Soft Factors in Global ICT Sector Development:
Studies with Bangladeshi and Rwandan ICT Workers

by

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Table of Contents

List of Tables

List of Figures

List of Appendices

Abstract

Some low- and middle-income countries (LMICs) aim to designate the information and communication technology (ICT) sector as a central pillar to expedite their economic development, and a key element of ICT sector development is to nurture capable ICT workers. Scholars and policymakers concerned with those ICT workers tend to focus on nurturing hard technical skills; however, there is increasing evidence that "soft factors"—less tangible elements that affect the performance and behavior of ICT workers—are just as important.

In this dissertation, I investigated the importance of certain soft factors for the development of ICT professionals, and ultimately the entire ICT sector, in LMICs. I use mixed methods across four projects that consisted of interviews to derive hypotheses, surveys for socio-economic correlation analysis, and a field experiment to evaluate the impact of training. My research focused mainly on young ICT professionals from Bangladesh and Rwanda—LMICs that focus on the ICT industry—who had foundational training in ICT and who had the potential to be ICT leaders in their countries. It was known that international experience such as study abroad programs could have dramatic effects on professionals from LMICs, but little was known about the actual impact of such programs, or whether their impact could be gained through other means.

This dissertation consists of four interrelated projects. Project 1 analyzed what group of university students majoring in ICT in Bangladesh was most likely to be interested in experiences abroad. I found that top-tier university students tended to prefer to work in high-

income countries and others expected to remain in Bangladesh, and the desire to go abroad correlated with parental income, attendance at elite universities, gender, and the presence of role models abroad. Project 2 explored the reported strengths and challenges of Rwanda's ICT sector. I found that (1) there are sincere and widely shared aspirations for ICT-led national development; (2) policy support for ICT entrepreneurship is successful at helping to start ICT-based businesses but not at maintaining them or helping them succeed; and (3) some challenges in higher education exist. Project 3 found a gap between the expectations that Rwandan had for studying abroad and the learning outcomes of their international experiences. Specifically, while the candidates expected to have knowledge-based growth (e.g., hard skills), the returnees identified experience-based growth and mindset changes as the main learning outcomes. Based on the findings in Project 3, Project 4 implemented an intervention to develop the soft factors for young ICT engineers in Bangladesh who were interested in working abroad. The results suggest that soft factors training for ICT human resources can have some positive effect on individuals' adaptation to new environments when they started working, especially in a foreign country.

This dissertation makes several new contributions. First, these findings support the critical role of experiences abroad in cementing soft factors among ICT workers, and point to these workers' potential value in their home countries' national ICT sector development. Second, it builds on the existing theory of brain circulation by opening an avenue of inquiry about the initial emigration required for brain circulation; indeed, it appears that there is much to be understood with respect to migration dynamics pre-diaspora. Third, I argue that leap-frogging into a robust ICT economy is unlikely but that ICT workers' development can be accelerated.

Chapter 1 Introduction

When I had a task in Rwanda, I gave all my effort to finish that task as soon as possible. But here in Japan, the process is important. The quality of what we deliver is very important, so we must have time to think again and again. – Rwandan ICT worker

My colleagues are so punctual and organized. They always try to maintain a time schedule. I will work like this in the future in Bangladesh.
– Bangladeshi ICT worker

These quotes are from two information and communication technology (ICT) professionals, one from Rwanda and one from Bangladesh, each of whom had an opportunity to work in Japan. They were commenting on differences in the work culture that they experienced. It is evident that their direct experiences in Japan made them realize the importance of *soft factors*, such as the emphasis on quality or time management, to be a global ICT professional.

In recent years, some low- and middle-income countries (LMICs) have designated the ICT sector as a central pillar to expedite their economic development. For example, Rwanda is seeking to transform its agriculture-led economy into an information-rich and knowledge-based middle-income economy by adopting policies that encourage entrepreneurship and e-government (Ministry of Finance and Economic Planning, 2000). Similarly, Bangladesh is promoting ICT exports, such as offshoring software development and business process outsourcing, to shift its

main export industry from the garment sector to the ICT sector (Prime Minister's Office, 2009). These countries situate the ICT sector as a lever for creating knowledge-based jobs and obtaining foreign investment.

Many LMICs, however, face challenges in a shortage of high-caliber ICT professionals (Asian Development Bank, 2019; Kano & Toyama, 2020). One way in which ICT professionals are cultivated is through "brain circulation." Unlike brain drain, where talented citizens leave their home countries in search of opportunities in more industrialized countries, brain circulation happens when people who have worked abroad return as business leaders with strong social networks and professional skills (Saxenian, 2005). These leaders then use their skills and networks to accelerate economic growth in their home countries. According to Saxenian (2007), multiple countries have benefited from brain circulation, including India, Israel, and Taiwan. More recently, there are indications that sub-Saharan African countries such as Ghana have benefited, as well (Avle, 2014). However, while brain circulation, as a phenomenon, has been effective in cultivating ICT professionals, sending substantial numbers of people abroad to acquire the skills necessary to support the ICT business is not a viable option. Few individuals in LMICs have opportunities to study or work abroad because of economic difficulties. In Bangladesh, for example, only 1.6% of students in tertiary education have a chance to study abroad (UNESCO, 2018).

This insufficient opportunity points to the need for LMICs to improve domestic training of ICT workers, especially in higher education. Some studies have highlighted a gap between the demand for capable ICT professionals and the supply of such a labor force from the higher education sector and argued it is the result of insufficient practical training, such as project activities (Asian Development Bank, 2019; Kano & Toyama, 2020). Scholars and policymakers

concerned with this challenge have thus been focused on nurturing hard technical skills. However, there is increasing evidence that a range of soft factors are just as important.

By "soft factors," I mean less tangible factors that affect the performance and behavior of ICT workers. For individuals, this includes soft skills but also a range of less tangible personal characteristics such as mindset and cultural fit. Soft skills, which are non-technical skills (e.g., communication and leadership skills), have recently been acknowledged as critical skills for capable ICT workers, in addition to hard technical skills by scholars and policymakers (Capretz & Ahmed, 2018; Cimatti, 2016; Garousi et al., 2020). But, non-technical elements that affect the performance of ICT workers cannot be explained by soft skills alone. For example, aspiration and attitude toward work are not skills, but they affect work performance. Therefore, this dissertation introduces the concept of soft factors and discusses their importance in cultivating global ICT workers. In addition, while soft factors are recognized as important elements for the global ICT sector, the value of soft factors is highly dependent on cultures. For example, because the definition of "on time" is different among cultures, the flexibility of business punctuality varies depending on cultures and countries (L. T. White et al., 2011). Therefore, both individual soft factors (e.g., soft skills, mindset) and institutional soft factors (e.g., cultures) should be researched to uncover the essential soft factors for global ICT workers.

In this dissertation, I investigated how soft factors and cross-cultural experiences are crucial for the development of ICT professionals, and ultimately the entire ICT sector, in LMICs. I use mixed methods that consisted of interviews to derive hypotheses, surveys for socio-economic correlation analysis, and a field experiment to evaluate the impact of training. My research focused mainly on young ICT professionals from LMICs who had foundational training in technical ICT and who had the potential to be ICT leaders in their countries.

The dissertation consists of four interrelated research projects. Figure 1-1 shows the framework of the dissertation with a mapping of the four projects.

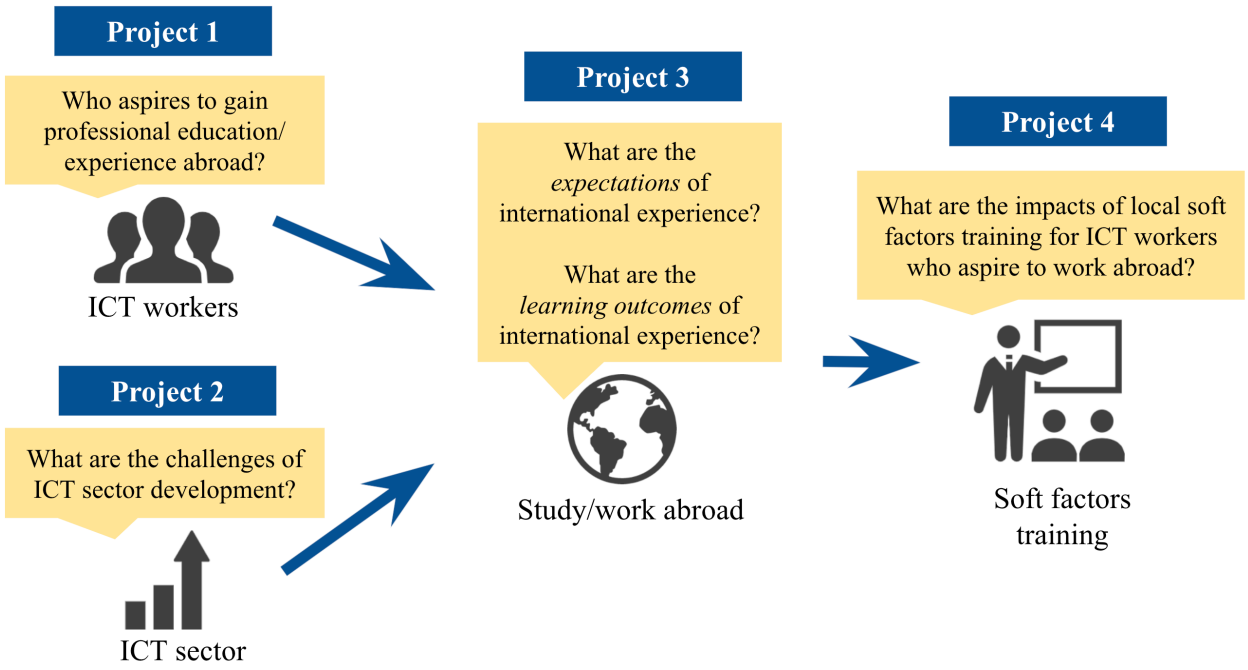


Figure 1-1. The framework of the dissertation

These projects derived the influence of soft factors in terms of individuals (Project 1) and institutions (Project 2), extracted specific elements of these factors (Project 3), and examined the possibility of training through an intervention (Project 4). These projects answered the following research questions on soft factors for global ICT human resource development, respectively: (1) Who aspires to gain professional experience abroad?; (2) What are the challenges of ICT sector development?; (3) What do these individuals believe they will learn from such experiences, and what do they actually learn?; and (4) What are the impacts of local soft factors training for ICT workers who aspire to work abroad?

In answering these research questions, my goal was to identify specific soft factors, a target population, and how this population could be better nurtured to advance their ICT sector development. These questions also illuminated possible interventions that could be implemented

using existing domestic resources. For example, if experience-based learning—the learning that individuals obtain through experience in foreign countries—could be replicated in LMICs, this would allow individuals to acquire effective and affordable educational content without going abroad. Because this educational content could be spread locally, it would have the potential to partially address the issue of brain circulation where only a limited number of ICT professionals have the opportunity to work in different areas of the world.

With regard to the geographic area of research, I chose Rwanda and Bangladesh because (1) I have connections in these countries through my practitioner experiences on development assistance and (2) these countries are representative of LMICs that focus on the ICT industry. I contrast the two countries in the following three aspects: (1) regions, (2) population size, and (3) focused areas in the ICT industry. Regarding the regions, I chose one country from Africa and one from Asia because of the high demand for international development and research in these regions. Among 46 countries categorized as the least developed countries in the world, 91% of them are located in Africa and Asia (UNCTAD, 2021), and more than 80% of ICT and international development (ICTD)-related research has been conducted in the two regions (Kano & Toyama, 2016). In terms of population, while Rwanda is a middle-populated country with 13 million people (76th in the world), Bangladesh is one of the most highly-populated countries with 165 million people and ranks 9th in the world (The World Bank, 2021). Regarding these countries' focus on the ICT industry, Rwanda is working to improve entrepreneurship and innovation, while Bangladesh is seeking more large-scale software development and outsourcing (Prime Minister's Office, 2009; Republic of Rwanda, 2016). To understand better about how study/work abroad influences the cultivation of ICT professionals, I chose Japan as the study/work destination because Japan has accepted many ICT students and ICT workers from

foreign countries historically and Japan has ICT business relationships with both Rwanda and Bangladesh. Although my research covered only these three countries, my main goal was to determine what contributes to cultivating internationally competitive ICT sectors and human resources. As a result, this dissertation offers insights into possible applications to other countries that seek to grow their global ICT businesses.

Project 1 analyzed what group of university students majoring in ICT was most likely to be interested in experiences abroad. To explore this, I conducted a survey on the career aspirations of 595 students majoring in ICT at 10 universities in Bangladesh. I found that, in general, top-tier university students preferred to work in high-income English-speaking countries and others expected to remain in Bangladesh. The desire to go abroad correlated with parental income, attendance at elite universities, gender, and the presence of role models. I also found that parental income was predictive of what factors students valued in a job. These findings have implications for the clear socio-economic differences between those who prefer to go abroad and those who remain in the home country, and for the potential interventions that could improve ICT brain circulation in LMICs.

Project 2 explored the reported strengths, weaknesses, and potential lessons of Rwanda's ICT sector through 31 semi-structured interviews with ICT sector stakeholders: government staff, entrepreneurs, faculty, students, engineers, and foreign aid organization staff. I found that (1) there are sincere, widely shared aspirations for ICT-led national development; (2) policy support for ICT entrepreneurship is successful at helping to start ICT-based businesses but not at maintaining them or helping them succeed; and (3) some of the challenges of continuing ICT-based business have to do with Rwandan higher education, the availability of start-up financing, and a weak ambition for entrepreneurial success. One of the implications of Project 2 is the

necessity of ICT human resources who can lead the ICT sector development at both the management and engineering levels.

Project 3 compared the expectations that individuals had for studying/working abroad and the learning outcomes of their international experiences. The target group of the study included two categories of participants from Rwanda: ten Rwandan nationals who planned to go to Japan in the near future, and nine Rwandan nationals who had returned from experiences in industrialized countries. The interview-based qualitative study found that there was a gap between the expectations and learning outcomes of international exposure. Specifically, while the candidates expected to have knowledge-based growth (hard factors), the returnees identified experience-based growth and mindset changes (soft factors) as the main learning outcomes. These findings point to the importance of developing soft factors, which tends to go unrecognized until one goes abroad.

Project 4 implemented an intervention to develop the soft factors of time awareness and management for young ICT engineers in Bangladesh who were interested in working abroad. I conducted a randomized controlled trial for 151 Bangladeshi ICT professionals to measure the impact of the intervention on soft factors development. The results suggest that soft factors training for ICT human resources has a positive effect on individuals' adaptation to new environments when they started working, especially in a foreign country, and the training can also be effective in fostering global ICT human resources even when they stay in their home country. The project highlights the importance of designing an intervention based on the expected outcome, as well as when and where the effects of the intervention are expected to be observed.

This dissertation makes several new contributions. First, I built on the existing theory of brain circulation by opening an avenue of inquiry about the initial emigration required for brain circulation; indeed, it appears that there is much to be understood with respect to migration dynamics pre-diaspora. Second, while I found a certain effect of soft factors training domestically, the effect might be enhanced when accompanied by working and overseas experience. Third, I argue that leap-frogging into a robust ICT economy is unlikely, but that ICT human resource development can be accelerated.

This dissertation also lead to two high-level recommendations for cultivating global ICT workers in LMICs. One recommendation is to focus on the majority, local ICT engineers who stay in their home countries. For this group, I propose immersive and experienced-based soft factors training with plenty of opportunities to interact with professionals who have international experience. This training should enable domestic ICT workers to learn the standards of international ICT business cultures without going abroad. Because this group comprises the majority of the ICT workers who would implement ICT business at the local level, the impact of this training would be huge and scalable. The other recommendation is to support the potential leaders of the ICT industry who have the opportunity and aspiration to study/work abroad. This support could be in the form of policies that encourage brain circulation and preparatory soft factors training for adapting to different corporate cultures. Although the target population of this strategy is small, this group could take the main role in brain circulation and lead the international ICT business in the future. These two strategies, which approach both a larger number of local ICT engineers and a limited number of potential leaders, contribute to fostering globally competitive ICT human resources in LMICs.

Culture, and the appreciation of its relevance to one's professional practice, is conceptually central to my dissertation. There are points throughout this dissertation, where I treat an understanding of a particular country's business culture as desirable. That does not mean one country's business culture is necessarily objectively superior to another's. In this paper, however, I proceed on the basis that there is something to be gained by ICT workers from LMICs when they learn about or assimilate into the culture of the international ICT industry, for the following reasons. First, whatever one's opinions about the moral failure of the structure of today's global economy, some ICT sub-cultures, such as that of a Silicon Valley software development team, are associated with greater economic success, so learning about them offers a business advantage both at the individual and company levels. In this dissertation, I am mostly concerned with global IT sub-cultures, which differ from other sub-cultures. Second, the LMICs' participants in my research often mentioned that they desired to learn from industrialized countries. Those perceptions might be a product of the economic hegemony of industrialized countries, so what they believe should not necessarily be accepted at face value. Nevertheless, many workers want to learn from successful industries abroad, so we cannot deny that preference entirely. Third, the origins of the modern digital economy in parts of the West, and the consequent genealogy of its norms in a Silicon Valley ethic—its attitudes toward work, intellectual property, professional growth, etc.—have been the subject of much conversation (Himanen, 2009), which has in turn meant that the values of the industry are fundamentally Western. Despite the evolution of these values through the globalization of the ICT industry, these foundations pose a learning curve to many young professionals seeking to enter the space from outside this intellectual and practical core.

