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The Effectiveness of Entrepreneurship Ecosystem and EE Toward Enriching IG in Pakistan: The Moderating Role of EI

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Abstract:
This paper looks into the contribution of the (DEE) towards assisting people in low-income households in Pakistan to generate income. In particular, it explores whether the involvement in a DE ecosystem can contribute to the increase in income and the promotion of entrepreneurship among the university students. The survey which was made up of 500 students of five Pakistani state universities was conducted online and analysed with the help of the Partial Least Squares Structural Equation Modelling (PLS-SEM). The results indicate that DE has a positive impact on income-generating among B40 students in the university level. Besides, the findings show that EI moderates such that it reinforces the correlation between (DEE) and IG. In general, the research illustrates that DE with the help of technological involvement gives B40 students in Pakistan a feasible chance to earn revenues and engage in viable entrepreneurial activities. The results are valuable as they can be used by (HEI) and policymakers in order to encourage inclusive economic growth by means of (DE).

Keywords: Digital entrepreneurship, Income generating, Entrepreneurial Intention, Digital

Introduction:

Scholars, business practitioners, and policymakers have widely accepted that by promoting students to start their own businesses, they help promote economic growth and reduce poverty and create employment (Dobson and Muhammad, 2022). At the backdrop of more difficult economic times, coupled with the accelerated pace of technological progress, DE has become a highly important tool of transforming innovative ideas into feasible economic opportunities. According to Sahut et al. (2021), digital entrepreneurs have another set of challenges, unlike traditional business owners, since their production, promotional strategies, products, and work settings inherently are digital in nature. These unique features offer digital entrepreneurs flexible and scalable features unavailable to the non-digital entrepreneurs. The university students and especially those of low-income households (Bottom 40 or B40-equivalent groups) in Pakistan have increasingly taken an interest in DE as a source of income and livelihoods. Despite the extensive number of programs that have been introduced to reduce poverty in low-income populations, there are still various

structural, educational, and technological challenges that prevent the involvement of B40 students in the DE sphere. As a result, the given research was carried out to understand the nature of DE ecosystems in Pakistani universities better and their background. In the wider context of the policies in Pakistan, especially the Digital Pakistan Vision, the Youth Programme by the Prime Minister, and Kamyaab Jawan Programme, this study falls under the framework of entrepreneurship, innovation, and the development of digital skills as avenues to inclusive economic development. Like the higher education reforms in other emerging economies, these projects focus on the need of higher education institutions to inculcate entrepreneurial spirit, creativity, innovation, and practical problem-solving skills in students. Such skills are likely to contribute to innovation, job creation and economic empowerment especially to the marginalised groups. Ability to develop entrepreneurship is directly linked to the degree of innovativeness and technological preparedness of employees in universities. This highlights the relevance of an active entrepreneurship curriculum that is in line with Industry 4.0, sustainable entrepreneurship, and global digital threats. It is with this respect that DE is becoming a recognised career opportunity, which enables the attainment of the 2030 (SDGs),. It is estimated that in Pakistan, a large percentage of households belong to low-income groups with both the urban informal settlements and rural regions being highly concentrated. The academic unemployment has also increased the susceptibility to the economy, especially in the immediate aftermath of the COVID-19 pandemic that impacted young graduates and low-income families unevenly.

B40-equivalent graduates are more willing to engage in economic support of their families in the future, and DE can become a suitable alternative to the conventional ones. Though the level of interest toward DE among students is quite high, there is a limited amount of empirical research in this field (Yaghoubi Farani et al., 2017). EI is also singled out as a major driver of entrepreneurial behaviour as it inspires opportunity-seeking, self-reliant and proactive behaviour in people (Alferaih, 2022). Without EI, creating a business is not probable, so it is crucial to comprehend the forces that influence the desire of people to become an entrepreneur (Elnadi and Gheith, 2021).

It has been proposed that the universities offer the basic knowledge to be an entrepreneur, but the knowledge alone cannot ensure entrepreneurial success (Embiat et al., 2019; Fzlinda, 2019). This has created a continuous debate on the ability of universities to create high quality entrepreneurs who are able to achieve objectives of national development. It has also been shown that students with no formal education in entrepreneurship areless prone to becoming an entrepreneur, but exposure to entrepreneurship education can boost confidence, motivation, and interest in entrepreneurship (Fabeil, 2019).During the digital age, digital marketing and the use of technology has become an irreplaceable part of the entrepreneurship as it provides accessible and cost-effective entry to a broader market. The COVID-19 crisis increased digital use in all countries worldwide, forcing micro, small, and medium

enterprises to develop further digital strategies to be more resilient and competitive (Yusof et al., 2022). The digital policies and skills should be updated on a regular basis hence to have sustainable growth in the economy. Baig et al. (2022) highlight the role of entrepreneurship education in equipping students- especially those in the B40 background to be able to engage in DE.

Although the research on entrepreneurship as an agent of the Sustainable Development Goals has been an increasing scholarly interest, little empirical research has been conducted to study poverty in low-income student groups. The pandemic also intensified the situation of B40 students, as it is increasingly important to prepare them with industry-related digital and entrepreneurial competencies and keep them afloat in the post-pandemic labour market (Ratten and Jones, 2021). Students who are exposed to DE in the university can be able to acquire an entrepreneurial mentality and know some viable career opportunities that can be employed in the country in line with the goals of national development.Entrepreneurship is an option income-generating approach that graduates can adopt (Dobson and Muhammad, 2022) and fits the larger Pakistani agenda of minimizing the income inequality and youth unemployment. In line with this, the research paper intends to analyze how well the DE ecosystem increases the amount of income generated by B40 students in Pakistani

higher education institutions and also investigate the contribution of EI to this relationship. This study is based on two research questions:

Does the quality of (DEE) performance have any significant effect on the IG of the B40 students of universities?
Does the EI enhance this relationship?

The education on entrepreneurship has been growing as a strategic policy instrument to uplift the populations to end poverty (Kuratko, 2005; World Economic Forum, 2009; Weber, 2012; Neck et al., 2014; Piperopoulos and Dimov, 2015; Solomon and Matthews, 2014; Wu and Gu, 2017). The end goal of entrepreneurship education is to convert students into successful entrepreneurs who are able to create economic and social value (Kuratko, 2005; Greene and Saridakis, 2008; Thurik et al., 2013; Nabi et al., 2017). According to the World Economic Forum, entrepreneurship education is an essential part of economic and social development, which leads to job creation, innovation, and the development of new markets (Cancino et al., 2015; Galvao et al., 2017; Todtling and Trippl, 2005).
The increasing focus has resulted in the development of a number of entrepreneurship programmes worldwide (Abou-Warda, 2016; Gordon et al., 2012; Lyons and Zhang, 2018). In line with these international developments, the higher education sector in Pakistan has seen the need to incorporate DE in the curriculum of education institutions to facilitate the process of IG, innovation, and inclusive development. According to Galvao et al. (2020), by actively involving stakeholders in entrepreneurship education and training programmes, the EI and business outcomes are improved. Along this view, the DE ecosystem has become one of the important sources of economic growth, poverty alleviation, and employment (Dobson and Muhammad, 2022), especially in the case of low-income student groups.

