

Article

Higher Educational Institutions' Digital Transformation and the Roles of Digital Platform Capability and Psychology in Innovation Performance after COVID-19

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Abstract: Digital technologies have transformed business models quickly, making sustainable, inventive performance essential for the survival of businesses, particularly in emerging markets. However, a lot of English educational institutions struggle to make use of digital platform capability (DPC) due to a lack of funding, resources, and experience that stifles prospects for advanced innovation. After the COVID-19 pandemic, this study suggests a framework to investigate how English educational institutions might improve their innovation performance using DPC. The study examines the relationship between digital innovation (DI) and innovation performance (IP), as well as the moderating effects of digital technology (DT). This study uses a quantitative methodology and questionnaire survey with 435 respondents from institutions that support DPC. The analysis examines the hypotheses using correlations, regression analyses, and 5000 bootstraps. The results demonstrate a positive relationship between DPC and IP, with DI acting as a mediator. Additionally, the outcomes show that the development of digital technology strengthens the positive influence of DPC on innovation performance. Through filling research gaps, this study adds to the body of knowledge. It also has significant management implications for English educational institutions looking to improve their innovation performance by fostering digital platform ability and digital innovation.

Keywords: DPC; digital innovation; digital technology; English educational institutions; innovation performance; China



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1. Introduction

Organizational innovativeness is a significant element for organizations to capture leading edges and take up a dominant, competitive place in the marketplace from the perspective of IT development and advancement and industrialized integration [1]. During digital economy era, advanced digital technologies linked to dynamic surroundings put pressure on enterprises to implement the latest innovative processes and technologies and provide infrastructural assistance for economic growth [2]. However, the complexity linked with technical dynamism and digital platform capability makes the survival of companies more challenging. Even in such a challenging environment, IP, and its resultant transformation, cannot be ignored due to its key role in affecting the success and better performance of organizations, particularly in English educational institutions [3]. On the other hand, most English educational institutions in China do not have core technologies and lack technological advancement, increasing the resistance toward their innovation performance [4]. English educational institutions should deeply incorporate into the digital

economy and discover innovative growth points with digital development and cross-boundary incorporation based on the system effects in terms of English compatibility [5]. This is possible with innovation, better skills in English, and specifically, advancement in technology; thereby, conventional businesses are capable of adapting modern prototypes in present digitalized and knowledge-based economies. Thus, digital platforms can break the limitations of time, organization, and space with help of digital technology, and are increasingly attracting the attention of scholars [6]. Mostly, industry leaders are trying to create digital platforms and digital business ecosystems to overcome secretarial barriers and accomplish technological, collaborative novelty [7]. English educational institutions are responsible for the organized transmission of skills, cultural values, and knowledge in an officially controlled structure [8]. DPC performs a critical role in the survival of English educational institutions with regard to ecological and scientific challenges, and it gives novel ideas for bringing about innovation in procedures and services through aligning resources strategically on the basis of their activities [9]. DPCs are advanced technologies employed in enterprises to facilitate editing, distributing, and standardizing data and information at an incomparable scale [10]. They aid in transforming the ways through which organizations gain competitive benefits and play huge role in innovative practices with offering valuable information [11]. DPC has a significant role in the enhancement of organizational innovation performance.

Currently, single innovation no longer meets the requirements of industry development, specifically for English educational institutions with restricted resources [12]. Therefore, enterprises are further inclined to rely on digital platform capabilities to acquire vital information, resources, and discover partners for their digital innovation and thus innovation performance [13]. These enterprises' strategies are flexible, with few decision times and rapid innovation. Thus, this study was carried out to recognize DPC and determine its positive effects on innovation performance in the presence of various supporting factors.

Digital innovation is the application and ideas of digital technology to business problems. Digital innovation enables management to utilize novel information and knowledge and explore opportunities to bring about innovativeness in a firm; it is recognized as a facilitator of innovation performance [14]. Digital innovation acts as bridge between DPC and IP links, and DI supports enterprises in exploring novel opportunities and knowledge to take part in innovative activities regarding their practices and services [6]. Several researchers have identified that digital innovation facilitates companies' innovation performance in the unlocking of innovation perspectives, although, at present, there is lack of clearness relating to the role that digital innovation plays in the linkage between DPC and the innovation performance of an organization [15]. Hence, this paper investigated how digital innovation affects the association between DPC and organizations' innovation performance.

Simultaneously, digital technology plays an essential role in improving innovation performance, and through digital technology competencies, enterprises are competent in boosting their information or knowledge about the technological market, its competitors, and suppliers. This valuable information adds to decisions regarding innovation activities [16], where practitioners are presented with various outcomes of digital technology. However, researchers lack related evidence about the moderating role of digital technology. Thus, in this study, the moderating role of digital technology in the relationship between DPC and IP was investigated.

Most of the existing literature has highlighted the numerous impacts of digital platform capability, for instance, organizational agility [17], B2B firm performance [18], network capability [19], and digital transformation [20], but the most exciting outcomes of DPC in terms of digital innovation and innovation performance have been overlooked until now. However, the majority of studies on digital platform capability have focused on SMEs and large industries, with less consideration given to English educational institutions. To fill this gap, this study contributes to the body of literature through examining the exciting results of digital platform capability (DPC) in terms of digital innovation and

innovation performance, which has been overlooked so far. This study focused on English educational institutions to evaluate the direct influence of DPC as a major facilitator for achieving innovation success, in contrast to earlier studies that have mostly focused on SMEs and large businesses. The study examined how digital innovation mediates the relationship between DPC and innovation performance, as well as how technology itself has a moderating effect on it. Through filling this vacuum, the research offers insightful information about how DPC promotes innovation outcomes in the educational field, with pertinent benefits for policymakers and practitioners looking to use digital platforms and innovations for improved education.

