section 2. Section 3 describes the data gathering and presents the study model, providing the research technique. The data is analyzed in Section 4 of the report. The debate and consequences are presented in Section 5. Section 6 concludes with findings, limits, and recommendations for further research.

2. Review of literature

This section checks the critical theoretical viewpoints that create the foundation of the current work.

2.1. Related work

Liao, Murphy [18] examined how technology-enabled e-learning may help health-care trainees develop person-centered communication skills. The findings revealed that online education utilizing computers might improve respondents' person-centered communication abilities and what factors impacted social distancing learning consequences. Also, Babaeinesami and Ghasemi [19] looked at how learning affects the performance of businesses and hospitals. This investigation aims to assess and rate hospitals based on Organizational Learning (OL) criteria across hospital employees. The findings revealed that increased communication among hospital personnel results in increased learning in companies; as a consequence, it will be beneficial and valuable in improving the

firm's growth and progress. Moreover, Ravangard, Yusefi and Gholami [20] investigated the impact of work-life quality on OL across nurses working in medical centers. The outcomes revealed that the nurses surveyed had a moderate OL and working-life quality. Furthermore, there was a strong link between OL and one's professional life quality. OL was also positively influenced by "participation in decision-making," "security," "career advances," and "nurses' desire for accomplishing work and duties," according to the findings of multiple linear regression analysis. Aparicio, Bacao and Oliveira [21] provided a profound perception of pupils' cultural features for collectivism/individualism influence the comprehended yields of e-learning systems' utilization. The result showed that satisfaction critically influences the individual and institutional effects for pupils with a more powerful individualistic culture.

Furthermore, Alsabawy, Cater-Steel and Soar [22] assessed the influence of IT infrastructure services with a view to the prosperity of e-learning systems. A survey had been prepared for data gathering from the study samples. These results showed that the IT infrastructure's service is a reliable and valid structure for assessing the success of e-learning systems. Besides, it proves IT infrastructure services' significant effect on the e-learning system success through its critical influence on user satisfaction, comprehended utility, organizational value, and client value. Liu, Huang and Lin [23] provided a framework checking out how organizational factors influence the service and quality of e-learning systems and how they impact organizational pros in the Information System (IS) success model and resource-based theory view. The outcomes showed that information security policy, institutional policy, and top management support are affirmatively connected with the quality of the system. At the same time, they are positively related to system service. Also, Lee and Lee [24] studied structural connections among knowledge management's procedures, abilities, and efficiency and offered tactical means for prosperous knowledge management execution. These results showed that knowledge potency theories supply a fertile resource to improve experimental investigations. do Carmo Caccia-Bava, Guimaraes and Harrington [25] examined the organizational culture that impacts hospital institutions' valence to novelize by attracting novel technology and its significance in IT execution prosperity. The outcomes showed the significance of organizational culture as a critical element in improving the attractive valence and the latter's impact on the execution of novel technologies. Finally, Ragu-Nathan, Apigian [26] developed a two-tiered structure to evaluate the relevance of top management support and IS function. The outcomes of the path analysis indicated that top management support notably influences the IS functioning of a firm.

2.2. Hospital capabilities: infrastructure and processes

IT innovations fall under process innovations in the hospital environment (e.g., the significant use of modern telemedicine tools or clinical decision support systems), leading to important variations in the related workflows [27,28]. The abrupt IT progress, such as the Internet of Things (IoT) [29], improvement and execution of the 4th Industrial Revolution opinions, and the exponential capability improvement and enhancement in potencies of novel medicine science within the recent years have highlighted the outlook to form a diverse model for health care. Health-care is the main service that organizes the least constraint for a country. Nations incapable of supplying instruction and health services are assumed to have ignored the main human and global rights requirements [30]. Technology capability is a supportable competitive benefit, and several investigations indicate a critical linkage between organizational performance and technological potencies [31]. Technology is a critical element of competitiveness within the organizational structure, its products, services, and procedures. In fact, it has been believed that technology develops organizational innovation and efficiency. In this study, these factors have been considered hospital capabilities: structural capabilities, knowledge management capabilities, cultural capabilities, application capabilities, top management support, and IT infrastructure.

2.3. Sustainable learning

What is the creator of success in e-learning? Efforts to consider the stated question have caused a huge amount of anecdotal investigations, evaluating the e-learning initiatives' prosperity on diverse measures like learning styles, learning environment, learning benchmarks, learning outcomes, teaching practices, and cost-benefits [32]. Cyber courses, interactive learning, distance training, and virtual classes are some terms that have been utilized for explaining diverse executions of the present technology-provided learning space. In contemporary instruction, IT has a critical influence [33]. To attain competitive pros, several universities or schools have established e-learning. The basic causes of the e-learning improvement in the countries' universities and colleges contain those organizations' intention to develop access, extend novel efficiency streams, and suggest pupils greater training cooperation [34]. E-learning eliminates the geographical distance constraints and time restrictions so that persistent worker progress may adjust to various learning settings like offices, offsite conference rooms, and homes. In addition, e-learning systems supply a time and cost-efficient procedure for employee instruction. Information, service, and communication quality notably and affirmatively influence subscriber loyalty and satisfy desires to utilize the e-learning system to connect to others, share experiences, and attain feedback. The acquisition of novel intellectual knowledge, schemata, skills, abilities, etc., is learning that can be utilized for addressing issues more prosperously and making decisions depending on the experience, which enhances "doing" as a foundation to attain an impressive knowledge perception.

2.4. Conceptual model and hypothesis

To promote sustainable learning, hospitals must cultivate a learning culture encouraging continuous development and knowledge sharing among staff members. This involves creating an environment where learning is valued, mistakes are seen as opportunities for growth, and collaboration and feedback are encouraged. A learning culture fosters creativity, critical thinking, and problem-solving skills, benefiting the staff and the patients. Sustainable learning is examined in this research using a model based on the

investigations conducted. The model comprises six constructs: cultural capabilities, structural capabilities, knowledge management capabilities, IT infrastructure, top management support, and application capabilities (see Fig. 1). Additionally, the following are the research's hypotheses.

- Cultural Capabilities

Cultural capabilities refer to the shared values, beliefs, norms, and practices that define the identity and behavior of an organization. In hospitals, cultural capabilities encompass the attitudes toward learning, collaboration, innovation, and continuous improvement. Culture plays a crucial role in shaping the learning environment within hospitals. A strong and positive organizational culture can significantly contribute to the success of sustainable learning initiatives.

H1. Cultural capabilities are related to sustainable learning.

- Structural Capabilities

The structural capabilities of a hospital play a significant role in supporting sustainable learning initiatives. The physical and organizational structures, processes, and systems within a hospital can either facilitate or hinder the development of a culture of continuous learning.

H2. Structural capabilities are related to sustainable learning.

- Knowledge management capabilities

Knowledge is a valuable asset within the health-care industry, and effectively managing and leveraging that knowledge is essential for sustainable hospital learning. Knowledge management capabilities refer to hospitals' processes, systems, and strategies to capture, organize, share, and apply knowledge.

H3. Knowledge management capabilities are related to sustainable learning.

- IT Infrastructure

In today's digital age, the integration of IT infrastructure and cloud computing [35] is crucial for supporting sustainable learning initiatives within hospitals. An efficient and robust IT and cloud infrastructure provides the foundation for seamless access to information, communication, and learning resources [36].

H4. IT infrastructure capabilities are related to sustainable learning.