Litrature Review:
The digitalisation phenomenon has created significant changes in the human culture especially in the ways organisations conduct their activities in the market place. The scholarly investigation, entrepreneurial practice, and policy-making of governments should have a complete picture of the determinants that support DE (DE) with the goal of stimulating economic growth and employment generation (Sahut et al., 2021). (DE) refers to entrepreneurial endeavors aimed at restructuring a service, an asset or a significant element of an organisation into the digital world (Le Dinh et al., 2018). The idea has developed as a result of the overlapping of the legacy entrepreneurship and new technologies, thus allowing companies to operate successfully in the digital age (Rippa and Secundo, 2019).The challenges faced by digital entrepreneurs compared to conventional ones are quite distinct, and the differences between the products, marketing techniques, and business environments are quite noticeable (Baig et al., 2022; Hull et al., 2007). It has been proven that the introduction of digital technologies in educational institutions can improve the entrepreneurial knowledge and skills of students and promote their innovation and competitiveness in the online market (Gunaseelan et al., 2022; Zainal and Yong, 2020).DE is important because it has the potential to boost economic development, create jobs, and enhance innovation. Policymakers and educators therefore need to put priority on activities that facilitate DE such as training, mentoring and access to digital infrastructure.

Digital Entrepreneurs Ecosystem:
The DE ecosystem is a significant component of modern business based on the presence of a digital ecosystem, which involves institutions, users, and relations between governments, industries, and universities. This ecosystem provides the students with a chance of becoming entrepreneurs and generating new ideas. As the regulatory framework, institutions play a dominant role in the development of the DE ecosystem (Sussan & Acs, 2017). People who have access to digital technologies are also considered key elements of this

ecosystem as users (Hu et al., 2016).

Significance of Teamwork:
The communication between governments, industries and universities plays a crucial role in the promotion of innovation and economic growth. According to the Triple Helix model, these stakeholders should be collaborative in order to develop a knowledge society and enhance innovativeness and economic development (Marques et al., 2021). Colleges, especially the universities, have a crucial position to play in imparting the original skills, ideologies and talent that are relevant to the DE.

Digital Entrepreneurship Education:
The education of DE is essential to improving entrepreneurial knowledge and skills of students, introducing innovation and competitiveness in the digital market, and developing an entrepreneurial mindset and potential (Zainal and Yong, 2020; Fabeil, 2019).

Income Creation and Entrepreneurship:
Entrepreneurship is also a major source of income and economic growth, as it provides jobs to people, which promotes economic growth (Langston, 2020; Sahut et al., 2021).

Entreprenuerial Intention:
The strength of acquisition of new behaviours and attitudes determines the EI, or, in other words, the willingness of a person to start a new business venture (Arshad et al., 2019; Ferreira et al., 2017). (EI) is an important concept that should be understood to understand the business start-up phenomenon.

Attitudes and Start-up Intention:
The provision of entrepreneurship education entails a conscious pedagogical approach and experiential learning activities, the main goal of which is the development of a necessary knowledge base, skill set and entrepreneurial mindset in students who are necessary for navigating and thriving within entrepreneurial pursuits (Ekpoh & Edet, 2011; Ooi et al., 2011).The Higher Education Commission (HEC) of Pakistan documents that graduate employability is a thorn in the flesh, and only a slight upward trend was noticed within the past years. According to national graduate job reports, a large percentage of university graduates fail to find jobs in the very first six months of university graduation. These statistics imply that many graduates in Pakistan are joining the labour market every year and fail to find an appropriate job, which is an alarming problem to the policymakers, educators and institutions of higher learning. The high rate of graduate unemployment has been an ongoing phenomenon which means that academic performance is no longer potent guarantee of successful entry into the labour market.The absence of soft skills and personal qualities are the factors that were discovered as the major contributors to graduate unemployment in previous studies. Hanapi and Nordin (2014) emphasized that the lack of soft skills and personal qualities is a major constraint of the employability of graduates. Equally, employer survey results, including those published by JobStreet.com (2012), have shown that about 60 percent of employers have weak personality characteristics and poor readiness to work in the job environment as key factors that have made them decline fresh graduates. According to this, Pakistan(2016) has found low self-confidence, no initiative, and a shortage of soft skills to be common factors that adversely affect graduate employability- which are becoming more and more apparent in the Pakistani environment.
To overcome these issues, there has been a renewed effort by the Government of Pakistan and institutions of higher learning to incorporate entrepreneurship training in university programs. These programs are in line with national agendas of higher education reforms that seek to deliver all rounded, entrepreneurial and industry prepared graduates. Instead of concentrating only on producing graduate entrepreneurs, these

programmes aim to provide students with entrepreneurial attitudes and transferable skills, which will make them self-reliant, flexible, and resourceful in an ever more competitive and uncertain employment market.

The adoption of programme to train entrepreneurial behaviour, attitudes, skills, and values in Pakistani universities has taken an upsurge in the inclusion of entrepreneurship related programmes and co-curricular activities in Pakistani universities. Some publicly funded universities have vigorously encouraged entrepreneurial activity by organising innovation shows, entrepreneurial competitions, start-up boot camps, business incubation

centres, and working with the public and private entrepreneurial development organisations. These programs are supposed to introduce the students with various academic backgrounds to entrepreneurial thought and practice, thus cultivating entrepreneurial behaviour and improving the ability of those graduates to be employed and have higher incomes.

Over the past years, the Government of Pakistan has taken several substantive initiatives that aim at empowering students in higher education in terms of their entrepreneurial competency. In line with the national development strategies that Vejayaratnam et al. (2019) have identified, Pakistan has been progressively placing entrepreneurship as one of the most important pillars of its higher education and economic reform agenda, the specific aim of which is to furnish university students with the entrepreneurial skills that they will need to compete in a globalised business environment. These programs are expected to develop a new generation of businesspersons who can make a contribution towards economic development, innovation and job creation especially with the growing digital economy of the country.Such initiatives are proven by empirical evidence in similar contexts. The literature investigating the motivation of university students towards entrepreneurship shows that profit orientation is one of the key factors motivating them to become entrepreneurs, and a considerable percentage of students showed significant interest in income-generating business (Vejayaratnam et al., 2019). With the present pace of technological advancement being witnessed in Pakistan, the DE skills are gradually finding their way into the curriculum of entrepreneurship studies to make sure that the students are competent enough to meet the pace of innovation and change of market demands.

The social and institutional support have been accepted as essential in nurturing the entrepreneurial skill sets in the students. In Pakistan there has been a rise in societal acceptance of entrepreneurship as a viable career option and this has led to students being proactive in learning entrepreneurial and digital skills willingly through universities, training centres and through development programmes run by the government. Structured institutional systems and educational committees have enabled access to digital resources and entrepreneurship learning opportunities and, consequently, increased the preparedness of students to take part in entrepreneurial actions (Kamaruddin et al., 2021). Therefore, entrepreneurial skills among higher education students are being advanced more frequently together with the expansion of digital infrastructure and experiential learning programs.In the bigger framework of the Fourth Industrial Revolution (IR 4.0), Pakistan has set its students in strategic positions to be able to adjust to the changes in technology at a high speed. According to Kamaruddin et al. (2021), modern students are living in an era of a more connective, faster, and more technologically transformative environment, which are some of the attributes of IR 4.0. The focus by the government on the integration of IR 4.0 ideas in the entrepreneurship education is aimed at developing the ability of the learners to react dynamically to the changes in the market trends and to gain the survival skills needed to succeed in the digitally-driven entrepreneurship.