The rest of the dissertation is organized as follows. Chapter 2 reviews the related literature on ICT sector development, ICT human resource development, and adaptation to an international corporate working culture. Chapter 3 explains the background of my research, focusing on geographic information about Rwanda, Bangladesh, and Japan. In Chapters 4–7, I explain the interrelated research projects—Projects 1, 2, 3, and 4, respectively. Chapter 8 discusses the overall themes with some policy recommendations. Then Chapter 9 concludes the dissertation.

Chapter 2 Related Work

This chapter first reviews papers on the elements of information and communication technology (ICT) industry development in low- and middle-income countries (LMICs) and their challenges. Next, among those challenges, I focus on global ICT workers' development in order to understand the factors and challenges involved in cultivating a global ICT workforce. Then, based on the required factors, I introduce the concept of soft factors, which covers both soft skills and non-skill elements that contribute to global ICT workers' development, and review critical approaches to obtain those soft factors from cultural and methodological perspectives. (Additional research specific to each study is reviewed within the corresponding chapters.)

2.1 ICT Sector Development and Challenges

Vast literature has sought to identify the ideal features for nurturing the ICT sector, encompassing the ICT sector development model (Carmel, 2003; Heeks, 2006; Heeks & Nicholson, 2002; Porter, 1998), ICT export industry development (Arora & Athreye, 2002; Joshi & Mudigonda, 2008), the innovation ecosystem (Delbecq & Weiss, 2000; Entrepreneur, 2018; Munroe & Westwind, 2009), and human resources across borders (Saxenian, 2005). LMICs face many challenges to growing their ICT sectors such as the small size of their market (Reichgelt, 2000), an in-country brain drain (Nicholson & Sahay, 2009), and insufficient labor (Garg & Varma, 2008). The following subsections focus on the related research on theoretical frameworks, success cases, and the challenges of ICT sectors in LMICs.

2.1.1 ICT Export Sector Development

Theories of successful ICT sector development tend to focus on the distinct elements required for it (Carmel, 2003; Heeks & Nicholson, 2002; Porter, 1998). For example, Heeks and Nicholson (2002) introduced five dimensions for a successful ICT export sector in emerging countries: market and labor demand, national vision and strategy, international linkages and trust, software industry characteristics, and domestic input factors/infrastructure. Based on these five factors for a successful ICT export sector, Carmel (2003) introduced a framework called the "oval model." In this model, Carmel added three more factors: monetary reward for quality of life, geographic benefit for the quality of life, and capital to support new start-ups and expand existing business.

For an example of successful ICT export sector development, take a look at India. With the exception of India, ICT sector development in LMICs has received scant attention. However, India's rise as an information technology (IT) superpower has inspired countless articles on the reasons for its success (Bhattacharjee & Chakrabarti, 2015; Rodrik & Subramanian, 2004; Sengupta, 2008; Toyama, 2015). First, early investments in elite education had an impact on cultivating ICT human resources to lead the ICT industry (Arora & Athreye, 2002; Toyama, 2015). Second, economic reforms between 1980 and 1990 impacted the ICT sector development in India: the transition to high growth began in the 1980s as Infosys was founded in 1981 and Wipro first ventured into IT in 1980 (Rodrik & Subramanian, 2004). Later, there was a paradigm shift in the liberalization of 1991 (Sengupta, 2008). Third, since the medium of instruction is English in India, the language has been an advantage to work with countries with strong ICT businesses such as the United States and the United Kingdom. Fourth, as a "chance" factor, the Y2K problem (a computer flaw expected to cause mass chaos as the calendar flipped from 1999

to 2000) supported business expansion in India. Due to the Y2K problem, small- and medium-size companies in the United States that had not previously connected with India began to place orders with India because of a shortage of available ICT engineers (Bhattacharjee & Chakrabarti, 2015). Indian ICT firms then began retaining those companies in the United States as repeat customers.

However, it is unclear how many of these factors translate to other contexts outside of India. For example, it seems unlikely that a Y2K-like opportunity will occur again, and the labor-abundant environment found in India is also difficult to find in most less-populated countries (Arora & Athreye, 2002). An additional benefit to India was that, links with expatriates working in the United States in high-level managerial and technical positions helped Indian entrepreneurs to start businesses, so sending human resources to high-income countries (HICs) was also an effective prior investment for India (Arora & Athreye, 2002).

This dissertation uses those models and successful cases of ICT sector development in order to (1) classify the characteristics and challenges of the ICT sector and ICT workers in Rwanda and Bangladesh, (2) derive similarities with other countries, and (3) discover their distinct features.

2.1.2 Challenges in the ICT Sectors in LMICs

Despite some success cases in ICT export sector development, there are multiple challenges to building a strong ICT export sector in LMICs. To overcome such obstacles, prior research suggests devising a policy that considers both the benefits and risks of promoting foreign investment (Gockel, 2002; Nicholson & Sahay, 2009; Ntale et al., 2013) and establishing a niche market that fits the country's characteristics (Heeks & Nicholson, 2002; Nicholson & Sahay, 2009; Saxenian, 2005). In addition, while it is important to develop highly skilled ICT

human resources, there are challenges to cultivating such human resources in LMICs in terms of both quality and quantity (Garg & Varma, 2008; Ratten, 2014; Reichgelt, 2000).

Although opening to the international market and promoting foreign investment create opportunities for building the ICT export sector, risks such as "in-country brain drain," whereby talented local resources are exploited by foreign companies, exist. One of the risks trigged by promoting foreign direct investment in LMICs is that capable engineers might be monopolized by large-scale foreign software companies because those companies offer high salaries (Nicholson & Sahay, 2009). This situation is a typical example of in-country brain drain. Another example is Costa Rica, where many local software companies have subcontracted their low-skill labor to international companies at a cheap rate (Nicholson & Sahay, 2009).

For countries with a limited domestic ICT market, it is important to build a strategy that focuses on a specific and niche domain that fits the country's profile. While many international organizations and LMICs try to use the ICT sector for expanding their export industry, this is not easy, especially for small LMICs. This is because the software industry is a labor-intensive industry involving many processes and requiring a large workforce of engineers (Reichgelt, 2000). Hence, the policy should be reformed based on how local companies have been shaped historically and how those companies are influenced by software export policy (Nicholson & Sahay, 2009). Exceptional cases of successful software export countries with a limited domestic market include Israel, Ireland, Taiwan, and Singapore (Reichgelt, 2000; Saxenian, 2005). Israel, for example, has achieved success because of its robust tertiary education system (Reichgelt, 2000), and Ireland has focused on outsourcing business in Europe where it has a geographical and economic advantages (Saxenian, 2005). Identifying and focusing on a niche market has been

an effective strategy for these small countries to develop their ICT export sector (Heeks & Nicholson, 2002; Reichgelt, 2000).

While human resource development is another essential factor that promotes the ICT export industry, many LMICs face a lack of high-caliber software engineers who can lead the industry. Although Rwanda, for example, has implemented an ICT-based national development policy and is willing to expand business processes by outsourcing, the shortage of highly skilled ICT personnel is a critical problem (Ntale et al., 2013). Countless researchers have sought to identify reasons for the shortage of skilled engineers and ICT training deficiencies among LMICs. Some studies have emphasized the importance of higher education as a necessary factor for brain circulation and for ICT export (Reichgelt, 2000; Saxenian, 2005). A comprehensive literature review on entrepreneurship in LMICs listed low-level education as one obstacle to ICT entrepreneurship (Ratten, 2014). Even countries with very successful ICT industries, such as India, still worry about not applying enough attention to relevant topics, especially in terms of knowledge, skills, and mindset (Garg & Varma, 2008).

In Chapter 5, I identify how those closest to Rwanda's ICT sector see its strengths and weaknesses, with an eye toward understanding what, if anything, is needed for Rwanda's innovation ecosystem to grow. These challenges for ICT export sector development emphasize the importance of policy and ICT human resource development. The next section further explores the skills required for global ICT workers.

2.2 Global ICT Human Resource Development

This section focuses on human resource development in the global ICT sector. I first cover human resource development in the global context, such as brain circulation. Next, I discuss individual success factors for engineers and entrepreneurs, especially soft factors.

2.2.1 Brain Circulation

More than a third of the software engineers in Silicon Valley were born outside the United States (Joint Venture Silicon Valley & Institute for Regional Studies, 2016). Some interpret this a brain drain for the countries of origin because they have lost engineering talent. For example, a study lamented that limited opportunity and political turmoil in Bangladesh caused talented students to look for work elsewhere (A. M. Abdullah & Hossain, 2014).

On the other hand, many such workers return to their homelands with new skills and networks, either on temporary visits or as permanent returnees. Saxenian (2005) found through research in India, Israel, and Taiwan, that such *brain circulation* plays a critical role in ICT sector development, whether through encouraging more international investment, improving the connectivity of professional networks, or transferring skills to the home country. Brain drain is problematic, but it redeems itself when it becomes brain circulation (Ng'ambi, 2006; Saxenian, 2005).

Saxenian's (2005) work focused on what persuades diaspora engineers to return home. The author found that this occurs, first, when the government has invested heavily in higher technical education and, second, when the country is stable and open politically and economically (Saxenian, 2005). India again provides an example: as early as the 1960s, at a time when there was little software industry in India, its government developed policies to promote outsourcing businesses with strong investment in technical universities (Norman & Venter, 2016). That groundwork led to a burgeoning industry in India that generated hundreds of thousands of new jobs per year, occupied by well-trained but low-cost engineers (Heeks & Nicholson, 2002; Joshi & Mudigonda, 2008).

Brain circulation is increasingly found in other countries. Avle (2014), for example, tracked the phenomenon in Ghana. Through interviews with returnees who managed small- or medium-size companies, Avle found that returnees work as catalysts for economic growth because they bring up-to-date technical information and capital for business. She also pointed out that international exposure leads to management and strategic skills that make entrepreneurs competitive on a global scale (Avle, 2014).

But, while the literature on brain circulation has investigated conditions under which workers return home, little is known about what causes the emigration of engineers in the first place. Existing studies have focused on the negative impact of brain drain and have not sought to understand how outward migration might be encouraged as a precursor to brain circulation. I investigated this issue and discussed my findings in Chapter 4.

2.2.2 Individual Success Factors in the ICT Sector

To develop a strong ICT sector, capable engineers and entrepreneurs are necessary. Personal mindset, decision-making, and teamwork are considered factors leading to success for both engineers and entrepreneurs.

As to the success factors of ICT entrepreneurs, a holistic literature review on entrepreneurship in LMICs found that entrepreneurship is a key ingredient of growth in LMICs (Ratten, 2014). The author asserted that important elements of entrepreneurial capacity are the ability to be innovative, proactive, take risks, and integrate individual skills in a group work setting (Ratten, 2014). The ability to form a partnership is also an important element of entrepreneurial behavior (Franco & Pessoa, 2014).

Regarding the success factors of ICT workers, there are three points to be considered: institutional environment, personal characteristics, and communication. First, institutional

environments influence the cultivation of ICT workers, especially in LMICs. For example, low-level education hampers the capacity of ICT workers at a national level (Ntale et al., 2013; Ratten, 2014). Further, geographic disadvantages for export and a lack of national financial investment also hamper the cultivation of high-caliber ICT workers in places where there is little money for such investment in human resource development (Okpara & Wynn, 2007).

Second, personal characteristics such as self-improvement, passion, open-mindedness, and data-driven qualities are the core attributes of ICT workers (Li et al., 2015). The authors conducted interviews of 59 engineers at Microsoft and concluded that productivity is just one criterion for excellence and that being able to learn new technical skills—through internships and open-source projects—is equally important (Li et al., 2015).

Third, soft skills, such as teamwork and decision-making, are core skills for ICT workers (Li et al., 2015). For example, important soft skills for decision-making include having knowledge about people and the organization, seeing both the forest and trees, and having the ability to handle complex situations (Li et al., 2015). Soft skills are fundamental skills that support teamwork (Li et al., 2015).

Based on these required elements for global ICT workers, the next subsection introduces soft factors as non-technical elements that are required for global ICT workers.

2.2.3 Soft Factors and Soft Skills

Soft skills are recognized as essential skills for ICT workers by the ICT industry (Garousi et al., 2020). Soft skills, in contrast to hard technical skills such as computer programming abilities, have a broad range of definitions; one definition is “personal transversal competencies,” which includes time management, communication, leadership, and critical thinking (Cimatti, 2016; Garousi et al., 2020; Singh Dubey & Tiwari, 2020; Stevens & Norman, 2016). Several

studies found that both soft- and hard-skills are equally important for professional jobs (Berglund, 2018; Garousi et al., 2020). For example, an analysis of the required skills in ICT job advertisements in North America, Europe, Asia and Australia noted that all of the ICT job categories marked communication skills as the most desired set of skills, followed by analytical and problem-solving skills (Ahmed et al., 2013).

Despite the attention from the industry, soft skills have not been recognized by researchers, educators and policymakers as important skills that should be taught in higher education in both HICs and LMICs (Ahmed et al., 2013; Berglund, 2018; Capretz & Ahmed, 2018). Capretz and Ahmed (2018) asserted that soft skills should be more researched and studied because soft skills have been considered complementary to hard skills by researchers. They also claimed that educators and policy makers have overlooked the importance of soft skills as a content of higher education (Capretz & Ahmed, 2018). The reasons for the perception gap between industry and higher education are two-fold: (1) the curriculum of higher education in ICT-related majors tends to be dominated by technical education and (2) soft skills are complex and intangible and difficult to quantify as an educational outcome (Capretz & Ahmed, 2018). As a reflection of analyzing 5-year programs in computer science, Berglund (2018) proposed that education institutions need to focus more on soft skills, such as self-motivation and personal leadership, to prepare students for professional jobs.

Furthermore, students in higher education have not recognized the importance of soft skills before starting in the workforce (Berglund, 2018; Parts et al., 2013). Soft skills training for university students in Sweden as a part of a computer science course showed that students recognize the benefit of soft skills only after the training is complete (Berglund, 2018). As this example shows, because students do not have enough opportunity to obtain soft skills during

their school years, recent graduates tend to struggle with the gap between the hard skills they learned in school and the soft skills they are expected to have once they start working (Garousi et al., 2020; Parts et al., 2013).

Soft skills are a key aspect of this dissertation, but I refer more frequently to a broader concept that I call "soft factors," or non-technical elements that affect the performance of global ICT workers. Soft factors, therefore, include soft skills, but also incorporate a range of personal, organizational, and even national characteristics that are important to a robust ICT economy, but which are less tangible and harder to measure. For example, an individual's aspiration and attitude toward work are not skills, but they influence work performance. To include these uncovered soft elements, this dissertation introduces the concept of "soft factors" as a broader concept of soft skills, which covers both soft skills and non-skill soft elements, such as mindset (e.g., aspiration and attitude), organizational cultures, and national characteristics, that affect the performance and behavior of ICT workers. Prior studies on soft factors are limited and the definitions vary. For example, management commitment was found to be a soft factor that affects qualitative improvement in company management (M. M. B. Abdullah et al., 2008). Another study defined soft factors as one of four types of factors that affect performance in software development teams—soft, technical, environmental, and organizational factors (Sudhakar et al., 2011). These studies flexibly defined soft factors depending on study scope, and this dissertation focuses on ICT workers and the ICT sector as the scope of soft factors.

2.3 Adaptation to International Business Cultures

A way to recognize the necessary traits for successful ICT workers is to understand differences between those who are in highly successful ICT economies and those who are not. While soft factors are recognized as important elements for the global ICT sector, the definition

of “better soft factors” is highly dependent on culture. This section reviews how socio-cultural differences influence ICT sector development and how ICT workers learn those cultural differences.

2.3.1 Socio-cultural Differences in the Global ICT Sector

Cultural influence has been a major challenge in project management of software development with multinational members (Fazli & Bittner, 2017). Cultures affect management style with regard to project management, communication, quality requirement, and productivity (Lee et al., 2011; Marutschke et al., 2019; Mendonca & Kanungo, 1996; Narayanaswamy & Henry, 2005). On the other hand, certain rules have been introduced by industrialized countries under the name of “standardization” that hinder ICT business in LMICs because of social and cultural differences (Fendler & Winschiers-Theophilus, 2010; Jimenez & Roberts, 2019; Ratten, 2014).

A major difference in project management style depending on culture is the preference regarding control or authoritarian management approach. The differences in control/authoritarian approaches and the roles of managers impact performance management in multi-national software development companies (Mendonca & Kanungo, 1996). For example, while a more confrontational mode is preferred in the United States, some countries prefer mentorship-style feedback. In LMICs, managers tend to play a role as mentor and coach rather than taking a high-level authoritarian approach (Mendonca & Kanungo, 1996). These cultural differences affect not only global teams but also outsourcing projects. A study on the relationship between national culture and control mechanisms asserted that while U.S. workers desire clear objectives and prefer not to be monitored, Indian workers prefer teamwork and consensus-building before implementing the development (Narayanaswamy & Henry, 2005).

