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Digital Technology and Brain Development among Entrepreneurial Ambitions

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Abstract

Brain development (BD) is an important factor. To effectively enhance BD, institutions employ digital tools, technology, and innovative digital competencies to improve students' entrepreneurial ambitions. The present paper examines the role of digital technology in developing BD among entrepreneurial ambitions in Egypt. The study modes are quantitative and cross-sectional to collect data from the entrepreneurial aspirations of Egyptian universities where business, management, economics, and commerce students were focused. The study utilizes 312 cases to infer the results. Using the structural equation model (SEM), the results show a positive effect of technological capabilities (TCs) on technology incentives (TIs) ($\beta = 0.126$; $p < 0.01$); searching skills (SKS) on TIs ($\beta = 0.078$; $p < 0.01$); and technology usage (TU) on TIs ($\beta = 0.256$; $p < 0.01$). Moreover, TIs positively affect BD ($\beta = 0.366$; $p < 0.01$) among potential Egyptian entrepreneurs. This study will assist policymakers in enhancing technological resources and skilled talent to enhance entrepreneurs' motivation to innovate and adopt new technologies. It will also help entrepreneurs' BD, as they contribute to society by creating more entrepreneurial activities. Finally, the study's findings contribute to the field literature on psychology, management, business and commerce.

Keywords
Brain development; innovating digital competencies; technology capabilities; searching skills; technology usage; technology incentives; entrepreneurial ambitions

1. Introduction

Thanks to the increasing role of digitalization, developing career opportunities and the mindset of entrepreneurial ambition through digital technologies is a necessity. Similarly, improving technology incentives (TIs) through digital inclusion is vital because digital networks contribute massively towards the development of society. More specifically, cheaper and faster internet subscriptions work as significant online services, which nurture entrepreneurs' minds towards entrepreneurial activities [1, 2]. In this way, the development of this is possible through diverse technology-related constructs such as technology capabilities (TCs), searching skills (SKS), and technology usage (TU) [1, 3-5]. TCs allow entrepreneurs to use, understand, and manage information, which also makes them capable of communicating with others regarding the adoption of digital technology in upcoming business activities [1, 6]. SKS empowers entrepreneurs and helps them find reliable and authentic sources of information to improve their chances of launching profitable ventures [1, 7]. Likewise, TU is also a substantial factor that contributes positively to TIs, as it assists entrepreneurs in developing network technology to get jobs [5, 8]. In the same style, TIs positively develop the entrepreneurs' brain development (BD). BD is associated with activities through which the brains of entrepreneurs assist them in feeling relaxed in learning about technology. Entrepreneurs' brains are anxious when they do not use technology-related activities [9-11].

In the literature, several constructs positively predict Tis, including reliability and credibility of digital sources, legal thoughts, digital information, technology-based environments, organizational incentives, innovation, high-skill equilibriums, data-driven decision-making, technology communication, social media, remote work, TCs, financial incentives, digital technology circulation, SKS, search efficiency, professionals' online resources, TU, financial transactions, job information, technology readiness, adoption of health technologies, etc. [1, 2, 7, 12-15]. Similarly, technology user engagement, relaxation, stress, technology learning, anxiety, mindset incentives, cognitive engagement, technology-driven incentives, neurological well-being, neuromodulation technologies, mental abilities etc., are the positive enablers of BD [11, 16-20].

However, the domain literature has noticeable gaps, such as the absence of an integrated model. This model, which would integrate TCs, SKS, TU, TIs, and BD into a single framework, is a crucial need in our field. Specifically, in the context of Egypt, this needs further concentration. It is this pressing need that has led to the formulation of the following research questions:

RQ1: What role do TCs, SKS, and TU factors play in helping Egyptian entrepreneurs develop their TIs?

RQ2: What is the link between TIs and BD among potential Egyptian entrepreneurs?

The present study aims to examine the influence of digital technology in developing TIs and BD among potential Egyptian entrepreneurs. The study's findings will assist in developing policies focused on the upgrade and promotion of technology designed to nurture entrepreneurial ambitions, specifically concerning the establishment of enterprises and business ventures. Also, this study will help to develop policies that enhance the BD of students who take part in business matters. Finally, the study's outcomes contribute to the domain literature.

2. Literature Review and Conceptualization

2.1 Technological Capabilities (TCs)

TCs underline the skills and competencies that enable an individual to effectively use, comprehend, and manage information through technology; communicate with others using digital tools; and control technology to augment productivity, achieve remote work, and expand training or interactions [4]. According to [1] factors such as TCs, SKS, and TU are the best predictors of TIs. Likewise, the connection between digital technology circulation, capabilities and incentives is positive and significant, as discussed by [6]. For example, Thailand's industrial TCs are better tools that are enhanced through the improvement of the system of financial incentives [21]. In the perception of [22], TCs are responsible for developing cognition and cognitive development of individuals. This consequently assists in developing innovations and new ideas, which make the organizations successful. In the same direction, electronic TCs have a positive and massive role in Guadalajara, Mexico [4]. Furthermore, the literature demonstrates a positive role of TCs in developing TIs [2, 4, 12, 13, 23, 24]. Similarly, advanced artificial intelligence algorithms are the best tools to advance technological networks and make advancements in consumer electronic products [25]. In all networks, data transmitted is valuable and practical for allocating all resources [26, 27].