- Top management support

The support of top management is crucial for successfully implementing sustainable learning initiatives within hospitals. When hospital leaders prioritize and actively support continuous learning, it creates a culture that fosters professional development, innovation, and knowledge sharing among health-care professionals.

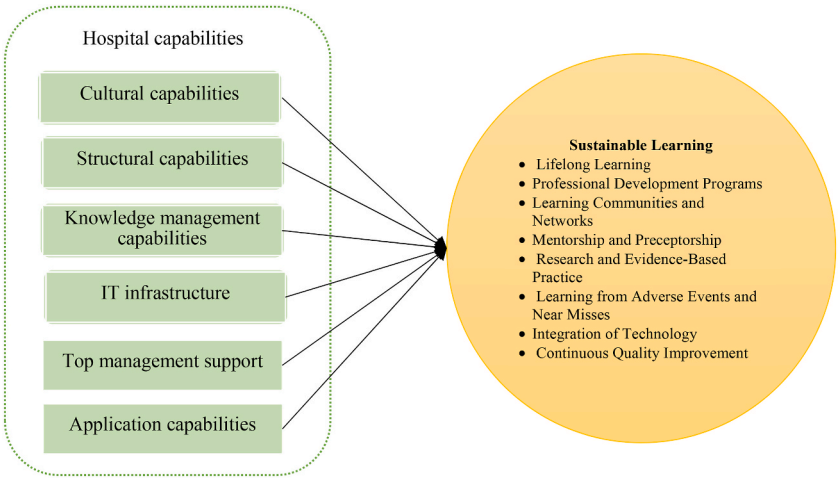

Fig. 1. The proposed research model.

H5. Top management support is related to sustainable learning.

- Application capabilities

Application capabilities refer to the practical implementation and utilization of knowledge and skills acquired through learning within the hospital setting [37]. These capabilities play a significant role in sustainable learning, enabling health-care professionals to translate theoretical knowledge into real-world practice.

H6. Top management support is related to sustainable learning.

3. Methodology

A proper procedure will help the progress process of a system that may be executed and managed. The current investigation made use of a quantitative procedure for study schematization. Many papers rely on the self-reported learning success of Technology-Mediated Learning (TML) subscribers, measured by several elements with the utilization of a Likert response format [38]. The rest of this section describes the measurement instrument and data collection.

3.1. Measurement instrument

The current investigation aimed to make use of a cross-sectional study schematization. This plan activates the real data survey integration with the literature review that utilizes the objective and subjective measurement as the primary data gathering procedure; since it may prevent and decrease the research bias feasibility and attain the highest precision in collected data. This study examined all accessible library resources, including papers, books, trustworthy online sites, and scientific research journals, to gather information on theoretical underpinnings, literature, and research background. A questionnaire was also used to collect the information required to evaluate the link between the research variables. In addition, the article's model was examined using the PLS structural modeling approach. When it comes to studying reflective and formative indicators, Smart PLS has consistently outperformed other tools.

3.2. Data collection

This paper's study uses SmartPLS, which is extensively used in information systems and education research. The key benefit of SmartPLS is that sample size and the assumption of normalcy for survey data are not subject to tight guidelines. As opposed to covariance-based SEM (CB-SEM), which requires normally distributed data, SmartPLS utilizes bootstrapping to significantly minimize estimation bias [39]. The investigators assumed a quantitative procedure to assess the theoretical model using a questionnaire conducted. The survey was made up of questions containing the research indicators. Nurses responded on a five-point scale. They also contained questions about the aspects that respondents included, for instance, age, gender, etc. They were electronically distributed to numerous hospitals (public hospitals and private hospitals) in China, and they were asked to distribute them to pupils in e-learning scenarios or on the hospitals' social networks. We made no payments or other inducements. Subjects willingly and anonymously provided their input. There was a sizable and little-known population. The data-gathering method was conducted during the summer semesters of 2021. A total of 350 nurses answered the survey, but because of some defective surveys, 297 were valid. The demographic data for the respondents is shown in Table 1.

Ethical Approval

The study was approved by Georgia State University.
Accordance: All the methods were performed in accordance with the relevant guidelines and regulations.

Table 1
Respondents' demographic information.

Measure	Item	Frequency	Percentage
Gender	Female	132	44.4 %
	Male	165	55.6 %
Age	Under 25	32	10.8 %
	25–35	108	36.4 %
	35–45	99	33.3 %
	Over 45	58	19.5 %
Education	Bachelor	24	8.1 %
	Masters	108	36.4 %
	P.H.D	165	55.6 %

4. Analysis and findings

In the current paper, SEM has been used in conjunction with PLS software. SEM applications have recently seen significant improvement. It primarily results from the procedure's improved capacity to assess the reliability and validity of multi-item structure measurements and test structural model links [40]. The structural path analysis and exploratory factor analysis, which enable the concurrent evaluation of the structural and measurement model, are two powerful statistical approaches that SEM combines. Furthermore, SEM is more effective at explaining variance in the dependent variable(s) than multiple regressions since it is thought to have direct and indirect effects. The two SEM methods available for research are variance-based partial least squares and covariance-dependent SEM. When choosing which approach to use for your study, it is important to understand the differences between the two procedures. CB-SEM is mostly used to verify accepted theories (i.e., explanations). On the other hand, PLS is a prediction-oriented alternative to SEM that is mostly used in exploratory research and is appropriate for confirmatory research. Particularly, the sounding divide between predictive and confirmatory research is dominated by PLS-SEM. It is done because researchers believe that by using the technique, their model would have exceptional prediction precision and be based on much improved causal explanations. Gregor [41] describes this process as belonging to the description and anticipation theory, stating that it "implies both comprehension of underlying anticipation and causes, in addition to the clarification of theoretical structures and the connections among them" [42]. SEM is a statistical procedure to examine and assess causal connections by integrating theoretical causal hypotheses and statistical data. Cautious investigators detect the feasibility of distinguishing between structural and measurement models and consider measurement errors clearly [21]. This section explains the structural model assessment and measurement model evaluation.

4.1. Assessment of the measurement model

Reflective indicators were utilized for building the constructs [43]. Reflective measurement models for one-dimensionality, internal consistency, discriminant validity, convergent validity, and indicator reliability were investigated using conventional decision laws in addition to the validation standards proposed by Lewis, Templeton, and Byrd (2005). Cronbach's alpha (CA) is the customary element for evaluating interior stability. Total CAs are more than 0.700, which shows interior stability, and the total construct items' scores have identical scope and meaning, as explained by Cronbach [44]. An alternative measure for CA is composite reliability (CR) [45]. The CR has been suggested by Chin [46] as the preferred measure, as it dominates some CA defects. As illustrated in Table 2, the CR and CA values of total structures in our model are more than the least suggested 0.700 [47]. The model has measured the CR as more than 0.800, satisfying the criteria settled by Ref. [48].

Assessment of indicator reliability was performed with the utilization of factor loadings. While relevant indicators illustrate an identical basis, the case is taken within the structures and further stated by such structures' high loadings. Based on Hair, Black [49],

Table 2
Reliability and validity of the measurement model.