Communication style also reflects cultures. For example, a behavior analysis based on theories on cultural difference found that people in Germany tend to value direct communication and feel uncomfortable in ambiguous situations, in contrast to people in Japan, Mexico, and Mongolia, who might take offense to such direct communication (Marutschke et al., 2019). To avoid miscommunication and build trust among team members, cooperative and task-oriented projects are effective; such projects were found to contribute to cultivating intercultural communication skills that are necessary in an international team (Marutschke et al., 2019). Even without going abroad, the participants in the projects could learn cultural differences (Marutschke et al., 2019).

Such socio-cultural differences in project management and communication also affect quality and productivity requirements. A survey of 436 people from 44 nationalities that compared the quality and productivity found that the cultural differences in quality and productivity exist not only between Western and Asian countries, but also among Asian countries (Lee et al., 2011). According to their survey, India and Bangladesh are categorized as quality-oriented countries, China and Hungary are productivity-oriented, and the United States, Australia, and the United Kingdom are in the middle. The authors also insisted that these differences come not only from culture but also from economic targets; Western companies tend to pursue short term financial targets (Lee et al., 2011).

Although the examples raised are cultural differences without indicating any hierarchical relationships, in the name of standardization, some international standards have been created based on the business cultures in industrialized countries. For example, elements surrounding the overall business culture such as learning the technical artifacts, navigating interpersonal dynamics in engineering teams, expressing dissatisfaction, and critiquing are all derived from

metaphor and styles of engagement rooted in industrial nations where the ICT sector took off first (Himanen, 2009). These involve a contextual learning curve for those outside these regions. A study that analyzed software engineering in Africa found that most standards in software engineering were established based on the Western culture, absent of African contexts (Fendler & Winschiers-Theophilus, 2010). The authors argued for the importance of education for ICT workers that has been contextualized in African contexts because most system developments are still far from locally sustainable. Furthermore, innovation and entrepreneurship have been influenced by industrialized-nation-based standards. Jimenez and Roberts (2019) critiqued applying the Global North style of innovation and entrepreneurship to the Global South. Through studying innovation hubs in Africa and India, the authors found that if LMICs introduced the Silicon-Valley style of innovation approach uncritically, the approach might subordinate indigenous knowledge, ways of knowing, and cultural values (Jimenez & Roberts, 2019). They also asserted that many Global South countries have a concept of living-well-type cultural values that might be diminished by Silicon-Valley style innovation (Jimenez & Roberts, 2019).

While individual cultures are important and should be respected, understanding and adapting to the business cultures in industrialized countries is important from a practical standpoint to obtain global economic success. On the other hand, despite the importance of cultural collaboration, the number of research projects on this subject is limited. Therefore, researchers have called for more study on cultural collaboration based on religion, race, or geographic location in LMICs (Ratten, 2014). In Chapters 6 and 7, I identify these gaps, and measure the effectiveness of an intervention in filling those gaps.

2.3.2 Motivations and Methods of Learning Different Cultures

Specific methods of experiencing and understanding different cultures include (1) studying abroad and (2) generalizing and maintaining knowledge through on-the-job training (OJT) and other training.

There are several motivations to study abroad, such as an international career, adventure, and the influence of past experiences. In LMICs, scholarship and quality of education are also types of motivations. The motivations of those who study abroad are similar regardless of whether their origins are in HICs or LMICs (King & Sondhi, 2018). Based on a survey and interviews with British and Indian students who studied abroad, the authors asserted that people shared three similarities in their motivation to study abroad (King & Sondhi, 2018). The first shared motivation was to build successful international careers. Even in the United Kingdom, students put this point as a high priority for their studies (King & Sondhi, 2018). The second motivation was adventure. Participants from both countries felt that studying internationally was a kind of adventure that would help distinguish them through their experiences living and learning in different cultures (King & Sondhi, 2018). The third motivation was previous experience. If participants had experience abroad, their interest became high and they started thinking about studying abroad (King & Sondhi, 2018). In the case of students from LMICs studying in industrialized countries, they had other motivations, as well. A qualitative analysis on the motivations of Pakistanis who studied abroad found that students were motivated by a desire for professional recognition, a high-quality education, and immigration opportunities (Javed et al., 2019). The author proposed that Pakistan should have (1) high-quality domestic education, (2) opportunities for exchange programs, and (3) availability of scholarships, in order to retain their brightest talent from brain drain.

What kind of environments or methods are effective to connect students' motivations to learning outcomes? Some studies asserted that OJT and a mix of OJT components and other training methods are effective to pursue training outcomes, and that trainee characteristics and work environment are important influences in generalizing and maintaining the training effects. As a comparison of methods of training, OJT seems to be the most influential contributing factor for learning: both OJT and classroom-based training increased learning motivations but OJT was more effective (Huang & Jao, 2016); further, among training methods (OJT, classroom, and computer-based training), only OJT showed statistically significant effects on transfer of training and firm performance (Saks & Burke-Smalley, 2014). As for effective training, several approaches have been suggested. First, ensuring the use of training contents in an actual job situation is effective (Saks & Burke-Smalley, 2014). Second, blending contents of OJT into classroom or computer-based training could produce positive effects (Huang & Jao, 2016; Saks & Burke-Smalley, 2014). Third, OJT is an approach that can cover content that is difficult to learn through knowledge-based training such as online courses (Bates, 2018; Swinnerton et al., 2017). With regard to the retention of training outcomes for the long term, Baldwin and Form (1988), in their theory of transfer of training, found the conditions of transfer to be important. They argued for generalizing the training output and maintaining the learning. The most influential factors of generalization and maintenance, they found, were trainee characteristics (ability, personality, motivation) and work environment (support, opportunity to use).

Building on the literature reviewed in this section, I extract motivations and learning outcomes from studying/working abroad in Chapter 6 and verify the effects of local training on the extracted contents (soft factors) in Chapter 7.

In sum, there are several theories on distinct elements required for ICT sector development in LMICs (Carmel, 2003; Heeks & Nicholson, 2002). India is an example of successful ICT export sector development, and many studies have analyzed the success factors, such as an investment in elite education systems in ICT (Arora & Athreye, 2002). However, the lessons from India cannot be applied to other LMICs directly because of the unique geographic features in India, such as the large working population and the chance factor, the Y2K problem, which is not expected to occur again (Bhattacharjee & Chakrabarti, 2015). Therefore, individual considerations based on the specific socio-economic situation of each country are necessary for their respective ICT sector and ICT human resource development.

As to global ICT human resource development, brain circulation is well-studied (Avle, 2014; Saxenian, 2005). But, while the literature on brain circulation has investigated conditions under which workers return home, little is known about what causes the emigration of ICT workers in the first place. With regard to the required factors for competitive ICT workers, previous studies suggest that not only technical skills but also institutional environment, personal characteristics, and soft skills are critical (Li et al., 2015; Ntale et al., 2013). I introduce the concept of soft factors to cover these non-technical factors. On the other hand, research on how to acquire these soft factors suggests there are challenges in adjusting to the global ICT business culture given cultural differences, such as the differing preferences about control and authoritarian management (Mendonca & Kanungo, 1996). Further, more research on cultural adaptation and collaboration for global ICT workers is needed (Ratten, 2014).

Chapter 3 Background

In this chapter, I explain my reasons for choosing the specific research fields of this dissertation—Rwandan, Bangladesh, and Japan—and clarify the background behind that decision.

This dissertation focuses on information and communication technology (ICT) sector development in low- and middle-income countries (LMICs), and I chose to research Rwanda and Bangladesh because they are both representatives of LMICs that prioritize ICT industry development. These countries are also different in the following three aspects: (1) region, (2) population size, and (3) focus areas in the ICT industry. Regarding the region, I chose one country from Africa and another from Asia because of the high demand for international development and research in those areas. Among 46 countries categorized as the least developed countries in the world, 91% of them are located in Africa and Asia (UNCTAD, 2021), and more than 80% of information and communication technology and development (ICTD) research has been conducted in Asia and Africa (Kano & Toyama, 2016). In terms of population, while Rwanda is a middle-populated country with 13 million people (76th in the world), Bangladesh is one of the most highly populated countries, with 165 million people, and ranks 9th in the world. (The World Bank, 2021). Regarding these countries' focus in the ICT industry, while Rwanda focuses on entrepreneurship and innovation, Bangladesh focuses on large-scale software development and outsourcing (Prime Minister's Office, 2009; Republic of Rwanda, 2016).

Because I investigated two countries with some significant differences, I expected that anything they might have in common in my findings might generalize to other countries.

To better understand how study/work abroad influences the cultivation of ICT professionals, I chose Japan as the study/work destination because Japan has accepted many ICT students and ICT workers from foreign countries historically and Japan has an ICT business relationship with both Rwanda and Bangladesh.

These are also all countries that I have some familiarity with, so it was relatively easy for me to develop the relationships required for research. The following sections provide brief overviews of the socio-economic and ICT sector/policies of the three countries.

3.1 Rwanda

Since the late 1990s, the Rwandan government has sought a program of national development that places ICT at the center (Africa Renewal, 2014). The country's ambitious "Vision 2020" plan sought to "transition her agrarian economy to an information-rich, knowledge-based [middle- income country] by 2020" (Ministry of Finance and Economic Planning, 2000). Indeed, the country's leadership seems determined to facilitate growth. Rwanda ranks 2nd in Africa in both the ease of doing business and the lack of government corruption (The World Bank, 2018; Transparency International, 2016).

Although Rwanda's Vision 2020 goals have not been met, average annual gross domestic product (GDP) growth since the '90s has been an enviable 7.85% (The World Bank, 2019a)—comparable to the growth rates of other fast-growing nations such as Singapore, on which Rwanda has consciously modeled itself (Mwangi, 2006). There are also many signs of Rwanda's commitment to ICT: entrepreneur-friendly policies, a nationwide optical fiber network, and visibility as a regional center of ICT. On the other hand, Rwanda's per capita income in 2019

was $820 (USD), still under the $1,036 threshold that the World Bank uses to classify low-income economies (The World Bank, 2019b, 2021). The United Nations Development Programme (UNDP)'s 2018 Human Development Index ranked Rwanda 157th of 189 countries (UNDP, 2018). And ICT progress still lags. The International Telecommunication Union (ITU)'s ICT Development Index, which assesses readiness, use, and capability of ICT, ranked Rwanda 153rd in 2017 (ITU, 2017). Rwanda's ICT sector is still small, generating only 2.6% of the GDP (National Institute of Statistics of Rwanda, 2016). So, there seems to be a considerable gap between aspirations and outcomes.

3.2 Bangladesh

Bangladesh has a population of 165 million whose per capita GDP in 2020 was $1,888 (USD), ranking 147th among 192 nations (International Monetary Fund, 2020). The ICT Development Index ranked Bangladesh 147th of 175 countries (ITU, 2017). Yet, the country is the site of many ICT-focused aspirations. It is recognized for its forward-thinking mobile efforts. It rolled out 4G service in 2018 (Waring, 2018), as well as bKash, which is a mobile money transfer service with a network of more than 30 million accounts and 180,000 agents (bKash, 2020). Innovative projects such as Ekhanei—classified ads delivered via Short Message Service (SMS) text messages—demonstrate the fertility of the nation's entrepreneurial elite (Zainudeen et al., 2011).

Meanwhile, according to the Bangladesh Association of Software & Information Services (BASIS)—an ICT industry organization in Bangladesh—the ICT export business has become the second largest export industry in Bangladesh and is growing rapidly. For example, from 2014 to 2017, the number of registered ICT companies increased by 200%, the revenue of the ICT industry increased by 33%, and ICT exports, while small (only 0.32% of Bangladeshi GDP),

increased by 50% (BASIS, 2014, 2017). As of 2017, Bangladesh was ranked second in the world for the number of English-speaking online software developers (Lehdonvirta, 2017). Many of the necessary conditions for ICT-enabled growth are in place in Bangladesh (Zaman, 2019).

Caught between the realities of a poor economy and a significant ICT ambition are information technology workers—the software engineers, ICT administrators, and technical staff required to innovate and implement ICT projects. In 2017, there were 300,000 people working in the ICT sector; 44% of the revenue of the ICT industry comes from software development, and 56% comes from ICT-enabled services such as data entry and other business process outsourcing (BASIS, 2017); more than 10,000 students graduated from Bangladeshi universities with ICT-relevant degrees such as computer science, information technology, and ICT administration (Hossain, 2018). Because established tertiary education and its scale are recommended for promoting software exports (Reichgelt, 2000), Bangladesh has an advantage compared to countries with smaller populations.

3.3 Japan

Although Japan has the fourth largest economy in the world with a large ICT sector (International Monetary Fund, 2020), Japan is challenged by an insufficient number of ICT engineers (Ministry of Economy, Trade and Industry, 2016). Therefore, the Japanese government has actively engaged in (1) supporting the ICT sector development in LMICs to cultivate business partners and (2) inviting ICT workers to work in Japan to make up for the shortage of ICT engineers in Japan. For example, the Japan International Cooperation Agency (JICA), the Japanese foreign aid agency, has implemented ICT human resource development in several LMICs, such as Bangladesh, Vietnam, Myanmar, and the Philippines (JICA, 2021). These

projects support higher education institutes in LMICs to improve curriculum, train instructors, and build connections with the Japanese industry.

The Japanese government has also tried to invite foreign ICT engineers to work in Japan to make up for the shortage of ICT engineers in Japan. According to the Japanese government's forecast, the ICT sector in Japan will be short 750,000 ICT engineers by 2030 (Ministry of Economy, Trade and Industry, 2016). To overcome the situation, the Japanese government uses several approaches to encourage foreign ICT engineers to work in Japan, such as loosening restrictions on visa requirements and providing local Japanese language training.

Based on this situation, Japan is a good site to consider as a possible destination for Rwandan and Bangladeshi students/workers. For these reasons, I chose Japan as the study/work abroad destination for this dissertation to better understand how study/work abroad influences the cultivation of ICT professionals.

Chapter 4 Career Aspirations among ICT Workers[1]

ICT Career Aspirations in Bangladesh: a Trigger for Development?

4.1 Introduction

AnnaLee Saxenian's theory of "brain circulation" suggests that developing economies benefit from having their brightest information-technology talent move and work abroad, because some later return home with new skills and networks that accelerate economic growth within their country of origin (Saxenian, 2005). The theory has been used to explain, at least in part, the rapid development of countries such as India, Israel, and Taiwan, and follow-up studies have broadened its relevance—for example, there is research about brain circulation in the context of China's growth (Fan, 2007; Jonkers & Tijssen, 2008), the causes of individuals' return home (Tharenou & Caulfield, 2010), and the limits of what brain circulation can accomplish (Chen, 2008; Gamlen, 2014).

However, very little research about brain circulation has focused on the essential precondition for brain circulation—the initial emigration of information and communication technology (ICT) workers out of a country. Actually, previous studies have considered "brain drain" (against which "brain circulation" was meant as a retort (Saxenian, 2005)) as a negative phenomenon by which low- and middle-income countries (LMICs) lost their brightest talent to industrialized countries (A. M. Abdullah & Hossain, 2014), but under the newer conception of

[1] The material on this chapter is based on the following paper.
Kano, T., Sheikh, A, M. Toyama, K. (2021): *IT Career aspirations in Bangladesh: a Trigger for development?* Information Technology for Development.

brain circulation, encouraging a diaspora of ICT talent could be a worthwhile endeavor. For any country to succeed at ICT-based economic growth, building competitive ICT human resources is an essential factor—brain circulation of the country's ICT workers is a critical component (Heeks & Nicholson, 2002; Joshi & Mudigonda, 2008).

I considered this question in the context of Bangladesh, a country that seems conscious of its own potential for national growth through ICT. The nation's "Digital Bangladesh" policy set a target of USD 5 billion in ICT exports by 2021, and Bangladesh is recognized as the second largest supplier of English-speaking online workers in the world (Lehdonvirta, 2017; Palak, 2019). Yet, while Bangladesh shares much of its history, geography, and languages with India, it has not achieved the "IT superpower" status of its larger neighbor. An understanding of what could encourage Bangladeshi brain circulation is likely to have lessons for other countries also seeking to kick-start a robust ICT economy.

Specifically, I focused my examination on the career aspirations of young ICT talent within Bangladesh, especially those with an interest in working abroad. What kind of ICT student is most likely to seek to migrate abroad for work? And, what are their reasons for doing so? Canonical studies of career aspirations, most of which have been conducted in the developed world, showed that aspirations play a critical role in individual careers trajectories and that these aspirations correlate with class and social status (Arulmani et al., 2003; Haller & Virkler, 1993; Lent et al., 2002; Raelin, 1980). Yet, much less is known about career aspirations in LMICs contexts. To my knowledge, no studies have linked career aspirations with geographic migration of the sort required for brain circulation.

Through a survey of 591 students across 10 Bangladeshi universities, this chapter seeks to verify two hypotheses:

H4-1. Among Bangladeshi university students who major in ICT-related topics, there are at least two groups: those who aspire to an ICT job in Bangladesh, and those who aspire to an ICT job abroad in a developed country.