2.2 Searching Skills (SKS)

SKS explains the ability to effectively locate, access, and assess information online by utilizing websites, retaining the internet to improve search efficiency, evaluating the reliability and credibility of digital sources, and accepting the ethical and legal thoughts associated with opening and using digital information [1]. This definition includes proficiency in directing online platforms, proficiently conducting searches, unfavorably assessing sources, and upholding awareness of ethical and legal features of digital information use [1, 3, 28]. SKS are fundamental in technology-based environments, where the capability to locate and apply technical knowledge directly affects innovation and growth. In young, tech-driven firms, for example, effective knowledge-seeking empowers employees to stay updated with industry advancements and align them with organizational incentives for growth and innovation [29]. Institutional frameworks further highlight the standing of skills like information searching to establish high-skill equilibriums, creating a requirement for maximizing technology-based incentives [14]. Advanced search expertise is indispensable not only for technical fields but also for business and management roles, where it supports data-driven decision-making and competitive analysis [30]. Similarly, educational interventions, particularly in health sciences, suggest that skillful searching enables individuals to access complex information, contributing to evidence-based practices and tech innovations [7]. Whether for postgraduate students developing expertise [31] or professionals’ online resources, strong SKS enable informed decision-making and improve technology adoption, driving individual and organizational progress.

2.3 Technology Use (TU)

TU can be defined as integrating networked tools, i.e., the internet and social media, into daily activities for various purposes. These include searching for job information, staying updated about local events, handling financial transactions, making online purchases, and engaging in social activities like sharing photos and linking with others [1, 8]. The media, TU and attitudes shows that technology readiness shape individuals' interactions with digital devices and its effects on cognitive function [5]. Technology readiness is crucial for effectively adopting health technologies, such as brain-computer interfaces, that support cognitive development and rehabilitation [32, 33]. However, the influence of digital devices on brain structure and function requires careful monitoring, social skills, and neurological processes [8, 34]. Excessive exposure in children, for example, can disturb natural developmental pathways and the need for mindful technology use [10, 15].

2.4 Technology Incentives (TIs)

TIs are initiatives, programs, or policies aimed at inspiring the adoption, accessibility, and usage of technology within a community. These incentives frequently include refining infrastructure, reducing costs, and increasing access to devices and internet services [1, 35]. For instance, TIs offer more affordable and faster internet subscriptions, provide subsidies for technology devices to improve digital inclusion, upgrade public networks to expand connectivity, and enable the sharing of resources like computers and video conferencing services to fulfil public needs, i.e., education and online services [19, 36]. [37]'s study highlights that technology-based incentives, such as mobile applications and telemedicine tools, can promote healthier behaviors by making involvements more engaging and accessible. In the context of mobile health (mHealth), [38] suggests that incentives like gamification increase user engagement and empower individuals to take control of their health. In hospital settings, TIs, predominantly financial and regulatory, play a vital role in adopting health information exchanges (HIEs), as they inspire data sharing and integration to increase patient care [39]. Also, [40] argues that incentives, ranging from ease of use to direct rewards, reduce perceived risks and drive individuals' intentions to adopt new technologies.

2.5 Brain Development (BD)

BD is termed as the process through which the brain grows and adapts to various inducements and activities, leading to improved relaxation and reduced stress, predominantly when participating in activities that are both inspiring and appealing to numerous parts of the brain [9, 11]. Incorporating technology into learning can support BD by reducing anxiety and enabling cooperative, appealing experiences that encourage relaxation [16, 17].

The domain literature defines numerous constructs as meaningful and positive predictors of Tis, such as technology communication, social media, remote work, TCs, financial incentives, digital technology circulation, SKS, search efficiency, reliability and credibility of digital sources, legal thoughts, digital information, technology-based environments, organizational incentives, innovation, high-skill equilibriums, data-driven decision-making, professionals' online resources, TU, financial transactions, job information, technology readiness, adoption of health technologies, etc. [1, 2, 4, 7, 12-15, 21]. Moreover, BD is also predicted through diverse factors such as TIs, technology user engagement, relaxation, stress, technology learning, anxiety, mindset incentives, cognitive engagement, technology-driven incentives, neurological well-being, neuromodulation technologies, mental abilities, and many more [11, 16-20, 41, 42].

