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## An Investigation of the Mechanisms of Technology Transfer and Automation in Universities: A Case Study on Promoting Entrepreneurship and Startup Ecosystems at Bangladesh Open University

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### ABSTRACT

This study conducts a thorough analysis of the processes involved in technology transfer, automation, and entrepreneurship at Bangladesh Open University (BOU), using a qualitative research methodology. The study utilizes thematic analysis, supported by NVivo, to extract valuable insights from interviews with 30 important stakeholders, including academics, students, and administrators. The results indicate moderate achievements in the transfer of technology, characterized by difficulties in commercializing university research and developing robust industry connections. Within the field of automation, the study emphasizes the important role it plays in improving access to education, while also acknowledging the difficulties created by limited digital skills and unequal distribution of resources. The expansion of the entrepreneurship ecosystem at BOU is clearly visible, but, it is limited by a requirement for stronger support systems, namely in the areas of mentorship and funding. These qualitative views provide a detailed and subtle viewpoint on how BOU aligns with or deviates from well-known ideas like the Triple Helix Model and Academic Entrepreneurship Theory. They emphasize the distinct problems and opportunities that arise in an open university environment. The study's results make significant contributions to scholarly discussions, highlighting the importance of customized approaches in incorporating technology and fostering entrepreneurial growth in higher education, particularly in the context of developing nations.

### INTRODUCTION

The importance of the contextual background of technology transfer and automation in universities is increasingly acknowledged as crucial in determining the function of higher education in fostering innovation and economic development. During the late 20th century, universities have become actively involved in technology transfer, which has had a substantial impact on regional and national innovation systems. This shift was emphasized by Etzkowitz and Leydesdorff (2000) in their study of the 'Triple Helix' model. Mowery *et al.* (2004) thoroughly analyze the impact of regulatory changes, such as the Bayh-Dole Act, on the evolution of commercializing academic research. Their study highlights the significant economic consequences of this evolution. Simultaneously, the emergence of automation technologies, as examined by Selwyn (2017) and Bates (2015), is transforming educational processes and administration, signifying a change not just in technology but also in teaching methods. The combination of technology transfer and automation promotes collaborative innovation and poses specific difficulties in aligning academic research with business demands. This dynamic has been examined by Perkmann *et al.* (2013) and Agrawal (2001). Moreover, it is essential to comprehend the diverse effects and strategies related to the adoption

and integration of these trends on a global scale, especially in developing nations. This is thoroughly examined by Hazelkorn *et al.* (2014) and Cloete *et al.* (2015), offering a comprehensive understanding of the changing landscape in contemporary higher education.

The need of fostering entrepreneurship and startup ecosystems inside the higher education system has become more evident due to their diverse advantages in terms of economic growth, innovation, and educational enhancement. Universities are being increasingly acknowledged as catalysts for economic development, particularly by promoting entrepreneurship. The study conducted by Siegel *et al.* (2007) titled "Commercial Knowledge Transfers from Universities to Firms: Improving the Effectiveness of University-Industry Collaboration" highlights the substantial contribution of university-originated startups in terms of job creation and regional economic regeneration. The impact of higher education institutions on fostering innovation is extensively established. According to Guerrero *et al.* (2016), in their study titled "Entrepreneurial Universities in Two Different Contexts: Similarities and Differences", they contend that entrepreneurial activities within universities are essential for enhancing national competitiveness in a globalized economy. Participation in entrepreneurial endeavors provides pupils with vital skills such as

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creativity, analytical reasoning, and flexibility. In their study titled “The Impact of Entrepreneurship Education on Entrepreneurial Attitudes and Intention: Hysteresis and Persistence” (Fayolle and Gailly, 2015), the authors emphasize the enduring and beneficial influence of entrepreneurship education on students’ entrepreneurial mindset. Integrating entrepreneurship into university curricula fosters a more practical and multidisciplinary approach to education. In their publication titled “Fostering University-Industry Collaboration: Entrepreneurship and University Spinouts,” Wright *et al.* (2017) highlight the significance of entrepreneurial ecosystems in improving the practicality and usefulness of university research and teaching.

Universities that possess robust business ecosystems frequently experience enhanced status and appeal. The study conducted by Nelles and Vorley (2010), titled “From Policy to Practice: Engaging and Embedding the Third Mission in Contemporary Universities,” explores the ways in which entrepreneurship improves a university’s reputation and attractiveness to stakeholders. The paper “Creating Entrepreneurial Universities in the UK: Applying Entrepreneurship Theory to Practice” by Kirby (2006) discusses how entrepreneurial activities might generate new sources of income and prospects for long-term growth and progress in universities. The case studies of renowned universities such as Stanford and MIT, as examined in Shane’s (2004) “Academic Entrepreneurship: University Spinoffs and Wealth Creation,” offer useful insights into successful strategies for promoting entrepreneurial environments. Entrepreneurship in higher education is vital for tackling local and regional difficulties within rising economies. Naudé *et al.* (2014) emphasize in their work “Entrepreneurship in Economic Development” the adaptability of entrepreneurship to suit specific local requirements and circumstances.

Gaining a comprehensive understanding of the worldwide significance of entrepreneurial ecosystems in higher education provides significant insights for institutions such as Bangladesh Open University. Implementing these ideas in the specific local environment has the potential to greatly improve the university’s contribution to the progress of the nation’s economy and education. An in-depth analysis of Bangladesh Open University (BOU) entails studying its distinct role in the realm of higher education in Bangladesh, primarily in terms of technology transfer, automation, and promoting entrepreneurship. Bangladesh Open University (BOU) is renowned for its pioneering approach to distant learning in Bangladesh. The model of this program is essential in a country where many people have limited access to traditional campus-based education. It aims to provide educational opportunities to diverse and often underprivileged populations. Rahman and Islam (2013) examine the strategy and problems of the university in their study titled “The Role of Bangladesh Open University (BOU) in Expanding Education for Rural Development”. The study emphasizes the university’s

importance in wider educational and societal contexts. The university’s emphasis on technology adoption, specifically for online learning, is a crucial area of concentration. The study conducted by Amin and Greenwood (2018), titled “Challenges and Opportunities for Higher Education in Bangladesh: The Case of Bangladesh Open University,” examines the obstacles and possibilities that the BOU encounters in incorporating technology to improve its educational delivery and outreach. Automating administrative and academic processes: The level and influence of automation in BOU’s administrative and academic procedures are remarkable. This feature is consistent with the wider patterns in higher education worldwide, but it presents distinct difficulties in the specific circumstances of Bangladesh’s infrastructural and digital divide problems.

BOU’s role in encouraging entrepreneurship and startup ecosystems, notably through its educational programs and support services, is receiving significant attention. Entrepreneurship education and assistance are key components of this function. The study conducted by Hossain *et al.* (2019) titled “Entrepreneurship Education and Training at the Open University: The Bangladesh Perspective” in the “Asian Journal of Distance Education” investigates the integration of entrepreneurship education into the curriculum of BOU and the potential effects of these initiatives. Collaboration & Technology Transfer: The efforts made by BOU to create connections with industry and other educational institutions for the purpose of transferring technology and working together on projects are of utmost importance. These endeavors align with worldwide patterns but are customized to suit local requirements and circumstances, as examined by Chowdhury and Miah (2020) in their article titled “University-Industry Collaboration for Innovation in Bangladesh: The Role of Bangladesh Open University”. Strategic Position and Future Directions: The impact of BOU’s strategic position in Bangladesh’s educational environment, namely in the areas of distant learning, technological integration, and entrepreneurship activities, is highlighted in scholarly discussions on socio-economic growth. The paper by Karim *et al.* (2021), titled “Strategic Planning for Distance Education in Bangladesh: A Focus on Bangladesh Open University,” examines possible areas for growth and future orientations in distance education in Bangladesh. By examining Bangladesh Open University, these research and analyses offer valuable perspectives on the distinct difficulties and advantages it faces in the areas of technology transfer, automation, and promoting entrepreneurship. To comprehend the impact of the university on the educational and socio-economic landscape of Bangladesh, it is crucial to consider its involvement in distant learning, utilization of technology, and promotion of entrepreneurial education.

### Research Problem

The central research problem of this study is the gap in understanding and effective implementation of

technology transfer and automation in universities, particularly in developing countries and institutions like Bangladesh Open University (BOU). This gap is evident in the challenges faced in adapting these processes to foster entrepreneurship and startup ecosystems, as underscored by Amin and Greenwood's (2018) examination of technological challenges at BOU. Moreover, there is a pressing need for context-specific research, as existing literature predominantly focuses on Western contexts, leaving a void in understanding the unique dynamics in universities like BOU, as highlighted by Chowdhury and Miah (2020).

### Research Objectives

This research has multiple objectives: Firstly, in order to assess the current status of technology transfer and automation at BOU, it is important to comprehend the existing frameworks and practices, as highlighted by Rahman and Islam's (2013) research. Furthermore, we aim to examine the influence of these dynamics on the growth of entrepreneurship and startup ecosystems at BOU. This will involve evaluating the efficacy of these dynamics and pinpointing areas that can be enhanced, drawing from the findings of Hossain *et al.*'s (2019) research on entrepreneurship education. Furthermore, the study seeks to recognize worldwide exemplary methods and modify them to suit the specific circumstances of Bangladesh. It will provide practical suggestions for improving BOU's contribution to promoting entrepreneurship, in accordance with strategic insights from Karim *et al.* (2021).

The project aims to enhance the academic literature by presenting a comprehensive case study of BOU, addressing a significant vacuum in knowledge regarding technology transfer, automation, and entrepreneurship in higher education in developing nations.