H4-2. Among Bangladeshi university students who major in ICT-related topics, geographic aspirations correlate with socio-economic factors, with those aspiring to an ICT job in the developed world tending to have the following characteristics, as compared with those who aspire to work within Bangladesh: enrollment at a better university; greater family socio-economic status; and acquaintance with friends or role models abroad.

In addition to providing partial support for these hypotheses, my work makes several new contributions. First, clear distinctions in career aspirations occur not just with respect to what type of occupation a person desires, but also the larger context of the job. Second, I go beyond the findings from industrialized-world career-aspiration literature and highlight a study of an international, border-crossing context, specifically within the ICT industry. Third, I build on existing theory by opening an avenue of inquiry about the initial emigration required for brain circulation; indeed, it appears that there is much to be understood with respect to migration dynamics pre-diaspora. Fourth, I make contributions to social cognitive career theory, demonstrating that career aspirations can be studied at a finer grain within a single career category; this is more granular than the broad occupational categories that most career aspiration research focuses on. Finally, I suggest that these differences should be taken into account when designing policies or programs to encourage ICT-relevant brain circulation.

4.2 Related Work

For this chapter, I focus the literature review on career aspirations to understand how career aspirations are studied both in high-income countries (HICs) and LMICs. In addition, a related area of work is brain circulation, which was reviewed in Chapter 2.

4.2.1 Career Aspirations

There is robust literature on career aspirations and their downstream impacts, especially in HICs contexts (Arulmani et al., 2003; Haller & Virkler, 1993; Lent et al., 2002; Raelin, 1980). Most of this work found that career aspirations are correlated with education and social class (Arulmani et al., 2003; Haller & Virkler, 1993; Raelin, 1980). For example, Raelin (1980) analyzed data from the National Longitudinal Surveys in the United States and found salient correlations between career aspirations and age, intelligence, race, social class, and education. He concluded that career aspirations are largely determined by one's background before one's first job.

Some studies considered differences in career aspirations between rural and urban students, but the results were mixed. Haller and Virkler (1993) found that high school students in urban and suburban areas in the United States have greater aspirations for higher education than students in rural areas. In contrast, Bajema et al. (2002) did not find any difference regarding education and career aspirations of high school students between cities and less populous towns. They found that most of the students set similar educational and occupational goals and perceived that supports was available to nurture their aspirations regardless of the area in which they lived (Bajema et al., 2002).

Research on career aspirations in LMICs is limited, but a few studies exist and confirm findings similar to those in HICs (Arulmani et al., 2003; Japan Institute for Labour Policy and

Training, 2010; Murata et al., 2016). For example, Arulmani et al. (2003) analyzed how socio-economic background and social-cognitive environments influence the career aspirations of high school students in India. Through a survey of 1,366 high school students divided into five groups by socio-economic status (SES), Arulmani et al. (2003) found consistent with Raelin (1980) and others, that students in higher SES groups tend to see the value of high school education more positively compared with students in lower SES groups.

An established body of work also suggests a two-way link between career aspirations and actual career outcomes—on the one hand, one's aspirations predict career outcomes to some extent (especially with respect to coarse categories such as blue-collar or white-collar work); on the other hand, there is evidence for social cognitive career theory, that people temper their career aspirations based on what they believe they can achieve (Lent et al., 2002). Self-efficacy—a person's estimation of their ability to achieve a goal (Bandura, 1986)—plays a central role in the latter theory. Self-efficacy itself can be built through enactive attainments, vicarious experience, verbal persuasion, and physiological state (Bandura, 1986). Meanwhile, Murata and Nishimura (2016) found evidence in Bangladesh for the outcome expectations element of social cognitive career theory—they found a positive correlation between job satisfaction and wage, gender, employment status, work location, and size of the non-government organization (NGO) where one worked.

Finally, some work suggests a link between one's willingness to move large distances for job opportunities and one's career choices, a critical factor for any potential brain circulation (Chemsripong, 2019; Japan Institute for Labour Policy and Training, 2010; Niedomysl, 2011). For example, the Japan Institute for Labour Policy and Training (2010) conducted a survey of university students in China and Vietnam. Among 30 students, not a single one chose "work

abroad" as a first choice, despite considerable interest in studying abroad. The interviews for the survey showed that most students had never been abroad and did not have a clear idea of what it meant to work abroad. On the other hand, in another survey by the same institute, 9 of 23 university students in Dalian (China) who had contacts with foreign companies expressed interest in finding a job abroad. These results illustrate that even for university-level students, personal exposure and experiences with foreign countries or companies strongly affect their aspirations for working abroad.

Research also shows that some aspiration-driven migration depends on distance. One survey of international students studying in Thailand showed that the number of applicants decreased according to the distance between Thailand and their home countries (Chemsripong, 2019). The reasons included the cost of travel or cultural differences, both of which tend to increase as distance increases (Chemsripong, 2019). Another study showed that when people stay near their homes, their motivations are social and environmental; but with more distant migration, improved education and employment opportunities become the main motivation (Niedomysl, 2011). The same study suggested that the anxiety of going far beyond one's own social network also tends to make people avoid long-distance moves (Niedomysl, 2011). These studies gesture toward a connection between migration distance and professional aspiration, but few studies connect migration distance with career goals, and none within a single vocational category.

Overall, the literature agrees that a range of issues related to a person's socio-economic background affects career aspirations, with the expected correlations—lower socio-economic indicators are linked to less productive career aspirations. Given the generality of the findings, it seems likely that similar patterns would exist, and even be exaggerated, in countries such as

Bangladesh, where there is greater educational and economic diversity. In addition, while a handful of studies have considered conditions under which workers in LMICs might consider working abroad, none have focused on ICT workers in the context of brain circulation. Regarding aspirations on the emigration of engineers, prior studies have not discussed the degree to which outcome expectation and geographic distance affect ICT workers' career aspirations.

4.3 Hypotheses

I sought to understand the nature of career aspirations and their correlates, especially as it has to do with the geographic site of work, for ICT-focused Bangladeshi university students.

I formulated two hypotheses based on previous work suggesting that career aspirations themselves are determined by self-efficacy and outcome expectations (Lent et al., 2002), and that larger distances between one's home and eventual place of work require greater self-efficacy and ambition to overcome (Chemsripong, 2019), Based on these findings, I hypothesized that among Bangladeshi ICT students, their aspirations with respect to place of work will demonstrate a clear separation between those who wish to stay at home and those who pursue very different opportunities abroad.

> *Hypothesis 4-1. Among Bangladeshi university students who major in ICT-related topics, there are at least two groups: those who aspire to an ICT job in Bangladesh, and those who aspire to an ICT job abroad in a developed country.*

(To clarify, my hypothesis is that the two options—Bangladesh or a developed country—will emerge as distinct options. There may be additional possibilities, such as a desire to work in another LMIC, which my hypothesis does not make claims about.) Next, socio-economic status

plays a major factor in career aspirations, with more ambitious career aspirations correlated with higher socio-economic status and greater education (Arulmani et al., 2003; Raelin, 1980). This leads directly to my second hypothesis:

> *Hypothesis 4-2. Among Bangladeshi university students who major in ICT-related topics, geographic aspirations correlate with socio-economic factors, with those aspiring to an ICT job in the developed world tending to have the following characteristics, as compared with those who aspire to work within Bangladesh: enrollment at a better university; greater family socio-economic status; and acquaintance with friends or role models abroad.*

4.4 Methodology

4.4.1 University Criteria and Selection

Between July and September 2016, I conducted a survey of the career aspirations of 591 students (448 male and 143 female) majoring in computer science and engineering (CSE) at 10 Bangladeshi universities. Among CSE students, I chose third- and fourth-year students as a sample to narrow my focus to students who were actively thinking about their careers.

Table 4-1. List of universities

Tier	University	Participants	Gender		Private/Public	Area (Division)
			Male	Female		
1	DU	50	41	9	Public	Dhaka
2	NSU	47	35	12	Private	Dhaka
2	RU	67	51	16	Public	Rajshahi
3	AIUB	44	38	6	Private	Dhaka
3	BRACU	80	69	11	Private	Dhaka
3	DIU	36	20	16	Private	Dhaka
4	AUST	60	50	10	Private	Dhaka
4	EWU	47	41	6	Private	Dhaka
5	UAP	66	39	27	Private	Dhaka
5	SEU	94	64	30	Private	Dhaka
	Total	591	448	143		

Abbreviations:
AIUB: American International University-Bangladesh
AUST: Ahsanullah University of Science and Technology
BUET: Bangladesh University of Engineering and Technology
BRACU: BRAC University DIU: Daffodil International University
DU: University of Dhaka EWU: East West University
NSU: North South University RU: Rajshahi University
SEU: Southeast University UAP: University of Asia Pacific

Table 4-1 shows the universities included in my sample. I chose them for their diversity across several dimensions: public/private models, gender, urban/rural location, and difficulty of admission. My sampling of two public universities and eight private universities reflects the fact that less than 30% of all universities in Bangladesh are public (University Grants Commission of Bangladesh, 2020). Similarly, my sample of female students (24.2%) approximates the 27.8% of Bangladeshi female ICT graduates (UNESCO, 2018). Most students attend universities in urban areas, and accordingly, nine universities were located in Dhaka, the capital city, and one university was located in Rajshahi division, a regional area in the north-west part of Bangladesh. To categorize the difficulty of admission, I referred to three online university rankings (CSIC Cybermetrics Lab, 2016; TheTopTens, 2016; uniRank, 2016), which summed each university's rank, chose universities that spanned the range of summed rankings, and categorized the universities into Tier 1 (top) to Tier 5.

After choosing the universities, I targeted CSE departments and faculty members in each department. My research partner had flyers posted about the survey on the wall of each

department's school building and sent emails to targeted third- and fourth-year CSE students. I asked faculty to help recruit as many participants as possible, with a target of 50–100 students at each university. Among about 2,000 students who received the invitation email, 591 participated in the survey. Most of the surveys were administered on paper, but some of the universities requested online versions, which were identical to the paper surveys.

4.4.2 Survey Questionnaire

The survey asked questions having to do with basic demographics, socio-economic status, and career aspirations. The questionnaire is attached as Appendix A.

Basic Demographic Information: Participants were asked for their date of birth, sex, place of residence, place of birth, university name, and parents' highest educational attainments.

Socio-economic Status: Subjects were university students, typically with no income, so I solicited information about their parents and households. One question asked about combined parental income; it was a multiple-choice question with six exponentially increasing bins organized around median monthly salary in Dhaka (41,000 Bangladesh Taka (BDT), or USD 525 in 2016 when the survey was administered (Salary Explorer, 2015)). I also asked about durable household goods owned, modeled on the Progress Out of Poverty Index (Innovations for Poverty Action, 2013). Participants were asked to check which of seven items their household owned: non-smartphone mobile phone, smartphone, refrigerator, washing machine, air conditioner, scooter/motorcycle, and automobile.

Career Aspirations: Because I was interested in what might kick-start brain circulation through emigration, a significant portion of the survey focused on questions related to career aspirations. Based on informal conversations with students and professors, it was reasonable to assume that most ICT students intended to become ICT professionals, so career type did not differentiate significantly among participants.

One distinguishing factor, however, was the geographic location where they wanted to work, which I will call their geographic aspiration. I asked three versions of this question. In one question, participants were asked to check all of the locations in which they were willing to work. In another, participants indicated their ideal geographic aspiration ("Where is your most desired [dream] place of work?") Finally, participants were asked to indicate their realistic geographic aspiration—a destination they aspired to that they believed was realistically within their reach ("Realistically, where do you think you will be working 5-10 years from now?"). In all three questions, the responses allowed for "In Bangladesh (outside of Dhaka)," "In Bangladesh (Dhaka)," and "Foreign country (please specify)."

Based on the frequency of responses, I clustered aspirational destinations into four categories: (1) own hometown/region; (2) the capital city, Dhaka; (3) abroad, but not the United States; (4) the United States.

The concept of geographic aspiration was developed through existing literature on the factors of career goal-setting (Lent et al., 2002) and the relationship between geographic distance and the motivation of migration (Chemsripong, 2019), with reference to informal conversations with Bangladeshi faculty, students, and engineers, that a participant's aspirational ambition correlates with the geographical distance from their hometown to their aspirational destination. It is also directly relevant for brain circulation, which requires the movement of skilled people out

of and back into a country. In general, as ICT professionals, it is believed that working in regions outside of Dhaka is less prestigious than working in Dhaka, and that working abroad is a sign of more ambitious aspirations, with the United States as the apex. I cast the United States as the apex for several reasons. First, the United States, and especially Silicon Valley, is widely regarded as the global hub of ICT innovation; second, Saxenian (2007) asserted that one of the most important factors of brain circulation is the strong connection with Silicon Valley itself; third, among the options, the United States was located in the farthest region from Bangladesh, and so migration would require greater motivation; and fourth, the United States is also what peers of survey participants themselves cited in previous informal discussion as the apical destination.

In addition to questions about geographic aspiration, I included other questions about career aspirations, specifically about their willingness to work in the ICT sector, the most important factors in deciding their choice of work, their willingness to emigrate, and the existence of a role model who worked abroad.

4.5 Findings

4.5.1 Demographic Distribution

Capital/Regional Status: I divided students' place of birth and current residence into two categories: capital area (Dhaka division) and regional areas (the other divisions). Among 591 respondents, 45.7% of students were originally from regional areas and 54.3% were from capital areas. Regarding place of current residence, 19.9% of students lived in the regional areas, and 80.1% in the capital.

Parents' Educational Attainment: Figure 4-1 shows the distribution of the participants' parents' highest educational attainment. Higher education of less than 4 years, including vocational training school, is categorized as "College." Several points are worth noting. First, against a very low rate of college matriculation in Bangladesh overall (only 6.9% in 2011 (Institute for Statistics, 2014)), the university participants had parents with high educational attainment: almost 70% of fathers and about 40% of mothers had at least a university degree. This emphasizes how closely participants' educational attainment was linked to parental attainment.

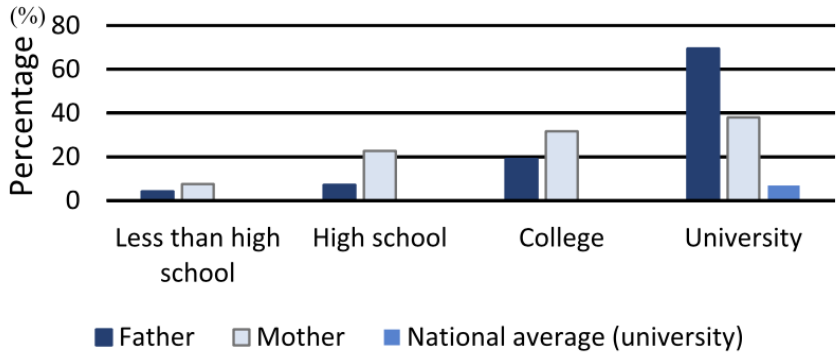
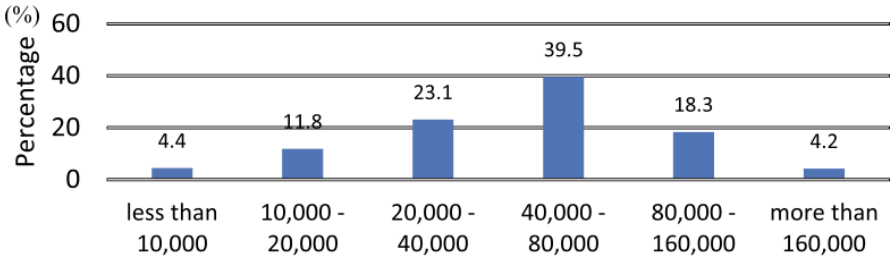


Figure 4-1. Parents' highest educational attainments (n=571)

4.5.2 Economic Status

Parental Income: Figure 4-2 summarizes the participants' best guesses of the combined monthly income of their parents. The distribution is close to a normal distribution with a peak at BDT 40,000–80,000 (USD 512–1,024) monthly income (39.5% of participants), and respondents estimating "less than BDT 10,000 (USD 128)" or "more than BDT 160,000 (USD 2,048)" comprised less than 5% each of all participants. Considering the median individual monthly salaries in Dhaka and Bangladesh are BDT 41,000 (USD 525) and BDT 36,000 (USD 461), respectively (Salary Explorer, 2015), the participants' estimates seem reasonable.



Note: USD 1 = BDT 78.01 (as of 2016)
Figure 4-2. Monthly income of the parents (unit: BDT) (n=575)

Household Possessions: Another estimate of participants' economic status came from household material possessions. Figure 4-3 shows the most expensive durable household goods that participants reported at their parents' home. While 19.2% of the students' parents owned a car, 41.9% of them did not have a home appliance more expensive than a refrigerator.