However, the literature has a few gaps that need to be considered. Firstly, the above literature shows different factors that positively and negatively affect TIs and BD, but there is not an integrated framework that may connect all the constructs, such as TU, SKS, and TCs, towards TIs and BD. Secondly, the effect of TIs on BD is still lacking in the literature. Finally, contextually, the confirmation of the integrated model based on TCs, TU, SKS, TIs and BD is not explicitly confirmed among the Egyptian entrepreneurial ambitions of various business, management, economics and commerce university students. Therefore, based on these gaps, the present conceptual model of the study uses an integrated framework, where TCs, TU and SKS are explored as the potential predictors of TIs, and TIs as the predictor of BD (see Figure 1). In the framework, TCs, TU, and SKS positively enhance TIs among Egyptian university students, where TIs are also responsible for improving the cognitive ability and BD.

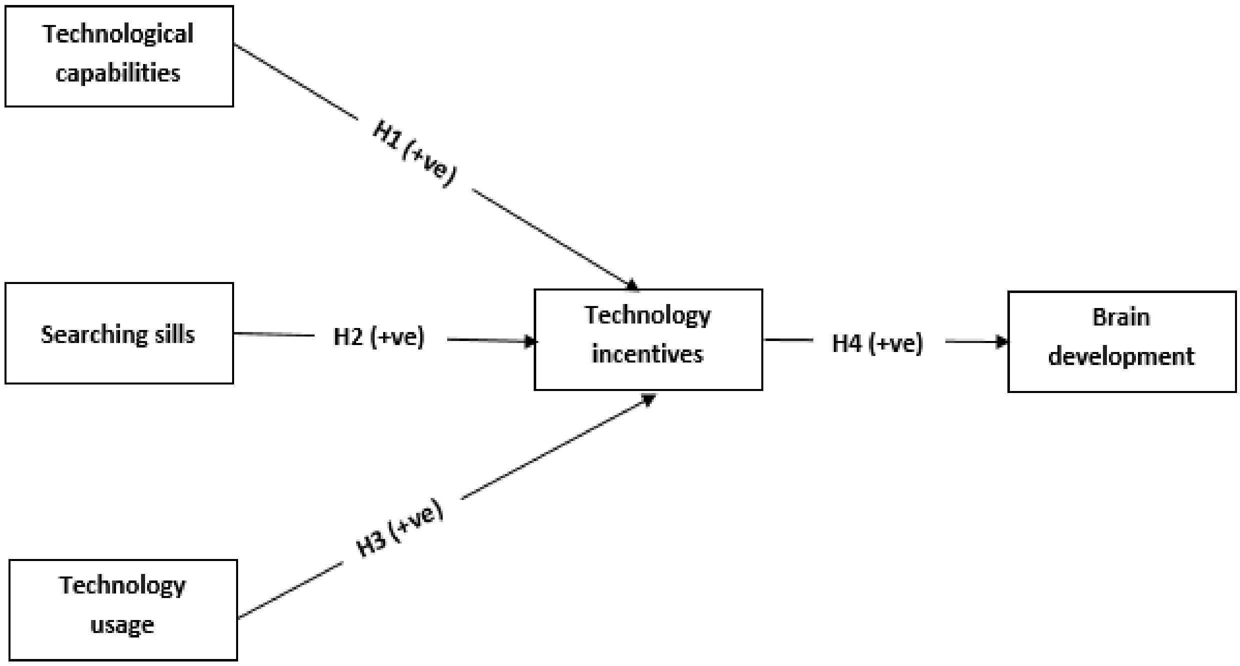

Figure 1 Conceptual model of the study. Source: Developed by the authors.

3. Hypotheses Derivation

3.1 Technological Capabilities (TCs) and Technology Incentives (TIs)

TCs have a more substantial and predictive contribution to developing TIs. This includes access to digital tools and training and improves digital inclusion by enhancing individual capabilities, which in turn enhances digital literacy and social integration within communities [1]. The empirical assessment of [6] demonstrates that both incentives and existing capabilities are indispensable for technology adoption, with incentives frequently serving as an initial push that needs a base of capability for active utilization. [21]'s study found that targeted financial incentives can increase innovation by making it financially feasible for industries to invest in technology and skill development in Thailand's industrial sector. Similarly, [43] confirm that incentives that kindle initial technological adoption are essential capabilities for sustained innovation. Renowned scholars, such as [22, 23], favor this view by suggesting that cognitive and competitive incentives can enhance firms' TCs and innovation strategies. Correspondingly, [12] further support the same claims and reveal that capabilities and incentives collectively contribute to digital technology diffusion. Incentives can initiate technological progress, sustained advancement, and active adoption but depend heavily on existing and developed TC*s* [2, 4, 13, 24].

As a result, the literature establishes the positive contribution of TCs in developing TIs, except for among potential university students, specifically in management, commerce, economics and business. As such, we expect:

H1. TCs positively impact the development of technical innovations among entrepreneurial ambitions.