As an additional measure to increase entrepreneurial readiness, the government has advanced Massive Open Online Courses (MOOCs) and online learning systems as tools of exposing students to internationally applicable business concepts and entrepreneurship. These digital programs have played an important role in the growth of entrepreneurial and technological skills, which enable the graduates to generate job opportunities, maintain livelihoods, and enhance economic development (Kamaruddin et al., 2021). The heightened awareness of DE in the society has also enhanced the capacity of the students to handle business

activities in the entrepreneurial environment.The policy interventions have been core to institutionalisation of entrepreneurship education in Pakistan. This has happened due to the introduction of national higher education and youth development policy that have helped in reforming the structures and incorporating entrepreneurship into the education system (Kamaruddin et al., 2021). Consequently, the teaching of entrepreneurship has become a mandatory or central aspect in most institutions of higher learning, which further supports the national agenda of entrepreneurial progress. It is also on these reforms that strategic plans were implemented with the objective of entrepreneurship development in the context of higher education (Santoso et al., 2021). Moreover, these policy frameworks have facilitated the introduction of a diverse number of entrepreneurship support programmes such as youth entrepreneurship, business incubation and acceleration, start-up financing, business development workshop, and graduate entrepreneurship programmes, which are administered by various organisational bodies within the public sector as well as semi-autonomous organisations. The broader institutional support has been enhanced with the efforts put forward by the agencies engaged in the technology development, support of the small and medium enterprises, the vocational training, and facilitating the trade (Kamaruddin et al., 2021).

In order to achieve an increased student engagement and full development of the skills, a number of national programmes have been introduced where youth entrepreneurship, cooperative development, agribusiness innovation, small enterprise modernisation and economic transformation initiatives are considered. Such programmes are focusing on entrepreneurial exposure of the students in various sectors, inclusive participation, and boosting the role of entrepreneurship in the economic development of the country.

Role of Higher Education and Challenges for students who become entrepreneurs after being exposed to Digital Entreprenuership Program

The concerted action of the Government of Pakistan, along with the higher education institutions in this area has produced good and positive results. Efforts by the country to enhance entrepreneurship development in the higher education sector have created many positive impacts since they have placed universities at the center of producing graduates with high entrepreneurial skills. These competencies will help the graduates to operate in an increasingly competitive labour market with more independence and resilience. In addition, the following rise in the individual income levels has also helped in the expansion of the national income structure. The aim to achieve better economic prosperity in Pakistan, supported by such policy initiatives, has been established on the need to enhance the skill sets that can support the students to improve their entrepreneurial expertise, especially in the field of business acumen (Ishak et al., 2018). To this end, EE is at the center stage in that it effectively imprints systematic entrepreneurial knowledge, skills and attitudes in the academic programmes and as such equips the students with the ability to translate learning into income-generating activities.In parallel, the incorporation of entrepreneurship-oriented policies has facilitated the integration of technology in the EE as manifested in the government-led institutions to implement digital learning tools, use of online business simulations, as well as technology-enhanced instructional systems. These programs have been found to be very useful in honing business skills and increasing technology application among learners that are required to compete digitally and in very competitive business worlds at local and global levels. Students in these programmes have recorded better focus, digital literate and polished business skills in accordance with global business practices (Bagheri and Pihie, 2011). This type of empirical evidence indicates the significance of legislative interventions and programme-based interventions on enhancing the synergistic effects of EE and technology usage on student preparedness to be digital entrepreneurs. The fact that the government has been working closely with the advisory bodies and the regulatory bodies in the higher education is another provision that reinforces its concern in cultivating both the soft entrepreneurial skills and the technological capabilities to make them adaptable and employable in a fast changing market.

Accounting as one of the key subjects in higher learning institutions has become critical in the description of the fiscal dynamics of the country, organisations, and individuals. Introduction of DE concepts and technology

based applications in accounting education is a strategic obligation to progressive governments that are adamant on sustainable development of the country (Zainuddin and Rozaini, 2010). The goal of the Pakistani government to develop accounting specialists who are familiar with the latest technological changes presupposes the significant investment into the entrepreneurship education which is highly oriented on the digital tools and platforms. The focus on technological integration of academic programmes equips accounting students with the power to solve complicated financial problems and analyse data using digital solutions (Wu et al., 2019). This program also shows that the government is determined to maintain a stable economy and fiscal security. Graduates who have been taught good EE and advanced technology utilization skills stand at a better more advantaged position to be valuable players in the economic development of nations.Although numerous students have gone through DE programmes, few of them take the entrepreneurial career path right after completing college. The main aim of such programmes is not only to produce entrepreneurs, but to equip students with flexible and transferable skills in the form of EE and technology application that would allow them to work in a variety of professional careers successfully. The facts show that about 10% of graduates are involved in entrepreneurial work soon after graduation (Hassan et al., 2020). This point of observation is important as it points out that entrepreneurship education is not about imposing a career choice on people as entrepreneurship, but by developing employability, flexibility, and problem-solving abilities.

In this regard, the Government of Pakistan and institutions of higher learning have implemented a policy line of thinking that enables students the liberty to decide in their vocational paths without being forced into entrepreneurial activities. Such independence is an indicator of care about the welfare of graduates and a motivating factor to involve more people in the process of generating national revenue via employment, innovation and taxes (Henry and Lewis, 2018). Although the entrepreneurship is not directly pursued by the graduates, the competency skills and the use of technology gained in these programmes allow them to stay competitive in the labour market and strong enough to withstand the economic uncertainty. Practice indicates that although a universal entrepreneurial implementation is impossible and even undesirable, a combination of EE and efficient use of technologies is the only way to achieve professional satisfaction, financial stability and national prosperity in the long term.

Theory Development

Social Cognitive Theory (SCT):

SCT by Bandura is one of the most famous and powerful theories in the field of social psychology (Bandura, 2005). It has transferred its impact to numerous areas (Nabi and Clark, 2008), and entrepreneurship learning is among them (Harinie et al., 2017). The theoretical framework is self-efficacy, which is a predictor of any behavior. Self-efficacy refers to the conviction that an individual has in his/her capacity to accomplish a task (Bandura, 1997). The theory holds that high self-efficacy level influences behavior, defines the steps that an individual undertakes, and enhances their persistence when faced with adversities (Bandura, 2005). According to researchers, it is a stronger relationship than most predictors applied in the study of entrepreneurship. As an example, Krueger et al. (2000) proposed that one of the major conditions of EI is self-efficacy. This is supported by the works of Harinie et al. (2017) and Liguori et al. (2018). Individuals that possess high entrepreneurial self-efficacy ESE tend to be more predisposed to entrepreneurship. In accordance with this, ESE is a good measure of how confident an individual is in the potential of developing a successful business (Karlsson and Moberg, 2013).