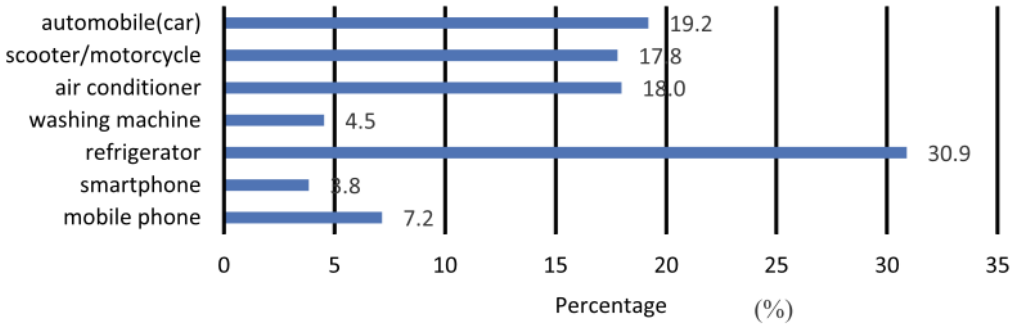


Figure 4-3. Most expensive durable good owned (n=581)

4.5.3 Career Aspirations

Willingness to Work in the ICT Sector: The ICT sector in Bangladesh has a huge demand for human resources (Hossain, 2018). Of my sample, 91.7% responded that they either "strongly agree" (51.9%) or "agree" (39.8%) that they wanted to work in the industry. Others included 7.9% who were neutral, and a negligible percentage disagreed.

Geographic Aspirations: Figure 4-4 shows the distribution of ideal and realistic geographic aspirations. Dhaka emerged as the most popular of the four categories for both ideal and realistic

aspirations. However, for many, Dhaka was the realistic "back up" option should ideal plans not work out. Among 120 students (20.6%) who chose the United States as their ideal place of future work, 30% of them reported the Bangladeshi capital city as their realistic site of work. These responses demonstrate that students make a clear distinction between their dreams and their more realistic expectations.

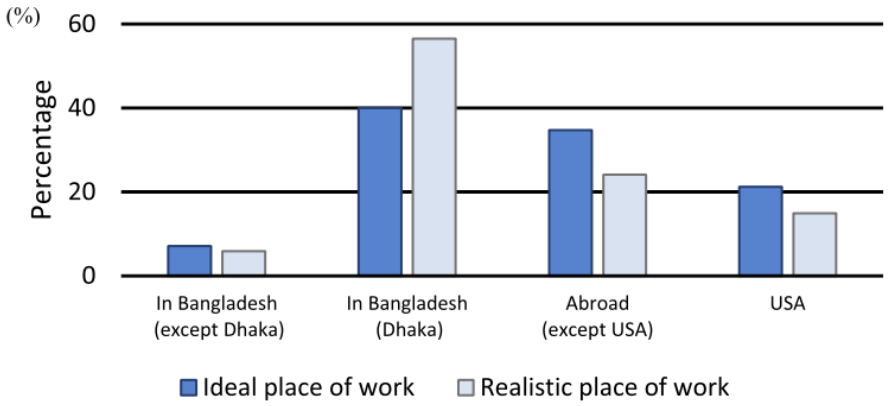


Figure 4-4. Ideal / Realistic geographic aspiration (n=578)

Because I asked about specific countries, I know the top five countries (after the United States) that figured into participants' ideal geographic aspirations. These are shown in Figure 4-5. English-speaking countries were the most favored, with 40.9% of the students choosing the United States; 18.6%, Canada; and 14.5%, Australia. Following these countries came the United Kingdom, Japan, and Germany, which were equally favored by 5.7% of participants.

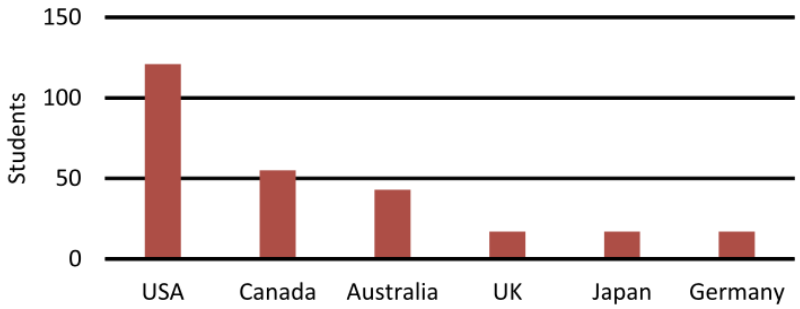


Figure 4-5. Country distribution on geographic aspiration (n=270)

Important Factors at Work: As shown in Figure 4-6, 46.3% of the participants chose salary/benefits as the most important element for job selection, followed by job contents (18.2%), work-life-balance (13.0%), and job security (11.9%). Social impact, location, job title, and colleagues were less important elements.

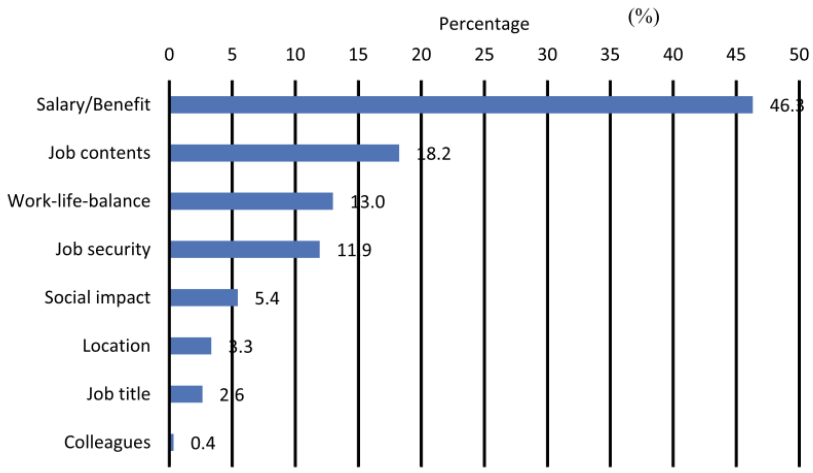


Figure 4-6. Important element of work (n=585)

Willingness to Emigrate Permanently: Figure 4-7 shows that a slight majority chose either "extremely likely" (25.5%) or "likely" (28.2%) in response to a question about whether they would stay abroad if they had a chance to work abroad. Their explanations for doing so ranged from it being a long-time dream; wanting a better lifestyle; or wanting to develop their careers. Those who chose "extremely unlikely" (5.1%) or "unlikely" (19.9%) explained their hesitation to emigrate as being related to family issues, a desire to contribute to their country, or a love of their country.

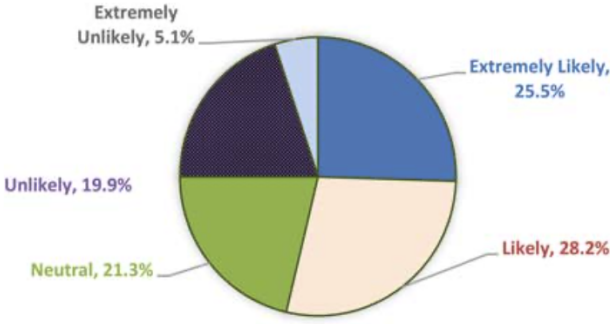


Figure 4-7. Willingness to emigrate permanently (n=585)

Role Models: Last, role models can affect students' career aspirations. In the survey, I prompted participants to "Think of someone whose career you admire. The person should be a person whom you know directly or through your friends or family"; participants were then asked about that role model: occupation, relationship, the place of residence, and the reason for admiration. Among the more than 60% of the participants who responded to my question about role models, 72.5% chose role models who lived in Bangladesh while 27.5% chose role models who lived abroad.

4.5.4 Statistical Analysis

4.5.5 Geographic Aspirations and University Caliber

Figure 4-8 shows the relationship between university tier and ideal geographic aspiration. While the lower four tiers show a unimodal distribution with a peak at "In Bangladesh (Dhaka)" or "Abroad (except the United States)," the participants from the Tier 1 (top) showed a different distribution, peaking at "the United States" (40.1%).

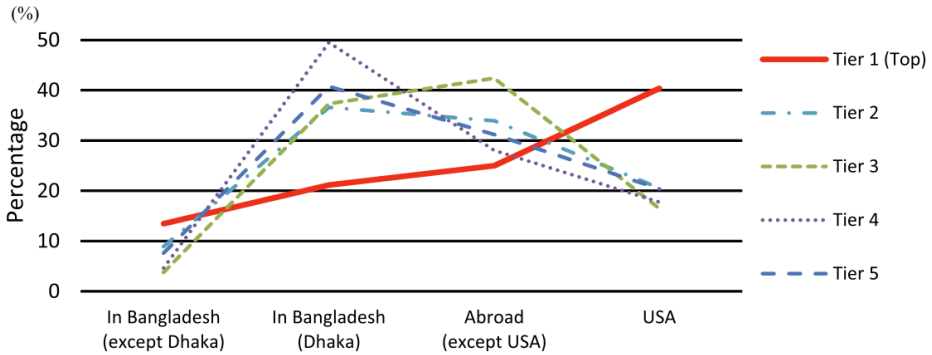


Figure 4-8. Ideal geographic aspiration and university level (n=586)

I conducted a two-sided *t*-test to compare the *ideal* geographic aspiration at Tier 1 and the other tiers. There was a statistically significant difference between Tier 1 (mean [M]=2.92,

standard deviation [SD]=0.15) and the other tiers (M=2.66, SD=0.04) conditions; $t(584)=2.09$, $p=0.04$. This suggests that the average ideal geographic aspiration of students from a top-tier university is higher than that of other students.

Figure 4-9 shows the relationship between university tiers and *realistic* geographic aspiration. All tiers have a peak at "In Bangladesh (Dhaka)," suggesting that a plurality of students think of the capital city as a realistic place of work. For the lower four university tiers, more than 50% of participants selected it.

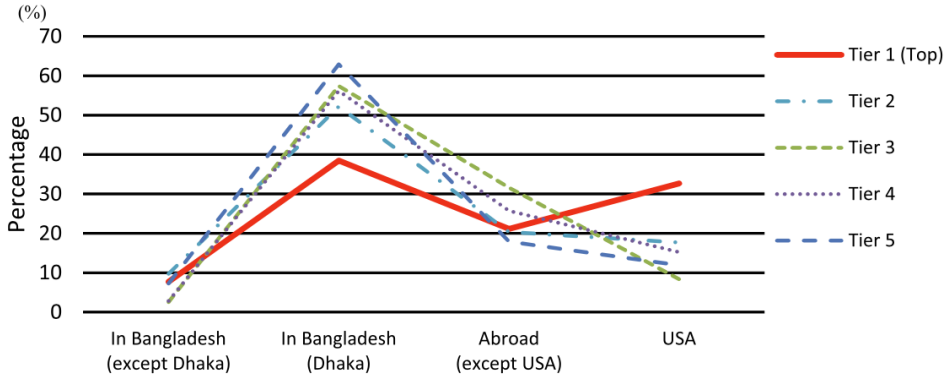


Figure 4-9. Realistic geographic aspiration and university level (n=576)

However, the top-tier university (Tier 1) again shows a different trend. More than 30% of students in the Tier 1 university wished to work in the United States, which is prominent compared to the other groups. A two-sided *t*-test confirmed a statistically significant difference between Tier 1 (M=2.79, SD=0.14) and the other tiers (M=2.44, SD=0.03) conditions; $t(574)=2.97$, $p<0.01$. So, both the ideal and realistic geographic aspirations of students from the top-tier university were higher than the other students,' though the effect was weaker with realistic aspirations.

4.5.6 Geographic Aspirations and Job Selection

Figure 4-10 shows trends between realistic geographic aspirations and the most valued elements in job selection. In all geographic categories, "salary/benefits" rated the highest, with between 37.5% and 49.0% of participants reporting it as the most important. More interestingly, participants exhibited links among "job content," "work-life-balance," and geographic aspirations. While only 3.1% of participants chose "job content" as the most important if they noted non-Dhaka, Bangladesh, as their realistic geographic aspiration, more than 20% of students wanting to work abroad cited the importance of job content. The trend flipped with work-life balance: while 34.4% of students whose geographic aspiration was non-Dhaka, Bangladesh, chose "work-life-balance" as critical, only ~10% of students chose it in the other aspiration categories.

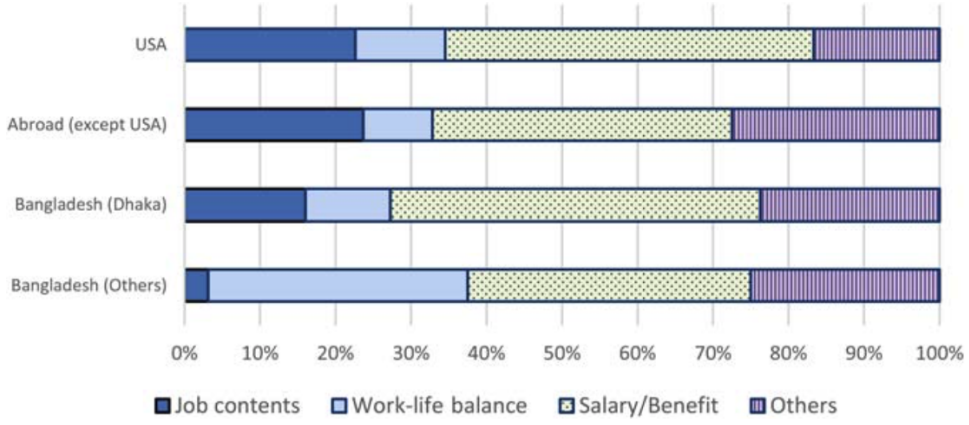


Figure 4-10. Realistic geographic aspiration and important element for job selection (n=576)

4.5.7 Parental Income and Job Selection

Figure 4-11 combines job selection criteria with parental income. Again, a plurality of participants indicated "salary/benefits" as the most important, with 41.6% and 53.9% of participants reporting it across income levels. But, there is a clear difference between the three

higher income groups and three lower income groups regarding "job content." Among the three lower income groups, less than 10% of students chose "job content" as most important; but in the three higher income groups, more than 23% of students chose it. A two-sided *t*-test showed a statistically significant difference in the three lower income groups (M=0.072, SD=0.017) and the three higher income groups (M=0.236, SD=0.023) conditions; $t(573)=5.18$, $p<0.01$. Job content appears to be far more important for participants with wealthy parents than for those coming from lower income households.

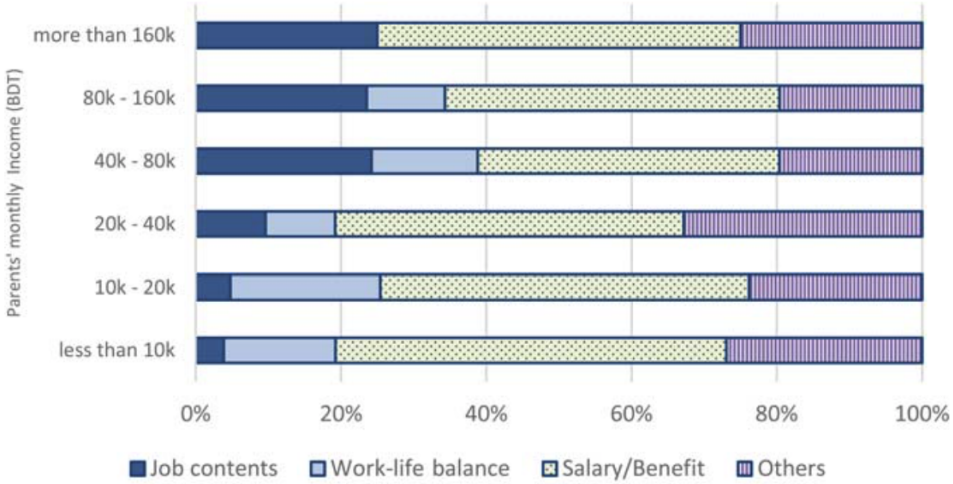


Figure 4-11. Income of the parents and important elements for the next job (n=565)

4.5.8 Geographic Aspiration Regressions

Table 4-2 shows the results of regressions using the ordered probit method (Daykin, 2002), with the following three dependent variables: Model (1) geographic aspiration (realistic), Model (2) gap between ideal and realistic aspirations, and Model (3) willingness to stay abroad permanently.

Model (1) Geographic aspiration (realistic): Participants' realistic geographic aspirations were correlated with variables relating to socio-economic background. Geographic aspirations were ordered as 1: In Bangladesh (except Dhaka), 2: In Bangladesh (Dhaka), 3: Abroad (except

the United States), and 4: the United States. A larger value means a more pronounced geographic aspiration to work abroad, especially in the United States.

Model (2) Gap between ideal and realistic aspirations: Many participants reported a difference between ideal and realistic aspirations. This model used that difference—ideal geographic aspiration minus realistic geographic aspiration—as the dependent variable. A smaller value means that there is a smaller gap between ideal and realistic targets.

Model (3) Willingness to stay abroad permanently: This model coded willingness to emigrate permanently on a scale of 1: Extremely unlikely to 5: Extremely likely. A larger value means a more pronounced willingness to stay abroad permanently.