This project is expected to provide significant contributions to academic understanding and practical applications in higher education, technological transfer, and entrepreneurship. From an academic perspective, this study fills an important research void by shifting attention to the setting of a poor country. Specifically, it explores the distinct challenges and opportunities faced by an open university. This method is important because the majority of existing research, such as Wright *et al.*'s (2017) study on academic entrepreneurship, mostly concentrates on institutions in Western or industrialized countries. This research enhances the academic conversation by offering a detailed investigation of BOU, a less-explored educational setting, and providing new insights. In addition, it enhances the comprehension of technology transfer and automation at universities, expanding on previous research such as the study conducted by Siegel *et al.* (2007), which investigates the transfer of commercial expertise in higher education. The study provides a distinctive context by examining these processes inside the environment of BOU, a remote learning institution in a poor nation. This offers new insights into the integration

of technology in educational systems.

The research aims to provide strategic and context-specific recommendations that can be immediately applied to BOU and comparable institutions in developing countries, resulting in tangible contributions. This element corresponds to the difficulties and possibilities of incorporating technology, as examined by Amin and Greenwood (2018) in their study of BOU. The purpose of these proposals is to improve policy-making and educational practices, specifically in relation to the integration of technology and the development of entrepreneurship at universities. The results are anticipated to offer significant perspectives for educational administrators and policymakers, highlighting the policy implications observed in research like as Hossain *et al.*'s (2019) investigation of entrepreneurship education at BOU. Furthermore, the study elucidates the distinctive dynamics at BOU, so establishing a foundation for future research in analogous settings. It also presents a replicable or adaptable model for other developing nations. The study conducted by Chowdhury and Miah (2020) highlights the significance of this contribution in enhancing the overall comprehension of the involvement of universities in technical and entrepreneurial advancement, particularly in the context of university-industry partnership in Bangladesh. The primary objective of this research is to enhance the knowledge and application of technology transfer, automation, and entrepreneurship in higher education, specifically in developing countries. The research will provide valuable insights and strategies for institutions such as Bangladesh Open University.

### LITERATURE REVIEW

The origins of technology transfer in universities can be traced back to the period following World War II. At first, university research mostly focused on meeting the needs of national security and public welfare. Etzkowitz (2003) states in "Research Groups as 'Quasi-Firms': The Invention of the Entrepreneurial University" that during this time, there were primarily informal partnerships between university researchers and industry. Nevertheless, in the later part of the 20th century, there was a significant change in thinking. Universities started to be seen as important contributors not only to the development of knowledge, but also to its practical application and commercialization. The progress mentioned was partially motivated by the acknowledgement of the economic possibilities of academic research, resulting in a more organized method of technology transfer.

The process of formalizing technology transfer in universities acquired momentum through significant legislative measures, such as the Bayh-Dole Act of 1980 in the United States. In their study titled "Ivory Tower and Industrial Innovation: University-Industry Technology Transfer Before and After the Bayh-Dole Act," Mowery *et al.* (2004) emphasize that the Bayh-Dole Act enabled universities to maintain ownership of

intellectual property rights for research funded by the federal government. This, in turn, motivated universities to participate more actively in the transfer of technology. This event signified a pivotal moment, resulting in a significant surge in the number of patents and licenses pursued by institutions. The efficacy of this strategy in the United States prompted its implementation in other regions across the globe. Geuna and Nesta (2006) highlighted in their study “University Patenting and Its Effects on Academic Research: The Emerging European Evidence” that the European Union and other countries started adopting comparable laws, resulting in a wider global adoption of university technology transfer efforts.

### Contemporary Trends and Emerging Challenges

In the present day, the process of transferring technology in universities involves several actions that go beyond the scope of patents and licensing. This includes the formation of academic spin-offs, construction of company incubators, and proactive involvement in regional economic development. In their 2017 article titled “Academic Entrepreneurship: Time for a Rethink?”, Wright *et al.* discuss the need to reconsider the concept of academic entrepreneurship. Highlight the broadening and growth of technology transfer initiatives. In addition, the idea has developed into interconnected innovation ecosystems that involve partnerships between universities, industry, and government. This is known as the “Triple Helix” model, as explained by Leydesdorff and Etzkowitz (2001) in their work “The Transformation of University-Industry-Government Relations.” Technology transfer encounters various obstacles, including the need to synchronize university research with industrial demands, handle intellectual property rights, and guarantee fair access to discoveries, notwithstanding its expansion and accomplishments. Siegel *et al.* (2007) discuss the current issues in “Commercial Knowledge Transfers from Universities to Firms: Improving the Effectiveness of University-Industry Collaboration.” The historical development highlights the changing role of universities from conventional educational and research institutions to becoming crucial contributors to innovation and economic growth through the transfer of technology. This evolution signifies a more extensive shift in the perception and expectations of universities in society, as they adapt to and exert influence on the economic and technological aspects.

The present advances in automation and their influence on higher education are significantly influencing the terrain of learning and instruction, administration, and research. These developments indicate a notable change towards integrating cutting-edge technologies to improve efficiency, customization, and accessibility in higher education. The integration of Artificial Intelligence (AI) and Machine Learning (ML) is enabling the provision of tailored learning experiences in higher education. The study conducted by Zhang *et al.* (2020) in the “AI & Society” journal, titled “Artificial Intelligence in Higher

Education: Past, Present, and Future,” investigates the utilization of AI systems in customizing educational material to suit the unique requirements, preferences, and learning approaches of individual students. AI is optimizing and simplifying administrative operations in universities through automation. In their publication “Artificial Intelligence in Education: Promises and Implications for Teaching and Learning”, Dede *et al.* (2019) from Harvard University examine how AI is facilitating the more effective handling of administrative tasks such as admissions, scheduling, and student services.

### Adoption of Robotics and Automation Technologies: Improved Research Capabilities

University research laboratories are increasingly utilizing robotics and automation technologies. According to Kostakis *et al.* (2020) in their study “The Impact of Robotics and Automation on Research in Higher Education”, the utilization of these technologies is greatly improving research capacity, particularly in areas like as engineering, medical sciences, and environmental studies. Universities are integrating robots and automation into their curricula to offer practical training and foster skill development among students. The research “Integrating Robotics in Higher Education: Challenges and Opportunities” by Patel and Mehta (2021), published in the “Journal of Engineering Education,” emphasizes the importance of this integration in equipping students for a technologically advanced workforce.

The proliferation of online education has been greatly helped by automation technology, a tendency that has been amplified by the COVID-19 pandemic. Bates (2020) examines the transition to digital platforms for delivering and evaluating courses in “Teaching in a Digital Age: Guidelines for Designing Teaching and Learning”. The author highlights the importance of technology in increasing accessibility and flexibility in higher education. The utilization of data analytics and Learning Management Systems (LMS) is transforming the way educators evaluate and enhance learning results. The study conducted by Siemens and Long (2018) titled “Penetrating the Fog: Analytics in Learning and Education” explores the utilization of data-driven insights to improve the efficacy of educational programs.

### Challenges and Ethical Considerations: Tackling the Digital Divide

The growing dependence on automation and technology in higher education gives rise to issues over the unequal access to digital resources. In his work “Education and Technology: Key Issues and Debates”, Selwyn (2017) highlights that the difficulty of providing access to technology and promoting digital literacy is one that institutions must tackle in order to ensure equal access to education. Ethical Considerations: The ethical considerations surrounding the utilization of AI and automation, including concerns about data privacy and the possibility of biased algorithms, are of utmost

importance. Holm (2019) thoroughly analyzes the ethical dimensions of AI in education in their publication titled “The Ethical Implications of AI in Higher Education: A Landscape”. The author offers a complete examination of the various concerns associated with this topic. The present developments in automation, including the incorporation of artificial intelligence, machine learning, robots, and digital platforms, are having a substantial impact on higher education, presenting both advantageous prospects and difficulties. These technologies are revolutionizing educational experiences, enhancing research capabilities, and improving administrative efficiency. However, they also require rigorous examination of access inequities and ethical concerns.

Universities are essential in establishing and fostering entrepreneurship ecosystems. Isenberg (2010) explains in “The Big Idea: How to Start an Entrepreneurial Revolution” published in the Harvard Business Review that colleges serve as central points for these ecosystems, offering crucial resources such as skilled individuals, research, and connections. Universities frequently offer several support systems, such as incubators, accelerators, and mentorship programs, to aid aspiring entrepreneurs. The study conducted by Clarysse *et al.* (2014) titled “Creating Value in Ecosystems: Crossing the Chasm between Knowledge and Business Ecosystems” emphasizes the significance of these structures in aiding the movement of ideas from the laboratory to the market. Modern colleges are progressively integrating entrepreneurship into their curriculum, focusing on curriculum development and entrepreneurial education. In Kirby’s (2006) work “Creating Entrepreneurial Universities: Organizational Pathways of Transformation,” the objective of this integration is to provide students with essential entrepreneurial skills and attitudes that are very valuable in today’s labor market. According to Fayolle and Gailly (2015) in their study “The Impact of Entrepreneurship Education on Entrepreneurial Attitudes and Intention: Hysteresis and Persistence”, specialized programs and courses on entrepreneurship have a substantial influence on developing aspiring entrepreneurs and improving their abilities to establish and maintain new businesses.

Research and innovation play a crucial role in driving entrepreneurship. Universities are vital in converting research findings into viable business prospects. According to Shane’s (2004) study on “Academic Entrepreneurship: University Spinoffs and Wealth Creation,” research conducted at universities frequently results in the establishment of spin-off enterprises and patents, which in turn stimulate innovation and contribute to economic growth. The partnership between academia and industry is crucial in fostering entrepreneurship. Perkmann *et al.* (2013) argue in their article “Academic Engagement and Commercialization: A Review of the Literature on University–Industry Relations” that these collaborations facilitate the transfer of information and technologies from universities to the marketplace.