Variables	Item	Loading	T-value	VIF	CA	rho_A	CR	AVE
Cultural Capabilities (CC)	CC1	0.594	9.930	1.264	0.854	0.891	0.897	0.640
	CC2	0.782	25.071	1.660				
	CC3	0.870	64.694	2.082				
	CC4	0.855	51.384	2.058				
Structural Capabilities (SC)	SC1	0.781	32.404	1.416	0.718	0.734	0.825	0.542
	SC2	0.748	19.449	1.387				
	SC3	0.783	34.684	1.477				
	SC4	0.622	13.292	1.232				
Knowledge Management Capabilities (KMC)	KMC1	0.794	30.267	1.409	0.740	0.716	0.800	0.577
	KMC2	0.862	62.966	1.339				
	KMC3	0.598	8.928	1.158				
IT Infrastructure (ITI)	ITI1	0.763	35.978	1.448	0.820	0.825	0.881	0.650
	ITI2	0.827	39.150	2.168				
	ITI3	0.858	48.935	2.284				
	ITI4	0.773	30.999	1.593				
Top Management Support (TMS)	TMS1	0.840	51.681	1.776	0.821	0.834	0.881	0.649
	TMS2	0.796	25.080	1.863				
	TMS3	0.794	24.947	1.871				
	TMS4	0.790	36.928	1.583				
Application Capabilities (AC)	AC1	0.767	25.756	1.381	0.740	0.755	0.851	0.657
	AC2	0.813	31.166	1.557				
	AC3	0.849	52.308	1.515				
Sustainable Learning (SL)	SL1	0.510	8.333	1.395	0.758	0.785	0.830	0.521
	SL2	0.677	18.850	1.709				
	SL3	0.389	5.497	1.181				
	SL4	0.650	16.297	1.544				
	SL5	0.749	27.352	1.931				
	SL6	0.768	29.478	1.884				
	SL7	0.711	15.724	1.683				

more than 0.70 may illustrate significant factor loadings. Table 2 demonstrates all items in this investigation as having factor loadings more than the offered amount of 0.7. Convergent validity, which depicts the extent to which the measures correlate favorably with similar substitute measures of the same architecture, was assessed using average variance extracted values (AVE). AVE's amount fell between 0.510 and 0.718, which goes over the offered amount of 0.50 [50]. To determine whether multicollinearity is a problem, researchers should look at whether it is present. The Variance Inflation Factor (VIF), available in most statistical applications, is examined to achieve this. Multicollinearity cannot be a problem if the VIF is 3.0 or lower. In previous research, the optimal VIF threshold was thought to be 5.0; however, a more recent examination reveals that this level is too high. Additionally, collinearity is a potential issue in the structural model and is frequently implied by a VIF score of 5 or above [51]. Therefore, as demonstrated in Table 1, total structures have met the convergent validity satisfactorily.

Table 3 illustrates the outcomes for discriminant validity attained via the utilization of the Fornell-Larcker criterion. The square roots of the AVEs upon the diagonals (as illustrated in bold) had been understood to be more than that for the correlations among structures (respective columns and rows), which is ordinarily an indication of powerful correlations among structures and their corresponding indicators, compared to the other model structures [52]. According to Sarstedt, Ringle and Hair [53], it illustrates good diacritical validity. Therefore, total structures satisfied their diacritical validity.

Ultimately, the HTMT was used to evaluate discriminant validity. Table 4 shows that the findings were under the 0.90 criterion [54], which is a good outcome. The findings show that value 1 is not included in any of the HTMT confidence intervals, which implies that all HTMT values are distinct from 1. Thus, we may say that discriminant validity has been proven.

Examining whether the variables in their original components have higher loads than the other structures is one method to assess the discriminant validity [55]. As shown in Table 5, the cross-loading research produced satisfactory discriminant validity results.

Social desirability and the consistency theme are just some causes of standard method biases. The common method bias in the PLS-SEM is caused by the measurement method used in an SEM inquiry, not the network of causes and effects in the model under examination. It is believed that a VIF of greater than 3.3 indicates severe collinearity and that a model may be tainted by common procedure bias. Therefore, the model is free of standard method bias [56] if all VIFs produced from a thorough collinearity test are equal to or less than 3.3 (See Table 6).

4.2. Assessment of the structural model

To test the hypotheses, an assessment of the structural model was performed. From Fig. 2, the innovative performance R^2 is 0.897, which shows that sustainable learning has described 89% of the variance in the dependent variable.

The hypotheses analysis was conducted with the utilization of the bootstrapping procedure. Table 7 illustrates the outcomes of the hypotheses examination; total t values of more than 1.96 have been notable at the level of 0.05. There were significant positive relationships between structural capabilities and cultural capabilities when T values were taken into account: IT infrastructure, knowledge management capabilities, top management support, application capabilities, and sustainable learning. Therefore, H1, H2, H3, H4, H5, and H6 are accepted.

The absence of a global scalar function and thorough Goodness of Fit (GoF) measurements has long been seen as a drawback of PLS route modeling. Tenenhaus, Vinzi [57] proposed the GoF to address this problem by taking into account the effectiveness of both measurement and structural models at the same time. R-square and AVE can be used to compute the GoF [58,59]. recommend setting the value to 0.36. This study model has a GoF of 0.73, according to Henseler and Sarstedt [60]. As a result, it is valid.

The next criterion to calculate forecast, known as "blindfolding," is the Q^2 value [61]. Some researchers consider this statistic to be an evaluation of the ability to predict outcomes outside of a sample, and in some respects, they are right. However, it clearly falls short of PLSpredict as a model prediction metric. When analyzing Q^2, values over zero are significant, whereas numbers below 0 show a lack of predictive value. The PLS-SEM model's medium and wide predictive significance is represented by Q^2 values above 0.25 and 0.50, respectively [62]. Predictive relevance (Q^2) value assessments for endogenous structures are above zero (Sustainable learning: 0.348), demonstrating the model's suitably high predictive quality.

In an effort to improve the analytical results of the current study, an Importance-Performance Map Analytical (IPMA) was also employed. As done by Ringle and Sarstedt (2016) [63], IPMA assesses the performance level of latent and manifest variables in a

Table 3
Discriminant validity (Fornell-Larcker criterion).

Variables	CC	SC	KMC	ITI	TMS	AC	SL
CC	0.783						
SC	0.598	**0.736**					
KMC	0.645	0.597	**0.760**				
ITI	0.626	0.536	0.616	**0.806**			
TMS	0.461	0.652	0.610	0.673	**0.805**		
AC	0.547	0.675	0.646	0.613	0.624	**0.810**	
SL	0.646	0.684	0.680	0.692	0.657	0.699	**0.721**

Note: Diagonals represent the average variance extracted square root, and the other values represent the correlations.
CC: Cultural capabilities, SC: Structural capabilities, KMC: Knowledge Management Capabilities ITI: IT infrastructure, TMS: Top Management Support, AC: Application Capabilities, LPS: Sustainable Learning.

Table 4
Heterotrait–monotrait ratio (HTMT) values.

Variables	CC	SC	KMC	ITI	TMS	AC	SL
CC							
SC	0.785						
KMC	0.741	0.646					
ITI	0.744	0.703	0.605				
TMS	0.512	0.721	0.753	0.708			
AC	0.698	0.720	0.728	0.787	0.682		
SL	0.667	0.645	0.783	0.708	0.751	0.734	

Table 5
Discriminant validity-loading and cross-loading criterion.