The study used a quantitative approach and cross-sectional design, and the results showed a substantial positive association between digital platform capability (DPC) and innovation performance in English educational institutions after COVID-19. Digital innovation mediated this relationship, whereas digital technology played a moderating role, strengthening the positive impacts of DPC on innovation performance. According to the findings, enhancing the innovation performance in the educational sector will require spending money on DPC, encouraging an innovative culture, and encouraging the usage of digital technology. The promotion of digital preparedness and the development of an environment that encourages innovation in educational facilities should be given top priority by policymakers. These results provide insightful information for improving innovative education in the post-pandemic age.

The structure of the article starts with the section discussing the literature and hypotheses developed regarding the study variables. Section 3 includes the data collection and sampling techniques used, and the subsequent part comprises the results of the analysis. In the last section, implications from the theoretical and practical perspectives are extensively observed to compare the tested study hypotheses.

1.1. Resource Based View Theory

The Penrose (1959) study [21] served as the basis for the RBV, since it examined how resource deployment affects both an organization's internal and outward growth. The Resource-Based View (RBV) hypothesis is a well-known, theoretical viewpoint in strategic management that places an emphasis on how firm-specific resources and skills contribute to generating competitive benefits and a superior performance. The RBV contends that having access to and using one-of-a-kind, priceless, uncommon, and inimitable resources can give businesses a durable, competitive edge [22,23].

1.2. Theoretical Framework

The RBV theory fits well within the parameters of our framework when examining the impact of digital platform capability (DPC) on innovation performance in English educational institutions post COVID-19. These institutions can utilize the potential of digital technology for creativity and competitiveness due to DPC, which can be regarded as a priceless and special resource. Educational institutions can improve their performance in the post-pandemic period through growing and enhancing their DPC, which will enable them to better adapt to the shifting digital context. In our research, the intervening role of digital innovation (DI) was identified, which is further supported by the RBV theory. The ability to create and use innovative digital approaches and solutions constitutes what DI, as a firm-specific competence, represents. The study shows how DPC affects the acceptance and use of technological advances within educational institutions, with DI functioning as a mediating component. The RBV theory is also related to the idea of taking into account digital technology (DT) as a moderator in the link between DPC and innovation performance. DT stands for the global digital environment, and its regulating function illustrates how the efficiency of DPC in improving innovation performance may differ depending on the dominant digital advancements and trends in the education sector. We underline the significance of acknowledging and using DPC as a significant and distinct asset for English educational institutions to survive in a digitally driven landscape by

including the RBV theory in our framework. This perspective allows the study to offer insightful information about how strategic investments into digital capabilities might promote long-term creative thinking and competitive benefits for educational institutions, in particular in the wake of the COVID-19 pandemic.

2. Literature Review

2.1. Digital Platform Capability (DPC) and Innovation Performance (IP)

Digital platforms can offer technical frameworks and provide channels linking companies to platforms, which facilitate enterprises to integrate, gather, and determine the information in these platforms [6]. The distinctive features of hierarchical self-growth, the network effect, and modularization are an efficient mean for organizations to attain rapid innovation performance [13]. A digital platform could enable an organization to acquire resources, obtain great strategic flexibility, and vital interaction proposals, allowing these organizations to use the technical characteristics of DPC to acquire and incorporate key resources [24]. Hence, with an improvement in their digital platform capability, enterprises can more efficiently improve their innovation performance with resource interaction from digital platforms [25]. It may be contested in the literature that DPC and innovation performance are directly related. It might draw attention to the possibility that factors other than DPC, such as organizational culture, leadership, or market conditions, may have a stronger impact on innovation outcomes [18]. On the other hand, a digital platform permits organizations to incorporate a huge amount of information quickly and effectively and outline manifold resource channels, which reduce data asymmetry and ambiguity and also overcome resource searches and operational costs [26]. Organizations maintain their dynamic ability by extracting significant information and forecasting consumer preference trends that support the accomplishment of innovation performance [27]. Various companies use domestic and external sources to face quickly shifting market settings, which enhances the success speed of their innovation performance and provides sustainable competitive benefits [28]. Digital platform capability can let organizations pool significant shared information and knowledge to act in response to rapidly and flexibly dynamic market needs, reconfiguring inner and outer resources together that guide toward the enhancement of innovation performance [29]. DPC is the ability of an organization to maintain a relationship with its interactants through online marketing, communication, and cooperation, in order to attain low costs and innovative resource expansion [30]. Digital platform capability supports organizations to carry out valuable exchanges among the participants of other platforms at zero marginal cost, in a way of boosting their innovation performance [24].

H1. *DPC is significantly linked with innovation performance.*

2.2. Mediating Role of Digital Innovation

A digital platform and its applications become resources of advanced knowledge and information in an organization [31]. Likewise, digital innovation allows enterprises to seek opportunities that assist in innovation activities primarily linked with innovation performance [32]. If an enterprise is capable of obtaining a better digital platform capability in organizing its digital technologies, it has a high probability of building up the latest digital solutions, so as to improve the company's innovation performance [33]. The level to which a company or school successfully develops and introduces new concepts, items, methods, or services that enhance productivity, competitiveness, or general performance is referred to as innovation performance [3]. This involves an organization's capacity to successfully transform creative concepts into observable results, such as raised sales, a larger market share, happier customers, or cost savings [11]. DPC presents organization flexibility and dynamic digital abilities that can boost digital innovation, which direct toward an improved innovation performance [34]. A company possessing digital platform capabilities will have more digital innovation for achieving an enhanced innovation performance [35]. Digital capabilities are a set of strategies that use digital assets to make

discrepancy values; digital assets include IT resources, competencies, and information of the IT design to improve innovation performance [36]. However, the considerable linkage between DPC and innovation performance has not been extensively examined, particularly from the perspective of digital innovation. Additionally, some studies might present entirely alternative justifications by highlighting the significance of other variables in mediating the link between DPC and innovation success. For instance, they might argue that factors such as resource accessibility, the degree of external collaborations, and workforce digital literacy and skills are more important in determining how well educational institutions perform in terms of innovation [19]. Digital platform capability provides basic information for innovation activities in an organization [37]. Hence, current research proposes that digital innovation performs a mediating role between DPC and innovation performance. The majority of enterprises obtain an amplified benefit because of digital platform capability, as a result of advanced technologies and digital innovation developing methods of communication [38]. Digital innovation adds to the innovation performance of a company, with novelty for both the enterprises' practices and products [39]. The DPC of an organization provides an opportunity to acquire a variety of information and knowledge from diverse stakeholders. DPC increases digital innovation to improve innovation performance [40]. DPC assists companies in building relationships with innovative processes and products, which ultimately enhance their innovation performance [41]. Thus, this study argues that DPC has a foundational role in digital innovation, which successively enhances innovation performance.