Social Capital Theory (SCT):

SCT Over the last two decades, the Social Capital Theory has monopolized influential popular social science theories and models (Adler and Kwon, 2002; Coleman, 1988; Fukuyama, 2002). The fact that the SCT has been able to give a definite meaning regarding well-being within individuals or groups has also made it

popular. SCT views capital as an asset, which is embedded in social interactions. The interactions therefore give rise to social capital especially the traits that youths acquire when they join different groups, be it at home, school and other organizations like self-confidence, trust, security and loyalty. In addition, a few researchers identified a connection between the development of various types of capital among an individual and his/her education level (Rogosic & Baranovic, 2016). Based on the theoretical frameworks of the study conducted by Coleman (1988), a number of studies have found a relationship between education and the emergence of social capital. Even though social capital was first conceptualised within the family setting by Coleman, this framework was further extended to social capital embedded in the community (Rogosic and Baranovic, 2016). Bourdieu (2011) further postulated that social capital has a role to play in the reinforcement of social reproduction especially when it is directly linked to the level of education of an individual. Schools and universities, in this respect, play a significant role in shaping, concentrating, and passing social capital (Rogosic & Baranovic, 2016).

Hypothesis Development:

The hypotheses outlined in the study are based on the theoretical perspectives as well as empirical evidence of the study variables. The systematic review of previous studies was conducted to investigate the connections between these variables and this informed the development of the main hypotheses. Besides this, the study takes into account the possible moderating effects in the relationships that are hypothesized.

Online Entrepreneurship System and Revenue:

DE ecosystem has become a pivotal element of modern innovation systems, which affect the organisational aims, organisation and networking activities of the overall business sphere (Konig et al., 2019; Satalkina and Steiner, 2020). Entrepreneurship contributes to economic development through multiple aspects of boosting innovation and economic activities and providing jobs, although the process involved comes with its complexities and tensions, which are inherent (Mu et al., 2020; Scholz et al., 2020).Digital skills and (ICT) have led to rapid changes in the world, which have radically altered global patterns of employment, communication, organisation, and learning (Chan et al., 2019). People, families, organizations, and government departments are being increasingly integrated to digitally empowered systems that convert the traditional physical processes into open-interactive and collaborative digital networks (Jain et al., 2015).

Available sources will always emphasize the importance of entrepreneurship education in developing entrepreneurial attitudes and skills in university graduates (Guerrero et al., 2015; Liu et al., 2022; Marques et al., 2018). Education can boost human capital by improving the knowledge and skill base on one hand as well as increase social capital by creating norms, values and professional networks, on the other. The educational institutions, especially universities, are considered as networking platforms and the linkage between students and industry players, where knowledge sharing and recognition of opportunity is made possible (Eesley and Lee, 2021).

Notwithstanding this, the contribution of higher education institutions in facilitating IG among B40 students has never been directly studied in a limited empirical research (Gordon et al., 2010; Hayter, 2013). Although the current literature recognizes the role of universities in developing human capital (Ilonen, 2021; Baig et al., 2022), limited information is available about how DE systems can convert educational achievements into real income-generating projects.Higher education institutions are crucial in encouraging and imparting students with the corresponding entrepreneurial and digital skills needed in innovation and involvement in the labour market (Eesley and Lee, 2021; Goyanes, 2015). Moreover, policy programs, especially those in less developed countries, focus on the combination of technological and entrepreneurial skills insourcing to make economic growth sustainable (Nambisan et al., 2019; Zhao, 2021). On the basis of these theoretical and empirical understandings, the hypothesis is formulated below:

H1: The success of the DE ecosystem has a positive relationship with IG.

Intermediate Effect of Entreprenuerial Intention.

Entrepreneurship education as a concept and applied field is characterized by some discrepancies in its aspects, especially in the formation of the curriculum and course design (Zhao, 2021). However, the learning organisation theory considers education as one of the most significant processes in the empowerment of individual skills and economic growth. Education assists in enabling competitiveness in the international markets as well as equipping people to react better to the emerging economic and technological demands (Harjanti and Noerchoidah, 2017).

Past studies have always identified the connection between the DE ecosystem and EI, particularly in the developing economy (Habib et al., 2020; Langston, 2020). Based on this background, the current research adds to the existing body of knowledge because it addresses how the EI can be moderating variable in determining the relationship between the DE ecosystem and the generation of income. Entrepreneurship education provides individuals with the knowledge, skills, and competencies required to formulate their intention to undertake the entrepreneurial activity (Dobson and Muhammad, 2022). High EI pushes students to take up entrepreneurial career thereby stimulating economic growth, generation of employment and poverty alleviation.

Empirical studies also show a significant positive impact of entrepreneurship education on the EI at university level (Ilonen, 2021; Turker and Selcuk, 2009). The results are in line with cross-cultural research that has proven that entrepreneurship education leads to improved EIs and knowledge under different settings (Baluku et al., 2019; Moriano et al., 2012). The same has been noted in Pakistan, whereby, sufficient exposure to entrepreneurship education has been found to play an important role in encouraging students to explore entrepreneurial careers (Dobson and Muhammad, 2022). When combined, these articles indicate that EI reinforces the capacity of people to take advantage of DE ecosystem to generate income. In this connection, the hypothesis is as follows:

H1: The success of the DE ecosystem has a positive relationship with IG

H2: The effectiveness of the DE ecosystem mediates the relationship between the effectiveness of the DE ecosystem and IG through EI.

H3: Technology use and IG has a positive moderating effect through EI where the impact of technology use on IG increase with the strength of EI.

Methodology

Design and Sample:

This study was based on the sample population which included students of low-income households (B40-equivalent group) attending five Pakistani Higher Education Institutions which are publicly based, that is, Univers (PU), (UoK), (QAU), (UET) and (NUST). These universities have been chosen because they have good reputation in entrepreneurship training, innovation efforts and because they are engaged in entrepreneurial development programmes within the national level. The unit of analysis, in this study, was the student that is in the B40-equivalent income group.

The inclusion criteria of study participation were:

(1) the student was required to be of low income household (B40-equivalent group);

(2) the student needed to have a monthly household income that was below the nationally established low-income level; and

(3) the student must have been a Pakistani citizen.

A cross-sectional online survey was selected as a method of data collection using a purposive sampling strategy and with the help of Google Forms. A survey link containing a structured questionnaire was sent to students of the chosen higher education institutions, and the participants received a cover letter that included information about the objective of the study and assured confidentiality and voluntary participation. The data

collection was conducted in the period between January 2022 and May 2022 where 500 full responses were received. The chosen size of the sample was considered sufficient to perform a PLS-SEM analysis (Adam et al., 2022).The demographic characteristics of the respondents were descriptively analyzed to establish that 39.7 percent of the respondents were men whereas 60.3 per cent were women. Ethnically, most of the respondents were Punjabis, then Sindhi, then Pashtun, and then Baloch among other ethnicities. With respect to education level, the majority of the respondents (89.0%), were undergraduate learners, with only 11.0% being postgraduate learners. Even the institutional distribution of respondents was well distributed with 20.0 per cent of respondents in each university meaning that there was balanced participation of respondents in the five universities selected in the study.