	AC	CC	ITI	KMC	SC	TMS	SL
AC1	**0.767**	0.532	0.486	0.578	0.580	0.536	0.586
AC2	**0.813**	0.502	0.503	0.505	0.498	0.382	0.593
AC3	**0.849**	0.330	0.505	0.500	0.565	0.585	0.646
CC1	0.195	**0.594**	0.292	0.375	0.244	0.183	0.389
CC2	0.358	**0.782**	0.422	0.410	0.476	0.306	0.514
CC3	0.565	**0.870**	0.626	0.609	0.612	0.559	0.720
CC4	0.501	**0.855**	0.546	0.580	0.469	0.317	0.648
ITI1	0.509	0.691	**0.763**	0.615	0.475	0.474	0.579
ITI2	0.482	0.429	**0.827**	0.472	0.372	0.541	0.567
ITI3	0.500	0.450	**0.858**	0.387	0.487	0.594	0.601
ITI4	0.483	0.427	**0.773**	0.515	0.373	0.561	0.584
KMC1	0.567	0.457	0.464	**0.794**	0.435	0.430	0.537
KMC2	0.544	0.644	0.602	**0.862**	0.544	0.454	0.668
KMC3	0.337	0.290	0.264	**0.598**	0.351	0.580	0.391
SC1	0.544	0.342	0.251	0.448	**0.781**	0.553	0.667
SC2	0.520	0.431	0.535	0.497	**0.748**	0.523	0.571
SC3	0.517	0.527	0.451	0.485	**0.783**	0.473	0.602
SC4	0.391	0.502	0.371	0.307	**0.622**	0.344	0.441
TMS1	0.504	0.556	0.654	0.638	0.520	**0.840**	0.716
TMS2	0.398	0.183	0.472	0.335	0.425	**0.796**	0.502
TMS3	0.500	0.246	0.509	0.323	0.433	**0.794**	0.523
TMS4	0.589	0.418	0.503	0.589	0.584	**0.790**	0.652
SL1	0.387	0.186	0.480	0.333	0.415	0.570	**0.710**
SL2	0.546	0.345	0.253	0.445	0.575	0.548	**0.677**
SL3	0.194	0.593	0.290	0.372	0.236	0.181	**0.389**
SL4	0.504	0.639	0.541	0.576	0.471	0.323	**0.650**
SL5	0.633	0.341	0.499	0.493	0.568	0.575	**0.749**
SL6	0.548	0.636	0.591	0.856	0.539	0.448	**0.768**
SL7	0.494	0.450	0.647	0.381	0.494	0.585	**0.711**

Table 6
Common method bias.

	Sustainable Learning
Cultural Capabilities	−4.820
Structural Capabilities	−7.533
Knowledge Management Capabilities	−2.861
IT Infrastructure	0.302
Top Management Support	−3.805
Application Capabilities	−5.690

PLS-SEM investigation. As a result, IPMA offers insight into the variables' significance to the goal construct in addition to showing the importance of latent and manifest factors (i.e., path coefficient) [64]. In order to improve the targeted variable, IPMA permits the prioritizing of variables. Researchers can also find the most crucial actions for raising the dependent variable by looking at the indicator level. In summary, IPMA has benefits and is particularly significant when it comes to assigning managerial responsibilities a priority. Table 8 displays the Latent Variable (LV) values and constructs' importance-performance metrics as measured by Ringle and Sarstedt (2016). The highest performance rating went to structural capabilities (55.567), which were followed by knowledge management (55.226), top management support (54.090), cultural (52.640), application (51.759), and IT infrastructure (50.789). Because it fared badly in comparison to other criteria, it suggested that firms should concentrate on their infrastructure.

The standardized total effects (importance) are shown in Fig. 3. In terms of importance, infrastructure (0.234) scored the highest,

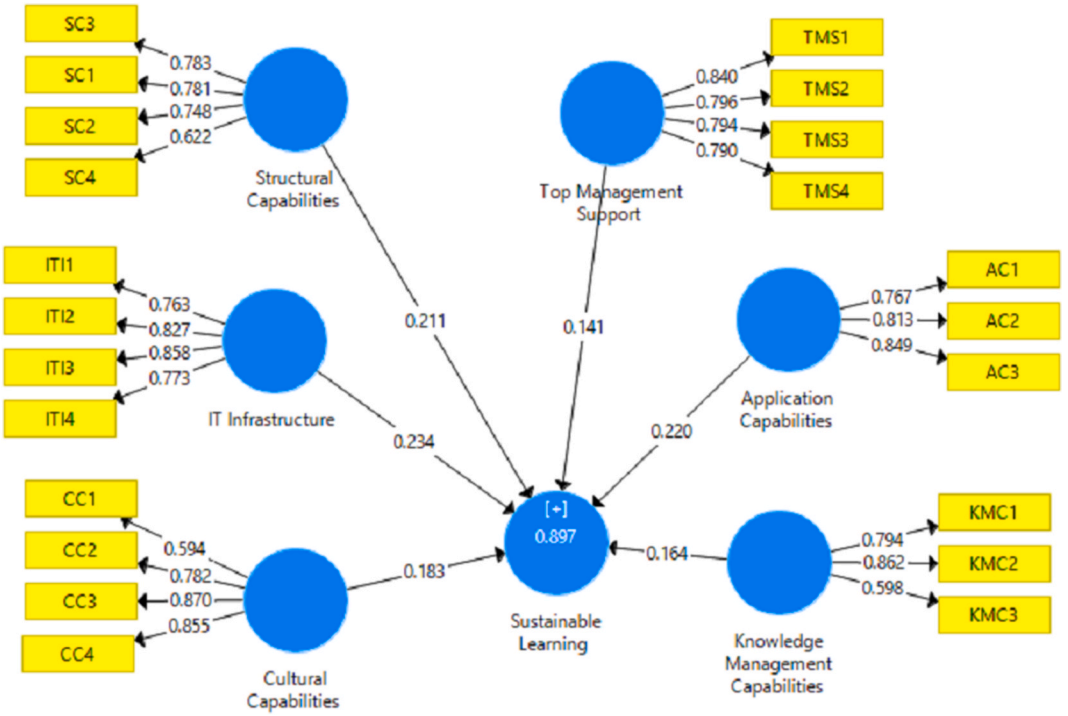

Fig. 2. Structural model.

Table 7
Summary of research results (Hypothesis Testing).

Hypothesis		Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
H1	Cultural capabilities→ Sustainable learning	0.183	0.185	0.041	4.464	0.000
H2	Structural capabilities → Sustainable learning	0.211	0.214	0.032	6.518	0.000
H3	Knowledge management capabilities→ Sustainable learning	0.164	0.167	0.024	6.749	0.000
H4	IT infrastructure→ Sustainable learning	0.234	0.234	0.034	6.801	0.000
H5	Top management support→ Sustainable learning	0.141	0.133	0.047	2.998	0.003
H6	Application capabilities→ Sustainable learning	0.220	0.220	0.027	8.191	0.000

followed by application capabilities (0.220), structural capabilities (0.211), cultural capabilities (0.183), knowledge management capabilities (0.164), and top management support (141).

5. Dissolution and IMPLICATIONS

The health-care industry and hospital learning and development landscape are continuously evolving. Future trends include personalized learning paths, microlearning modules, virtual reality training, artificial intelligence-assisted learning, and gamification. These emerging technologies and methodologies have the potential to revolutionize the way hospitals approach learning, making it more accessible, engaging, and effective. E-learning is also known as e-education, online learning, and distant learning. "The broad

Table 8
Latent Variable Index Values and Performance of the Target Construct the Sustainable learning.