H2. *Digital innovation plays a mediating role between DPC and innovation performance.*

2.3. Digital Technology's Moderating Role

Digitalization increases the significance of digital technology within the operational activities of business enterprises. Enterprises make use of digital technologies that permit them to rapidly obtain a high volume of knowledge and latest information [42]. DPC shows the ability of an organization to organize its information technologies jointly with inside and outside resources [22]. DPC enables businesses to enhance their managerial communications, and exclusively, digital technologies help in the centralization of resources among numerous artists of the organization [43]. Conversely, innovation activities are mostly based on the formation of the latest information and new ideas that enhance innovation performance. Organizations with structural DPC are probably able to form novel ideas and initiatives that increase their digital innovation and innovation performance [44]. Digital platforms can be conceptualized as innovative information technology solutions that incorporate digital technologies, which come to support the digitalization and innovation performance in an enterprise [45]. Briefly, DPC is the critical strategic ability of an organization to contribute in the digital business ecosystem, which supports an organization in achieving high-quality platform information and resources that enhance the efficiency of its innovation performance [46]. Digital technology supports an enterprise in realizing value transmission and digital sharing via integrated digital platform capabilities. It could be supposed that digital technology provides strong information communication and resource diffusion support for organizations' innovation performance [47]. Digital technology is considered to be critical for every subject matter to obtain and share valuable communication from the participants of other digital platforms. It characterizes an organization's ability to unite its digital technology resources with its innovative resources [16]. In addition, organizations use digital tools to build community feedback loops, expanding their digital innovation and integration capability. Therefore, the spontaneous feedback of digital platform participants is accurate and well-timed for sharing resources and data together, accordingly improving enterprises' innovation performance [48].

H3. *Digital technology moderates in the association between DPC and IP.*

Figure 1 is presenting the theoretical framework of the present study.

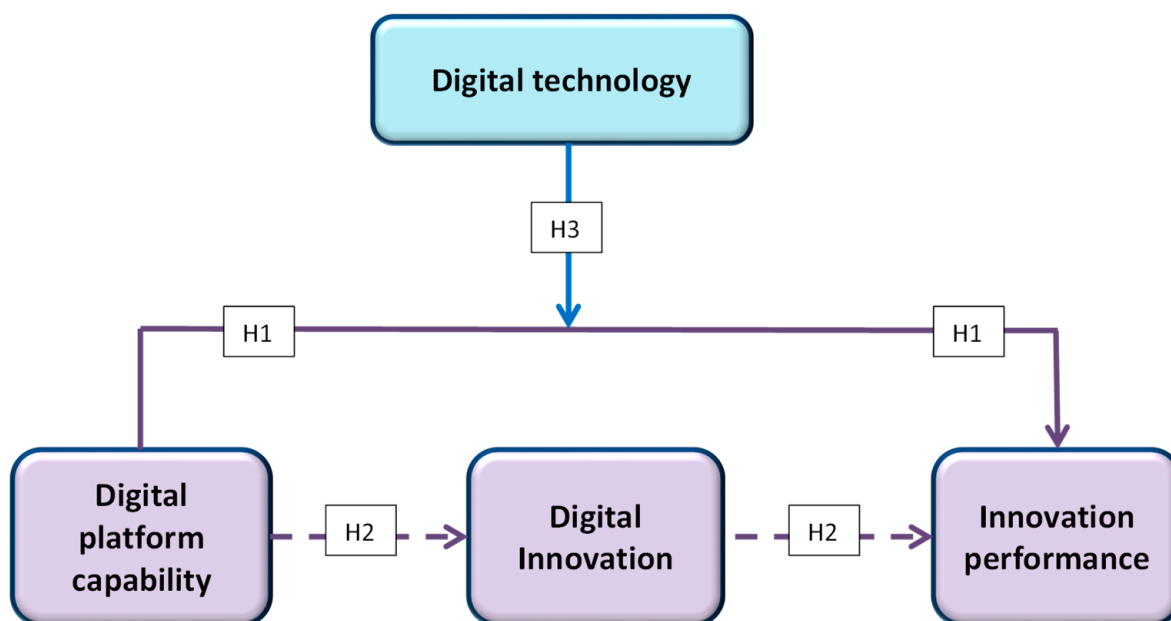


Figure 1. Conceptual framework.

3. Methodology

3.1. Data Collection and Sampling

In this research, data were collected using a quantitative method with a random sampling technique. We conducted an online survey targeting English educational institutions working in China for testing the study hypotheses. Using a purposive sampling technique, participants were chosen based on their relationships with English educational institutions that possessed digital platform capability (DPC), in order to ensure representation from institutions competent in using digital technologies for innovation performance. These institutions were selected as they functioned in an aggressive, dynamic environment after COVID-19, where the capability to innovate was a prerequisite for a high performance and development. To reach the intended audience in these English-speaking educational institutions with digital platform capability (DPC), questionnaires were sent electronically through email to the target participants. Furthermore, through sampling English educational institutions, we placed emphasis on institutions that put forward tangible products and therefore had formalized innovation practices. Regarding the preference of country, in this study, we chose China due to various reasons; first of all, China is one of the leading economies in digitalization. Secondly, China has the latest technological advancements and HR that assist in the implementation of digital platforms. Subsequently, we developed a self-administered questionnaire. The survey tools were pre-checked by four academics and seven field experts from different industry areas to make sure that the items were valid. Based on the pilot survey feedback, a few adjustments were performed on the survey questions. The online survey was addressed to English educational institution owners, CEOs, and principals, who have a holistic indication of the enterprise's operations and tactical orientation. For the data collection, 675 random samples were chosen. The questionnaire was sent with a cover letter describing the rationale of the study and clearly stating that those who officially agreed to take part in the study were providing information that concerned confidentiality and data about critical variables, which would be used only for research purposes. After a reminder, 435 usable and fulfilled questionnaires were returned, which represents a return rate of 64.44%. The data were gathered in 2 months. The questionnaire was divided into two sections. In the first section, information regarding demographic variables such as gender, field experience, and education was included.