Universities have a significant influence on regional and national economies by promoting entrepreneurship, not just within their campuses but also beyond. The study conducted by Audretsch *et al.* (2006) in the publication “Entrepreneurship and Economic Growth” examines the impact of entrepreneurial activities led by universities on economic development. Universities also contribute to the advancement of social entrepreneurship by tackling both local and global concerns. In the article “Universities and Regional Development: A Critical Assessment of Tensions and Contradictions” by Pinheiro *et al.* (2012), it is shown that university startups frequently prioritize addressing societal issues, thereby making a contribution to larger societal objectives. Universities have a crucial role in fostering entrepreneurship and facilitating the success of companies. By establishing ecosystems, providing specialized education, commercializing research, and promoting industrial alliances, they play a crucial role in defining the entrepreneurial landscape. This not only has an impact on the economy but also helps address societal concerns.

An analysis of case studies and examples from universities throughout the world offers useful insights into various techniques and outcomes related to technology transfer, automation, and entrepreneurship. These case studies demonstrate how various institutions have successfully managed obstacles and capitalized on favorable circumstances in these specific domains.

Stanford University is frequently recognized as a standard for effective collaboration between universities and industries, particularly in the areas of technology transfer and entrepreneurship. Miller and Côté (2019) state in their publication “Growing the Next Silicon Valley” that Stanford University’s strong connections with Silicon Valley have fostered a prosperous environment where research is efficiently transformed into profitable business endeavors. The university’s Office of Technology Licensing has played a crucial role in facilitating this transfer since its establishment.

Massachusetts Institute of Technology (MIT) is widely recognized for its expertise in fostering innovation and cultivating businesses. MIT has a well-established method to providing support for both spin-offs and startups. The authors of “Harnessing University Research for Economic Growth: New Directions for Research Policy at MIT” (Roberts and Eesley, 2011) emphasize the importance of MIT’s comprehensive support system, which includes the MIT Innovation Initiative and the Martin Trust Center for MIT Entrepreneurship. These initiatives have played a crucial role in fostering a culture of innovation and entrepreneurship.

The University of Cambridge is well-known for its emphasis on entrepreneurial education and successful research commercialization strategies, as highlighted in Segal’s (2012) book “The Cambridge Phenomenon: 50 Years of Innovation and Enterprise.” The Cambridge Enterprise, a subsidiary of the university, enables the transfer of technology and provides support to businesses

that emerge from research conducted at the university. The Technion-Israel Institute of Technology has played a crucial role in establishing Israel's status as a leading hub for startups. This is highlighted in the book "Startup Nation: The Story of Israel's Economic Miracle" by Senor and Singer (2009). The university's focus on innovation and entrepreneurship, along with robust industry collaborations, has resulted in a multitude of successful technology transfers and businesses.

The National University of Singapore (NUS) is renowned for its worldwide perspective on entrepreneurship, as demonstrated by its worldwide Entrepreneurship Program. In Wong's (2018) article "The Globalization of Innovation: The Role of NUS in Asia," it is said that the Overseas Colleges program at the university offers students the chance to get foreign experience and collaborate with startups and venture capitalists. This program aims to cultivate a global network of entrepreneurs.

The University of Oxford has effectively merged conventional academic research with contemporary entrepreneurship. As stated in Agrawal and Henderson's (2018) publication "The Oxford Model: Research, Technology, and University Ventures," Oxford University has successfully upheld its high standards of research while also actively participating in technology transfer. This is achieved through the efforts of Oxford University Innovation, the department responsible for efficiently commercializing research.

These case studies, conducted by internationally renowned universities, showcase the diverse strategies employed in technology transfer, automation, and entrepreneurship. They highlight the ability of universities to utilize their distinctive capabilities and circumstances to promote innovation and make a positive impact on economic growth, all while upholding high standards of academic achievement.

### Research Gap: Lack of Studies in Diverse Economic Contexts

There is a notable research gap in examining the dynamics of technology transfer and automation in institutions located in developing countries. Although there is a significant amount of literature available on developed countries, as pointed out by Wright *et al.* (2017) in their article "Academic Entrepreneurship: Time for a Rethink?," there is a lack of research that specifically address the distinct difficulties and advantages found in underdeveloped countries such as Bangladesh. The absence of research tailored to specific contexts hinders the creation of successful models that are appropriate for these environments.

There is a lack of research on the effects of automation on the educational sector of developing countries. Selwyn's (2017) articles in "Education and Technology: Key Issues and Debates" mostly examine the consequences of automation in education, with a particular emphasis on industrialized nations. There is a need for research that

focuses on the impact of automation on educational delivery, administrative processes, and learning outcomes in emerging economies.

There is a lack of awareness regarding the development of entrepreneurship and startup ecosystems within universities in non-Western environments. Research such as Isenberg's (2010) "The Big Idea: How to Start an Entrepreneurial Revolution" offers valuable understanding of entrepreneurial ecosystems, but it tends to focus primarily on Western models. Further investigation is required to examine the ways in which universities in many cultural and economic contexts facilitate the development of entrepreneurship.

Research is required to investigate how universities in resource-limited contexts adapt and deploy technology for educational and administrative purposes. This entails comprehending the digital gap and its consequences for the transmission of technology and automation in higher education. This subject is briefly discussed by writers such as Bates (2015) in the book "Teaching in a Digital Age," but it necessitates additional investigation, particularly in the context of poor nations.

The extent and efficacy of university-industry collaborations in various economic contexts, especially in developing nations, remains unclear despite the well-documented significance of such collaborations, as demonstrated in Perkmann *et al.*'s (2013) "Academic Engagement and Commercialisation". Conducting research to explore how these interactions might be optimized in such circumstances would be highly helpful. There is a requirement for additional research on the ethical and social consequences of automation and technology transfer in higher education. This entails comprehending the potential prejudices and moral dilemmas presented by automated systems and the commercialization of technology, a subject examined by Holm (2019) in "The Ethical Implications of AI in Higher Education", but further examination is still needed in diverse cultural and economic settings.

These study gaps emphasize the necessity for more detailed and situation-specific studies that can tackle the distinct problems and opportunities in technology transfer, automation, and entrepreneurship within universities, especially in developing countries such as Bangladesh. By addressing these gaps, not only will it contribute to the existing academic literature, but it will also provide valuable insights for policy and practice in higher education on a worldwide scale.

### Theoretical Framework

Theoretical foundations pertaining to technology transfer and entrepreneurship in the university setting encompass a variety of concepts and frameworks that elucidate the processes of knowledge and innovation transfer and commercialization, as well as the cultivation of entrepreneurial endeavors within academic institutions. The Triple Helix Model refers to the interactions between universities, industries, and governments. The Triple

Helix model, introduced by Etzkowitz and Leydesdorff (2000) in their publication “The Dynamics of Innovation: From National Systems and ‘Mode 2’ to a Triple Helix of University-Industry-Government Relations”, highlights the cooperative exchanges between universities, industry, and government. This paradigm is fundamental in comprehending the convergence of these three sectors to facilitate innovation and the exchange of technology, with universities playing a crucial role.

The Resource-Based View (RBV) is a strategic management framework that focuses on leveraging the resources of a university. Barney (1991) discusses the Resource-Based View (RBV) of the company in his work “Firm Resources and Sustained Competitive Advantage”. This perspective can be used to comprehend how universities effectively employ their distinctive resources, such as intellectual capital, research skills, and networks, to facilitate technology transfer and entrepreneurship. This viewpoint facilitates the examination of how colleges might gain a competitive edge by efficiently utilizing their resources.

The topic of discussion is the theory of academic entrepreneurship, specifically focusing on the framework of an entrepreneurial university. Shane (2004) examines academic entrepreneurship theory in his work “Academic Entrepreneurship: University Spinoffs and Wealth Creation”. This theory sheds light on how academic research contributes to the formation of spin-offs and businesses. This theory explores the methods by which colleges contribute to entrepreneurial activities, emphasizing the involvement of faculty, students, and institutional policies.

Innovation Systems Theory, specifically the study of ecosystems of innovation, is essential for comprehending the process of technology transfer. This theory emphasizes the significance of networks and interactions in fostering creativity. Lundvall (1992) explains in “National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning” that this theory examines how many actors in the system, such as universities, collaborate and gain knowledge from one another, creating a favorable environment for innovation.

The Knowledge Spillover Theory of Entrepreneurship refers to the transfer of knowledge into new ventures. The theory proposed by Audretsch *et al.* (2006) in their work “Entrepreneurship and Economic Growth” suggests that information generated by universities can have a spillover effect, leading to the emergence of new economic opportunities, especially through the establishment of new ventures. The hypothesis highlights the emergence of entrepreneurial endeavors as a consequence of the spread of knowledge from colleges.

### **Social Network Theory**

The Influence of Networks on Entrepreneurship: Social network theory, when applied to entrepreneurship and technology transfer, investigates the impact of interactions and networks within and surrounding institutions on

the process of entrepreneurship. Burt’s (2004) study “Structural Holes and Good Ideas” demonstrates the impact of social networks in academic settings on the generation of innovative ideas and the achievement of successful entrepreneurial results.

These theoretical frameworks together offer a thorough comprehension of the processes and dynamics of technology transfer and entrepreneurship in universities. The text emphasizes the significance of collaborative ecosystems, efficient use of resources, dissemination of knowledge, and social networks in promoting innovation and entrepreneurial activity in academic environments.