3.2 Searching Skills (SKS) and Technology Incentives (TIs)

SKS have great prominence in enhancing TIs, where robust SKS enable more effective utilization of incentives and boost innovation and sustained growth. Policy and financial incentives are vital drivers of entrepreneurial activity in technology sectors, as they inspire individuals and organizations to be involved in high-tech entrepreneurship and build competitive skills that bring them into line with broader economic and sustainability goals [14, 44]. Along with the promotion of a SKS equilibrium within the labor market, these incentives create a base where workers are enthused to frequently develop relevant technology skills to meet the demands of the industry. In organizational contexts, incentives like tax reliefs and grants meaningfully and substantially encourage firms' investments in employee and technology development, stimulating a culture of constant learning and enhancing the overall innovation capacity of firms [25, 24, 43]. These incentives also contribute to knowledge-seeking behaviors within technology-driven firms, enabling them to sustain a competitive advantage in a progressively complex and consistent global economy. In this way, access to digital technology boosts SKS, which leads to enhanced incentives and digital inclusion. This is predominantly evident in community settings and among educators, where incentives assist in improving both access to technology and the motivation to acquire digital skills [1, 45-47]. In education, institutions, i.e., universities, are protagonists in offering economic incentives that support students' and teachers' assignments with technology, thus enhancing technological literacy and practical skills [48-50]. Also, by incentivizing innovative approaches, i.e., design thinking, educational institutions empower future professionals to grow technology-related motivation and creative problem-solving skills, nurturing them to meet industry challenges with polished creative capabilities [51].

Consequently, SKS has a meaningful role in enhancing TIs in diverse contexts. However, its role in Egyptian entrepreneurs is still limited. Therefore:

H2. SKS positively impacts the development of technical innovations among entrepreneurial ambitions.

3.3 Technology Usage (TU) and Technology Incentives (TIs)

TU is a substantial predictor of TIs. Financial incentives, i.e., subsidies and tax breaks, play a positive role in lowering the initial barriers to technology adoption by dropping costs for consumers and organizations, making new technologies more attractive and easier to reach [52-54]. Policy-driven incentives that encourage infrastructure investment are predominantly effective for long-term adoption, as these create a flourishing technological environment. For instance, government-backed incentives bring technological advances in renewable energy over several decades, which points to the standing of stable, reassuring policy frameworks for constant innovation [55]. Similarly, policies supporting infrastructure for biomass recovery and digital inclusion demonstrate the positive role of governments in driving technology adoption by addressing financial and logistical barriers [1, 13]. Likewise, behavioral incentives focus on persuading individual engagement and usage patterns by satisfying specific actions or interactions with technology. These incentives have been effective in inspiring initial experimentation and adoption of consumer-facing technologies [40, 56]. Organizational incentives within firms are crucial, particularly in technology-intensive industries, where bringing incentives with performance metrics can stimulate innovation and technology adoption [57]. For instance, performance-linked incentives for CEOs in tech firms have been exposed to motivate innovation and contribute to the company's competitive advantage by reassuring risk-taking and investment in new technologies [58-60].

In the literature, TU positively predicts TIs. However, the association between TU and TIs, in the presence of TCs, SKS and BD, is still unexplored, specifically among Egyptian entrepreneurs. Thus:

H3. TU has a positive impact on developing technical innovations among entrepreneurial ambitions.

3.4 Technology Incentives (TIs) and Brain Development (BD)

TIs promote BD. There is a positive link between incentives and technology, principally those designed for educational contexts, which can significantly improve motivation and cognitive control, ultimately leading to BD [61]. For instance, interactive learning tools and educational games employ growth mindset incentives to advance persistence and boost resilience, reinforcing cognitive engagement [19, 20]. Similarly, financial and other rewards stimulate brain motivation circuits. On the other hand, removing such incentives can lead to demotivation, underlining the effect of incentives on brain activation [35]. Outside education, using advanced technologies like artificial intelligence and machine learning positively develops brain health, suggesting that technology-driven incentives can enhance cognitive development and neurological well-being [11, 42]. Furthermore, the creative potential fostered through information technologies within the educational process further supports the idea that technology is a powerful tool for BD by reassuring skills like problem-solving and creative thinking [62]. Likewise, innovations in brain preservation and neuromodulation technologies underline the potential for technology to aid current cognitive abilities and sustain and improve brain health in the future [18, 41].

As a result, BD is predicted through various technical and technological factors, while the predictive effect of TIs towards BD is still found in a limited manner, and contextually, it is not confirmed among potential Egyptian entrepreneurs. Therefore:

H4. TIs have a positive impact on the business development of entrepreneurial ambitions.

4. Methods

4.1 Approach, Respondents and Data Collection

The researchers reviewed a large amount of literature to select suitable methods to explore the present study's problem. We applied a quantitative approach to gather the cross-sectional data. This approach is used by several scholars of the domain such as [1, 2, 4, 7, 12-15].

We targeted potential Egyptian entrepreneurs who are university students in business, management, economics, and commerce. These students use technology for various learning and educational purposes, i.e., communication, learning, and entertainment. Technology is a massive and significant source of information that boosts students' cognitive and mental development [10, 11]. Specifically, in the context of Egypt, students are dealing with and developing their mental approach through digital technology [11, 63].