Section 2 comprised detail of the items of the study. Around 37.23% of the participants were female and 62.77% were male. About 23.54% of the participants had a master's degree, 42.5% of the respondents had a bachelor's degree, and the other 33.96% of the participants had matriculated. The average age of the participants ranged between 25 and 45 years.

3.2. Measurement

To measure the reliability and validity of the study constructs, pre-tested items from prior studies were used. Each item's consistency and reliability was checked using a five-to seven-level Likert scale ranging from strongly disagree to strongly agree.

The competence of their digital platforms was evaluated using a scale with eight elements adapted from Khattak [49]. This metric evaluates a company's prowess in exploiting cutting-edge IT systems and software to gain a market advantage. An example of this would be the statement "The digital platform allows flawless interaction between us and our students or partners".

Digital innovation was measured through a 6-item scale, which was adopted from Khin and Ho [50]. This construct measures an organization's digital transformation progress and success. The question item was "The digital solutions used for education are better than others".

To measure innovation performance, a 7-item scale was used, which was adopted from Huang and Li [51]. This variable measures a company's success in achieving their desired goals. An example question is "The firm develops innovative administration in planning procedures".

Digital technology was measured with a 7-item scale, which was adapted from the work of Henderson et al. [52]. This variable measures how digital technology helps in communication, learning, and work. An example item is "Learning Management System".

4. Results

4.1. Data Analysis

We analyzed the study's variables—including digital platform capability, digital innovation, digital technology, and innovation performance—using a confirmatory factor analysis (CFA). As stated by Anderson and Gerbing [53], the model we proposed was the best model among those tested. Four models were tested, and they are presented in Table 1. In accordance with the results, our four-factor model addressed the best data and variable relationships. The following results, $\chi^2 = 1032.58$, $df = 465$, $2/df = 2.221$, CFI = 0.93, GFI = 0.92, and RMSEA = 0.05, sustain the four-factor model.

Table 1. Results of CFA.

Model Details	χ^2	df	χ^2/df	RMSEA	GFI	CFI
Hypothesized four-factor model	1032.58	465	2.221	0.05	0.92	0.93
Three-factor model	1132.57	385	2.942	0.13	0.84	0.85
Two-factor model	1252.25	355	3.527	0.18	0.72	0.73
Single-factor model	1465.47	375	3.908	0.22	0.64	0.65

4.2. Reliability and Validity

For this investigation, we used SPSS 18.0 and structural equation modeling. The convergent validity, mean extracted variance, and Cronbach's alpha are presented in Table 2. The discriminant validity was tested by researchers using the method described by [54]. All the values in Table 2 were definite, and both the CR and AVE were more than the thresholds set out therein; specifically, the CR was greater than 0.70, and both the AVE and CR were greater than the average variance retrieved. Above 0.6 was achieved for the Cronbach's alpha.

Table 2. Results of Factor Loading, T Value, AVE, and CR.

Variables	F-L	T	Alpha	C-R	AVE
Digital Platform Capability			0.82	0.94	0.76
DPCap-1	0.82	15.42			
DPCap-2	0.89	14.57			
DPCap-3	0.78	14.63			
DPCap-4	0.86	15.58			
DPCap-5	0.84	15.24			
DPCap-6	0.87	15.47			
DPCap-7	0.85	15.63			
DPCap-8	0.78	15.58			
Digital Innovation			0.86	0.96	0.74
DigiInn-1	0.84	15.47			
DigiInn-2	0.88	15.64			
DigiInn-3	0.82	14.57			
DigiInn-4	0.86	15.21			
DigiInn-5	0.78	15.64			
DigiInn-6	0.85	14.57			
Digital Technology			0.84	0.98	0.72
DigiTech-1	0.84	15.41			
DigiTech-2	0.86	15.27			
DigiTech-3	0.74	14.51			
DigiTech-4	0.78	15.21			
DigiTech-5	0.86	14.32			
DigiTech-6	0.88	15.47			
DigiTech-7	0.78	15.58			
Innovation Performance			0.88	0.92	0.78
InnP-1	0.82	15.63			
InnP-2	0.88	14.57			
InnP-3	0.78	15.21			
InnP-4	0.84	15.57			
InnP-5	0.86	14.56			
InnP-6	0.84	15.58			
InnP-7	0.78	15.42			

4.3. Descriptive Statistics

Table 3 presents the results for the descriptive statistics and correlation of the constructs used in this study. The results indicate that all the values were clearly significant. Innovation performance was positively correlated with DPC ($r = 0.28^{**}$, $p = \text{sign}$), digital innovation ($r = 0.32^{**}$, $p = \text{sign}$), and digital technology ($r = 0.24^{**}$, $p = \text{sign}$). Similarly, there was positive correlation between DPC, digital innovation ($r = 0.38^{**}$, $p = \text{sign}$), and digital technology ($r = 0.24^{**}$, $p = \text{sign}$). There was positive correlation between digital innovation and digital technology ($r = 0.38^{**}$, $p = \text{sign}$). The VIF scores were less than the cut-off values of 10.0, which verified that there was no issue.

Table 3. Correlation results.