	LV Performances	LV Index Values
Cultural Capabilities	52.640	3.106
Structural Capabilities	55.567	3.223
Knowledge Management Capabilities	55.226	3.209
IT Infrastructure	50.789	3.032
Top Management Support	54.090	3.164
Application Capabilities	51.759	3.070

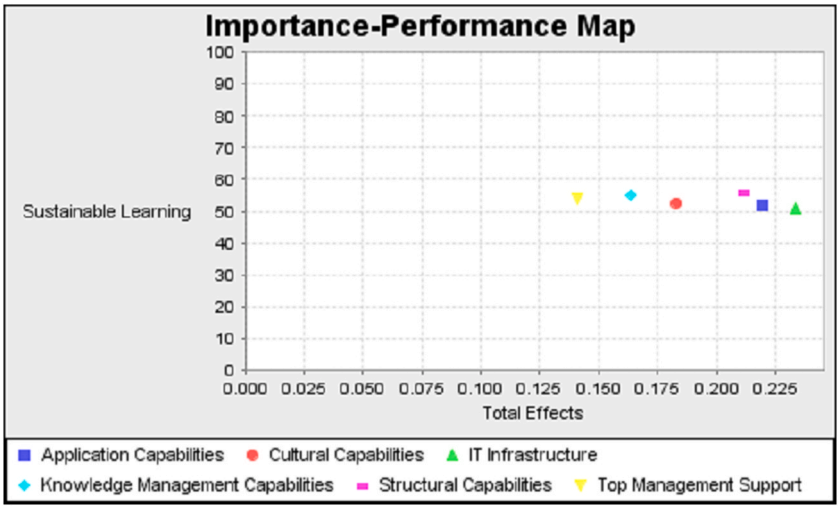

Fig. 3. IPMA chart for the variables.

range of applications and processes that leverage accessible electronic media and tools to deliver vocational education and training" is what e-learning is defined as. E-learning is "the use of different web-based, web-distributed, or web-capable technical instruments for education." It has been growing recently due to the COVID-19 pandemic [65,66]. It has several benefits, like internet accessibility, flexibility, and cost-effectiveness. These benefits have the potential to turn education into a lifetime of learning. This study aimed to determine the link between hospital capabilities and sustainable learning. Fig. 2 demonstrates the resulting path coefficients, and Table 7 indicates the hypothesis outcomes. The empirical results support the proposed conceptual model. Regarding the first hypothesis, the relation between cultural capabilities and sustainable learning is significant and positive ($\beta = 0.183$, $t = 4.464$, $p < 0.001$). Therefore, the outcomes affirmatively confirm hypothesis 1. In a hospital that values innovation, employee members are encouraged to think creatively, challenge traditional practices, and propose new ideas. Staff members should feel comfortable sharing their thoughts, asking questions, and providing feedback. This culture promotes active dialogue and the exchange of knowledge and insights. Feedback mechanisms, such as regular performance evaluations and constructive feedback loops, help identify areas for improvement and provide opportunities for continuous learning and growth.

The results showed that cultural capabilities significantly affect nurses' learning. It means that the higher the hospital's cultural capabilities, the more effective it will be in identifying needs, formulating goals, evaluating learning outcomes, and directing behaviors and tendencies. The second one has also been approved, as the analysis indicates an affirmative connection between structural capabilities and sustainable learning ($\beta = 0.211$, $t = 6.518$, $p < 0.00$). The structural ability and the nurses' learning are closely related. Flexible structure leads to progress and development in applying new ideas, but the learning rate of these structures is much higher than rigid and inflexible systems. Hospitals need a flexible and dynamic structure in today's age, where organizational excellence depends on knowledge, creativity, and innovation. With a traditional structure, it does not have the flexibility to adapt to the changes caused by globalization and its complexities. Therefore, it has to change its structure or equip itself with tools to cope with global developments to survive. Hospitals' learning requires open, flexible, and creative structures. Hospitals should prioritize and invest in learning and development activities, including training programs, technology infrastructure, faculty development, and staff time for learning. Adequate resource allocation demonstrates the hospital's commitment to sustainable learning and supports health-care professionals to engage in continuous education.

Hypothesis 3 has also been approved since there is a connection between knowledge management capabilities and sustainable learning ($\beta = 0.164$, $t = 6.749$, $p < 0.00$). Effective exchange and management of knowledge distributed in various forms play an important role in supporting nurses' learning, better performance, and creating a competitive advantage based on knowledge. Knowledge sharing helps evade mistakes and reduce employee dependency in a critical knowledge state. Also, it increases individual competencies, including knowledge, experience, skills performed, and improved decision-making. Based on sharing, nurses can efficiently understand, identify, and estimate improvement needs to achieve temporary goals and improve overall performance. Hospitals should have strategies to capture and retain the knowledge of experienced health-care professionals nearing retirement or transitioning out of their roles. This knowledge can be documented, archived, or transferred to younger generations through mentoring programs, knowledge handovers, and structured training. Likewise, the 4th hypothesis on the relationship between IT infrastructure and sustainable learning is significant and positive ($\beta = 0.234$, $t = 6.801$, $p < 0.00$). Therefore, the study outcomes support it. Organizations with information technology and the ability to acquire, store, and transfer knowledge can be leaders in other organizations. IT infrastructure is instrumental in the quantity and quality of learning. E-Learning might utilize internet technology with IT infrastructure for controlling and supporting acquisition and training with more flexibility and yield. A reliable network infrastructure is the backbone of the hospital's IT system. It ensures smooth connectivity and data transmission across various devices and systems. A stable network infrastructure is essential for accessing online learning platforms, retrieving knowledge resources, and engaging in

collaborative learning activities. Along these lines, the results show an important relationship between top management support and sustainable learning ($\beta = 0.141$, $t = 2.998$, $p < 0.03$), which supports the fifth hypothesis. The key to successfully implementing a company's new system is IT managers' ability to coordinate multifaceted activities related to implementation efforts. Thus, top management support capabilities represent resources that may be used to increase efficiency and gain a competitive advantage. Top management plays a vital role in setting a vision and strategy that emphasizes the value of continuous learning within the hospital. They should communicate the importance of lifelong learning and its alignment with the hospital's mission and goals. By establishing a clear vision and strategy, top management provides a framework that guides the development and implementation of sustainable learning initiatives. The final hypothesis is that the relationship between application capabilities and sustainable learning is meaningful ($\beta = 0.220$, $t = 8.191$, $p < 0.00$). Thus, hospitals' functional capabilities provide the resources of an organization's assets that provide scalable and flexible capabilities for educational applications. Sustainable learning in hospitals involves a commitment to continuous quality improvement. Application capabilities include participating in quality improvement initiatives, such as root cause analyses, process mapping, and performance improvement projects. Health-care professionals should be empowered to identify areas for improvement, implement changes, and evaluate the impact of these changes on patient outcomes and organizational performance.

Our investigation supplies notable outcomes for its theoretical concepts by integrating variables into the new model for sustainable success in developing countries. It suggests proof that it is feasible to develop model efficiency. There are not many investigations that perform the analysis. The current investigation suggests many concepts practically. For instance, it is feasible to highlight the potential pros of considering particular learning management remedies for hospital training with hospital capabilities. For example, the relationship between cultural capabilities and sustainable learning is empowered among sensitive, sequential, and reflective users. In conclusion, the role of hospital capabilities in sustainable learning cannot be understated. Hospitals can create an environment that fosters continuous learning and drives positive change by cultivating a learning culture, providing effective training and development programs, leveraging technology, promoting collaboration, and measuring the impact of learning initiatives. Embracing sustainable learning enables hospitals to deliver high-quality care, enhance patient outcomes, and thrive in an ever-changing health-care landscape.