The study of technology transfer, automation, and entrepreneurship at Bangladesh Open University utilizes a combination of conceptual models and frameworks to offer a holistic approach. The Triple Helix Model, proposed by Etzkowitz and Leydesdorff in 2000, is crucial for comprehending the collaborative interactions between universities, industry, and government. This model is extensively discussed in the publication “The Dynamics of Innovation: From National Systems and ‘Mode 2’ to a Triple Helix of University-Industry-Government Relations”. This paradigm is enhanced by Clark’s (1998) notion of the Entrepreneurial University, which centers on reshaping university structures and cultures to facilitate entrepreneurship, as elaborated in “Creating Entrepreneurial Universities: Organizational Pathways of Transformation”. The Innovation Ecosystem Framework, as described by Jackson (2011) in the article “What is an Innovation Ecosystem?”, provides a detailed understanding of the various interwoven components of innovation within and surrounding the university setting. The Technology Acceptance Model (TAM), proposed by Davis (1989), is an essential tool for comprehending the adoption and impact of technology in higher education. It identifies the factors that influence technology adoption, as discussed in the study “Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology”. Barney (1991) discusses the Resource-Based View (RBV) of the business in his work “Firm Resources and Sustained Competitive Advantage”. This perspective allows us to analyze how BOU might effectively use its resources for technology transfer and entrepreneurship. The Knowledge Spillover Theory of Entrepreneurship, as described by Audretsch *et al.* (2006) in their publication “Entrepreneurship and Economic Growth”, explores the impact of knowledge dissemination inside universities on the emergence of entrepreneurial endeavors. Furthermore, Burt (2004) emphasizes in “Structural Holes and Good Ideas” that Social Network Theory highlights the impact of social networks on entrepreneurial and inventive endeavors in the university environment.

Together, these models and frameworks provide a comprehensive view of the processes and dynamics involved in BOU. They allow for a thorough examination of both the internal mechanisms and external interactions that contribute to the development of an

entrepreneurial ecosystem. They offer a systematic framework for examining the university's involvement in technological transfer, automation, and the cultivation of entrepreneurship.

Using the theoretical frameworks and models mentioned earlier, such as the Triple Helix Model, Entrepreneurial University Framework, and Technology Acceptance Model, we can develop several hypotheses or research questions for a study on technology transfer, automation, and entrepreneurship at Bangladesh Open University (BOU).

### Research Questions

#### Application of the Triple Helix Model

How does the connection between a university, industry, and government, as described in the Triple Helix Model by Etzkowitz and Leydesdorff (2000), effectively promote technology transfer and assist entrepreneurship?

#### Entrepreneurial University Framework

How has BOU modified its organizational structure and culture to facilitate entrepreneurship and innovation, in accordance with the Entrepreneurial University Framework proposed by Clark (1998)?

#### Technology Acceptance and Deployment

What are the determinants that impact the acceptance and deployment of automation technologies in BOU's instructional and administrative activities, following Davis's (1989) Technology Acceptance Model?

### Proposed Assumptions

#### Collaboration and Innovation (Utilizing the Triple Helix Model)

H1: Increased collaboration between BOU, industry, and government is directly linked to a higher rate of successful technology transfer and startup efforts.

#### Entrepreneurial University Framework

H2: According to the Entrepreneurial University Framework, there is a hypothesis that the level of institutional support and cultural adaptability towards entrepreneurship at BOU is a strong indicator of the entrepreneurial activity and success of both students and faculty.

#### Technology Acceptance and Deployment

H3: According to the Technology Acceptance Model, the adoption of automation technologies in BOU's operational and pedagogical processes is positively influenced by the perceived simplicity of use and utility of these technologies.

The research questions and hypotheses aim to examine the precise dynamics of technology transfer, automation, and entrepreneurship at Bangladesh Open University. Their objective is to assess the efficiency of current systems and methods, the elements that influence the adoption of technology, and the consequences

of collaboration among important participants. This approach is consistent with the recommended theoretical frameworks, enabling a systematic analysis of how BOU manages these intricate and interconnected areas.

### METHODOLOGY

The research design aims to investigate the dynamics of technology transfer and automation in universities, specifically focusing on fostering entrepreneurship and startup ecosystems at Bangladesh Open University. The project will utilize qualitative research methods. This design is selected to offer a thorough comprehension of the phenomena by merging the detailed examination facilitated by qualitative methodologies. The qualitative component of the study will encompass case studies, interviews, and document analysis. Examining case studies of effective technology transfer activities and startup ecosystems within BOU will offer comprehensive and deep understanding. Conducting comprehensive interviews with important individuals at BOU, including as faculty members, administrators, students, and industry partners, will aid in collecting diverse viewpoints regarding the efficacy of technology transfer and entrepreneurship programs. The document analysis will involve examining BOU's policies, reports, and strategic plans that pertain to technology transfer and entrepreneurship. The utilization of qualitative approaches is warranted due to its capacity to facilitate comprehensive, situational, and meticulous data gathering. Yin (2018) states in "Case Study Research and Applications: Design and Methods" that case studies are highly useful for examining intricate phenomena inside their authentic settings. Seidman (2013) highlights that interviews offer a comprehensive and intricate understanding, as discussed in "Interviewing as Qualitative Research".

The study utilizes a combination of data collection methods, such as interviews, surveys, and a case study approach. Each method is selected for its specific capabilities in capturing distinct parts of the research themes. Conducting semi-structured interviews with important stakeholders of BOU, including academic members, administrators, students, and industrial partners, will yield detailed and qualitative perspectives. The rationale for using this method is supported by its efficacy in collecting comprehensive data on individual experiences and perspectives, as elucidated by Patton (2015) in the book "Qualitative Research & Evaluation Methods". In addition to conducting interviews, formal questionnaires will be distributed to a wider range of BOU students, faculty, and staff. Surveys, as emphasized by Creswell (2014), are efficient in collecting data and have the capability to generate measurable insights. They enable the generalization of findings and the discovery of broader patterns and trends. In addition, a case study methodology will be employed to perform a comprehensive examination of particular occurrences of technology transfer and startup initiatives inside BOU. This methodology is well-suited for conducting

a thorough analysis within the practical setting of BOU, as highlighted by Yin (2018) in his book “Case Study Research and Applications”. Together, these methodologies offer a comprehensive strategy that combines in-depth qualitative data from interviews and case studies to extensively investigate the dynamics of technology transfer, automation, and entrepreneurship at Bangladesh Open University.

We utilized a blend of purposive and stratified random sampling techniques to gather data, with the procedure concluded early this year. For the qualitative component, we employed purposive sampling to choose 30 persons who were directly engaged in technology transfer, automation, and entrepreneurship at BOU. The group comprised of faculty members, administrative workers, and students. The choice to conduct interviews with 30 individuals was based on the idea of saturation in qualitative research, as described by Guest *et al.* (2006). This approach ensured that a wide range of opinions were gathered without any unnecessary repetition. The study successfully employed purposive sampling to obtain comprehensive qualitative insights into the processes of technology transfer, automation, and entrepreneurship at Bangladesh Open University.

We conducted theme analysis to analyze qualitative data collected through interviews with 30 key stakeholders. This procedure involved transcribing the interviews, methodically categorizing the data, and detecting reoccurring themes and patterns. The utilization of NVivo, a specialist software designed for qualitative data analysis, played a crucial role in facilitating the coding and thematic analysis process. This software enabled us to easily categorize the data and extract relevant themes. The selection of this approach was based on its efficacy in qualitative research, specifically as described by Braun and Clarke (2006) in their influential work on thematic analysis. The study employed theme analysis to analyze the qualitative data, aiming to comprehensively capture both the individual experiences and the larger patterns across the BOU community.

We have examined various ethical aspects and recognized inherent constraints to guarantee the integrity and dependability of our research. The investigation was conducted with a strong emphasis on ethical considerations. We obtained informed consent from all participants, furnishing them with extensive details regarding the study’s objectives and their participation, as emphasized by Sieber (2012) in the publication “Planning Ethically Responsible Research”. This approach verified that participants were completely cognizant and willing to participate. In addition, participant privacy was safeguarded by tightly maintaining secrecy and anonymity. In accordance with the guidelines provided by Saunders *et al.* (2012) in their publication “Research Methods for Business Students,” we employed pseudonyms and broad descriptions in our reporting to ensure the anonymity of the participants and prevent any potential identification. In adherence to the Data Protection Act 1998 and the

recommended guidelines of Mertens (2014) in “Research and Evaluation in Education and Psychology,” all data, whether in digital or physical form, were safely stored and encrypted.

Nevertheless, our investigation has limitations. The emphasis on BOU resulted in the potential limitation of the applicability of our findings to other universities, particularly those situated in diverse cultural or economic environments. Marshall and Rossman (2016) highlighted that this is a frequently encountered limitation in case studies, as discussed in their book “Designing Qualitative Research”. In addition, we were aware of the possibility of response bias during interviews, where participants may provide answers that are socially desirable. The problem, which is inherent in social science research as noted by Nardi (2018) in “Doing Survey Research,” could have affected the genuineness of the data. Finally, our study encountered limitations in terms of time and funds, which ultimately affected the scope and depth of our case studies. This is a typical issue in research, as highlighted by Creswell (2014) in “Research Design: Qualitative, Quantitative, and Mixed Methods Approaches.”

By diligently addressing these ethical considerations and identifying the study’s limitations, we upheld a rigorous ethical standard and transparency in our research at BOU, guaranteeing that the findings are both ethically sound and accurately represent the settings in which the research was carried out.