Constructs	Mean	SD	Alpha	1	2	3	4	5	6
1 Respondent Experience	1.25	0.48	0.88	1.00					
2 Respondent Education	1.35	0.54	0.42	0.048	1.00				
3 Digital Platform Capability	3.35	0.38	0.86	0.105 **	0.017	1.00			
4 Digital Innovation	3.45	0.47	0.84	−0.035	0.072 *	0.381 **	1.00		
5 Digital Technology	3.65	0.65	0.87	0.018	−0.02	0.247 **	0.382 **	1.00	
6 Innovation Performance	0.26	0.42	0.82	0.023	0.002	0.284 **	0.327 **	0.243 **	1

Note: * $p < 0.05$, two tailed; ** $p < 0.01$, two tailed.

4.4. Hypothesis Testing

Hypothesis 1 (H1) was confirmed, as Table 4 shows the direct effect of digital platform capability on innovation performance. A structural equation modeling analysis (SEM) was used to examine the positive significance between DPC and IP. The results proved analytically ($\beta = 0.28^{**}$, $p < 0.00$).

Table 4. Direct effect of DPC on innovation performance.

Model	Hypothesis	Beta	F-Value	T-Value	Sig	Remarks
M-01	DPC to Innovation Performance	0.28	18.046	0.1468	0.000	Accepted

4.5. Mediating Effect of Digital Innovation between DPC and Innovation Performance

Table 5 explains the indirect effect of digital innovation between digital platform capability and innovation performance. The research techniques of Preacher and Hayes [55] was considered to test the mediation. We can appreciate that it was valid and a significant value was obtained. The mediating role of digital innovation was proved by the analytical results (Beta = 0.2685, Lower = 0.2856 to Upper = 0.3475). These allow us to consider that Hypothesis 2 (H2) was proven and that DI mediated the DPC and IP link.

Table 5. Mediating effect of digital innovation between DPC and innovation performance.

Model Detail	Data	Boot	SE	Lower	Upper	Sig
DPC → DI → IP	0.2685	0.3265	0.48	0.2856	0.3475	0.0000

4.6. Moderating Effect of Digital Technology between DPC and Innovation Performance

A hierarchical regression analysis was used to evaluate digital platform capability and innovation performance and test the moderating influence of digital technology. The results are presented in Table 6. The causal relationship between DPC and innovation performance output was mediated and digital technology had a beneficial moderating effect ($\beta = 0.32^{**}$, $p < 0.01$). Digital technology plays an important role in the association between DPC and IP, and this confirmed Hypothesis 3 (H3).

Table 6. Hierarchal regression results for moderating effect of digital technology.

Detail	B-Value	Innovation Performance		T-Value	B-Value	T-Value
		T-Value	B-Value			
Step-1						
Respondent Experience	0.14	0.28	0.18	0.14	1.04	1.26
Respondent Education	0.15	0.18	0.16	0.85	0.01	0.16
Step 2						
Digital Platform Capability			0.32 *	6.85	0.24 *	3.62
Digital Technology			0.26 *	4.65	0.28 *	4.84
Step 3						
DPCxDT					0.32 **	2.24
F		4.15 **		24.42 *		14.25 *
R ²		0.04		0.26		0.24
R ²				0.24		0.02

Note: * $p < 0.05$, two tailed; ** $p < 0.01$, two tailed.

5. Discussion

The current paper suggested a mediated moderating model to investigate the association between digital platform capability and innovation performance via digital innovation. For this purpose, in this research, we linked DPC to innovation performance. Furthermore, the mediating role of digital innovation between DPC and IP was also examined. The moderating role of digital technology in the linkage between DPC and IP was also checked.

Through focusing on English educational institutions, we gathered 435 valid questionnaires, tested our theoretical assumptions through an empirical analysis, and explored several interesting conclusions.

To accomplish the research objectives, three hypotheses were proposed to explore relationship among DPC, DI, DT, and IP. Regarding H1, a direct positive association between DPC and IP was suggested. It was found that DPC has a considerably positive influence on English educational institutions' innovation performance. The outcomes were congruent with previous studies' findings that a digital platform could enable an organization to acquire resources, obtain great strategic flexibility, and vital significant interaction proposals, allowing organizations to use the technical characteristics of DPC to acquire and incorporate key resources [24]. Hence, with an improvement in their digital platform capability, enterprises can more efficiently improve their innovation performance with resource interaction from digital platforms [25]. Secondly, the empirical findings revealed that digital innovation mediates the linkage between DPC and innovation performance. That is, it allows for cooperative, combined problem solving and the flexible ability to create adjustments with digitalization, performing a mediating role in the relationship between DPC and innovation performance. Educational English institutions with a strong DPC can efficiently use a huge amount of resources collected from platforms to deal with emergent challenges and insufficient organizational resources. The improved efficiency of digital innovation assists in increasing the speed of innovative service development and obtaining the benefits of first entry into the market, therefore improving innovation performance. All at once, DPC emphasizes that an organization can attain a high innovation performance through embedding and implementing digital innovation. These results are consistent with prior findings that a digital platform and its applications become resources of advanced knowledge and information in an organization [31]. Likewise, digital innovation allows enterprises to seek opportunities that assist in innovation activities primarily linked with innovation performance [32]. If an enterprise is capable of obtaining a better digital platform capability in organizing its digital technologies, it has a high probability of building up the latest digital solutions so as to improve its innovation performance [33]. Regarding H3, the outcomes verified that digital technology provides critical innovation information about infrastructure for innovative activities, in order to enhance innovation performance. In conclusion, this study proposed that digital innovation moderates the linkage between DPC and innovation performance. This paper's outcomes corroborate that the impact of DPC on innovation performance is moderated by digital technology. The findings support the work of preceding researchers that digitalization increases the significance of digital technology within the operational activities of business enterprises. Enterprises make use of digital technologies that permit them to rapidly obtain a high volume of knowledge and the latest information [42]. DPC shows the ability of an organization to organize its information technologies jointly with its inside and outside resources [22].