With regard to the data collection process, we used an offline and online approach to gather the cross-sectional data. The offline survey was conducted through personal visits to the different general universities in Egypt that offer economics, management, business, and commerce degrees. Prior to entering the classes, we contacted the deans and directors to get permission. We used a convenience sampling technique to reach respondents due to its quicker response and utilization of minimum resources. Likewise, the online data was gathered through emails, WhatsApp groups, and Facebook pages. We correctly followed the ethical protocols of research. We got the survey from the departmental ethical committee of "the Deanship of Scientific Research, Vice Presidency for Graduate Studies and Scientific Research, King Faisal University, Saudi Arabia". Moreover, we got the respondents' permission to participate in the study, and we correctly ensured the privacy and confidentiality of their responses. In this manner, we collected 312 valid cases, and then these proceeded for final analysis.

4.2 Survey Tools, Reliability and Validity

The researchers applied the survey questionnaire to get the responses for the study. This questionnaire is already valid and reliable as it was adopted from the domain literature confirming. We further confirmed these assumptions by conducting a pilot study and collecting responses from 25 respondents. After entering these responses in SPSS, we calculated their reliability using Cronbach's alpha. We found all the items had great internal consistency, and the overall alpha was noted as 0.805, above 0.70. Also, we found loadings of the items, where all the items of scale loaded above the recommended values, i.e., >0.70 [64]. Furthermore, we contacted two specialists, specifically university professors, who were well-versed in SEM analysis. We also sent the survey to the professor of management, specifically of management and psychology, who ensured the content and physical appearance of the survey. After ensuring reliability and validity, we launched the collection of large-scale data.

4.3 The Full Collinearity Test

The misleading inaccuracy of the results is commonly brought by a standard method bias (CMB). In this way, researchers should be careful regarding this issue. In the present study, we conducted a collinearity test to avoid this significant issue following the recommendations of [65, 66]. We used a variance inflation factor (VIF) to calculate the complete collinearity analysis. A VIF greater than 3.3 underlines extreme collinearity with CMB, while its values less than or equal to 3.3 ensure CMB's unavailability. In the present study, all values of VIF are found to be less than 3.3 for all the constructs. These acquired values ensured no issue of CMB (Table 1).

Table 1 Full collinearity VIF.

Factor	VIF [<3.3]
Technological capabilities [TCs]	1.982
Searching sills [SKS]	2.823
Technology usage [TU]	1.832
Technology incentives [TIs]	1.666
Brain development [BD]	2.931

Source: The researchers' own calculations.

4.4 Measures

We measured TCs on three items, SKS based on four items, TU on four, and TIs on five items. All the items of TCs, SKS, TU and TIs were adopted from the study of [1]. Finally, the BD constructs are measured on five items adopted from the study of [9] as measured by [11]. We gauged all the questionnaire items using a five-point Likert scale (strongly agree to strongly disagree) (see details in Appendix A).

5. Results

5.1 Sample Characteristics

The sample characteristics suggest that most respondents were males (n = 214 or 68.59%) against females (n = 98 or 31.41%). With regard to the age of the respondents, the majority of respondents (n = 154 or 49.36%) were 25-34; 39.10% (n = 122) were 18-24, and only 11.54% (n = 36) were thirty-five and above years of age. Furthermore, the level of education indicator suggests that most respondents (n = 198 or 63.46%) were undergraduate, while the remaining (n = 114 or 36.54%) were postgraduate students. Finally, concerning to area of the study, the majority of respondents (n = 105 or 33.65%) were business students, 30.77% (n = 96) were management, 18.91% (n = 59) were economics and 16.67% (n = 52) were commerce students (Table 2).

Table 2 Sample characteristics.

Indicator	Features	Samples	Percentage
	Male	214	68.59
Gender	Female	98	31.41
	Total	*312*	*100.0*
	18-24	122	39.10
Age	25-34	154	49.36
	35 and >	36	11.54

	Total	*312*	*100.0*
Education level	Undergraduate	198	63.46
	Post-graduate	114	36.54
	Total	*312*	*100.0*
Subject/area	Economics	59	18.91
	Management	96	30.77
	Commerce	52	16.67
	Business	105	33.65
	Total	*312*	*100.0*

Source: Authors' questionnaire data.

5.2 Measurement Model

We conducted the calculation of the measurement model, where we recorded the indicators such as loadings, composite reliability *(CR),* average variance extracted values (*AVE*), and Cronbach's alpha reliability to ensure the associations among the items and their connection with respective constructs [67]. We fixed the cut-off ratio of loadings and CR as >0.70, AVE as >0.50, and alpha as >0.70, as suggested by [67, 68]. About loading, all the items qualified for their acceptance values (>0.70), while items such as TIs4 and BD2 did not qualify for the required values. Hence, we decided to exclude these values to make our analysis more robust and transparent. Likewise, the range of the values for AVE appeared to be greater than 0.50 (>0.50), which ensured adequate values. Concerning CR, we found these values for all the constructs as the above-required values (>0.70) and found them to be satisfactory. Finally, we confirmed all the constructs had fair internal consistency through Cronbach's alpha reliability, which also appeared within satisfactory and acceptable scores (>0.70) [64, 68] (Table 3).