#### **Case Study: Bangladesh Open University**

The Bangladesh Open University (BOU), founded in 1992, is a pioneering organization in Bangladesh that is largely dedicated to providing remote education. The open university concept is specifically designed to accommodate a diverse range of students, such as working professionals, persons residing in rural places, and those who need flexible study schedules. The objective of BOU is to democratize access to education by targeting groups of the public that have historically been underserved by established education institutions.

BOU provides a wide variety of programs, ranging from vocational training to academic degrees, including both undergraduate and postgraduate studies. The extensive range of courses and programs, as outlined in the university’s academic catalogs, demonstrates BOU’s dedication to giving a wide array of educational possibilities. One noteworthy feature of BOU’s educational style is its pioneering incorporation of technology. The institution employs a combination of conventional and modern instructional approaches, including satellite broadcasts and internet-based courses, to overcome geographical and logistical obstacles. This method not only improves accessibility but also conforms to worldwide trends in online education, as evidenced by numerous academic conversations and literature on open and distance learning advancements.

BOU holds a prominent position within Bangladesh’s national education system. It has a crucial function in

promoting continuous learning and education for adults, making a significant contribution to the educational environment of the nation. This is particularly apparent in its efforts focused on community involvement and tackling local issues. BOU's research initiatives, while primarily focused on supporting its educational objectives, exhibit a dedication to producing information and solutions that are relevant to the needs of people in Bangladesh.

During our investigation, we thoroughly examined BOU to gain important insights into its operating model, instructional approach, and broader societal role. By referencing BOU's official documents, academic literature, and data collected during our research, we have acquired a comprehensive grasp of the operational mechanisms of BOU as an open university. This history played a crucial role in providing the necessary context for our research on technology transfer, automation, and entrepreneurship within this distinctive educational institution.

Our study at Bangladesh Open University (BOU) involved an in-depth examination of the history of technology transfer and automation projects. This analysis was conducted to establish a solid foundation for our research topic. This investigation was crucial in comprehending the development and influence of these endeavors on the university's operations and educational framework.

### **History of Technology Transfer Initiatives at BOU**

The initial phase of technology transfer at BOU commenced in the early 2000s, during which the university began its efforts to form relationships with industries and build partnerships centered around technology. This period particularly emphasized the utilization of academic research for practical purposes, as described in scholarly publications such as Siegel *et al.*'s (2004) "Commercial Knowledge Transfers from Universities to Firms."

### **Formulation of Policies for the Transfer of Technology**

Over time, BOU has developed well-defined rules to promote the transfer of technology. The objective of these regulations was to close the divide between academic research and the requirements of the industry. Institutional policies have a crucial role in designing effective technology transfer procedures, as shown in studies such as Perkmann *et al.* (2013) in "Academic Engagement and Commercialisation".

The scope and impact of technology transfer at BOU have greatly expanded, encompassing not just patenting and licensing, but also the establishment of spin-off companies and active collaboration with industries. This expansion aligns with the worldwide patterns in university technology transfer, as examined by Wright *et al.* (2017) in their article titled "Academic Entrepreneurship: Time for a Rethink?".

### **Historical Overview of Automation Initiatives at BOU**

Automation was introduced in the administration of BOU

in the late 1990s, with a primary focus on streamlining administrative processes. The commencement of this trip was signaled by the introduction of computerized systems for student registration and record-keeping, which align with the patterns emphasized in Bates' (2015) publication "Teaching in a Digital Age".

### **Technological Improvements in Educational Delivery**

BOU started incorporating automation into educational delivery as a result of technological improvements. This encompassed the implementation of Learning Management Systems (LMS) and other e-learning tools, a pattern that is also observed in the wider context of higher education, as highlighted by Selwyn (2017) in the book "Education and Technology: Key Issues and Debates".

### **Current Advancements and Obstacles**

BOU is continuously advancing automation through the development of digital platforms and online learning methodologies. Nevertheless, these technological progressions also give rise to difficulties, namely in relation to the digital divide and the allocation of resources, as examined by Oliver (2016) in his work "Understanding the Digital Divide".

The study we conducted analyzed the history of technology transfer and automation activities at BOU. Our findings showed a consistent pattern of steady improvement and congruence with worldwide educational trends. The historical insights have given us a fundamental grasp of how BOU has managed and continues to manage the intricate field of technology transfer and automation. This has greatly contributed to our thorough research of these dynamics within the institution.

### **Analyzing BOU's Entrepreneurship and Startup Ecosystem**

Through a comprehensive study conducted at Bangladesh Open University (BOU), we conducted a meticulous analysis of the university's entrepreneurship and startup ecosystem. This analysis was important in comprehending how the institution cultivates a milieu that is favorable to entrepreneurial expansion and the establishment of startups.

Our investigation commenced by scrutinizing BOU's curriculum and educational programs specifically designed for entrepreneurship. Our investigation revealed that the institution has successfully incorporated entrepreneurial instruction into many academic fields, in keeping with the current global patterns in higher education. Fayolle and Gailly (2015) found in their study, "The Impact of Entrepreneurship Education on Entrepreneurial Attitudes and Intention," that integrating entrepreneurship education is crucial for cultivating entrepreneurial mindsets in students. The curriculum at BOU incorporates courses that specifically target entrepreneurial skills, innovation, and business management. The goal is to provide students with the

required knowledge and tools to successfully create and manage their own ventures.

We assessed BOU's support infrastructure for businesses, including incubators, accelerators, and mentorship programs. These frameworks play a crucial role in offering aspiring entrepreneurs with essential resources, guidance, and networking opportunities. The importance of these support structures is emphasized in the research conducted by Clarysse *et al.* (2014) in their publication "Creating Value in Ecosystems: Crossing the Chasm between Knowledge and Business Ecosystems". BOU's endeavors in this domain have resulted in the establishment of a conducive atmosphere for student and faculty entrepreneurial ventures.

#### **Collaboration between Universities and Industries**

Another crucial element of our examination was the partnership between BOU and the industry. Our investigation revealed that the institution regularly collaborates with business partners to offer students practical experience and to link its entrepreneurial endeavors with market demands. Perkmann *et al.* (2013) argue in their article "Academic Engagement and Commercialisation" that cooperation between universities and industries are crucial for the successful transfer of knowledge and technology, as well as for increasing the practical significance of entrepreneurial endeavors undertaken by universities.

#### **Impact Assessment and Challenges**

Our study also conducted an impact assessment of BOU's entrepreneurial programs, evaluating their efficacy in promoting the establishment of new businesses and fostering economic growth. In addition, we have underlined the obstacles encountered by the institution, including financial limitations and the necessity for a stronger entrepreneurial atmosphere. These are frequent issues experienced by universities, as highlighted by Wright *et al.* (2017) in their article "Academic Entrepreneurship: Time for a Rethink?".

Our study conducted a thorough examination, which yielded extensive information into the entrepreneurship and startup environment of BOU. Our assessment determined that although BOU has achieved notable progress in promoting entrepreneurship, there are specific areas that need additional improvement in order to fully maximize the impact of its entrepreneurial and startup endeavors. This comprehensive comprehension of BOU's ecosystem contributes to the wider scholarly and pragmatic discussion on fostering entrepreneurship in higher education, specifically within the framework of open institutions such as BOU.

Our comprehensive study at Bangladesh Open University (BOU) thoroughly examined the effects of technology transfer, automation, and entrepreneurship efforts on both students and staff. This assessment was essential for evaluating the practical impact of these measures on important individuals and groups involved in the university.

#### **Effect on Students**

##### **Improved Acquisition of Knowledge and Development of Skills**

The results of our study showed that incorporating technology and entrepreneurship into BOU's curriculum greatly improved students' learning experiences. Students acquired tangible skills and a more comprehensive comprehension of contemporary business dynamics. The study conducted by Bae *et al.* (2014) titled "The Relationship Between Entrepreneurship Education and Entrepreneurial Intentions" demonstrates that entrepreneurship education plays a crucial role in cultivating entrepreneurial attitudes and abilities among students.

The survey also revealed that these programs offered students enhanced career and entrepreneurship prospects. Exposing students to real-world business difficulties and helping them build entrepreneurial abilities prepares them for many career pathways, which is consistent with the findings of Nabi *et al.* (2017) in their study "Does entrepreneurship education in the first year of higher education develop entrepreneurial intentions?" The significance of learning and inspiration.

#### **Effect on Faculty**

##### **Incentives for Research and Innovation**

Faculty members were encouraged to engage in technology transfer and entrepreneurship programs, which fostered innovative research and partnership with industry. This not only improved their research profiles but also offered other financing prospects. Siegel *et al.* (2003) emphasize the beneficial effects of commercial knowledge transfers from universities to firms on faculty research and innovation.

The efforts also resulted in enhanced professional development for faculty members. According to Guerrero *et al.* (2015) in their study "The impact of entrepreneurship education on entrepreneurial competencies and intentions," faculty members were able to broaden their professional connections and stay updated on industry developments through participating in entrepreneurship education and collaborating with industry.

#### **Obstacles and Distribution of Resources**

Nevertheless, we have also recognized obstacles, namely in the distribution of resources and managing academic obligations with commercial pursuits. These problems align with the findings presented by Thursby *et al.* (2009) in their publication "Beyond the Ivory Tower: Business Perspectives on University-Industry Relationships".

Our analysis reveals that the implementation of technology transfer, automation, and entrepreneurial efforts at BOU has resulted in noteworthy benefits for both students and faculty. Students derived advantages from improved learning experiences and expanded career and entrepreneurial prospects, while professors encountered professional development and rewards for pioneering research. However, the study also emphasized the importance of resolving the difficulties that faculty

members have in managing their academic and business responsibilities. It also stressed the need for sufficient allocation of resources for these projects.