5.1. Theoretical Implications

The current research has some valuable theoretical contributions relating to innovation value. First of all, the key input of the current research was the testing of the outstanding role of DPC as a determinant of innovation performance, predominantly from the perspective of English educational institutions. This paper evidenced a broad explanation for boosting the innovation performance of educational English institutions, which was, until this time, adequately valued in the modern literature. Secondly, this study contributes to the existing literature body of research on innovation performance models for the English educational institutions sector. The innovation performance model presented how the integrated critical aspects of businesses, that is, DPC, digital innovation, and digital technology, determine innovation performance. Thirdly, this study indicated a review of DPC in developing digital innovation. Digital innovation is a significant mechanism of enterprises concerning the exploration of novel opportunities, which support the achievement of innovation. In the prior literature, there were limited deliberations on role of digital

innovation in the outcomes of DPC; thus, this study fills a gap in the prior literature knowledge and focused on DPC as a prospective determinant of IP as an outcome of digital innovation. Lastly, this study proposed digital technology as a moderator to provide a better understanding about the sustainability of DPC. This study proved how English educational institutions use DPC to adopt digital innovation and therefore improve their innovation performance, broadening the edges of the influence of DPC on this innovation performance. In this manner, this work contributes to the literature knowledge on English educational institutions' participation in digital platforms.

5.2. Practical Implications

The findings of this study will provide policymakers and administrators with a number of useful recommendations for ensuring the long-term viability of educational English institutions. To begin with, studies performed recently have shown that companies who use DPC are able to innovate better. By doing so, businesses can only accomplish innovative performance if they have access to the necessary digital technology resources for information. DPC may also be seen as a considerably superior reaction in the ever-changing IP environment, making it a prime candidate for the application of the best innovation techniques. Thus, we advocated for the establishment of a clear idea of DPC within educational institution administrations and the use of digital platforms by small- and medium-sized businesses, in order to gain an advantage in the market. For this reason, we stressed the importance of companies maintaining a healthy DPC and actively engaging with digital platforms. The capacity to exploit digital technologies, such as big data, cloud computing, and artificial intelligence, has become a critical component for enterprises seeking to improve their core competitive advantage since the beginning of the COVID-19 pandemic in China. Enterprises may better use resources from a variety of platform players, generate more innovative value, and establish a sustainable competitive advantage by cultivating and developing DPC via ongoing learning.

Second, once an organization has joined the digital platform, we urge them to aggressively seek out opportunities for collaboration and digital innovation. To help businesses to achieve digital innovation via communication and engagement and strengthen their competitive edge, digital platforms can effectively combine and virtualize a big number of resources. Third, consideration should be given to the evolution of platform governance systems by both platform owners and key players. Our research indicates that efficient digital technology improves companies' intellectual property. As a result, platform leaders can entice more academic institutions to join their digital platforms by establishing a robust governance system that lays out ground rules for platform subjects' interactions, sanctions for exploitative behavior, incentives for creative endeavors, and control over data.

5.3. Limitations and Future Research

Although the existing body of knowledge has some useful theoretical and practical implications, it also has a number of deficiencies that might point the way to future studies. Originally, this study solely focused on Chinese universities; however, future research may expand its scope to include schools from other nations. Second, the data came from educational English institutions; future research may draw from a wider range of industries. Finally, quantitative research was used to look at how DPC affects digital innovation and innovation performance. However, a qualitative analysis might be used in the future to shed light on the underlying factors of this. Moreover, this research employed a cross-sectional approach to evaluate the predicted model; however, future studies might benefit from a longitudinal design in order to more accurately identify the impact that DPC has on innovation performance via digital innovation.

6. Conclusions

In this study, we looked at the links between the independent variable, digital platform capability (DPC), the mediator, digital innovation, the moderator, and the dependent

variable, innovation performance (IP). These were our presumptions: H1: DPC and innovation performance are significantly correlated; H2: digital innovation serves as a bridge between DPC and IP; and H3: digital technology strengthens the relationship between DPC and innovation performance. Our findings highlighted the intricate dynamics of digital innovation and how they affect the efficacy of innovation. The findings demonstrated the significance of DPC and digital innovation in enhancing innovation performance, with digital technology acting as a key determinant of this link. These findings have important implications for companies and organizations trying to improve their capacity for innovation within the age of technology.

The study promoted sustainability by emphasizing the relationship between innovation performance and digital platform capability (DPC). It emphasized how crucial it is to make investments into digital skills in order to promote sustainable innovation practices. The study demonstrated how digital innovation works as a mediator, encouraging eco-friendly solutions in a variety of businesses. Additionally, the moderating influence of digital technology underlines the significance of incorporating sustainable technological practices for optimizing the effectiveness of innovation.