To illustrate the practicality of this conceptual model, let's consider a real-world example. Imagine a hospital that invests in state-of-the-art medical technology and provides ongoing training to its staff. Over time, this hospital sees reduced mortality rates, decreased patient complications, and increased patient satisfaction scores. These outcomes can be directly linked to the hospital's capabilities and its ability to learn and adapt.

6. Conclusion and future work

In management studies, the importance of learning has a long history. In all of these areas, numerous research has looked at the impacts of learning on organizational performance. Because there was a dearth of linked practical studies, there were some inconsistencies in early publications on learning. This research aimed to study the role of hospital capabilities in learning success patterns. Currently, e-learning gets hold of the online program form. Given the prevalence of knowledge workers in a service-based economy, organizations continue to invest in formal teaching and development opportunities for their nurses and consequently expect acquired knowledge and skills to be used on the job. This study examines the impact of the hospital capabilities (structural capabilities, knowledge management capabilities, cultural capabilities, application capabilities, top management support, IT infrastructure) on sustainable learning for realizing nurses' positive learning outcomes. The survey gathered data from 350 nurses from six hospitals (private and public) in China and was jointly analyzed via structural equation modeling (SEM) using SmartPLS 3. Results of research produce factors that are considered in the success of learning, including (1) cultural capabilities greatly affect nurses' sustainable learning; (2) structural capabilities affect nurses' sustainable learning; (3) knowledge management capabilities affect nurses' sustainable learning; (4) IT infrastructure affect nurses' sustainable learning; (5) top management support affect nurses' sustainable learning; (6) application capabilities affect nurses' sustainable learning. By applying this conceptual model, hospitals can unlock several benefits. First and foremost, it can lead to improved patient care. Hospitals that continuously enhance their capabilities are better equipped to handle complex medical cases and provide the best possible care to patients. Additionally, enhanced hospital capabilities can lead to increased efficiency. This translates into shorter wait times, streamlined administrative processes, and reduced operational costs. The findings of this investigation are useful to hospital administrators in their efforts to use current technology in teaching. Sustainable learning directly impacts patient outcomes by improving the quality and safety of care. Health-care professionals who engage in continuous learning stay updated with the latest research, evidence-based practices, and technological advancements. This enables them to provide accurate diagnoses, deliver effective treatments, and prevent medical errors, ultimately leading to better patient outcomes and improved overall health-care quality. Hospitals can enhance their capabilities through ongoing training, investment in technology, and fostering a culture of continuous improvement among staff.

While the new conceptual model offers valuable insights, it's essential to acknowledge potential challenges. Hospitals may face hurdles in terms of resource allocation, resistance to change among staff, and the need for ongoing assessment and improvement. Also, this research relied on cross-sectional data. It only considers hospitals' current state and does not look further beyond the short- and long-term effects of hospital capabilities on success in learning. Besides the measurement discussion of learning prosperity, the learning success notion is still ambiguous and varies in level and scope. Adverting our objective data, we will be prepared with objective data that briefly attain learning prosperity after teaching. However, the investigation also offers an assessment of the long-term influence of teaching measures. So, a critical addition to learning results would be constructed, like the task's postponed performance in a work context, which must be assessed in upcoming investigations and subsequent research. It is also relevant to a feasible reconceptualization of learning prosperity. As the health-care industry continues to evolve, so should the conceptual model. New

research that considers new variables such as soft tissue models [67] and triangular matching algorithm [68] is suggested. Future research could also compare e-learning in different nations. Morever, future iterations may incorporate artificial intelligence, differential sparse [69], data analytics, localization algorithm [70] and emerging technologies to enhance hospital capabilities and sustainable learning further.

Data Availability Statement

All data are reported in the paper.

Additional information

No additional information is available for this paper.

CRediT authorship contribution statement

Sui Zhihan: Conceptualization, Formal analysis, Software, Writing – original draft. **Ali Mohammadiounotikandi:** Conceptualization, Investigation, Methodology, Writing – original draft. **Saeed Ghareh Khanlooei:** Investigation, Methodology, Project administration, Resources, Visualization. **Sepideh Monjezi:** Data curation, Funding acquisition, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing, Writing – original draft. **Mekhmonov Sultonali Umaralievich:** Formal analysis, Investigation, Methodology, Resources, Software. **Ali Ehsani:** Conceptualization, Methodology, Writing – review & editing, Software, Writing – original draft. **Sangkeum Lee:** Formal analysis, Project administration, Resources, Validation, Writing – review & editing.

Declaration of competing interest

The authors (**Sui Zhihan[1], Ali Mohammadiounotikandi[2], Saeed Ghareh Khanlooei[3], Sepideh Monjezi[4], Mekhmonov Sultonali Umaralievich[5], Ali Ehsani[6], Sangkeum Lee[7]**) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Questionnaire

Greetings

The following questionnaire has been prepared and set up in order to use your opinions regarding " **A new conceptual model to investigate the role of hospital's capabilities on the sustainable learning**". Please help us by giving correct answers in order to achieve effective results. In addition, your information and answers are reserved.

A new conceptual model to investigate the role of hospital's capabilities on sustainable learning		
Variables	Item	
Cultural Capabilities (CC)	CC1	With its learning-oriented culture, the hospital prioritizes acquiring knowledge and skills among its employees.
	CC2	In a hospital with a learning-oriented culture, employees are encouraged to seek learning experiences, share knowledge, and actively participate in professional development activities.
	CC3	Cultural capabilities that support innovation and risk-taking are essential for sustainable learning.
	CC4	An open communication culture facilitates sustainable learning within hospitals.
Structural Capabilities (SC)	SC1	Integrating learning into work processes is a structural capability that promotes sustainable learning.
	SC2	Allocating resources, both financial and human, to support learning initiatives is a critical structural capability.
	SC3	Effective performance evaluation and feedback mechanisms are essential structural capabilities for sustainable learning.
	SC4	Structural capabilities that support competency-based training contribute to sustainable learning in hospitals.
Knowledge Management Capabilities (KMC)	KMC1	Hospitals should have mechanisms in place to capture new knowledge, whether it is through research, professional development activities, or learning from practical experiences.
	KMC2	Hospitals should implement knowledge management systems that allow for the categorization, tagging, and storage of knowledge resources.
	KMC3	Knowledge management capabilities should focus on facilitating the application and implementation of knowledge into practice.
IT Infrastructure (ITI)	ITI1	Hospitals should invest in robust network equipment, sufficient bandwidth, and backup systems to ensure uninterrupted access to learning resources.
	ITI2	Hospitals should implement user-friendly LMS platforms that offer diverse learning resources and interactive features to support sustainable learning.
	ITI3	Hospitals can develop or utilize existing mobile learning applications that deliver bite-sized educational content, quizzes, and interactive modules.