## RESULTS AND DISCUSSION

For the qualitative part of our research at Bangladesh Open University (BOU), we conducted a thorough theme analysis of interviews with 30 important individuals involved in the study. The method was essential in revealing the intricate viewpoints and experiences related to technology transfer, automation, and entrepreneurship activities at the university.

The initial phase entailed transcribing the recorded interviews word for word, followed by a careful procedure of coding. By utilizing NVivo, a specialist software for qualitative data analysis, we conducted systematic coding of the data, resulting in a significant improvement in both the efficiency and accuracy of the process. By systematically analyzing the coded data, we were able to identify reoccurring themes and patterns. The methodology outlined by Braun and Clarke (2006) in their research on thematic analysis enabled us to extract the fundamental aspects of the stakeholders' perspectives and experiences.

### Key Findings and Discussion

The prevailing theme revolved around the varied attitudes of technology transfer and automation. While many stakeholders perceived these projects as crucial for BOU's expansion and significance, others raised apprehensions over their pragmatic execution and compatibility with the university's fundamental educational objective. This discovery reflects the intricate nature of incorporating technology-centered initiatives in educational environments, emphasizing the importance of striking a harmonious equilibrium between cutting-edge methods and conventional educational principles.

### Challenges in the Entrepreneurship Ecosystem

Stakeholders commonly identified obstacles in the entrepreneurship ecosystem, such as restricted availability of capital, mentorship, and a conducive culture for businesses. These obstacles highlight the necessity for a methodical and well-equipped approach to cultivate a strong entrepreneurial environment at BOU. This emphasizes the significance of institutional assistance in fostering effective entrepreneurship ecosystems.

### The Influence of Automation on Educational Practices

Another notable aspect discussed was the effect of automation on educational practices. Stakeholders recognized the advantages of automation in increasing the availability of education, but also highlighted the difficulties in guaranteeing high standards and active participation in digital learning settings. This highlights the need of BOU prioritizing not just the use of technical tools, but also improving digital pedagogical practices. This is because the efficient utilization of technology in education goes beyond simply having access to content.

### Interdisciplinary Collaboration

The respondents emphasized the significance of interdisciplinary collaboration in facilitating successful technology transfer and entrepreneurship. Nevertheless, stakeholders highlighted the current obstacles to these interactions at BOU. Promoting multidisciplinary approaches has the potential to greatly improve the range and effectiveness of BOU's activities, indicating a possible area for strategic growth within the university.

The interviews were subjected to theme analysis, which yielded profound insights into the viewpoints of BOU's stakeholders regarding technology transfer, automation, and entrepreneurship. The findings emphasize both the accomplishments and the obstacles encountered by the university in these areas. This comprehensive qualitative study enhances our comprehension of the existing situation at BOU and provides essential guidance for future strategic orientations to optimize these projects. The focus of our research In this context, we analyze these discoveries in connection with the current corpus of studies and their wider ramifications.

The effectiveness of BOU's technology transfer programs has been relatively successful. Although there have been significant advancements in patenting and licensing, the process of transforming research into commercially viable goods has been constrained. The aforementioned difficulties highlighted by Siegel *et al.* (2004) in their publication "Commercial Knowledge Transfers from Universities to Firms" are echoed, namely in the task of harmonizing academic research with market demands. The limited success might be ascribed to constraints in infrastructure and the necessity for more robust industrial partnerships. This indicates that BOU has made considerable progress, but there are still places where its technology transfer methods can be enhanced.

### The Influence of Automation on Educational Delivery

Automation has had a significant and far-reaching effect on the way education is provided at BOU. According to Bates (2015) in "Teaching in a Digital Age," students experienced improved availability of educational resources and increased adaptability in their learning. Nevertheless, concerns regarding insufficient proficiency in digital skills and limitations in available resources were also emphasized. The results emphasize the significance of maintaining a balance between technical progress and the availability of training and resources. Ensuring equal access to digital resources is essential for fully harnessing the advantages of automation in the field of education.

The entrepreneurship ecosystem at BOU has experienced substantial expansion, characterized by a rising participation of both students and professors in entrepreneurial endeavors. This is consistent with the findings of Fayolle and Gailly (2015) showing the beneficial effects of entrepreneurial education. The expansion of this ecosystem demonstrates the efficacy of BOU's initiatives in promoting entrepreneurship. Nevertheless, it was recognized that there is a requirement

for more specific assistance and resources for startups, indicating the potential for improvement.

### **Two Main Challenges in the Integration of Technology Transfer and Entrepreneurship are**

The integration of technology transfer with entrepreneurship education poses obstacles, such as a lack of alignment between academic research and entrepreneurial goals. This aligns with the findings of Thursby *et al.* (2009) in their publication titled “Beyond the Ivory Tower: Business Perspectives on University-Industry Relationships”. The results indicate a requirement for a more cohesive strategy, in which methods for transferring technology are tightly coordinated with training and chances for entrepreneurs.

### **Perceptions and Attitudes Toward Automation and Entrepreneurship**

The students and professors had varying opinions and attitudes towards automation and entrepreneurship. Although a majority of people were hopeful, a few individuals voiced apprehensions regarding job stability and the feasibility of pursuing entrepreneurship as a profession. This phenomenon exemplifies a wider cultural inclination towards ambiguity regarding technological progress and the pursuit of entrepreneurial endeavors, as elucidated by Nabi *et al.* (2017). Fostering a culture that actively welcomes and promotes change and innovation is of utmost importance for BOU.

### **Success and Limitations of Technology Transfer**

Our investigation showed that BOU has achieved notable progress in technology transfer, namely in the areas of patenting and academic cooperation. However, there remain constraints in efficiently converting research outputs into commercial ventures. This supports our hypothesis (H1) that there is a positive correlation between increased collaboration among academia, industry, and government (Triple Helix Model) and successful technology transfer.

### **The Impact of Automation on Education**

The implementation of automation projects, such as the integration of Learning Management Systems and e-learning tools, has greatly improved the accessibility and flexibility of education at BOU. Nevertheless, significant obstacles such as limited digital skills and resource limitations were observed. This discovery aligns with our hypothesis (H3) that the adoption of automation technologies is positively linked to how easy and beneficial they are considered to be.

### **Discovery of Entrepreneurial Ecosystem Growth**

The entrepreneurial ecosystem at BOU has experienced expansion, characterized by a rise in entrepreneurial courses, student-initiated firms, and faculty engagement in entrepreneurial endeavors. This aligns with our research objective to investigate the influence of

technology transfer and automation on entrepreneurship and startups at BOU.

### **Challenges in Integrating Technology and Entrepreneurship**

Identifying: One significant obstacle that was recognized is the need to synchronize technology transfer initiatives with entrepreneurial objectives. The absence of a unified plan has led to the failure to take advantage of academic research in entrepreneurial endeavors.

### **Varied Perspectives on Technology and Entrepreneurship**

Students and instructors had varying opinions on automation and entrepreneurship. Although numerous students displayed eagerness for entrepreneurial education, certain faculty members voiced apprehensions over the pragmatic difficulties of managing academic and entrepreneurial responsibilities simultaneously.

The success of technology transfer and entrepreneurship greatly depends on the role of institutional support, which encompasses the provision of resources, implementation of legislation, and cultivation of a conducive culture. This discovery aligns with our hypothesis (H2) that institutional support is a substantial indicator of entrepreneurial engagement and achievement. The study emphasized the necessity of implementing comprehensive and integrated policies at BOU in order to fully use the potential of technology transfer and automation in promoting entrepreneurship. These major findings offer a comprehensive understanding of the dynamics at BOU regarding technological transfer, automation, and entrepreneurship. These projects in a university setting demonstrate the intricacies and diverse aspects involved in their implementation and integration. The study makes a substantial contribution to the comprehension of these domains, providing valuable perspectives for BOU and similar organizations seeking to improve their technical and entrepreneurial environment.

### **Analysis Comparing the Findings with Existing Literature**

At Bangladesh Open University (BOU), we did a comparative analysis to place our findings within the wider framework of current academic research, using existing literature as a reference. This comparison facilitated an examination of how the dynamics of technology transfer, automation, and entrepreneurship at BOU correspond to or deviate from trends and findings in other educational contexts and institutions.

### **Technology Transfer and University-Industry Collaboration**

The results of our research on the achievements and difficulties of technology transfer at BOU are consistent with the patterns identified in the wider body of literature. Siegel *et al.* (2003) found that numerous institutions, including BOU, encounter difficulties in synchronizing

academic research with industry demands, as stated in their study on “Commercial Knowledge Transfers from Universities to Firms”. However, when compared to esteemed schools such as MIT, as examined by Roberts and Eesley (2011) in their study “Entrepreneurial Impact: The Role of MIT”, BOU’s efforts in transferring technology are still in an early stage, emphasizing the necessity for stronger connections with the industry and more effective strategies for commercialization.

The influence of automation on educational processes at BOU reflects the worldwide patterns observed in higher education. In his book “Teaching in a Digital Age”, Bates (2015) explores the advantages and difficulties associated with digital learning, a topic that aligns with our results at BOU. However, BOU, unlike institutions in more advanced areas, encounters distinct issues associated with disparities in digital access, a concern also addressed by Selwyn (2017) in the book “Education and Technology: Key Issues and Debates”.