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References

1. Pouwels, I.; Koster, F. Inter-organizational cooperation and organizational innovativeness. A comparative study. *Int. J. Innov. Sci.* **2017**, *9*, 184–204. [\[CrossRef\]](#)
2. Urbinati, A.; Chiaroni, D.; Chiesa, V.; Frattini, F. The role of digital technologies in open innovation processes: An exploratory multiple case study analysis. *RD Manag.* **2020**, *50*, 136–160. [\[CrossRef\]](#)
3. Benitez, J.; Arenas, A.; Castillo, A.; Esteves, J. Impact of digital leadership capability on innovation performance: The role of platform digitization capability. *Inf. Manag.* **2022**, *59*, 103590. [\[CrossRef\]](#)
4. Giebel, M. Digital divide, knowledge and innovations. *J. Inf. Inf. Technol. Organ.* **2013**, *8*, 1–24.
5. Datta, A.; Bhatia, V.; Noll, J.; Dixit, S. Bridging the digital divide: Challenges in opening the digital world to the elderly, poor, and digitally illiterate. *IEEE Consum. Electron. Mag.* **2018**, *8*, 78–81. [\[CrossRef\]](#)
6. Esposito De Falco, S.; Renzi, A.; Orlando, B.; Cucari, N. Open collaborative innovation and digital platforms. *Prod. Plan. Control* **2017**, *28*, 1344–1353. [\[CrossRef\]](#)
7. Bonina, C.; Koskinen, K.; Eaton, B.; Gawer, A. Digital platforms for development: Foundations and research agenda. *Inf. Syst. J.* **2021**, *31*, 869–902. [\[CrossRef\]](#)
8. Jamali, D. Changing management paradigms: Implications for English educational institutions. *J. Manag. Dev.* **2005**, *24*, 104–115. [\[CrossRef\]](#)
9. Helfat, C.E.; Raubitschek, R.S. Dynamic and integrative capabilities for profiting from innovation in digital platform-based ecosystems. *Res. Policy* **2018**, *47*, 1391–1399. [\[CrossRef\]](#)
10. Cenamor, J.; Parida, V.; Wincent, J. How entrepreneurial SMEs compete through digital platforms: The roles of digital platform capability, network capability and ambidexterity. *J. Bus. Res.* **2019**, *100*, 196–206. [\[CrossRef\]](#)
11. Khan, A.; Tao, M.; Li, C. Knowledge absorption capacity's efficacy to enhance innovation performance through big data analytics and digital platform capability. *J. Innov. Knowl.* **2022**, *7*, 100201. [\[CrossRef\]](#)
12. Laine, K.; van der Sijde, P.; Lähdeniemi, M.; Tarkkanen, J. *Higher Education Institutions and Innovation in the Knowledge Society*; Oy Nord Print Ab: Helsinki, Finland, 2008.
13. Santoso, A.S.; Prijadi, R.; Balqiah, T.E. How open innovation strategy and effectuation within platform ecosystem can foster innovation performance: Evidence from digital multi-sided platform startups. *J. Small Bus. Strategy* **2020**, *30*, 102–126.

14. Nylén, D.; Holmström, J. Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Bus. Horiz.* **2015**, *58*, 57–67. [\[CrossRef\]](#)
15. Khattak, A.; Tabash, M.I.; Yousaf, Z.; Radulescu, M.; Nassani, A.A.; Haffar, M. Towards innovation performance of SMEs: Investigating the role of digital platforms, innovation culture and frugal innovation in emerging economies. *J. Entrep. Emerg. Econ.* **2022**, *14*, 796–811. [\[CrossRef\]](#)
16. Underwood, J.D. *The Impact of Digital Technology: A Review of the Evidence of the Impact of Digital Technologies on Formal Education*; DERA: London, UK, 2009.
17. Ahmed, A.; Bhatti, S.H.; Gölgeci, I.; Arslan, A. Digital platform capability and organizational agility of emerging market manufacturing SMEs: The mediating role of intellectual capital and the moderating role of environmental dynamism. *Technol. Forecast. Soc. Chang.* **2022**, *177*, 121513. [\[CrossRef\]](#)
18. Liu, L.; Long, J.; Fan, Q.; Wan, W.; Liu, R. Examining the functionality of digital platform capability in driving B2B firm performance: Evidence from emerging market. *J. Bus. Ind. Mark.* **2022**, *38*, 1941–1957. [\[CrossRef\]](#)
19. Van de Wetering, R.; Dijkman, J. Enhancing digital platform capabilities and networking capability with EA-driven dynamic capabilities. In Proceedings of the 27th Americas Conference on Information Systems: Digital Innovation and Entrepreneurship, Online, 9–13 August 2021; p. 16.
20. Carcary, M.; Doherty, E.; Conway, G. A dynamic capability approach to digital transformation: A focus on key foundational themes. In Proceedings of the European Conference on Information Systems Management, Evora, Portugal, 8–9 September 2016; p. 20.
21. Penrose, E.T. *The Theory of the Growth of the Firm*; Oxford University Press: Oxford, UK, 1959.
22. Wu, L.; Chiu, M.L. Organizational applications of IT innovation and firm's competitive performance: A resource-based view and the innovation diffusion approach. *J. Eng. Technol. Manag.* **2015**, *35*, 25–44. [\[CrossRef\]](#)
23. Chaudhuri, A.; Subramanian, N.; Dora, M. Circular economy and digital capabilities of SMEs for providing value to customers: Combined resource-based view and ambidexterity perspective. *J. Bus. Res.* **2022**, *142*, 32–44. [\[CrossRef\]](#)
24. Jiang, H.; Yang, J.; Gai, J. How digital platform capability affects the innovation performance of SMEs—Evidence from China. *Technol. Soc.* **2023**, *72*, 102187. [\[CrossRef\]](#)
25. Bhatti, S.H.; Ahmed, A.; Ferraris, A.; Hirwani Wan Hussain, W.M.; Wamba, S.F. Big data analytics capabilities and MSME innovation and performance: A double mediation model of digital platform and network capabilities. *Ann. Oper. Res.* **2022**, 1–24. [\[CrossRef\]](#)
26. Ben Arfi, W.; Hikkerova, L. Corporate entrepreneurship, product innovation, and knowledge conversion: The role of digital platforms. *Small Bus. Econ.* **2021**, *56*, 1191–1204. [\[CrossRef\]](#)
27. Sedera, D.; Lokuge, S.; Grover, V.; Sarker, S.; Sarker, S. Innovating with enterprise systems and digital platforms: A contingent resource-based theory view. *Inf. Manag.* **2016**, *53*, 366–379. [\[CrossRef\]](#)
28. Zeng, S.X.; Xie, X.M.; Tam, C.M. Relationship between cooperation networks and innovation performance of SMEs. *Technovation* **2010**, *30*, 181–194. [\[CrossRef\]](#)
29. Ali, A.; Bahadur, W.; Wang, N.; Luqman, A.; Khan, A.N. Improving team innovation performance: Role of social media and team knowledge management capabilities. *Technol. Soc.* **2020**, *61*, 101259. [\[CrossRef\]](#)
30. Bresciani, S.; Huarng, K.H.; Malhotra, A.; Ferraris, A. Digital transformation as a springboard for product, process and business model innovation. *J. Bus. Res.* **2021**, *128*, 204–210. [\[CrossRef\]](#)
31. Xie, X.; Han, Y.; Anderson, A.; Ribeiro-Navarrete, S. Digital platforms and SMEs' business model innovation: Exploring the mediating mechanisms of capability reconfiguration. *Int. J. Inf. Manag.* **2022**, *65*, 102513. [\[CrossRef\]](#)
32. Törner, R.L. Internal Digital Platforms and Generative Mechanisms of Digital Innovation. 2018. Available online: <https://aisel.aisnet.org/icis2018/innovation/Presentations/12> (accessed on 19 July 2023).
33. Appio, F.P.; Frattini, F.; Petruzzelli, A.M.; Neirotti, P. Digital transformation and innovation management: A synthesis of existing research and an agenda for future studies. *J. Prod. Innov. Manag.* **2021**, *38*, 4–20. [\[CrossRef\]](#)
34. Hanelt, A.; Firk, S.; Hildebrandt, B.; Kolbe, L.M. Digital M&A, digital innovation, and firm performance: An empirical investigation. *Eur. J. Inf. Syst.* **2021**, *30*, 3–26.
35. Yaqub, M.Z.; Srečković, M.; Cliquet, G.; Hendrikse, G.; Windsperger, J. Network innovation versus innovation through networks. *Ind. Mark. Manag.* **2020**, *90*, 79–89. [\[CrossRef\]](#)
36. Li, Y.; Wang, Y.; Wang, L.; Xie, J. Investigating the effects of stakeholder collaboration strategies on risk prevention performance in a digital innovation ecosystem. *Ind. Manag. Data Syst.* **2022**, *122*, 2045–2071. [\[CrossRef\]](#)
37. Panori, A.; Kakderi, C.; Komninos, N.; Fellnhöfer, K.; Reid, A.; Mora, L. Smart systems of innovation for smart places: Challenges in deploying digital platforms for co-creation and data-intelligence. *Land Use Policy* **2021**, *111*, 104631. [\[CrossRef\]](#)
38. Mariani, M.M.; Nambisan, S. Innovation analytics and digital innovation experimentation: The rise of research-driven online review platforms. *Technol. Forecast. Soc. Change* **2021**, *172*, 121009. [\[CrossRef\]](#)
39. Lee, J.; Berente, N. Digital innovation and the division of innovative labor: Digital controls in the automotive industry. *Organ. Sci.* **2012**, *23*, 1428–1447. [\[CrossRef\]](#)
40. Okano, M.T.; Santos, H.D.C.L.D.; Ursini, E.L. The digital platform as digital innovation: A study from the perspective of dynamic capabilities. *Int. J. Innov. Technol. Manag.* **2022**, *19*, 2140014. [\[CrossRef\]](#)
41. Oppong-Tawiah, D.; Bassellier, G. Digital Innovation, Platform Orientation and the Performance of IT Startups. 2017. Available online: <https://aisel.aisnet.org/icis2017/DigitalPlatforms/Presentations/23> (accessed on 19 July 2023).