Measures:

The measurement instrument used in the data collection was adapted from well-established empirical research to ensure the validity of the measure and its contextual appropriateness (Adam et al., 2022). The total number of items in the questionnaire (besides the demographic information) was 43 and it contained five key constructs, classified based on their analytical roles, which contain: 1.DE Ecosystem (Independent Variable), 2.EE (Mediating Variable), 3.Technology Use (Mediating Variable), 4.EI (Moderating Variable) and 5.IG (Dependent Variable).

The Digital Entrepreneurial Ecology: (DEE) was operationalized as the independent variable and was measured in 17 items (DEE1-DEE17) adapted from Sooreh et al. (2011) and Salamzadeh et al. (2022). These items captured institutional entrepreneurial support, policies oriented to entrepreneurship, promotion of innovation and creativity, the involvement of stakeholders, knowledge-sharing mechanisms, collaboration with industry, incubators and science parks, student mobility between academia and practice, institutional autonomy and institutional responsibility in leading entrepreneurial ventures. This construct is the underlying environment for entrepreneurial learning and technology adoption and economic outcomes.

Entrepreneurial Education (EE): was operationalised as a mediating variable and was measured with the help of seven items (EE1-EE7) taken from previous research related to entrepreneurship education (Fayolle & Gailly, 2015; Nabi et al., 2017). The items measured the effectiveness of entrepreneurship curriculum, experiential learning approaches, recognizing the right opportunity, innovation ability, problem-solving ability, business planning knowledge, and readiness to enter an entrepreneurial profession. EE was included as a mediator to explain how entrepreneurial ecosystem translated in enhanced entrepreneurial capabilities and subsequent income generating outcomes.

Technology Use: (TU) was also modelled as a mediating variable that increases the relationship between the entrepreneurial ecosystem and income generating. This construct was measured based on seven items (TU1-TU7) adapted from DE and technology adoption studies (Zhao et al., 2021; Salamzadeh et al., 2022). The items reflected the level of utilisation of digital technology such as online platforms, e-commerce tools, social media, digital marketing, data analytics, and digital infrastructure in supporting entrepreneurial activities, market access, innovation and revenue generation. Technology Use was included to show the means by which resources in the ecosystem are transformed into direct economic products.

The Intention to be an Entrepreneur: Ei construct was specified as a moderating variable and was measured by using seven items (EI1-EI7) adapted from Tofan and Semizhon (2017) and Salamzadeh et al. (2022). These items indicated respondents commitment to undertake business while having the willingness to take risks, career preference, and intention to set up business after finishing their university education. EI was included as a moderator to account for individual-level motivational differences that might lessen the effects of

ecosystem-level and educational influences or that might increase the effects.

The Income Generation: IG construct was used in the current study as a dependent variable and indicated with five items (IG1-IG5) adapted from Helen et al. (2023). These included employability skills development, enabling small-scale business creation, poverty alleviation through entrepreneurship, lifelong learning readiness, career awareness and preparation for productive economic participation.All the measurement items were measured by a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). As a measure of reliability, Cronbach alpha and (CR) were used to assess measurement reliability and internal consistency. Data were gathered from the respondents in five higher education institutions, thus increasing the robustness and generalisability of the findings.

Prior to the main survey, a pilot study was carried out for establishing content validity, face validity and construct reliability (Adam et al., 2022). Expert validation by five scholarly experts in the field of entrepreneurship and digital innovation was used to assure content validity, and some form of refinements were done to enhance the clarity and contextual fit. Face validity was examined using 5 B40 students as respondents and they found no

ambiguity of the questionnaire items. Subsequently, 30 pilot questionnaires were distributed to students (B40) of the chosen universities. The pilot results showed that all constructs reached the threshold of the recommended Cronbach's alpha to suggest that the measurement instrument was appropriate for the full-scale study.

Table1 1
Descriptive Analysis Scores for DEE, EE, TU, EI, and IG

Construct	Mean	(SD)	Interpretation
1.DE Ecosystem (DEE)	3.69	0.37	High
2.EE (EE)	3.62	0.44	High
3.Technology Use (TU)	3.66	0.41	High
4.EI (EI)	3.58	0.49	Moderate
5.IG (IG)	3.73	0.49	High

Data Analysis

Analytic Table of the Study Variables:

The study based the analysis using descriptive statistics to establish the mean scores and standard deviations of the study variables. This discussion gives a summary of the views of the respondents concerning the major constructs that were analyzed in the research.

The general average score of DEE was 3.69 (SD = 0.37; Sekaran, 2000), which is a high level. This observation implies that the five higher education institutions had good abilities in creating entrepreneurial attitudes and abilities, and encouraging job creation and not job seeking among graduates. The implications of these findings are that institutional support of DE among B40 students is not new but further support needs to be enhanced by subsequent partnership with key stakeholders as well as sustained institutional support towards DE ecosystem. EE averaged 3.62 (SD = 0.44; Sekaran, 2000) which indicates a high level of the same. This implies that the entrepreneurship-related courses, experiential learning programs, and skills development programs provided by the universities are effective in improving entrepreneurial knowledge, innovation abilities, and opportunity recognition spur of the students. However, further training of B40 students on entrepreneurial principles through sustained enhancement of teaching strategies and real-life experience is required to enhance the outcomes of entrepreneurial skills.

On the same note, the total mean of TU stood at 3.66 (SD = 0.41; Sekaran, 2000) and this also portrays a high level. This observation shows that online platforms, digital tools, and technological resources are well employed by students in enhancing entrepreneurial actions, market access, innovation, and income-generating opportunities. The extensive rate of technology adoption indicates that the technological integration is the key factor in accelerating the entrepreneurial ecosystem and the level of revenue generation, though the increased focus on higher digital proficiency and new technologies may enhance the outcomes in entrepreneurship.
The average of the mean score of EI was 3.58 (SD = 0.49; Sekaran, 2000), which was moderate. This finding indicates that even though B40 students have a fairly good tendency to become digital entrepreneurs the confidence level, propensity to take risks and willingness to start businesses is still moderate. Hence, specific measures, such as EE and mentoring programmes, are needed to boost the level of EIs and motivation among the students.

Last of all, the IG construct had a large overall mean at 3.73 (SD = 0.49; Sekaran, 2000). It means that universities are effective in providing B40 with employability skills and lifelong learning ability and career awareness, thus making them productive wage earners and possible entrepreneurs. Even with this positive result, there should be efforts sustained to assist the students to open small-scaled enterprises in accordance with national development agendas and poverty alleviation policies.
Table 1 shows the overall descriptive statistics of DEE, EE, TU, EI, and IG.