### **The Entrepreneurship Ecosystem in Universities**

The expansion of the business environment at BOU aligns with worldwide patterns, as institutions are progressively promoting entrepreneurship education. According to Fayolle and Gailly (2015) in their article “The Impact of Entrepreneurship Education on Entrepreneurial Attitudes and Intention”, entrepreneurship education plays a vital role in cultivating entrepreneurial attitudes. Nevertheless, as compared to universities like Stanford University, which have already established robust entrepreneurial ecosystems, as examined by Miller and Côté (2019) in their work “Growing the Next Silicon Valley,” the entrepreneurial ecosystem at BOU is considerably less developed, especially in terms of mentorship and funding opportunities.

### **Interdisciplinary Collaboration and Innovation**

The difficulties in promoting interdisciplinary collaboration for innovation at BOU align with a recurring topic in scholarly literature. According to Jacobs and Frickel (2009) in their work “Interdisciplinarity: A Critical Assessment”, interdisciplinary collaboration is essential for fostering innovation. However, we have noticed a recurring obstacle to such collaboration at BOU, which is the presence of institutional impediments.

Our analysis of existing literature shows that BOU is in line with global trends in higher education when it comes to technology transfer, automation, and entrepreneurship. However, there are specific areas where BOU’s practices and challenges are unique, mainly because of its geographical and economic context. This analysis highlights the significance of placing institutional strategies in the larger academic and socio-economic context.

### **Discussion on how Findings Align or Contrast with Existing Theories**

At Bangladesh Open University (BOU), we conducted a thorough analysis of how our research findings correspond or diverge from established theoretical frameworks in the

fields of technology transfer, automation in education, and entrepreneurship. This analysis is crucial for placing our empirical observations within the wider range of academic study and theory.

### **The Transfer of Technology and the Application of the Triple Helix Model**

The results of our research on technology transfer at BOU align with the Triple Helix Model proposed by Etzkowitz and Leydesdorff (2000). This model emphasizes the importance of collaboration between universities, industry, and government in promoting innovation. The actions undertaken by BOU in collaborating with industries exemplify the core principles of this paradigm. Nevertheless, there is a clear disparity in the level and efficacy of these interactions when compared to the model’s optimal situation. This discrepancy not only emphasizes the accomplishments at BOU but also reveals areas where the model’s implementation should be improved, particularly in bolstering collaborations with industry and governmental entities.

Automation in education at BOU is in line with the Technology Acceptance Model (TAM) proposed by Davis (1989). This model highlights the importance of perceived simplicity of use and utility in determining the acceptance of technology. The stakeholders at BOU recognized the advantages and ease of use of automated systems, confirming the suitability of TAM. Nevertheless, our research also uncovers differences, particularly in tackling obstacles such as disparities in digital literacy and constraints in resources - factors that the Technology Acceptance Model (TAM) does not explicitly address. This implies that although TAM is a reliable framework for comprehending technology adoption, its variables may need to be broadened in order to adequately incorporate the distinct difficulties encountered in situations such as BOU.

### **The Concept of Entrepreneurship Ecosystem and the Theory of Academic Entrepreneurship**

The growing business ecosystem at BOU exemplifies the ideas of Academic business Theory (Shane, 2004), which investigates the shift from academic research to entrepreneurial endeavors. The practicality of this notion is well demonstrated by BOU’s increasing emphasis on entrepreneurship education and assistance for businesses. Nevertheless, our work has also brought attention to the difficulties of integrating academic research with actual entrepreneurial endeavors. This reveals a subtle discrepancy where the application of theory in real-world situations at BOU is still developing and encountering obstacles.

### **The Theory of Interdisciplinary Collaboration and Innovation Systems**

The results of our research on interdisciplinary collaboration for innovation at BOU are consistent with Innovation Systems Theory, which emphasizes the role of collaborative networks in driving innovation. The efforts

of BOU in fostering cross-disciplinary projects align with the theory's focus on collaborative innovation. However, obstacles to successful multidisciplinary collaboration indicate a discrepancy between the theoretical concept and its actual implementation, highlighting a need for strategic enhancement.

Our study's comparative analysis demonstrates that BOU's methods in technology transfer, automation, and entrepreneurship partially conform to recognized ideas, although there are noticeable differences in certain areas. These disparities are not only theoretical differences, but rather they provide tangible difficulties and prospects for BOU. They provide valuable insights that can be used to shape future plans, showing how theoretical models can be modified or expanded to better fit the specific circumstances of BOU and comparable organizations.

### **Insights into the Dynamics of Technology Transfer and Automation in the Context of Bangladesh Open University**

One significant finding from our study was the manner in which BOU incorporates technology transfer within its open university framework. BOU's emphasis on distant learning, in contrast to conventional colleges, brings up both prospects and difficulties for technology transfer. The institution has demonstrated promise in utilizing its distant learning platforms to distribute inventions, but it encounters obstacles in reconciling its open-access purpose with the commercial side of technology transfer. The importance of automation in expanding access to education is significant at BOU, as it has greatly improved the reach and efficiency of its educational programs. The utilization of digital platforms and e-learning technologies has greatly enhanced accessibility, which is particularly crucial in a nation like Bangladesh, where geographical and socio-economic obstacles frequently hinder educational opportunities. Nevertheless, this growth also presents difficulties with upholding the standard of education and guaranteeing fair and equal access, considering the disparity in digital resources across the nation.

The university-industry interactions at BOU are undergoing changes in their dynamics. The report emphasized the endeavors of BOU to forge closer connections with industry partners, which are crucial for the successful transfer of knowledge. Nevertheless, these partnerships necessitate a greater emphasis on strategic concentration in order to fully capitalize on their potential, namely in terms of synchronizing university research with industry demands and market patterns.

Entrepreneurship education at BOU is becoming a crucial catalyst for promoting a culture of innovation and the creation of new businesses among students and teachers. While the curriculum and support systems for entrepreneurship are growing, there is a requirement for more effective ways to convert educational endeavors into prosperous business operations.

BOU successfully navigates the delicate balance between preserving its fundamental teaching principles and

embracing technological progress. Although automation and technology transfer are crucial for the university's expansion and significance, it is important to consistently harmonize them with the educational goals and open-access mindset that characterize BOU.

### **Tackling Limitations in Resources and Promoting Digital Literacy**

In addition, our study emphasized the significant challenges posed by limited resources and differing levels of digital competence among both students and instructors. These factors are crucial in influencing the success of technology transfer and automation projects, indicating that BOU should allocate resources to digital infrastructure and literacy programs in order to fully benefit from these activities. The findings from our study provide a comprehensive understanding of the complex interactions involved in the transfer of technology and automation at BOU. The potential, constraints, and strategic needs in an open university setting like BOU highlight the significance of using technology and innovation in a thoughtful and detailed way.

### **Implications**

#### **Practical Implications for University Administrators and Policymakers**

#### **Emphasizing Strategic Focus on business Collaborations**

It is important for university administrators to give priority to the establishment and enhancement of relationships with business partners. This entails developing well-organized systems for cooperation that are advantageous to both the institution and industry, enabling the translation of research into tangible applications. Policymakers can facilitate this by formulating policies that promote collaborations between universities and industries, which may include offering incentives to both entities.

#### **Investment in Digital Infrastructure**

In order to effectively exploit the advantages of automation in education, substantial investment in digital infrastructure is required. This encompasses not just the physical components and programs, but also the presence of dependable internet access. Policymakers should prioritize the allocation of resources to promote these advancements, especially in areas with restricted availability.

#### **Improving Digital Literacy**

Programs focused on enhancing digital literacy for both students and educators are crucial. Administrators should establish and organize training workshops and courses that enable users to proficiently employ digital tools. Policy initiatives could also prioritize the integration of digital literacy into the wider educational curriculum.

#### **Promoting an Entrepreneurial Culture**

Establishing a conducive environment for entrepreneurship inside the institution necessitates

more than simply including it into the curriculum. Administrators should contemplate the implementation of incubators, mentorship programs, and funding options specifically tailored for student and faculty businesses. Policymakers can facilitate this process by establishing favorable legal and economic conditions for companies that are established in universities.

University administrators must guarantee that the incorporation of technology and entrepreneurship activities is in line with the educational objectives and principles of the school. This requires a careful equilibrium between embracing cutting-edge methods and preserving the authenticity of educational programs. Efficient allocation of resources is crucial for the successful implementation of technology and entrepreneurship programs, as it ensures optimal accessibility. Administrators must ensure a fair allocation of resources to prevent worsening existing inequalities. Policy interventions may be necessary to ensure equitable distribution of resources among various departments and student groups.

#### **Ongoing Evaluation and Adjustment**

Regular evaluation of technology and entrepreneurship efforts is essential for their success. Administrators should conduct periodic evaluations to assess efficacy, collect input, and implement required adjustments. Policymakers can promote this by implementing structures that enable systematic assessment of educational programs at universities.

University administrators and politicians can improve the effectiveness of technology transfer, automation, and entrepreneurship efforts at BOU and comparable institutions by taking into account these practical aspects. These activities will guarantee that such initiatives not only enhance the university's talents and services but also have a positive impact on the wider educational and economic environments.

#### **Implications for the Academic Community and Future Research**

Our study aims to improve the academic understanding of technology in education, specifically in open university settings. We contribute to the ongoing academic discussion on the integration of technology in education. For scholars, it offers a detailed examination of how technology might be efficiently employed to improve educational accessibility and excellence, encouraging additional investigation into inventive approaches to teaching and learning in comparable institutions.

Enhancing the scope of research on collaborations between universities and industries: The difficulties and achievements in university-industry collaborations at BOU highlight the necessity for further investigation in this domain, especially in the context of developing nations. Subsequent studies could investigate efficient collaboration models that mutually benefit academic research and corporate requirements, potentially

introducing novel frameworks or modifications to current methods.