Table 4-2. Correlation analysis of geographic aspirations

Dependent variable	Geographic aspiration (realistic)	Gap between ideal and realistic	Willingness to stay abroad permanently
Model	(1)	(2)	(3)
Tier 1 university	0.42**	−0.19	0.02
	(0.20)	(0.22)	(0.15)
Capital origin	−0.08	0.16	−0.12
	(0.10)	(0.11)	(0.10)
Parents income	0.15***	−0.16***	−0.01
	(0.05)	(0.05)	(0.04)
Role model in Bangladesh	0.02	0.02	−0.04
	(0.11)	(0.11)	(0.10)
Role model abroad	0.45***	0.03	0.55***
	(0.14)	(0.15)	(0.13)
Gender (male)	0.27**	0.27**	0.10
	(0.11)	(0.12)	(0.11)
Observations	555	554	543

Robust standard errors in parenthesis
*$p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.
Note:
Tier 1 university: A dummy variable of Tier 1 universities.
Capital origin: A dummy variable of students who were born in Dhaka division.
Parents income: 6-scale income of the parents.
Role model in Bangladesh: A dummy variable of students who filled out the existence of role model who was working in Bangladesh.
Role model abroad: A dummy variable of students who filled out the existence of role model who was working abroad.
Gender (male): A dummy variable of male.

In all cases, five independent variables were used. Four were based on Hypothesis 4-2: enrollment at a better university; capital family origin; greater family socio-economic status; and acquaintance with friends or role models abroad. Following Wigfield et al. (2002), who found

that people tend to choose jobs based on occupational gender stereotypes, I also added a fifth independent dummy variable: gender (male).

Overall, I found statistically significant support for university tier, parental income, existence of a role model abroad, and maleness correlating positively with greater geographic aspirations (willingness to work farther from home), with the strongest support for realistic geographic aspiration.

4.6 Discussion

Overall, my findings do several things. First, they confirm my two original hypotheses, though with some modifications. Second, they suggest that ICT worker emigration as a precondition to brain circulation is worthy of further study. Third, the findings show that more granular analysis of career aspirations than has previously been conducted is fruitful. Finally, they provide additional support for social cognitive career theory in the rarely studied context of Bangladesh.

To begin, I found strong support for Hypothesis 4-1: *Among Bangladeshi university students who major in ICT-related topics, there are at least two groups: those who aspire to an ICT job in Bangladesh, and those who aspire to an ICT job abroad in a developed country*. There was a clear difference in geographic aspiration between students enrolled in the top-tier university, University of Dhaka, and all of the other schools surveyed. The differences (visible in Figure 4-8 and Figure 4-9) were statistically significant in both ideal geographic aspirations ($p<0.05$) and realistic geographic aspirations ($p<0.01$). Students at the top-tier university were significantly more likely to aspire to work in the United States, in particular (within the ICT sector), whereas students from the other universities both preferred and expected to work in Bangladesh, and likely in Dhaka. This is similar to findings in India, where during the 1980s and

1990s, more than 30% of students who graduated from the Indian Institute of Technology (IITs) migrated to the United States (Saxenian, 2007). However, even at the top-tier university, realism tempers dreaming: slightly more students believed it was more realistic that they would find employment in Dhaka than in the United States.

I also note that there is visible bimodality to geographic aspirations. For almost all students, working in the United States or working in Dhaka was preferred over working abroad in a non-U.S. country, particularly among students at the top-tier university, who had relatively less interest in working in non-U.S. countries abroad. Among my respondents, one subgroup seemed to have both high career self-efficacy and high outcome expectations—their ideal and realistic geographic aspirations were equally high. Prior studies suggest that career aspirations themselves are determined by self-efficacy and outcome expectations (Lent et al., 2002), and that larger distances between one's home and eventual place of work require greater self-efficacy and ambition to overcome the obstacles involved (Chemsripong, 2019); this group aimed for a high goal, even if it meant crossing a literal and figurative ocean. The second subgroup seemed to have moderate or lower self-efficacy and outcome expectations, and sought safer goals and working conditions. This group had high ideal geographic aspirations but lower realistic geographic aspirations on average. This is consistent with previous findings in social cognitive career theory (Lent et al., 2002), but it demonstrates a new effect that applies to geography-related career aspirations. This survey results do not provide a direct explanation for this clear bifurcation, but based on related work and informal conversations with Bangladeshi ICT workers, I speculate that the reasons have to do with overall ability-based self-confidence (Bandura, 1986), distance-motivation trade-offs (students without high motivation tend to avoid long-distance moving because of the financial burden and cultural differences) (Chemsripong,

2019; Niedomysl, 2011), language (English-speaking countries preferred), and social networks (established networks in the United States, especially at the top schools; more about this later). Some of these factors could also explain why Dhaka is preferred over non-U.S. countries: the correlation suggested by Chemsripong (2019), between the geographic distance a worker is willing to cross and career ambitions, is not necessarily strict.

I also note some anecdotes I have encountered to support this finding—first, a professor of computer science at a prestigious national university in Bangladesh said that most of his students were interested in working abroad, especially the United States. He suggested that this was a result of the strong alumni networks that the university has in the United States (vicarious self-efficacy), as well as the higher salaries available in the United States (higher outcome expectations) (Bandura, 1986; Lent et al., 2002).

I also found some overall support for Hypothesis 4-2, but not all of my claims were confirmed. The original hypothesis was: *Among Bangladeshi university students who major in ICT-related topics, geographic aspirations correlate with socio-economic factors, with those aspiring to an ICT job in the developed world tending to have the following characteristics, as compared with those who aspire to work within Bangladesh: enrollment at a better university; greater family socio-economic status; and acquaintance with friends or role models abroad*.

First, I found significant correlations between realistic geographic aspiration and socio-economic factors (Table 4-2, Model (1)). In particular, students' realistic geographic aspirations were positively correlated with greater parental income. This is consistent with findings by Raelin (1980). A new finding, however, is that parental income shows a negative correlation in the gap between ideal and realistic geographic aspirations (Table 4-2, Model (2)). Students with

higher-income parents showed less of a gap between their ideal and realistic geographic aspirations.

I also found that realistic aspirations had a statistically significant correlation with having a role model abroad ($p<0.05$). This is also consistent with the literature of the social cognitive career theory and self-efficacy (Lent et al., 1994).

One of my sub-hypotheses, that there would be differences between students raised in the capital versus outlying regions (based on Haller & Virkler (1993)), was not confirmed. I found no statistically significant difference between the geographic aspirations of students hailing from capital and regional areas. This finding is consistent with those of Bajema et al. (2002), who also found no difference between a U.S. state capital city and those of the towns. They suggest that these sites did not manifest unequal access to educational or vocational resources. In this case, I suspect that class differences among university students did not necessarily split along capital/regional lines.

Further, I found strong evidence that geographic aspiration differs by sex. Men were more likely to aspire to work abroad than women ($p<0.05$). This is to be expected for Bangladesh, which ranks 135th among 144 countries in gender-equal "economic participation and opportunity" (World Economic Forum, 2016), and where cultural norms tend to inhibit women from working outside the household. This is in stark contrast to, for example, the finding of Patten and Parker (2012), who reported that women in the United States prioritize career more than men do.

The data also suggest a number of finer-grained possibilities. For example, what can we tell from the difference between ideal and realistic geographic aspirations? The questions about these variables differed based on what participants noted as their ideal place of work and what

was realistically achievable. Figure 4-4 illustrates that compared with their ideal geographic aspirations, participants' realistic geographic aspiration tended to be more modest, with most participants feeling that working in Dhaka was a realistic possibility. As to what causes these differences, informal conversations with ICT students suggested several barriers that students feel about working abroad: lack of familiarity with other countries and cultures, differences in language, challenges of immigration and visas, lack of confidence about access to jobs abroad, and fewer social ties to other countries. These barriers are largely consistent with previous findings (Chemsripong, 2019).

Regarding self-efficacy and its effect on aspirations, my findings are mixed. On the one hand, I found evidence for the possibility of vicarious experience to raise aspirations, as theorized by Bandura (1986). A person is more likely to believe in their own ability to achieve a task, if others whom he or she associates with are successful at that task. The regression analyses in Table 4.2 are consistent with this claim. They show that the existence of a role model abroad is a strong predictor of higher geographic aspirations even after controlling for other factors.

On the other hand, self-efficacy does not explain all (or even most) of the aspiration-related phenomena I see. While parental income was predictive of realistic geographic aspiration (Table 4-2), it showed no statistically significant correlation with ideal geographic aspiration. In effect, students within university groups seem to have similar ideal aspirations, but their confidence as to meeting their ideal differs by socio-economic background. This finding provides nuance to existing studies of career aspiration that tend to lump "aspiration" into a single category, and it also suggests that contrary to a first-order reading of Bandura's theory of self-efficacy (which suggests that self-efficacy is the primary driver of aspiration (Bandura et al., 2001)), students differentiate between what they genuinely prefer and what they believe they can

accomplish. It is unclear, however, why parental socio-economic status influences realistic aspiration. One hypothesis would be that wealthier households in Bangladesh are more likely to have friends and relatives who work abroad, but my model shows that socio-economic status had an effect beyond the existence of role models abroad. Another possibility is that socio-economic status correlates with various educational or resource advantages—however, these would have to be advantages that do not affect university entrance because the effect was evident even after controlling for university tier. Yet another possibility is that students from wealthier families have different character traits, such as all-around greater confidence that they can achieve their dreams. This study did not allow me to tease apart these possibilities; this is an area for future work.

One striking set of findings from my survey had to do with what students most value in a job. As noted in Figure 4-10 and Figure 4-11, what students valued was linked to both realistic geographic aspiration (Figure 4-10) and parental income (Figure 4-11). (Because the latter two factors are correlated, it seems likely that the links are explained by the same phenomenon.) The key trend here is that students who placed a premium on "job content"—the nature of the work they would be doing—as opposed to "salary/benefits" tended to come from higher-income households and to have greater geographic aspirations.

I believe this finding is consistent with Maslow's theory of the hierarchy of needs (Maslow, 1943), though I did not anticipate this point prior to my research. Maslow theorized that human motivations—for meeting physiological, safety, belonging, esteem, and self-actualization needs—were sorted in order of urgency. He suggested that in situations where survival was not at stake, people differed in their motivations based on what they had experienced, especially while young. "It is precisely those individuals in whom a certain need

has always been satisfied who are best equipped to tolerate deprivation of that need in the future" (Maslow, 1943). In my context, it could be that students who have grown up in higher-income households are more interested in good job content (i.e., self-actualization) than those who prioritize income (i.e., physiological or safety needs).

Ultimately, should a country such as Bangladesh seek to deliberately cause brain circulation, an initial requirement is that some of its ICT talent migrate abroad. To encourage such work-focused emigration, my findings suggest several things. First, the low-hanging fruit appears to lie with young ICT workers who come from relatively wealthier families; who are enrolled (or have graduated) from a top university; who have a role model abroad; and who are male. (I note with respect to the last, that this is just what my data suggest—no normative claim is intended.) This is the group that is most eager to move abroad. Second, for other ICT workers, while most of these factors are not easy to change in the short term, there is some room for intervention with respect to role models, as well as with any rationalization for work abroad—different groups of ICT workers might respond differently to messaging that highlights, for example, job quality versus higher pay.

In any case, the larger import of my study is that the preconditions of brain circulation are worthy of greater attention. As others have found in the context of study-abroad programs, young talent from LMICs sees significant individual benefits through engagement abroad with international centers of power, knowledge, and industry (Javed et al., 2019; Severino et al., 2014). What has heretofore been less emphasized, however, is that through brain circulation, encouraging something of an ICT diaspora can lay the groundwork for a future mass return of that talent to contribute to national development. However, ICT emigration itself is not a

monolithic phenomenon; to encourage it requires investigation of its complex causes, as I have begun to do in this chapter.

4.6.1 Policy Recommendations

A healthy possibility for "brain circulation" exists in Bangladesh. As noted in Figure 4-4 and Figure 4-7, over half of Bangladeshi CSE students expressed a dream to work abroad (Figure 4-4), and over half of participants suggested they would move abroad permanently if given the chance (Figure 4-7). They cite personal dreams, desire for a better lifestyle, and career development, suggesting they were unsatisfied with corresponding options in Bangladesh.

Of course, there is no guarantee that brain circulation, if it happens, would outweigh the cost of the initial brain drain. Saxenian (2005) outlined conditions, such as heavily investing in higher education and building policies around investment and entrepreneurship, that are essential for brain circulation to be a net benefit. Assuming that these previously understood conditions for positive brain circulation would also be met, I now focus on interventions to encourage the initial outbound movement of ICT talent. Circulation requires both an outflow and an inflow of talent, and I have two corresponding categories of recommendations: encouraging ICT talent to work abroad and encouraging ICT talent to return.

Encouraging ICT Talent to Work Abroad: One actionable factor that emerged from my study that differentiates students' geographical aspirations is whether they have a role model who works abroad. (Parental income, gender, and university group were also correlated with geographical aspiration, but these are all practically impossible to affect on an individual basis.) One possibility, then, is to encourage programs in which Bangladeshi engineers working abroad visit Bangladeshi universities to lecture about their experience, and perhaps more importantly, to

establish ties with students. Such a program could be run inexpensively by taking advantage of times when expatriates return home to visit. Once such ties are established, social media platforms could be used to help maintain relationships that allow Bangladeshi students to remain in touch with role models abroad.

Encouraging ICT Talent to Return: Overall growth of the ICT sector in Bangladesh is certain to encourage Bangladeshis overseas to return. However, my analysis also suggests some deliberate steps that the ICT industry and policy makers could take to accelerate brain circulation. Most relevant is the link between what most attracts students to a given job. I found that students who want to work abroad are more likely to claim job content as the most important factor in choosing a job. Though salary was important for these participants, what mattered most was whether the job itself was interesting and satisfying. Encouraging their career aspirations is an effective approach to human resource development because of its intrinsically motivated and self-determined features (Toyama, 2018). In addition, as shown in Figure 4-7, more than half of my participants claimed they would emigrate permanently if they had a chance to do so. Thus, it is important to consider those who would remain abroad apart from short visits to engage with local business opportunities.

These points lead directly to recommendations for Bangladesh to reach out to expatriates abroad through both social and technical enticements. Previous work suggests that LMIC returnees express a strong interest in contributing to their home country's economic development, partly as a way to gain social prestige (Kano & Toyama, 2020; Sabharwal & Varma, 2016). Bangladeshi entities—government, industry, and civil society—could capitalize on this inclination by creating opportunities for returnees to play a prominent role in Bangladeshi efforts at ICT-sector development (e.g., conference keynotes, meetings with state officials, etc.).

I also recommend that the Bangladesh government make investments in the higher end of the ICT industry. As with India in the early stages of development of its ICT sector, Bangladesh has a robust industry in offshore software development and business process outsourcing (BASIS, 2017). Also like India, however, much of this industry is engaged in repetitious work that more talented engineers will not find attractive. What India has successfully done is to add a layer to the industry that is focused on innovation and novel entrepreneurship. Bangladeshi policymakers and the ICT industry could similarly invest more in advanced offerings in higher education, technology research and entrepreneurship, focusing on recent trends in the technology world such as social media, artificial intelligence, information security, and so on (CompTIA, 2016). Doing so could kick-start a virtuous cycle whereby capable Bangladeshis working abroad would return to join an ICT industry that itself moves upward in the engineering hierarchy. This is not a novel recommendation, and the specifics present their own challenges, but my study provides a new perspective on how such investments not only support industry growth but could improve brain circulation.

4.6.2 Caveats and Limitations

As with most voluntary surveys, there may have been some selection bias in the participants. With a response rate of 30%, selection bias might weaken the generalizability of my findings, especially with respect to Hypothesis 4-2. Hypothesis 4-1, however, still stands—the claim that there are at least two groups of geographic aspirants would not be contradicted no matter how non-participants would have responded.

Specific questions in the survey might be prone to a social desirability bias (Biemer & Lyberg, 2003). Especially with regard to aspirations, students might inflate them. However, I found little evidence that this was a systematic problem—students seemed willing to report

differences in their ideal and realistic aspirations, for example, though social desirability would tend to shrink that gap. With respect to important factors in a job, there were a range of responses, with a majority of students willing to express salary/benefits as the most important.

Lastly, I note that my study is critically predicated on Bangladesh's present state of ICT sector development as well as on the economy and political situation abroad, especially in the United States. Geographic aspiration is a reasonable proxy for career aspiration only when a significant majority of workers see something desirable about working abroad. This is less and less the case, for example, in India, where ICT engineers increasingly choose India rather than the United States due to a well-developed ICT industry at home that often offers attractive and stable jobs comparable to those in the United States (Sabharwal & Varma, 2016). And, recent political uncertainty in the United States might also have dampened interest in working there.

4.7 Conclusion

While the theory of brain circulation is well-developed from the perspective of what causes ICT workers to return home, little work has examined how career aspirations are linked with emigration of ICT workers. I explored what socio-economic factors were correlated with career aspirations of ICT-focused Bangladeshi university students. Using a novel methodology using geographic aspiration as a proxy for understanding career aspirations within a single occupational class, I found that Bangladeshi ICT students bifurcate into those who aspire to work abroad and believe they will be able to do so, and others who, regardless of their dream aspiration, believe Dhaka to be the realistic site of their ambitions. The former show statistically significant correlations with enrollment at the top-tier university, higher parental income, the existence of a role model abroad, and male gender. I also found that students from higher-income households tend to show less of a gap between their ideal and realistic career aspirations. These

findings suggest that if countries are interested in encouraging brain circulation, investigation of the causes of its precondition—outbound emigration by ICT workers—is a critical line of inquiry.