Table 3 Measurement model.

Construct	Code	Loadings	CR	AVE	α
Technological capabilities [TCs]	TCs1	0.872	0.882	0.714	0.788
	TCs2	0.852			
	TCs3	0.810			
Searching skills [SKS]	SKS1	0.866	0.896	0.684	0.819
	SKS2	0.833			
	SKS3	0.809			
	SKS4	0.798			
Technology use [TU]	TU1	0.852	0.907	0.709	0.841
	TU2	0.849			
	TU3	0.837			
	TU4	0.829			
Technology incentives [TIs]	TIs1	0.899	0.919	0.740	0.822
	TIs2	0.870			
	TIs3	0.844			
	TIs5	0.825			

Brain development [BD]	BD1	0.872	0.900	0.692	0.837
	BD3	0.849			
	BD4	0.822			
	BD5	0.781			

Source: Calculated by the authors.

Notes: Excluded items = TIs4 and BD2.

CR = square of the summation of the factor loadings.

AVE = summation of the square of the factor loadings.

α = Cronbach's alpha.

Moreover, to detect the concern of multi-collinearity issues among the latent constructs, we applied the Fornell and Larcker criterion to conduct the assumption of discriminant validity as suggested by [64, 68]. As a result, each construct of the scale is found to have higher scores of the square root of each construct's AVE, which is higher than its connection (relationship) with another construct (Table 4). Hence, we achieved a satisfactory discriminant validity.

Table 4 Discriminant validity.

Constructs	1 BD	2 TCs	3 SKS	4 TU	5 TIs
1. BD	**0.828**				
2. TCs	0.817	**0.869**			
3. SKS	0.858	0.888	**0.814**		
4. TU	0.612	0.589	0.590	**0.602**	
5. Tis	0.137	0.097	0.115	0.119	**0.654**

Source: Estimated by the authors.

Note(s): BD = brain development; TCs = technological capabilities; SKS = searching skills; TU = technology use; TIs = technology incentives; "Diagonals represent the square root of the AVE while the other entries represent the correlations."

5.3 Structural Model

5.3.1 Model Fitness

Before jumping to path analysis, we ensured the model fitness brought robustness and consistency without any model fitness problem with the available data [64, 68]. In this way, we found all the model fit indicators within the adequate ranges as Chi-square/df (3.932), CFI (0.902), GFI (0.933), AGFI (0.939), NFI (0.942) and RMSEA (0.055). These acquired values ensure the satisfactory goodness of fit indices [64, 68] (Table 5 and Figure 2).

Table 5 Model fit indices.

S. No.	Model fit indicators	[appeared values]
1	Chi-square/df	[3.932]
2	CFI	[0.902]

3	GFI	[0.933]
4	AGFI	[0.939]
5	NFI	[0.942]
6	RMSEA	[0.055]

Source: Calculated by the authors.

Note: "CMIN = χ^2/chi-square/*df*; *df* = degrees of freedom; GFI = goodness-of-fit index; AGFI = adjusted goodness-of-fit index; NFI = normed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation".