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A new conceptual model to investigate the role of hospital's capabilities on sustainable learning		
	ITI4	Telemedicine platforms provide opportunities for learning through virtual patient encounters, teleconsultations, and remote supervision, enhancing the learning experience for health-care professionals.
Top Management Support (TMS)	TMS1	Top management demonstrates their commitment to supporting continuous learning by providing the necessary resources.
	TMS2	Top management should encourage a safe and supportive environment where health-care professionals feel empowered to learn, experiment, and share their knowledge and experiences.
	TMS3	Top management support includes providing training and development opportunities for health-care professionals.
	TMS4	Top management should establish platforms and mechanisms for sharing best practices, case studies, and innovative ideas.
Application Capabilities (AC)	AC1	Hospitals should foster a culture of evidence-based practice by providing healthcare professionals access to up-to-date research, clinical guidelines, and decision-support tools.
	AC2	Application capabilities include participating in quality improvement initiatives, such as root cause analyses, process mapping, and performance improvement projects.
	AC3	Hospitals should provide training and support to enhance communication skills, including active listening, empathy, and effective information sharing.
Sustainable learning (LS)	LS1	Hospitals play a crucial role in facilitating sustainable learning by implementing professional development programs.
	LS2	Hospitals should invest in advanced learning management systems, virtual simulations, e-learning platforms, and other technological tools that support remote learning, interactive education, and access to up-to-date information.
	LS3	Technology enables health-care professionals to engage in self-paced learning, online courses, and virtual training programs.
	LS4	Continuous quality improvement involves monitoring performance indicators, gathering feedback, and implementing changes to enhance learning experiences and patient care.
	LS5	In the work environment, innovation and creative ideas are encouraged.
	LS6	Learning from mistakes is evident among personnel.
	LS7	By promoting lifelong learning, providing professional development programs, facilitating learning communities, and integrating technology, hospitals create an environment conducive to continuous learning and high-quality patient care.

Appendix B. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2023.e20890.

References

[1] M. Khan, A. Haleem, M. Javaid, Changes and improvements in Industry 5.0: a strategic approach to overcome the challenges of Industry 4.0, Green Technologies Sustainability 1 (2) (2023), 100020.
[2] Y. Zhuang, N. Jiang, Y. Xu, Progressive distributed and parallel similarity retrieval of large CT image sequences in mobile telemedicine networks, Wireless Commun. Mobile Comput. 2022 (2022) 1–13.
[3] D. Zhang, et al., Target Tracking Method of Siamese Networks Based on the Broad Learning System, CAAI Transactions on Intelligence Technology, 2022.
[4] D. Raccanello, et al., Higher education students' achievement emotions and their antecedents in e-learning amid COVID-19 pandemic: a multi-country survey, Learn. InStruct. 80 (2022), 101629.
[5] O. Ilyashenko, I. Ilin, D. Kurapeev, Smart Hospital concept and its implementation capabilities based on the incentive extension, in: SHS Web of Conferences, EDP Sciences, 2018.
[6] W. Zheng, et al., Knowledge base graph embedding module design for Visual question answering model, Pattern Recogn. 120 (2021), 108153.
[7] R. Tavallaei, M. Hosseinalipour, A. Mohebifar, Top critical success factors for enterprises to benefit a prosperous learning through strategic alliances in developing countries, Procedia: Social and Behavioral Sciences 194 (2015) 174–180.
[8] L. Qiu, et al., How can China's medical manufacturing listed firms improve their technological innovation efficiency? An analysis based on a three-stage DEA model and corporate governance configurations, Technol. Forecast. Soc. Change 194 (2023), 122684.
[9] H. Mohammadi, Investigating users' perspectives on e-learning: an integration of TAM and IS success model, Comput. Hum. Behav. 45 (2015) 359–374.
[10] A. Gasparin, S. Lukovic, C. Alippi, Deep learning for time series forecasting: the electric load case, CAAI Transactions on Intelligence Technology 7 (1) (2022) 1–25.
[11] Y. Deng, et al., Conceptualizing the role of target-specific environmental transformational leadership between corporate social responsibility and pro-environmental behaviors of hospital employees, Int. J. Environ. Res. Publ. Health 19 (6) (2022) 3565.
[12] X. Shen, et al., Advance Scheduling for Chronic care under online or Offline revisit uncertainty, IEEE Trans. Autom. Sci. Eng. (2023), https://doi.org/10.1109/TASE.2023.3310116.
[13] Z. Zhang, et al., Endoscope image mosaic based on pyramid ORB, Biomed. Signal Process Control 71 (2022), 103261.
[14] S. Mandal, The influence of dynamic capabilities on hospital-supplier collaboration and hospital supply chain performance, Int. J. Oper. Prod. Manag. 37 (5) (2017) 664–684.
[15] O. Barati, M. Khamarni, A. Sadeghi, E. Siavashi, Skills, capabilities, and requirements of hospital managers: a qualitative study, Journal of Qualitative Research in Health Sciences 5 (1) (2016) 17–28.
[16] M. Darbandi, Proposing new intelligence algorithm for suggesting better services to cloud users based on kalman filtering, Published by Journal of Computer Sciences and Applications 5 (1) (2017) 11–16 (ISSN: 2328-7268).
[17] D. Luan, et al., Robust two-stage location allocation for emergency temporary blood supply in postdisaster, Discrete Dynam Nat. Soc. 2022 (2022) 1–20.
[18] F. Liao, et al., How technology-enhanced experiential e-learning can facilitate the development of person-centred communication skills online for health-care students: a qualitative study, BMC Med. Educ. 22 (1) (2022) 1–9.
[19] A. Babaeinesami, P. Ghasemi, Ranking of hospitals: a new approach comparing organizational learning criteria, Int. J. Healthc. Manag. 14 (4) (2021) 1031–1039.