Measurement Model

The analysis of the data was conducted with the help of Partial Least Squares Structural Equation Modelling (PLS-SEM), in the two-stage process, the measurement model and the structural model. During the first phase, PLS algorithm was used to test reliability of constructs and try out their validity.
Cronbach alpha and CR were used to measure the internal consistency reliability. Both reliability measures have been taken to have a threshold value of 0.70, which is suggested by previous research (Adam et al., 2022; Hair et al., 2017; Haq and Awan, 2020). These findings showed that all constructs such as (DEE), (EE), (TU), (EI), and IG satisfied the suggested reliability criterion. Cronbach alpha values were between 0.874 and 0.93 and composite reliability values were between 0.86 and 0.93, which ensured the appropriate internal consistency and reliability of the measurement items.The measure of convergent validity was evaluated through indicator (factor) loading and the Average Variance Extracted (AVE). All the retained items had a factor loading of between 0.603 and 0.915, which is higher than the acceptable level of 0.60 (Hair et al., 2017; Haq and Awan, 2020; Peterson and Kim, 2013). These findings reveal that the pointers were sufficient to demonstrate their respective latent constructs. Besides, all constructs AVE values were over the recommended cut-off of 0.50 and proved sufficient convergent validity (Hair et al., 2017; Haq et al., 2020; Huo et al., 2021; Nawaz et al., 2020, 2021).In the measurement model evaluation, three questions (DEE10, DEE15, and EI4) were dropped because of a low value of factor loading to enhance the overall quality of the measurement. After the deletion of the items, the AVE scores of all the constructs including EE and TU met the acceptable level, which again indicated convergent validity. The specific results are given in Table 2.
The Heterotrait-Monotrait (HTMT) ratio of correlations was used to test the discriminant validity, which is regarded as a strong measure of the discriminant validity in PLS-SEM (Hair et al., 2017). As per the accepted recommendations, the values of HTMT had to be less than 0.90 (Adam et al., 2022). The findings revealed that the all HTMTs between DEE, EE, TU, EI and IG were less than the predetermined threshold which indicated sufficient discriminant validity between the constructs. Table 3 represent the HTMT results.
The measurement model in general was found to have a good level of reliability, convergent and discriminant validity, meaning that the constructs of Digit Entrepreneurship Ecosystem, EE, Technology Use, EI as well as IG are well measured and could be used in further structural model analysis.

Structural Model

Direct Relationships

The third step of the data analysis was the structural model (path analysis) that was evaluated by means of Partial Least Squares Structural Equation Modelling (PLS-SEM) with the help of SmartPLS 3.0. This step was done after evaluation of the measurement model. The importance of the hypothesised relationships was tested on a bootstrapping procedure with 5,000 resamples, a process that is usually used to test both direct and indirect effects in PLS-SEM.

The coefficient of determination (R2) of the IG (IG) was 0.546 meaning that the model using predictor variables explained 54.6 percent of the variance in the IG. This is an indication of a moderate to high explanatory strength of the structural model.

The outcomes showed that the DE Ecosystem (DEE) directly influenced the IG (IG) in a significant and positive way (b = 0.346, t = 4.928, LL = 0.221, UL = 0.453), thus, proving H1. This result implies that any improvement in the DE ecosystem has a strong positive impact on income-generating among B40 students. Table 4 gives the detailed path coefficients and Figure 1 shows the structural model.

Moreover, EE was found to have a strong positive direct correlation with IG, which indicated that entrepreneurship-centered education and practical learning have a direct positive impact on enhancing students to generate income. Likewise, Technology Use (TU) showed a strong positive direct impact on IG, which proves meaningful use of digital technologies as one of the means to boost the performance of the entrepreneur and the economy.

Moderating Effects

The second aim of the research was to investigate the moderating role of EI (EI) on the correlation between the DE Ecosystem (DEE) and the IG (IG). In order to test the moderation of PLS-SEM, orthogonalization method was used as it is recommended by Henseler and Chin (2010) to reduce the multicollinearity between interaction term and the variables that make it up.

The moderating effect was determined as important based on bootstrapping with 5,000 resamples. It was calculated as the product of the exogenous variable (DEE) and the moderator (EI), and this generated the interaction term according to a process proposed by Adam and Mahadi (2018). As it can be seen in Table 5, the relationship between DE Ecosystem and IG was significantly mediated by the EI, which implies that the positive effect of the entrepreneurial ecosystem on IG is more strong with the students with the high EI.

Table 1

Descriptive Analysis Scores for DEE, EE, TU, EI, and IG

Construct	Mean	Standard Deviation (SD)	Interpretation
1.DE Ecosystem (DEE)	3.69	0.37	High
2.EE (EE)	3.62	0.44	High
3.Technology Use (TU)	3.66	0.41	High
4.EI (EI)	3.58	0.49	Moderate
5.IG (IG)	3.73	0.49	High

Table 2
Summary Results of Convergent Validity for DEE, EE, TU, EI, and IG

Construct	Item	Loading	CR	AVE
DE Ecosystem (DEE)	DEE1	0.696	0.911	0.772
	DEE2	0.722		
	DEE3	0.714		
	DEE4	0.734		
	DEE5	0.766		
	DEE6	0.722		
	DEE7	0.738		
	DEE8	0.759		
	DEE9	0.776		
	DEE11	0.854		
	DEE12	0.794		
	DEE13	0.770		
	DEE14	0.765		
	DEE16	0.728		
	DEE17	0.722		
EE (EE)	EE1	0.812	0.889	0.602
	EE2	0.798		
	EE3	0.774		
	EE4	0.746		
	EE5	0.791		
	EE6	0.765		
	EE7	0.803		
Technology Use (TU)	TU1	0.821	0.901	0.623
	TU2	0.846		
	TU3	0.798		
	TU4	0.772		
	TU5	0.814		
	TU6	0.786		
	TU7	0.829		
EI (EI)	EI1	0.797	0.879	0.646
	EI2	0.835		
	EI3	0.603		
	EI5	0.827		

Construct	Item	Loading	CR	AVE
	EI6	0.801		
	EI7	0.846		
IG (IG)	IG1	0.833	0.874	0.637
	IG2	0.846		
	IG3	0.915		
	IG4	0.805		
	IG5	0.765		

Note: CR = Composite Reliability; AVE = Average Variance Extracted. Items DEE10, DEE15, and EI4 were removed due to low factor loadings.

This step was a follow-up of the evaluation of the measuring model. The significance of the postulated relationships was analysed using path analysis, which enables the determination of direct effects, indirect ones (moderating) and indirect effects between the variables under study. Direct effects in PLS-SEM model are the general linear regression equations, whereas the indirect effects describe the processes that the independent variables impact the dependent variables. The bootstrapping procedure containing 5,000 resamples was used to assess the structural paths to determine whether the estimated coefficients are statistically significant. This bootstrapping procedure was used to create the path analysis diagram. DEE was the model independent variable, EE and TU were the model mediating variables, EI (EI) was the model moderating variable, and IG was the model dependent variable.

Its findings showed that the coefficient of determination (R2) of IG (IG) was 0.546, which showed that the influence of the independent variable DEE and the mediating variables (EE and TU) contributed to 54.6 percent of the change in IG (IG), and the interaction effect of the moderator EI. This observation indicates that the structural model is explanatory in a significant sense.