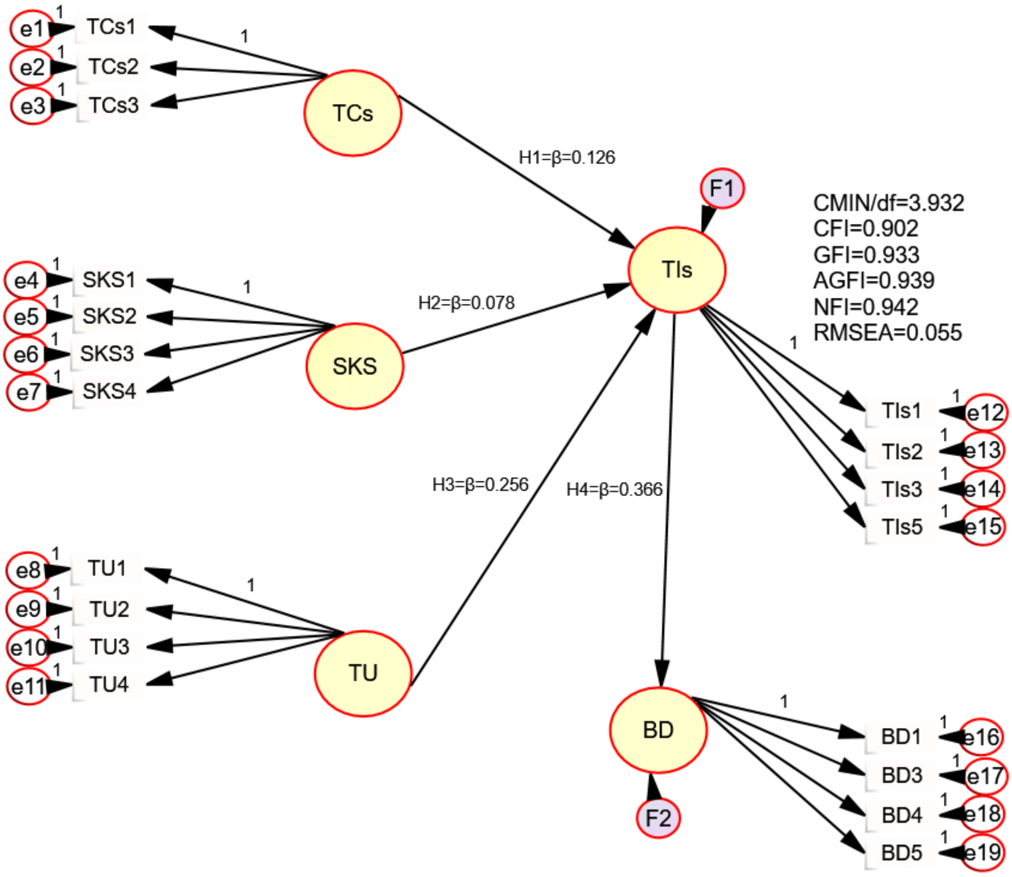

Figure 2 Path analysis. Source: The authors' calculation. Note(s): BD = brain development; TCs = technological capabilities; SKS = searching skills; TU = technology use; TIs = technology incentives.

5.3.2 Hypotheses Assessment

We applied structural equation modeling (*SEM)* using path analysis through analysis of moment structures (AMOS) as the best techniques and software for data analysis [69]. The data analysis shows a positive effect of TCs on TIs (H1 = β = 0.126; p < 0.01); SKS on TIs (H2 = β = 0.078; p < 0.01); TU on TIs (H3 = β = 0.256; p < 0.01). Therefore, H1-H3 is supported. Finally, the analysis also confirmed a positive effect of TIs on BD (H4 = β = 0.366; p < 0.01), which accepted the H4 (see Table 6 and Figure 2).

Table 6 SEM path analysis.

H.No	Proposed relationships	Estimate (β)	SE	CR	*P*	Acceptance = Yes/No
H1	TCs → Tis	0.126	0.034	3.687	0.000	*Yes*
H2	SKS → Tis	0.078	0.017	4.488	0.000	*Yes*
H3	TU → Tis	0.256	0.062	4.104	0.000	*Yes*
H4	TIs → BD	0.366	0.096	3.814	0.000	*Yes*

Source: Estimated by the authors.

Note(s): SE = standard error; CR = critical ratio; $p < 0.05$; BD = brain development; TCs = technological capabilities; SKS = searching skills; TU = technology use; TIs = technology incentives.

6. Discussion

The present study examined digital technology and brain development among entrepreneurial ambitions. The study employed the quantitative methods. The results of the study confirmed a positive effect of TCs on TIs. These outcomes are accorded with domain literature, such as the studies of [2, 4, 12, 13, 23, 43]. These results show that Egyptian entrepreneurial ambitions are capable and eager to use, understand, and manage information. They can also communicate with others using digital technology and its applications. Moreover, they can accomplish tasks faster, do remote work, and develop customer training using technology.

The study also established the positive effect of SKS on TIs, which is supported by the literature [1, 45-48, 50]. These results suggest that entrepreneurs feel potential because they are good at using and visiting websites. They can use the internet efficiently, which improves their competence in information searches. Besides, they are good at evaluating the reliability and integrity of online sources of information. Finally, they further understand the ethical/legal problems connected to access and use of digital material.

Moreover, the path analysis demonstrated a positive connection between TU and TIs among Egyptian entrepreneurs. These results align with several studies by [1, 40, 56, 57, 59] who claimed the positive effect of TU on TIs. These results demonstrate that the network technology assists entrepreneurs in searching for employment information, both daily and regularly. Besides academic accomplishments, they use technology that delivers material about local events, such as sports. They constantly use the internet for online purchases, billing, and banking. They further reveal that they use social media/post photos, etc., for different academic and career path purposes.

Finally, the study demonstrated a positive connection between TIs and BD, which is also supported by the literature [11, 18, 41, 62]. The results suggest that the cheaper, faster and higher data provision of a monthly internet subscription enhances the mental capability and BD of the students. Subsidies for technology devices advance the digital enclosure of the community and entrepreneurs. Besides, available network and video conferencing amenities benefit students in their assignments. They are confident and believe that activities that appeal to all of their brains assist them in feeling more relaxed. Learning about technology makes their brain more tranquil when getting an education. They feel less stress when they use technology in a group setting. Also, their brain is anxious when they do not use technology-associated activities. Their brain is more comfortable using technology to help access their education.