[20] R. Ravangard, A.R. Yusefi, F. Gholami, The effect of nurses' quality of working life on organizational learning: a case study in teaching hospitals affiliated to Shiraz university of medical sciences, Health and Development Journal 7 (2) (2018) 98–110.
[21] M. Aparicio, F. Bacao, T. Oliveira, Cultural impacts on e-learning systems' success, Internet High Educ. 31 (2016) 58–70.
[22] A.Y. Alsabawy, A. Cater-Steel, J. Soar, IT infrastructure services as a requirement for e-learning system success, Comput. Educ. 69 (2013) 431–451.
[23] Y.C. Liu, Y.-A. Huang, C. Lin, Organizational factors' effects on the success of e-learning systems and organizational benefits: an empirical study in Taiwan, The International Review of Research in Open and Distributed Learning 13 (4) (2012) 130–151.
[24] Y.C. Lee, S.K. Lee, Capabilities, processes, and performance of knowledge management: a structural approach, Human Factors and Ergonomics in Manufacturing & Service Industries 17 (1) (2007) 21–41.
[25] M. do Carmo Caccia-Bava, T. Guimaraes, S.J. Harrington, Hospital organization culture, capacity to innovate and success in technology adoption, Journal of Health Organization and Management 20 (3) (2006) 194–217.
[26] B.S. Ragu-Nathan, C.H. Apigian, T. Ragu-Nathan, Q. Tu, A path analytic study of the effect of top management support for information systems performance, Omega 32 (6) (2004) 459–471.
[27] S. Vahdat, The Role of IT-Based Technologies on the Management of Human Resources in the COVID-19 Era, Kybernetes, 2020.
[28] X. Liu, Real-world data for the drug development in the digital era, Journal of Artificial Intelligence and Technology 2 (2) (2022) 42–46.
[29] M. Wang, et al., Review on offloading of vehicle edge computing, J. Artific. Intell. Technol 2 (4) (2022) 132–143.
[30] Y. Kurniawan, D.F.C. Tapia, The influence of knowledge management capabilities on hospital services performance, in: 2018 International Conference on Information Management and Technology (ICIMTech), IEEE, 2018.
[31] K. Lin, H. Zhao, The impact of green finance on the ecologicalization of urban industrial structure—based on GMM of dynamic panel system, Journal of Artificial Intelligence and Technology 2 (3) (2022) 123–129.
[32] K. Yadav, M. Yadav, S. Saini, Stock values predictions using deep learning based hybrid models, CAAI Transactions on Intelligence Technology 7 (1) (2022) 107–116.
[33] X. Wang, et al., Block Switching: a Stochastic Approach for Deep Learning Security, 2020 arXiv preprint arXiv:2002.07920.
[34] B. Huang, et al., Automated trading systems statistical and machine learning methods and hardware implementation: a survey, Enterprise Inf. Syst. 13 (1) (2019) 132–144.
[35] M. Darbandi, Proposing new intelligent system for suggesting better service providers in cloud computing based on Kalman filtering, Published by HCTL International Journal of Technology Innovations and Research 24 (1) (2017) 1–9 (ISSN: 2321-1814).
[36] M. Darbandi, Kalman filtering for estimation and prediction servers with lower traffic loads for transferring high-level processes in cloud computing, Published by HCTL International Journal of Technology Innovations and Research 23 (1) (2017) 10–20 (ISSN: 2321-1814).
[37] M. Nezhadkian, S.M. Azimi, A. Ferro, A.H. Nafei, A model for new product development in business companies based on grounded theory approach and fuzzy method, Journal of Computational and Cognitive Engineering 2 (2) (2023) 124–132.
[38] A. Janson, M. Söllner, P. Bitzer, J.M. Leimeister, Examining the Effect of Different Measurements of Learning Success in Technology-Mediated Learning Research, 2014.
[39] H.M. Al-Hattami, Understanding perceptions of academics toward technology acceptance in accounting education, Heliyon 9 (1) (2023).
[40] J.F. Hair, M. Sarstedt, T.M. Pieper, C.M. Ringle, The use of partial least squares structural equation modeling in strategic management research: a review of past practices and recommendations for future applications, Long. Range Plan. 45 (5–6) (2012) 320–340.
[41] S. Gregor, The nature of theory in information systems, MIS Q. (2006) 611–642.
[42] J.F. Hair Jr., L.M. Matthews, R.L. Matthews, M. Sarstedt, PLS-SEM or CB-SEM: updated guidelines on which method to use, International Journal of Multivariate Data Analysis 1 (2) (2017) 107–123.
[43] A.S. Maihulla, I. Yusuf, S.I. Bala, Reliability and performance analysis of a series-parallel system using Gumbel–Hougaard family copula, Journal of Computational and Cognitive Engineering 1 (2) (2022) 74–82.
[44] L.J. Cronbach, Coefficient alpha and the internal structure of tests, Psychometrika 16 (3) (1951) 297–334.
[45] C.E. Werts, R.L. Linn, K.G. Jöreskog, Quantifying Unmeasured Variables. Measurement in the Social Sciences, Aldine, Chicago, 1974, pp. 270–292.
[46] W.W. Chin, The partial least squares approach to structural equation modeling, Modern methods for business research 295 (2) (1998) 295–336.
[47] J.C. Nunnally, I. Bernstein, Validity, Psychometric theory 3 (1994) 99–132.
[48] J.P. Peter, Reliability: a review of psychometric basics and recent marketing practices, J. Market. Res. 16 (1) (1979) 6–17.
[49] J.F. Hair, et al., Multivariate Data Analysis, vol. 5, Prentice hall Upper, Saddle River, NJ, 1998.
[50] O. Isaac, A. Aldholay, Z. Abdullah, T. Ramayah, Online learning usage within Yemeni higher education: the role of compatibility and task-technology fit as mediating variables in the IS success model, Comput. Educ. 136 (2019) 113–129.
[51] K.K.-K. Wong, Mediation analysis, categorical moderation analysis, and higher-order constructs modeling in partial least squares structural equation modeling (PLS-SEM): a B2B example using SmartPLS, Market. Bull. 26 (2016).
[52] C. Fornell, D.F. Larcker, Evaluating structural equation models with unobservable variables and measurement error, J. Market. Res. 18 (1) (1981) 39–50.
[53] M. Sarstedt, C.M. Ringle, J.F. Hair, Partial least squares structural equation modeling, Handbook of market research 26 (2017) 1–40.
[54] M. Rizun, A. Strzelecki, Students' acceptance of the Covid-19 impact on shifting higher education to distance learning in Poland, Int. J. Environ. Res. Publ. Health 17 (18) (2020) 6468.
[55] J.F. Hair Jr., M. Sarstedt, L. Hopkins, V.G. Kuppelwieser, Partial Least Squares Structural Equation Modeling (PLS-SEM), European business review, 2014.
[56] N. Kock, Common method bias in PLS-SEM: a full collinearity assessment approach, Int. J. e-Collaboration 11 (4) (2015) 1–10.
[57] M. Tenenhaus, V.E. Vinzi, Y.-M. Chatelin, C. Lauro, PLS path modeling, Comput. Stat. Data Anal. 48 (1) (2005) 159–205.
[58] M. Wetzels, G. Odekerken-Schröder, C. Van Oppen, Using PLS path modeling for assessing hierarchical construct models: guidelines and empirical illustration, MIS Q. (2009) 177–195.
[59] H. Yang, H. Lee, H. Zo, User acceptance of smart home services: an extension of the theory of planned behavior, Ind. Manag. Data Syst. 117 (1) (2017) 68–89.
[60] J. Henseler, M. Sarstedt, Goodness-of-fit indices for partial least squares path modeling, Comput. Stat. 28 (2) (2013) 565–580.
[61] M. Stone, Cross-validatory choice and assessment of statistical predictions, J. Roy. Stat. Soc. B 36 (2) (1974) 111–133.
[62] J.F. Hair Jr., M.C. Howard, C. Nitzl, Assessing measurement model quality in PLS-SEM using confirmatory composite analysis, J. Bus. Res. 109 (2020) 101–110.
[63] G. Nawanir, Y. Fernando, L.K. Teong, A second-order model of lean manufacturing implementation to leverage production line productivity with the importance-performance map analysis, Global Bus. Rev. 19 (3_suppl) (2018) S114–S129.
[64] G. Wei, W. Cheah, Pay satisfaction and organizational trust: an importance-performance map analysis, Journal of Applied Structural Equation Modeling 4 (1) (2020) 1–16.
[65] S. Vahdat, S. Samanian, S. Shahidi, A. Atapour, POS-497 Characteristics and outcome of COVID-19 in patients on Chronic hemodialysis in A dialysis center specific for COVID-19, Kidney International Reports 6 (4) (2021) S215.
[66] S. Vahdat, et al., POS-214 the outcome of COVID-19 patients with acute kidney injury and the factors affecting mortality, Kidney International Reports 6 (4) (2021) S90.
[67] Y. Tang, et al., An improved method for soft tissue modeling, Biomed. Signal Process Control 65 (2021), 102367.
[68] S. Lu, et al., Soft tissue feature tracking based on DeepMatching network, CMES-Computer Modeling in Engineering & Sciences 136 (1) (2023).
[69] S. Lu, et al., Iterative reconstruction of low-dose CT based on differential sparse, Biomed. Signal Process Control 79 (2023), 104204.
[70] S. Lu, et al., Analysis and design of Surgical instrument localization algorithm, CMES-Computer Modeling in Engineering & Sciences 137 (1) (2023).