Chapter 5 Challenges of ICT Sector Development[2]

Bottlenecks of ICT Innovation in Rwanda

5.1 Introduction

In this chapter, I report on an exploration of what people who are in or close to Rwanda's information and communication technology (ICT) industry have to say about the sector. Through 31 semi-structured interviews with government officials, entrepreneurs, engineers, faculty, and aid organization representatives, I sought to understand how Rwanda's ICT sector appears from the inside. Specifically, I wanted to understand what seemed to be going well, what remained as challenges, and what, if any, broader lessons could be drawn for countries seeking ICT-led economic growth for themselves.

Among my novel results, I found that Rwanda's government has been inordinately successful in disseminating and persuading citizens toward its ICT-focused vision. I also found that while both government and aid donors have done much to support ICT-based entrepreneurship, these efforts are lopsided in their impact. In particular, it seems that while it is very easy to start an ICT business in Rwanda, it remains very difficult to continue or succeed with one. Many reasons were given for the latter, but they tend to cluster around several themes, all of which hint at factors deeply embedded in the country's history and social norms:

[2] The material in this chapter is based on the following paper.
Kano, T., Toyama, K. (2020). *Bottlenecks of ICT Innovation in Rwanda.* Proceedings of the Eleventh International Conference on Information and Communications Technologies and Development, Paper – ICTD 2020 –

challenges with Rwandan higher education, lack of financing opportunities, and a weak sense for entrepreneurial initiative.

I situate these findings in a larger, decades-old discussion about the nature of national development. Scholars in the 1960s and ’70s often suggested that economic development occurred in “stages of growth,” whereby countries moved along distinct stages on the path to economic prosperity (Rostow, 2017). By the 1990s, those theories were largely discredited, with critics claiming they were fraught with overgeneralization, determinism, and condescension (Rogers, 1976). The rise of the “Asian tigers” and other fast-growing economies further weakened claims of staged growth, and modern ICT-driven economies such as India’s and Taiwan’s seemed to drive the last nail in the coffin. How could any staged theory make sense, if India could become an IT superpower while two-thirds of its population depended on agriculture for their livelihood? Yet, my findings suggest that a more nuanced view between these extremes is necessary. If growth stages are problematic, so, too, is any idea of economic “leap-frogging” of a kind that is so often associated with ICT-led growth. A robust ICT-driven economy does seem to require a national foundation of knowledge, education, and innovation that likely requires decades to build.

I conclude this chapter with potential directions for Rwanda’s ICT sector and lessons for other nations seeking to grow their ICT industries.

5.2 Related Work

Previous work on ICT-led national development is scattered across a number of fields, including development economics, technology innovation policy, urban planning, and entrepreneurship. Here I focus the review on recent trends to foster innovation hubs and

technology incubation. Additional related work for this chapter is on ICT sector development, which was reviewed in Chapter 2.

5.2.1 Innovation Ecosystem Development

Despite a lack of consensus in the requirements for ICT-led national growth, there have been many attempts across Africa to encourage innovation ecosystems. Historically, such efforts have focused on policies to encourage business, but increasingly, countries are investing in a "tech hub" or "innovation hub" model built around incubators and co-working spaces (Cunningham et al., 2014; Kelly & Firestone, 2016). These are physical spaces where technology entrepreneurs and experts collaborate on apps, platforms, and projects (Jimenez & Roberts, 2019). Tech hubs often provide training and workshops for innovators. There were 618 active tech hubs in Africa in 2019 to work on business strategy and create products as a part of an innovation ecosystem (GSMA, 2019); one prominent example is the iHub in Kenya, which has 8,000 members and more than 100 events each year (Hersman, 2012). A study on tech hubs found that stakeholders define success in diverse ways, with some noting personal goals, such as skill development and creating businesses, while others mentioned altruistic goals, such as offering mentorship and creating jobs (Obeysekare et al., 2017).

These hubs are meant to kick-start a Silicon-Valley-style entrepreneurial ecosystem with mentoring, investment capital, and a try-anything entrepreneurial ethic (Hersman, 2012). The hope is to generate more small and medium enterprises, which play a key role in labor markets in low- and middle-income countries (LMICs). Some estimates suggest that new start-ups account for 45%–80% of new employment in Africa (Mead, 1994).

Tech hubs, however, continue to face challenges. It is not clear whether these innovation hubs have had the intended effect (Cunningham et al., 2014; Kelly & Firestone, 2016). Some

studies found that innovation spaces are fragmented, with unsustainable businesses, insufficient funding, lack of mentorship, challenges with entry-level undergraduate training, few collaborations among entrepreneurs (Cunningham et al., 2014), and lack of interaction with universities (Kelly & Firestone, 2016). Others suggest that innovation models based on those in the Global North might unwittingly erode indigenous cultural values and ways of knowing (Jimenez & Roberts, 2019).

5.2.2 ICT Innovation in Rwanda

Rwanda's government has demonstrated a strong desire to build small and medium businesses, especially in the ICT sector, based on a belief that it will boost the economy and expand employment (Republic of Rwanda, 2016). Rwanda has established many entrepreneur-friendly policies, such as a simple process for registering a business—it takes only 6 hours to register a company, and there are no restrictions on foreign companies to operate there (The New Times, 2012; The World Bank, 2016). Indeed, the membership in the Rwanda ICT Chamber has grown rapidly in recent years to 84 firms in 2017 (Rwanda ICT Chamber, 2017). More technical vocational schools and universities are offering courses in ICT, with 16,000 students enrolled in 2015, a 27% increase from 2014 (Ministry of Youth and ICT, 2015). Rwanda also has its own tech hubs. The government established kLab in 2012 and FabLab in 2016 to accelerate the shift toward a knowledge-based economy (FabLab Rwanda, 2016; Ntale et al., 2013). The mission of kLab is to promote the development of innovative ICT solutions and to encourage collaborations among entrepreneurs (kLab, 2012). There are also private tech hubs, such as Impact Hub and Design Lab.

At the same time, studies of Rwanda's ICT sector have found weaknesses. Ntale et al.(2013) point out a shortage of highly skilled software engineers and limited access to finance.

Another study claimed that more technical collaboration is needed between the ICT and agriculture sectors (Aubert, 2018).

In this chapter, I sought to identify how those closest to Rwanda's ICT sector see its strengths and weaknesses, with an eye toward understanding what, if anything, is needed for Rwanda's innovation ecosystem to grow further.

5.3 Methodology

I conducted 31 face-to-face semi-structured interviews to explore the views of stakeholders regarding the ICT sector and the innovation ecosystem in Rwanda. The interviews consisted of a series of open-ended questions regarding perceptions of the ICT sector, entrepreneurship, education, and the motivations of entrepreneurs.

In this study, I sought to include a diverse range of participants from government policymakers, entrepreneurial leaders, students, higher education faculty, software engineers, and foreign aid organization staff. Using my connections with the Rwanda ICT Chamber, I used snowball sampling to identify participants. I conducted interviews with a total of 31 people in the following categories, each with a slightly different interview protocol:

- Government (5 people): Government officers at the Ministry of Youth and ICT, the Rwanda ICT Chamber, the Rwanda Development Board, and kLab.
- Entrepreneurs (5 people): Three with businesses that were 3-years old or more, and two with businesses less than 1-year old.
- Faculty (5 people): Faculty in ICT-related departments at the University of Rwanda and Carnegie Mellon University Africa, and lecturers in the ICT department at a vocational training college.

- Students (6 people): University students who are majoring in ICT or management.
- Engineers (4 people): Software engineers at ICT-based companies.
- Foreign aid organization staff (6 people): Representatives from the Japan International Cooperation Agency (JICA) and the German governmental aid agency.

A summary of interview participants, with gender and nationality, is shown in Table 5-1.

Table 5-1. Summary of interview participants

Category	Total	Gender		Nationality	
		Male	Female	Rwanda	Others
Government	5	5	0	5	0
Entrepreneur	5	4	1	4	1
Faculty	5	5	0	2	3
Student	6	2	4	6	0
Engineer	4	3	1	4	0
Aid Staff	6	5	1	0	6
Total	31	24	7	21	10

All interviews were audio-recorded with participant permission. The transcripts were coded with 337 labels that included categories for advantages, challenges, and capacity development with respect to the ICT sector. Within each code, I put interview excerpts into bins based on the sector that the participant was a member of (e.g., entrepreneurs, students, and government), which allowed me to understand how each participant's perspective affected their sense of the Rwandan ICT sector. Analysis proceeded within each code, and then hierarchically across codes until several top-level themes emerged. My Findings section is roughly organized by the higher-level themes.

Regarding the limitations of the study, because our interviewees were predominantly system insiders, the findings do not include perceptions from outside the ICT sector. The sample

probably also suffers from some selection bias because of the snowball sampling that started with a government official. The latter likely led to some pro-government bias, even though we nevertheless heard many critical comments.

5.4 Findings

The participants consistently cited a strong sense of mission and motivation toward developing Rwanda's capacity and status. That motivation is reflected, on the one hand, in good support for starting ICT-based businesses in the country. On the other hand, the participants also reported a range of reasons why it is difficult to continue or succeed with ICT entrepreneurship in the country. I provide details of these findings in this section.

5.4.1 Aspiration for ICT-based National Development

Almost all of the participants noted and appreciated the strong initiative that the Rwandan government has taken to support ICT activities: a strategic vision for ICT-based national building, a potential to be an ICT leader in Africa, and public-private partnerships. The Rwandan participants appeared to have internalized these aspirations thoroughly. Without exception, Rwandan participants expressed a strong desire to contribute to Rwandan society overall, and specifically with respect to ICT.

ICT-Based Nation-Building

Almost all of the participants—whether they were Rwandan or not—mentioned that they appreciated government actions toward an ICT-based economy. Foreign staff at large donor organizations, for instance, agreed that the Rwandan government consistently emphasized ICT-based nation-building and that it makes decisions and acts quickly on that basis. One employee at a donor organization gave a specific example:

I am amazed at how quickly things can move here. Like, if the president says, "We want to do drones," they just have start-ups here doing drones. – Aid Staff 3

Participants recognized the government's investments for ICT infrastructure, such as optical fiber networks and the distribution of more than 280,000 laptops in elementary schools (OLPC Inc, 2019). This attitude was recognized outside Rwanda, as well (ITU, 2017).

Government initiatives in Rwanda impact the private sector, sometimes in significant ways. Some of the participants—including government officials and at least one donor staff member—claimed that the government established e-government services, such as online tax systems, and then transferred them to private companies. In one case, the government launched an online portal site called Irembo and then went on to invite private companies to build on the service:

Irembo, an e-government portal service, was made by a government initiative. However, after launching, the government collaborated with private companies to expand the service through APIs. – Aid Staff 2

Finally, it is worth noting that Rwanda's aspiration to high ICT status is not limited to its internal efforts. Rwanda projects much of this desire outward, as well. It is widely known in international circles—both in Africa and globally—that Rwanda hopes to become an ICT leader in Africa. As an example, one of the interview participants noted that the president of Rwanda serves as the chairman of Smart Africa, a pan-African international initiative for ICT use in economic development (Smart Africa, 2019).

ICT Leadership in Africa

How well is Rwanda performing as an ICT leader in Africa? Interview participants claimed that Rwanda has advantages along these lines, as well as specific indicators of success. One advantage is language. Rwanda is one of three countries in Africa that use both English and French as official languages. This gives the country's linguistic access to at least 44 of the 54 African Union countries that also use these languages as an official language, language of business, or language of instruction (Central Intelligence Agency, 2019). One participant claimed that this point is a real consideration when an international company plans a regional office in Africa:

> *[Linguistically,] Rwanda covers the entire region [of Africa,] and the connectivity is managed locally. The language problem is managed locally. – Government 3*

Another advantage is public safety. Rwanda ranks 1st in sub-Saharan Africa and 2nd in the African continent for public safety (Gallup, 2019). This is another factor for foreign companies seeking a base in Africa.

As to what kind of regional role Rwanda seeks to play, government participants offered that Rwanda could be a center of business process outsourcing (BPO) in Africa. For this purpose, the Rwandan government was building a special economic zone, called the Kigali Innovation City (Rwanda Development Board, 2016). One government official claimed that the zone would help expand Rwanda's export market internationally, to counter the limited domestic market:

> *We want to create more jobs for Rwandese with international clients, we want to export our knowledge. Now we plan to have a very strong BPO sector in Rwanda.*
> *– Government 4*

Much of the goal of a BPO sector appears to be as a way to engage with international entities. One entrepreneur emphasized that BPO was an efficient way to learn international standards. For example, one entrepreneur insisted that having a global partner was very important when they thought about global business.

> *If I come to [a megacity in a developed country] with my briefcase and go to companies saying, "Send your projects to Rwanda," I think people would laugh at me. But if I go there with [a person] who already had business there, they may relate with me… That's the biggest barrier most people have in trying to start a business, and it's not a small barrier. – Entrepreneur 2*

Finally, there is some evidence that Rwanda has already achieved a measure of success in becoming an ICT leader in Africa. First, Rwanda has successfully hosted several headquarters of international organizations focused on African development, such as Smart Africa and the Sustainable Development Goals Center for Africa. (Smart Africa, 2019; The Sustainable Development Goals Center for Africa, 2019). Second, Rwanda was able to invite Carnegie Mellon University (CMU), a leading research university in the United States, to establish a campus in Rwanda in 2011. It was the first time that a U.S. research university established a master's degree with full-time operations in Africa (Carnegie Mellon University Africa, 2019). According to one CMU faculty member, applications have come from 27 African countries.

5.4.2 Unique Mindset for Social Contribution

One point that stood out in the interviews was a strong desire—expressed consistently by Rwandan participants—to contribute to Rwandan society. Interview participants suggested that personal experiences, education, and history caused this mindset.

When I asked about why they were interested in entrepreneurship, all Rwandan participants noted a strong desire to contribute to the development of Rwanda. Participants representing the government all asserted that the definition of "success" and "wealth" had completely changed after the genocide in 1994. Entrepreneurs, too, including those who had experience abroad, claimed to prioritize social contributions to Rwanda rather than personal success. Some comments along these lines:

> *What is the thing that will determine that I am rich? It is the time when my young brother will come to me having a problem, and I will be able to solve that problem. That's the thing that will determine that I am rich. – Student 1*

> *It's a personal mission. I'm Rwandan, so I thought I should come back and assist the development of the country. The government and I talked about it for about 10 years and then eventually I said, "OK, I'm ready, I'm coming. What do you want me to do?" – Government 3*

Some Rwandan participants ascribed this desire based on their witnessing of others' hardship:

When I was eleven… in the rural area where I was from, I was always the second in my class. This one kid, he is still alive, was always the first, and I was always the second. When we finished primary school, he didn't get the chance to continue, not because he is dumb, but because of limited means. He couldn't afford to pay for secondary school. We have many [such people] across this country. – Government 2

When I had an internship at an NGO, I trained [a rural community] about entrepreneurship and ICT. And I found that we have many things to give to them. If I have a bachelor's degree, if I have skills in ICT, why not go back [to the rural area] and share with those people to improve their lives? – Student 3

Another participant attributed Rwandans' support for their country to collective reflection after the genocide:

Rwanda has a very bad history, where the social and economic fabric of the country was broken down to pieces, to zero… it is everyone's responsibility to build a social and economic ecosystem that helps us to live together as a country first of all.
– Government 1

Some participants noted that the government was responsible for successfully focusing on Rwandan citizens' efforts toward nation-building. Research has suggested that there has been consistent messaging in schools and during the country's solidarity camps for young adults (Purdeková, 2011). Whatever the case, it seems fair to say that there is a base of social and cultural support that has penetrated deeply into individual citizens across sectors—government, private business, education—for national growth.

5.4.3 ICT Entrepreneurship as an Innovation Ecosystem

Given this backdrop of aspiration for a strong ICT sector, an obvious question is how well ICT businesses are actually supported. On this point, I found the following: On the one hand, interview participants appreciated government policies and efforts to encourage and support entrepreneurship. On the other hand, many participants pointed out a range of difficulties in continuing, growing, or succeeding as a business. In this section, I explain the things that participants appreciated about their entrepreneurial ecosystem; in the next, I uncover problems that they encountered.