In particular, the results showed that the DE Ecosystem (DEE) produced a direct and positive impact on IG b = 0.346, t = 4.928, LL = 0.221, UL = 0.453), thus, Hypothesis H1 was accepted. This finding suggests that an effective entrepreneurial ecosystem affects income-generating outcomes directly. Along with this direct impact, the EE also had a considerable positive mediating impact, which implies that ecosystem-level support enhances the generation of income by enhancing entrepreneurial knowledge, skills, and competencies. On the same note, Technology Use (TU) was used as an intermediate, indicating that the DE ecosystem will boost income obtained by promoting usage and effective utilisation of digital technologies. Table 4 shows the direct and indirect impacts of DEE, EE and TU on IG and Figure 1 demonstrates them.

Moderating Effects

Moreover, the research investigated the moderating effect of EI , between DE Ecosystem (DEE) and IG. The orthogonalization technique was used to measure the moderation in the PLS-SEM context since Henseler and Chin (2010) advise that orthogonalization technique be used to minimize possible multicollinearity of interaction term and indicators.

Bootstrapping with 5,000 resamples was used to determine the importance of the moderating effect similar to the process proposed by Adam and Mahadi (2018). The interaction term was developed by multiplying the independent variable (DEE) with the moderating variable EI. The results of Table 5 showed that EI resulted in a significant moderating effect in the relationship between DE Ecosystem and IG that the positive impact of the entrepreneurial ecosystem on IG is greater among persons who have high levels of EI.

Table 3. Results of HTMT Criterion (Including New Variables)

Construct	DEE	EI	EE	TU	IG
DE Ecosystem (DEE)	—				
EI (EI)	0.116	—			
	CI.90 (0.131, 0.195)				
EE (EE)	0.284	0.341	—		
	CI.90 (0.210, 0.392)	CI.90 (0.276, 0.451)			
Technology Use (TU)	0.366	0.298	0.412	—	
	CI.90 (0.301, 0.472)	CI.90 (0.231, 0.387)	CI.90 (0.335, 0.521)		
IG (IG)	0.103	0.577	0.392	0.448	—
	CI.90 (0.133, 0.214)	CI.90 (0.511, 0.671)	CI.90 (0.315, 0.496)	CI.90 (0.362, 0.552)	

Note. Discriminant validity is established as all HTMT values are below the conservative threshold of **$HTMT_{0.85}$.**
DEE = DE Ecosystem; EI = EI; EE = EE; TU = Technology Use; IG = IG.

Table 4. Resulting Direct Relationships (Extended Structural Model)

Structural Paths	Path Coeff.	SE	t-Value	p-Value	Boot LL	Boot UL
DEE → IG	0.346	0.070	4.928	.001	0.221	0.453
EE → IG	0.289	0.065	4.446	.001	0.171	0.402
TU → IG	0.318	0.068	4.676	.001	0.198	0.439
EI → IG	0.264	0.062	4.258	.001	0.147	0.379

Note. All path coefficients are significant at **p < .01**, indicating that **DE Ecosystem, EE, Technology Use, and EI** exert significant positive effects on **IG**.

Results

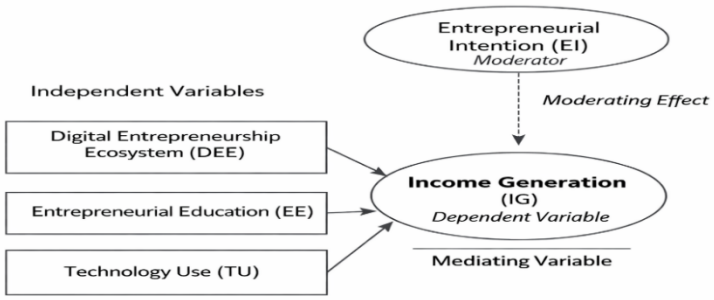

Table 5. for

Moderating Effects

Paths	Coefficient	t-value	p-value
DE Ecosystem → IG	0.427	6.440	.000
EI → IG	0.294	5.181	.000
DE Ecosystem × EI → IG	0.182	3.964	.000
EE → IG	0.289	4.446	.001
EE × EI → IG	0.167	3.521	.000
Technology Use → IG	0.318	4.676	.001
Technology Use × EI → IG	0.194	4.103	.000

Note: EI is an important factor that modulates the associations between DE Ecosystem, EE, Technology Use, and IG, meaning that the stronger the EI, the more the predictors affect the outcomes of the IG.
1.The findings suggest that the effect of DE Ecosystem on IG increases positively with the increase in EI. This observation supports the fact that there is a strong moderating effect and hence supports Hypothesis H2.
2.Hypothesis H3 was a hypothesis that used EI as a mediator between use of technology and IG. The findings suggest that there exists a positive and significant interaction effect of Technology Use x EI on IG (b = 0.194, t = 4.103, p <.001).
This observation implies that the beneficial effect of the use of technology on IG increases with the increase in the level of EI. As such, Hypothesis H3 is accepted.

Discussion

This research was aimed at testing the role that the DE ecosystem plays in boosting IG among B40 students as well as evaluating the moderating impact of EI. Moreover, research paper is an extension of previous studies since it considers EE and the use of technology as important explanatory variables that affect the creation ofincome in a digital entrepreneurial scenario. PLS-SEM was used to collect data on 500 B40 students in five Pakistani Universities. All in all, the results of this research are solid empirical evidence in support of the given framework since it is obvious that the DE ecosystem, education related to entrepreneurship, and the

use of technology play a significant role in IG, and the relations between the EI and the aspects mentioned above are enhanced.

To begin with, the findings indicate that the relationship between the DE ecosystem (DEE) and the IG (IG) is positive and significant. The result is consistent with the existing research indicating that the developed DE ecosystem can help students to elevate their socio-economic status through participation in income-generating entrepreneurial endeavors (Eesley and Lee, 2021; Liu et al., 2022; Marques et al., 2018). Salamzadeh et al. (2022) also highlighted that DE ecosystems form one of the most efficient measures of promoting online entrepreneurship, facilitating business development online, and making them sustainable by generating income. The case of the Pakistani higher education institutions is that universities are strategic centers in the Pakistani DE ecosystem, in that they offer infrastructure, digital assets, mentorship, and networking services that generate income among B40 students.

These results also indicate that the shift in the traditional systems of teaching to digitally driven systems of entrepreneurship is very vital in enhancing the abilities of students to generate income. This aligns with previous studies by Nambisan et al. (2019), Zainal and Yong (2020), and Zhao (2021) who have posited that entrepreneurial universities provide coherent and technology-facilitated learning experiences, which enhance long-term entrepreneurial skills. These are the kind of environments that not only promote employability, but also lead to other larger objectives of environmental sustainability and inclusive economic growth. The experiential learning opportunities, institutional support and networks integrated in the entrepreneurial Universities enhance the chances of students successfully engaging in DE.