42. Cardinali, P.G.; De Giovanni, P. Responsible digitalization through digital technologies and green practices. *Corp. Soc. Responsib. Environ. Manag.* **2022**, *29*, 984–995. [[CrossRef](#)]
43. Sousa-Zomer, T.T.; Neely, A.; Martinez, V. Digital transforming capability and performance: A microfoundational perspective. *Int. J. Oper. Prod. Manag.* **2020**, *40*, 1095–1128. [[CrossRef](#)]
44. Yablonsky, S. A multidimensional framework for digital platform innovation and management: From business to technological platforms. *Syst. Res. Behav. Sci.* **2018**, *35*, 485–501. [[CrossRef](#)]
45. Mubarak, M.F.; Petraite, M. Industry 4.0 technologies, digital trust and technological orientation: What matters in open innovation? *Technol. Forecast. Soc. Change* **2020**, *161*, 120332. [[CrossRef](#)]
46. Edeh, J.N. Customer Relationship Management and Business Performance: Do Digital Platform Capabilities Matter? In *Digital Service Delivery in Africa: Platforms and Practices*; Springer International Publishing: Cham, Switzerland, 2022; pp. 81–105.
47. Lyver, M.J.; Lu, T.J. Sustaining innovation performance in SMEs: Exploring the roles of strategic entrepreneurship and IT capabilities. *Sustainability* **2018**, *10*, 442. [[CrossRef](#)]
48. Wei, S.; Xu, D.; Liu, H. The effects of information technology capability and knowledge base on digital innovation: The moderating role of institutional environments. *Eur. J. Innov. Manag.* **2022**, *25*, 720–740. [[CrossRef](#)]
49. Khattak, A. Hegemony of digital platforms, innovation culture, and e-commerce marketing capabilities: The innovation performance perspective. *Sustainability* **2022**, *14*, 463. [[CrossRef](#)]
50. Khin, S.; Ho, T.C. Digital technology, digital capability and organizational performance: A mediating role of digital innovation. *Int. J. Innov. Sci.* **2018**, *11*, 177–195. [[CrossRef](#)]
51. Huang, J.W.; Li, Y.H. The mediating effect of knowledge management on social interaction and innovation performance. *Int. J. Manpow.* **2009**, *30*, 285–301. [[CrossRef](#)]
52. Henderson, M.; Selwyn, N.; Finger, G.; Aston, R. Students' everyday engagement with digital technology in university: Exploring patterns of use and 'usefulness'. *J. High. Educ. Policy Manag.* **2015**, *37*, 308–319. [[CrossRef](#)]
53. Anderson, J.C.; Gerbing, D.W. Structural equation modeling in practice: A review and recommended two-step approach. *Psychol. Bull.* **1988**, *103*, 411. [[CrossRef](#)]
54. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **1981**, *18*, 39–50. [[CrossRef](#)]
55. Preacher, K.J.; Hayes, A.F. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav. Res. Methods* **2008**, *40*, 879–891. [[CrossRef](#)]

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