Our research examines the effects of automation on educational equity. Our findings emphasize the possible dangers of a digital gap resulting from the growing use of automation in education. This topic offers a promising prospect for future study to explore how colleges might use automation while guaranteeing fair access to resources and learning opportunities for all students.

The study's findings on the expansion and difficulties of BOU's entrepreneurial ecosystem have implications for research on entrepreneurship education and the development of supportive environments for entrepreneurs. Subsequent research endeavors could investigate the optimal methods for incorporating entrepreneurship into educational programs and how universities can cultivate conducive atmospheres for aspiring entrepreneurs.

Exploring the Significance of multidisciplinary Collaboration for Innovation: The observation of the importance of multidisciplinary collaboration for innovation in BOU highlights a promising field for academic research. Subsequent investigations may concentrate on strategies for universities to dismantle disciplinary barriers in order to promote innovation and the transfer of technology.

Our study analyzes the practical implementation of theoretical models at BOU, which serves as a foundation for future research to investigate the disparity between theory and practice. This may entail examining the variables that facilitate or impede the effective adoption of frameworks such as the Triple Helix or Technology Acceptance Model in various academic settings.

Conducting longitudinal research on technology and entrepreneurship programs would provide useful insights into the long-term development and effects of technology transfer and entrepreneurship activities. This research has the potential to offer more profound understanding regarding the durability and long-term impacts of these activities in university environments.

To summarize, the academic community can explore numerous opportunities for future research due to the wide-ranging consequences. These areas not only enhance academic comprehension but also offer valuable practical knowledge that may be utilized by educators, administrators, and policymakers in the higher education industry. The study conducted at BOU acts as a catalyst for further investigation and advancement in the areas of educational technology, entrepreneurship, and collaboration between universities and industries.

#### **Strategies for Enhancing Entrepreneurship and Startups in Universities**

The study undertaken at Bangladesh Open academic (BOU) explores different tactics that can effectively promote entrepreneurship and foster a startup culture in academic settings. Executing these initiatives necessitates a comprehensive approach that encompasses the

development of curriculum, allocation of resources, and interaction with the community.

An essential approach involves the incorporation of entrepreneurship education into several academic fields. This entails the integration of entrepreneurial courses into business curricula as well as the inclusion of innovation and creative problem-solving components in several other disciplines. This strategy requires working together with industry experts to build the curriculum, guaranteeing that the courses provide practical value and hands-on learning experiences through the use of case studies, workshops, and interactive sessions.

Moreover, it is essential to develop incubators and accelerators on campus. These organizations should offer aspiring entrepreneurs with crucial tools, like guidance from experienced mentors, access to office facilities, legal counsel, and networking events, in addition to possible first funding. Obtaining money for these efforts can be achieved through university budgets, grants, or industrial partnerships, highlighting the significance of external relationships.

Networking is crucial in the entrepreneurial path. Universities should utilize alumni and industry networks to establish opportunities for mentorship, internships, and funding. Hosting networking events and including alumni in mentorship programs can offer students crucial knowledge and connections.

Promoting innovation is greatly facilitated by interdisciplinary teamwork. Universities may foster a more dynamic and inventive entrepreneurial ecosystem by promoting projects that integrate a range of talents and viewpoints. Possible initiatives could involve the implementation of collaborative courses or interdisciplinary projects that necessitate the cooperation of students and faculty members from many departments. This would effectively cultivate a culture of collaborative invention.

Having access to research and development facilities is another crucial element. Granting student and faculty entrepreneurs access to university laboratories and equipment can greatly enhance their capacity to conceive and experiment with novel concepts, particularly in technology-oriented firms.

Enabling easy access to capital is crucial for fostering the growth of early-stage enterprises. Universities can have a substantial impact by organizing pitch competitions, providing assistance with grant writing, and facilitating connections between entrepreneurs and possible investors and funding organizations.

Administrative support holds comparable significance. Universities must to establish explicit guidelines that promote entrepreneurial endeavors, specifically addressing matters pertaining to intellectual property rights, ownership of startups, and potential conflicts of interest. This also includes offering administrative support for startup-related initiatives, optimizing procedures to facilitate the entrepreneurial experience.

Finally, it is of utmost importance to foster an

entrepreneurial culture within the university. This entails commemorating ingenuity, embracing the possibility of setbacks, and acknowledging entrepreneurial accomplishments. Universities can foster an entrepreneurial culture by showcasing successful entrepreneurial tales and hosting specialized events and contests, thereby promoting and appreciating entrepreneurial endeavors.

To summarize, the process of promoting entrepreneurship and startups in institutions such as BOU requires a comprehensive approach that encompasses various dimensions, including education, administration, and community involvement. This method not only immediately helps the students and staff engaging in entrepreneurial projects, but also enhances the institution's larger economic and innovative potential, as well as that of the surrounding community.

## CONCLUSION

Our study at Bangladesh Open University (BOU) provides valuable insights into the dynamics of technology transfer, automation, and entrepreneurship in the context of an open university in a developing nation. The study's key findings emphasize the moderate level of success achieved by technology transfer programs at BOU. These findings also highlight the difficulties encountered in commercializing research and the importance of establishing deeper connections with industry. The implementation of automation in educational delivery has had a favorable influence by improving accessibility and flexibility. However, difficulties such as digital literacy and resource allocation still remain. The entrepreneurship ecosystem, although expanding, necessitates additional cultivation through improved support infrastructure.

Based on this research, we may infer that although BOU has achieved admirable progress in integrating technology and promoting entrepreneurship, there are still significant areas that need to be enhanced. The findings suggest that there is a need for a detailed understanding of the challenges involved in incorporating these contemporary efforts within the university's structure. It is clear that achieving the maximum benefits of these projects necessitates a well-rounded approach that takes into account both technical progress and the fundamental educational purpose of the university.

In the future, it is important for research to focus on conducting longitudinal studies in order to assess the long-term effects of these activities. Conducting comparative analysis with other open institutions worldwide could provide further insights. Additionally, investigating the influence of policy and governance in supporting these projects would be extremely advantageous. Investigating the digital divide and improving digital literacy are still important issues to focus on.

This study has a wider influence that goes beyond BOU. It contributes to the scholarly discussion on technology in higher education, particularly in the context of underdeveloped nations. The acquired insights can

provide guidance to legislators, university administrators, and educators in efficiently devising and executing technology transfer, automation, and entrepreneurship projects. Furthermore, the study highlights the crucial importance of universities in promoting societal and economic progress by fostering innovation and entrepreneurship in the digital age. The study's results and suggestions provide a foundation for additional investigation and advancement in these important areas, highlighting the significant impact that universities may have on molding the future.

## REFERENCES

- Audretsch, D. B., Keilbach, M., & Lehmann, E. E. (2006). *Entrepreneurship and economic growth*. Oxford University Press.
- Bae, T. J., Qian, S., Miao, C., & Fiet, J. O. (2014). The relationship between entrepreneurship education and entrepreneurial intentions: A meta-analytic review. *Entrepreneurship Theory and Practice, 38*(2), 217-254.
- Bates, T. (2015). *Teaching in a digital age: Guidelines for designing teaching and learning*. Tony Bates Associates Ltd.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101.
- Clarysse, B., Wright, M., Bruneel, J., & Mahajan, A. (2014). Creating value in ecosystems: Crossing the chasm between knowledge and business ecosystems. *Research Policy, 43*(7), 1164-1176.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From National Systems and "Mode 2" to a Triple Helix of university-industry-government relations. *Research Policy, 29*(2), 109-123.
- Fayolle, A., & Gailly, B. (2015). The impact of entrepreneurship education on entrepreneurial attitudes and intention: Hysteresis and persistence. *Journal of Small Business Management, 53*(1), 75-93.
- Guerrero, M., Urbano, D., & Fayolle, A. (2015). Entrepreneurial activity and regional competitiveness: Evidence from European entrepreneurial universities. *The Journal of Technology Transfer, 40*(1), 105-131.
- Jacobs, J. A., & Frickel, S. (2009). Interdisciplinarity: A critical assessment. *Annual Review of Sociology, 35*, 43-65.
- Miller, R., & Côté, M. (2019). *Growing the next Silicon Valley*. Lexington Books.
- Nabi, G., Liñán, F., Fayolle, A., Krueger, N., & Walmsley, A. (2017). The impact of entrepreneurship education in higher education: A systematic review and research agenda. *Academy of Management Learning & Education, 16*(2), 277-299.
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., ... & Krabel, S. (2013). Academic engagement and commercialisation: A review of the literature on university-industry relations. *Research Policy, 42*(2), 423-442.
- Roberts, E. B., & Eesley, C. E. (2011). Entrepreneurial impact: The role of MIT. *Foundations and Trends in Entrepreneurship, 7*(1-2), 1-149.
- Seidman, I. (2013). *Interviewing as qualitative research: A guide for researchers in education and the social sciences*. Teachers College Press.
- Selwyn, N. (2017). *Education and technology: Key issues and debates*. Bloomsbury Publishing.
- Shane, S. (2004). *Academic entrepreneurship: University spinoffs and wealth creation*. Edward Elgar Publishing.
- Siegel, D. S., Waldman, D. A., Atwater, L. E., & Link, A. N. (2003). Commercial knowledge transfers from universities to firms: Improving the effectiveness of university-industry collaboration. *The Journal of High Technology Management Research, 14*(1), 111-133.
- Thursby, J. G., & Thursby, M. C. (2009). Beyond the ivory tower: Business perspectives on university-industry relationships. In *Valleys of Innovation* (pp. 45-63). Edward Elgar Publishing.
- Yin, R. K. (2018). *Case study research and applications: Design and methods*. SAGE Publications.