Second, the article offers empirical data that EE (EE) produces an impact of great importance and is positive on IG. The finding aligns with available literature that suggests that a student with an entrepreneurship education background has the appropriate knowledge, skills, and competencies needed to identify opportunities, manage online businesses, and generate sustainable revenue (Dobson and Muhammad, 2022; Guerrero et al., 2015; Nabi et al., 2017). EE allows students to increase their cognitive preparedness and self-efficacy, and makes them able to use theoretical information on practical entrepreneurial actions. As far as B40 students are concerned, the role of the organized EE is a key to decreasing income disparity giving these students the skills and the entrepreneurial attitudes that would be relevant in the market.

Third, the results indicate that the use of technology (TU) has a powerful and positive effect on IG. This confirms previous research on the importance of digital technologies, including e-commerce platforms, social media marketing, digital payment systems, and analytics tools in boosting business performance and revenue performance (Autio et al., 2018; Kraus et al., 2019; Vial, 2019). Proper application of technology enables students to tap wider markets, lower the operation expenses, and enhance business expansion. Still in accordance with the trends of entrepreneurial universities, technology adoption is one of the enabling operational factors that help in converting entrepreneurial ideas into viable income-generating projects, especially in digitally intensive settings.In addition, the findings substantiate the interactive nature of the EI (EI) between the DE ecosystem and the generation of income. The effect of interaction implies that the higher the EI of the students, the more they can use ecosystem resources to earn income. The given finding aligns with the existing studies (Dobson and Muhammad, 2022; Habib et al., 2020) and supports the argument that EI is one of the most important psychological processes through which the environmental support is converted into economic results. The finding is theoretically based on Social Capital Theory (Coleman, 1988) and Social Cognitive Theory (Bandura, 2005) that propose that individual intentions and behaviours are influenced by their learning experiences, socialization, and institutional support (Arshad et al., 2019; Ferreira et al., 2017).Moreover, the moderating effect of EI is also extended to the associations between EE, use of technology and IG. The student having more EI can easily translate the educational inputs and technological resources to the income generating results. The given finding highlights the strategic role of EI in business start-up (Park, 2017) because intention is a crucial antecedent to

entrepreneurial action and performance. The better placed students have high motivation, persistence, and goal orientation which helps them transfer educational learning and technological potential to actual income. In general, this paper concludes that the comprehensive DE model, where support is provided on the ecosystem level, EE, and the use of technology and EI, is necessary to increase the level of IG among B40 students. One of the measures that can be taken to mitigate youth unemployment, skill gaps, and national socio-economic development goals is the promotion of entrepreneurial universities in Pakistan. Higher education facilities can transform the DE to become inclusive and sustainable through enhancing structural and individual level factors.

Implications, Future Research Directions and Conclusion.

Conclusion:

The research has been able to meet its aims and objectives as it has empirically confirmed the moderating effect of (EI), in the correlation between the (DEE) and (IG) among the B40-equivalent low-income university students in Pakistan. The study was based on 500 students studying in five schools of higher education (HEIs) in Pakistan: 442 males and 446 females participated in the analysis of the proposed conceptual framework. The data collection was analyzed using (PLS-SEM): a statistical tool that allows considering the study population by gender. The results verify that DEE has a strong and positive influence on the generation of income and the interdependence between the two increases with higher levels of EI among the students.

Besides the framework, this research paper can be regarded as the extension of the existing body of work by revealing that (EE) and (TU) play a prominent role in the IG. The findings indicate that students with organized entrepreneurial training and active use of digital technologies are at a better place of transforming entrepreneurial opportunities into sustainable income. EI is critical in maximizing such effects by making students more motivated, persistent, and able to be entrepreneurial in digitally enabled settings.

On the whole, the results suggest that a working DE ecosystem based on EE, the use of technologies, and a high level of EI can improve the decision-making capabilities of students, their business practices, and revenue-generating opportunities. This paper offers the basis on which low-income university students of Pakistan can assume more effective motivational and strategic strategies to enhance income and entrepreneurial performance.

Theoretical and Managerial Contributions.

Theoretical Contributions

Theoretically, the paper will add to the existing body of literature in entrepreneurship and digital economy as it combines the theory of DE ecosystem with the theory of EI, EE, and use of technology to describe how income is generated in the context of a developing country. Although previous works have focused on the importance of universities as the focal points of entrepreneurship learning and skill-building, little empirical data has been used to investigate the interaction between these variables in a DE ecosystem to determine their impact on low-income student income levels.

This paper fills this research gap by empirically confirming a detailed conceptual framework, which puts EE and technology adoption in the role of key enablers, and EI in the role of a primary psychological process that converts ecosystem resources into economic performance. The theoretical basis of the findings is the Social Cognitive Theory (Bandura, 2005), and the Social Capital Theory (Coleman, 1988), which emphasize the importance of the learning environment, behavioural intention and institutional support as they collectively influence entrepreneurship results. This theoretical contribution is especially helpful, considering the endemic issue of graduate unemployment and poverty in Pakistan.

Policy and/or Practical Implications.

In practice, the results provide significant insights into the Pakistani institutions of higher education, policymakers, and development agencies. The findings highlight the necessity of HEIs to leave the traditional academic learning process and change towards digitally empowered EE models incorporating experiential learning, adopting technologies, and collaborating with industries. Integrating the principle of entrepreneurship in university programs will contribute to making the students more prepared to engage in self-employment and income-earning activities.

Moreover, the high role of technology utilization demonstrates the need to offer access to digital technology to students, including e-commerce opportunities, digital marketing technologies, fintech solutions, and online marketplaces. In the case of low-income students, specialized digital education and access to cheap technology may go a long way in lowering barriers to entry into the world of entrepreneurship.

On a policy level, the results endorse national policies in Pakistan to empower youth, ensure their digital access, and reduce the poverty level, including the Digital Pakistan Vision, the Prime Ministers Youth Programme and Kamayaab Jawan Programme. The proposed framework can be used by policymakers in designing interventions beneficial to developing EI, enhancing DE ecosystems, and encouraging inclusive economic development among marginalised communities.

Future Research Directions and Limitations.

Irrespective of its contributions, this research is faced with a number of limitations that offer future research opportunities. To begin with, the sample was not representative because the researcher selected only five governmental universities in Pakistan, which might not have been representative. Future research needs to incorporate the private universities, (TVET) institutions, and rural HEIs to increase representativeness.Second, this paper interviewed only students and not faculty members, administrators and industry mentors who are also a vital part of developing the DE ecosystems. Future studies may take a multi-stakeholder approach in order to have a more comprehensive view of the ecosystems.

Third, although this research involved EE and the application of technology, the future study can enlarge the model by incorporating other variables like digital skills, access to finance, institutional support, social entrepreneurship, and the effectiveness of government policies. The longitudinal research designs are also suggested to be applied to the investigation to monitor the fluctuations of the EI and IG over time.

Lastly, further research might investigate the differences between the genders especially on women entrepreneurship in the digital world, since there are special barriers and opportunities that women in Pakistan have. Comparison across regions or countries can also contribute to knowledge by emphasizing regional differences in the development of DE.

Data availability statement: The data supporting the findings of this study are available from the corresponding author on reasonable request.

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