7. Conclusion

In conclusion, the study's overall outcomes establish a positive effect of different technology associates, such as TCs, SKS, and TU, on TIs. The study also found the positive impact of TIs on BD among Egypt's entrepreneurial ambitions. The results suggest that providing TCs, SKS, and TU is essential in developing TIs, while TIs also enhance BD among entrepreneurs.

The study's practical implications suggest that the study's findings assist and provide guidelines for various organizations and economies. For companies, investing in technological resources, skilled talent, and R&D will enhance their motivation to innovate and adopt new technologies, generating a competitive edge. The policymakers can develop policies that significantly improve national technological infrastructure and spur incredible innovation and economic growth. Economies with strong TCs are better situated to close the technology gap and increase global competitiveness. Eventually, strengthening these capabilities nurtures a positive response circle of innovation, augmented productivity, and long-term economic development. Besides, the study highlights that investing in developing vital research and SKS can increase technology adoption, leading to greater competence, creativity, and market adaptability for entrepreneurs. Furthermore, the study findings suggest that business incubators, and development agencies should invest in technology training and infrastructure to develop a more innovative entrepreneurial environment. Besides, entrepreneurs who are more visible to and comfortable with technology will likely seek more progressive digital solutions, leading to higher efficiency and attractiveness. Finally, TIs are found to be the best predictors of BD in entrepreneurs where these offer targeted incentives, such as grants, subsidies, or tax breaks. Policymakers and organizations can inspire entrepreneurs to adopt and assimilate the latest advanced technologies, improving their cognitive abilities, problem-solving skills, innovation, and creativity. This will also support the development of innovative business representations, higher productivity, and a greater capacity to adapt to swiftly changing market circumstances.

Concerning theoretical implications, the study's findings assist in developing theories where strong capabilities inspire earlier adoption and continuous innovation. The study's conclusions assist in fostering strong SKS within entrepreneurial teams, which can encourage a proactive approach to technological adoption, showing that businesses should continue to be adaptive and forward-thinking in swiftly changing markets. The positive connection between TCs, SKS, TU, TIs, and BD among entrepreneurs contributes to the literature on technology adoption, innovation diffusion, and entrepreneurial motivation. The findings reinforce the view that technology adoption is not static but a developing process shaped by ongoing interaction with the tools. Finally, the study's findings contribute to the literature on management, business, commerce, psychology, and economics, explicitly confirming the empirical evidence from a developing context.

The study has certain limitations, as it is limited to the students' contexts of universities in Egypt, where only business, management, commerce, and economics students were targeted as entrepreneurial ambitions. The study did not use any theory to underprop the study's framework, model, or hypotheses. We also conducted a quantitative cross-sectional study using a survey questionnaire. The study comprised limited factors such as TCs, SKS, TU, TIs, and BD. Finally, the results are based on only 312 cases.

In the future, the framework should concentrate on diverse theories such as Resource-Based View (RBV), Innovation Diffusion, and Dynamic Capabilities theories to underpin the conceptual framework. Regarding respondents, different entrepreneurs or students of medical and engineering universities should be considered suitable outlets for studies in the future. Future studies should concentrate on mixed methods approaches such as qualitative and quantitative. Finally, the sample size should be enhanced accordingly.

Appendix A

Technological Capabilities [1]

- I am capable of using, understanding, and managing information.
- I am capable of communicating with others using digital technology.
- I am capable of faster task completion, remote work, and improvement of customer training by using technology.

Searching Skills [1]

- I am good at using and visiting websites.
- Using the internet effectively improves the efficiency of information searches.
- I am good at assessing the reliability and credibility of online sources of information.
- I understand the ethical/legal issues related to access and use of digital information.

Technology Usage [1]

- Network technology helps me search for information about jobs daily.
- In addition to academic activities, the use of technology provides information about local events, including sports.
- I use the Internet for online purchases, billing, and banking.
- I use social media/post photos.

Technology Incentives [1]

- The monthly Internet subscription is cheaper, faster, and provides more data.
- Subsidies for technology devices improve the digital inclusion of the community.
- My municipality is working on upgrading its internal network (such as cable networks, routers, and/or wireless access points) for the general public.
- Accessible network and video conferencing facilities help children do their homework.
- The municipality is working to facilitate the sharing of computers for public online services.

Brain Development [9, 11]

- Activities that appeal to all of my brain help me feel more relaxed.
- Learning about technology makes my brain more relaxed in getting an education.
- I feel less stress when I use technology in a group cooperatively.
- My brain is anxious when I do not use technology-related activities.
- My brain is more relaxed when I use technology to get an education.

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Author Contributions

Abdelwahed NAA developed the conceptualization framework, hypotheses of the study, analyzed the data and discussed the results in the light of literature. Ramish MS developed the methods and write-up of the manuscript. Both authors accepted the final version after revisions.

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Competing Interests

The authors have declared that no competing interests exist.

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