Starting a Company

International indicators tend to highlight the ease with which enterprises can be started in Rwanda. The country is ranked among the top African countries with respect to the "ease of doing business" (The World Bank, 2018). People can start a company in only 6 hours in Rwanda (The New Times, 2012). Most of interview participants agreed with this assessment:

> *Now, starting a business in Rwanda is very easy. The administrative part of starting a business is not hard at all. – Entrepreneur 2*

> *It's difficult to find another place where you can create your own business so easily. – Faculty 3*

> One student participant who studied in another African country noted the comparison:

> *It takes you like almost for a month [in Country X] to register to do all those of things that you want to do. But in Rwanda, it's just one day. – Student 6*

Public Innovation Hub – kLab

The Rwandan innovation hub, kLab, is supported by the government and international aid organizations (kLab, 2012). Both government officers and entrepreneurs claimed that kLab, which is based in Kigali and boasts 1,600 members, was used as a place to access information, the Internet, and other innovators. Another hub, called FabLab with 3D printers and laser cutters was also launched at the site (FabLab Rwanda, 2016). As is common in tech hubs, kLab runs a mentorship program in which senior entrepreneurs advise young entrepreneurs. A government officer explained that kLab is an innovation hub for people in various stages of entrepreneurship, from novices without any business ideas to entrepreneurs working on early businesses. As one entrepreneur described,

> *The environment [at kLab] itself helps you to actually take your idea to the next level. It's also a very good place, actually, to meet investors. When investors come here, they know that they're going to find good ideas they can invest in. And, I think FabLab—it's a very nice place to make your prototypes, if you're making hardware-based solutions. Yeah, so kLab is actually a very nice place for developers. – Entrepreneur 1*

Investor Interaction

As noted later, traditional financing is hard to come by. The government recognizes this and has attempted to address the funding shortfall by facilitating access to investors at pitching events. One such event is called "Meet the Gorillas," and it is occasionally held at Transform Africa, an annual ICT international conference for African development:

> *The ICT Chamber has been working with different stakeholders and trying to get investors into the innovation ecosystem. "Meet the Gorillas" is the strategy where we*

match them with young innovators from kLab. They make pitches, virtually or physically, to petition investors. – Government 1

All of this is to say that starting a new business is strongly encouraged by the government and foreign donors, and that there is some degree of success in seeding a crop of new ICT businesses.

5.4.4 Obstacles to Business Success

Although many participants mentioned the ease of starting businesses in Rwanda, just as many pointed out difficulties in continuing them. There are difficulties with obtaining funding and investment. There are challenges with human resource capacity, both among business leaders and their employees. Some participants also reported potential issues with the current business culture in the country.

Financing

One challenge appears to be "access to finance." According to participants at an aid organization and a start-up company, commercial banks make loans only on a very conservative basis, and as a result most ICT companies cannot receive bank loans. A donor organization employee described the situation:

[The banks] come from this traditional approach of giving money, but with this ICT, they still feel like it's too risky. And then, you pay interest of 19% or even more, so it's really difficult to get the money also. – Aid Staff 3

And, while there are opportunities for funding, such as "Meet the Gorillas," these are few and far between. Entrepreneur interviewees noted they were constantly on the search for these

rare pitching events. Another point related to financing is a claim by one faculty member that the current tax regime expects tax revenue even from small start-up businesses, which makes it difficult for fledgling businesses to succeed. Indeed, taxpayers have complained about the high tax rate (Harelimana, 2018).

Educational Pipeline

Despite strong support from the national government and foreign donors, Rwanda's higher education system appears to be inconsistent in producing the required human capital for the thriving ICT sector. Participants from a range of sectors noted that Rwanda's public universities were not turning out employment-ready graduates. A key issue pointed out by a number of participants—especially university alumni—was "lack of practical experience."

For example, an alumnus of a public university in Rwanda claimed that most of the curriculum he experienced was theory-based and impractical:

> *The teacher is there, he is teaching. Everyone is writing something individually, and then everybody leaves. There are different levels of content, but none of them include practical exercises… At least in terms of software development, I've not seen that. – Engineer 3*

One software engineer mentioned how difficult it was to find job candidates with practical experience of any kind:

> *Sometimes we hire people even without work experience. Even if you had worked on some projects at school, that can also be counted as experiences when it comes to producing software. So, I ask, "Do you have any projects you've worked on?" And sometimes they say, "No." […] And then, some will come, "Okay, at university, I didn't*

do anything, but, on my own, I worked on this. These [are] some projects I did myself." – Engineer 4

Participants were equally vocal in noting that CMU Africa as an exception among universities in Rwanda. CMU Africa was highly appreciated by participants in the ICT sector because of its emphasis on practical education, as well as its strong connection with the ICT sector. Participants who were alumni and current students of CMU Africa said they were provided practical training such as hands-on projects with multinational teammates. A couple of participants noted that CMU Africa set higher standards for its students. An entrepreneur described this experience with CMU:

CMU challenges students. They make them think, they make them act... It's very hands-on. And, the professors are very committed. – Entrepreneur 3

A student who had a bachelor's degree from a public university in Rwanda and was in a master's course in CMU noted the practical experience:

At CMU, we do a lot of projects. Every class, we have some projects. And, in those projects, we practice a lot. We are learning at school. – Student 3

Representatives of aid organizations and some university faculty mentioned that there was a shortage of qualified teachers in higher education. One participant pointed out:

The number of middle-aged experienced teachers at higher education institutes is heavily insufficient as a consequence of genocide. – Aid Staff 1

One faculty member suggested that the pipeline of teachers with a PhD was also lacking. And, the problems may go deeper. Some participants—particularly among faculty and students—said that the level of secondary education in Rwanda was still uneven, with rural areas being at a disadvantage. Students entered university with uneven levels of English and technical education. One faculty member reported that as a result, some higher education institutes offered remedial courses that were taken by many students. Some participants noted that it had, after all, only been 11 years since the government changed the medium of education from French to English—thus, not all incoming university students were fluent in English:

> *We have an issue about English. Those people [who come from rural areas] need to continue learning the language in [higher education institute]. English is not quite focused in rural areas. – Faculty 2*

Meanwhile, some participants, particularly faculty at public universities, mentioned sincere efforts to address the challenges they saw. Some faculty members insisted that they reviewed their curriculum almost every year to fit industry trends. One faculty member claimed that higher education in Rwanda was improving as a result of (1) continuing education for faculty over the summer, (2) a greater number of visiting lecturers from industry, (3) increasing numbers of Rwandan faculty, and (4) support from international donors and foreign scholars.

Unprepared Entrepreneurs

If universities are not providing practical technical education, then it is not a surprise to find that graduates are also weak in practical professional skills. After all, even in the top universities around the world, there are ongoing discussions about how best to instill soft skills in students, and beyond that, the skills required for leadership and management (Bancino &

Zevalkink, 2007). Indeed, interview participants expressed concerns that budding Rwandan entrepreneurs rarely have the requisite soft skills for regular employment, to say nothing of entrepreneurship.

Among interview participants, representatives of donor agencies, students, and engineers all claimed that new graduates had difficulty in finding jobs, and this despite considerable effort to create jobs on the government's side. Lack of on-the-job experience and soft skills was frequently mentioned. One faculty member claimed that some people became entrepreneurs because they could not find a regular job. A student who started a company without previous experience with teamwork described one of the difficulties:

> *One thing that I recognize as a gap is how to interact with people in a company. When I'm a CEO, how do I say to someone when someone has done poorly? Do I really talk to him like, "hey, hey, hey" or just do I have to cool down? So, I need to learn from how my boss talks to me, or how other bosses talk to me. – Student 1*

Reluctance to Collaborate

Inexperience with teamwork might be one cause of a larger problem that a surprising number of participants noted: Rwandan entrepreneurs' reluctance to collaborate, especially with those who had complementary skills.

Most of the entrepreneur interview participants cited the importance of team building, especially involving people with different types of expertise. One entrepreneur said:

> *When we do a start-up, we tend to get people that have the same background. For instance, they're all computer engineers. That is actually…very much a challenge. You have to think from all angles, from business, from other stuff, so that the solution can be*

completed. When we started in 2010, we were four classmates, four computer engineering students. We faced a lot of issues in terms of our business skills, leadership skills. – Entrepreneur1

Combined with a general fear of sharing business ideas (more later on this), this led to a start-up community in which entrepreneurs worked in isolation. However, a government official who supports entrepreneurs asserted that working in isolation is unproductive. He echoed veteran entrepreneurial advice on required skills for entrepreneurs—"the ability to build a team, and being open to learning and changing your idea if you need to"—that emphasize collaboration, idea-sharing, and team diversity:

I sometimes ask [young ICT entrepreneurs], "Why don't you collaborate with a person from management, an MBA?" They always say, "Because I don't have money. So I cannot hire them." What you need to do is just to convince him, because this is one of the skills that entrepreneurs must have. – Government 2

The challenge of teambuilding and collaboration skills was reported not only among individuals but also among sectors. A government officer and an international donor representative pointed out a lack of collaboration among the ICT sector and other sectors:

The ICT ecosystem, and let's say, the tourism ecosystem, they don't talk to each other about what the tourism sector needs in terms of ICT, and what the ICT sector could provide for tourism. – Aid Staff 3

A government officer mentioned an experience when he connected a financial company and e-commerce companies:

[The financial firm] had online payments, but they didn't have customers. The [e-commerce firm] had online businesses, but they didn't have payments. I was like, Why? Why don't you communicate with each other? Now, the [financial firm] finally has online payments. He got five customers because of the small meeting I held.

– Government 4

For their part, the entrepreneur interviewees acknowledged their diffidence with respect to interaction and collaboration. They cited lack of funds to hire people, as well as a fear of having their start-up ideas stolen. Some of this might be due simply to entrepreneurial naivete of a kind encountered even in Silicon Valley. Experienced venture capitalists and serial entrepreneurs suggest that the fear of having ideas stolen is common among novice entrepreneurs, but unmerited (Schools, 2016).

Others said that the problem was a lack of ICT literacy among potential partners. One engineer noted:

Business owners don't understand ICT solutions. They don't like computers; they aren't familiar with computer basics like how to use a mouse. In Rwanda… to introduce those solutions for business, we have to teach them how to use a computer and a mouse.

– Engineer 2

Whatever the case, the kind of cross-pollination and team-building that robust start-up ecosystems boast appears not to be commonplace in Rwanda yet.

Missing Entrepreneurial Culture

One salient set of comments suggested that Rwanda's current entrepreneurial ecosystem needs more of an energetic start-up culture. For example, in international high-tech circles, it is commonly accepted that entrepreneurs must be willing to fail, and fail repeatedly (Entrepreneur, 2018). The common exhortations to "Fail fast!" or to "Move fast and break things!" are both examples of this culture. Many of the participants, however, suggested that Rwandan entrepreneurs on the whole are afraid to fail and that this keep them from taking risks of a kind that are necessary for entrepreneurship.

> *[Rwandans] are very, very afraid to fail. Because they see failure as something bad. They don't see failure as lessons, they see failure as final. [But,] you can always try again. – Entrepreneur 3*

A non-Rwandan serial entrepreneur who had experience in Tanzania suggested that his Rwandan employees were overly sensitive to the boss's words. He mentioned an experience when he commented on a staff member's idea:

> *When I made a comment on my team's idea freely, the team became upset and took my words very seriously. After that, I came to know I needed to be careful about my words. It's completely different from Tanzania. – Entrepreneur 5*

Of course, fear of failure is hardly unique to Rwanda, but at least one participant suggested a potential reason for it, related to the country's politics:

Even mayors and ministers are evaluated regularly and replaced by the government if their performance is not up to par. So, avoiding failure may be perceived as essential to success. – Faculty 1

Finally, there were indications—consistent with what has already been reported here—that inexperienced members of start-up companies do not demonstrate initiative. Some entrepreneur participants emphasized that it was important for their employees to be able to learn skills on their own. Because most ICT companies in Rwanda remain small, they tend not to provide employees with technical training. Entrepreneurial leaders expected engineers to address this gap themselves:

[When hiring,] I ask a question like this: "We have a client asking us to develop an app in a programming language that we don't have any skills in. How would you approach that?" If you say, "I need to go for training," you failed to answer the way I wanted you to answer it. But if you say, "I will find books on the programing language and then I'll ask the client to give me time to learn by myself," this is good for me. – Entrepreneur 2

In comparison, Silicon Valley's start-up culture is renowned for the drive of its entrepreneurs. Start-up mentors often cite the willingness to get things done regardless of obstacles to be the defining feature of the successful entrepreneur (Entrepreneur, 2018).

In any case, many of our participants tended to agree that the available young talent in Rwanda could have more initiative—to learn on their own, to form teams, to collaborate with others, to attempt things in spite of potential failure. And as indicated in some of the participant quotations here, these claims were made by foreign entrepreneurs as well as Rwandan entrepreneurs who had experience abroad, suggesting that these observations were made by

those most likely to have direct interaction with start-up cultures and to be able to see a difference.

Whatever the case, the outcome appears to be that new businesses have positions they are unable to fill, and new graduates are unable to meet the demand. Some cited this as the greatest challenge facing Rwanda's ICT sector. One donor representative said:

> *It's hard for graduates to find their first job. But if you have a job for, let's say, two, three, four years, then it's easy to get another job in the ICT field. Private companies are not willing to offer them job opportunities at the entry-level. I think that's the biggest challenge. – Aid Staff 3*

An engineer participant confirmed this idea, saying that as a result of this employment landscape, there are only two types of engineers in Rwanda: highly skilled ones who are few in number, and inexperienced engineers, who are numerous.

5.5 Discussion

I confirmed previous findings that the Rwandan government is energetically committed to ICT-led national development (Africa Renewal, 2014; Kimanuka, 2009), and interview participants—including both Rwandan citizens and foreign observers on the ground—seemed to agree that the commitment is genuine.

This study extends the finding, however, by noting that those closely involved with the Rwanda ICT sector have thoroughly internalized this mission and see it as a critical contribution to national development. In fact, it could be argued that few other countries have committed so thoroughly and successfully to an ICT-led development plan such as Vision 2020. Interview participants were full of praise for Rwanda's government efforts to build up the ICT sector, and

foreign observers noted the speed and determination with which the Rwandan government took ICT-focused actions. While some might question the value of modeling a nation's growth on an ICT-based trajectory as has occurred (or has been imagined to have occurred) in other countries, Rwanda has chosen this path. At the least, the aspiration seems to have come from within the country and to have been widely absorbed, not imposed from outside.

However, as even Rwanda's own official statistics indicate (National Institute of Statistics of Rwanda, 2016), the country's ICT sector is still a small part of what remains, after all, a low-income economy. In other words, after nearly two decades of sincere effort toward a robust ICT sector, the industry itself is yet to emerge. Why should this be? I do not claim to have the definitive answer to this question, but interviews with the participants—drawn from a broad cross-section of stakeholders with direct knowledge of Rwanda's ICT industry—suggest that Rwanda has done what it can to address short-term obstacles to ICT entrepreneurship but that it is hampered by barriers that require longer-term investment and attention.

Rwanda has overcome some short-term obstacles: the country has laid substantial digital infrastructure (Ministry of Youth and ICT, 2015); it hosts a world-class university within its borders; it encourages entrepreneurship through tech hubs, pitch contests, and introductions to investors; and it has built a business-friendly policy environment (The New Times, 2012; The World Bank, 2016).

But, as interview participants suggested, many other challenges remain: access to financing is limited; university graduates are not well-trained for professional work, either technically or with respect to soft skills; as a whole, entrepreneurs lack both leadership and management capability, as well as the means to learn it through mentors; and the entrepreneurial "culture"—what entrepreneurs expect of themselves—does not appear to match the free-

wheeling, collaborative, initiative-taking vigor of, say, Silicon Valley entrepreneurship (Delbecq & Weiss, 2000). Some participants noted that these challenges might have deeper roots in a weak educational system at the primary and secondary school levels, as well as a lack of high-caliber teachers across the educational system, up through higher education.

Some of these observations have been made before. For example, it has been previously reported that Rwanda has invested in start-up businesses (Obeysekare et al., 2017). Research on the innovation ecosystem in East Africa suggests that its university graduates are less than adequately prepared for knowledge work (Cunningham et al., 2014). The phenomena of start-ups formed solely of ICT engineers has been documented among small- and medium-size Rwandan businesses (Republic of Rwanda, 2010).

But while these issues have been noted in isolation, what I found is a pattern of obstacles, all of which seem likely to require at least a generation to address. The challenges of quality teaching in schools, of graduating high-caliber university students, of building a risk-taking finance industry, and of nurturing a hard-charging entrepreneurial culture are not things that can be solved in a year, or even a decade. They require sustained investments in individual and societal capability.

5.5.1 ICT Sector Development

Silicon Valley's status as a global center for digital innovation has been investigated thoroughly, with scholars attempting to explain the ingredients for its success (Delbecq & Weiss, 2000; Entrepreneur, 2018; Munroe & Westwind, 2009). Rwanda is a unique case study because it illustrates what is possible—and not possible—when national policy and citizen aspirations are fully aligned toward a strong ICT economy. Applying the five-dimensional categorization by

Heeks and Nicholson (2002), my findings suggest where Rwanda's remaining challenges lie as shown in Table 5-2 and outlined next:

Table 5-2. Summary of the promoting and hindering factors for ICT sector development

	National vision and strategy	International connections	Market and labor demand	Software industry characteristics	Domestic input factors / infrastructure
Success factors for ICT export (Theory)	National strategy and focus are important. Strategy must build on national strengths	Good relationships with international trading partners, capital networks, expertise, etc., are critical	Some demand for products/services must exist, whether it is domestic or for export	Competition among firms; geographic clustering; culture of collaboration	Software development skill; business skill; language skill; infrastructure; investment; R&D; international exposure
Rwanda (Findings)	Strong policy leadership; low corruption	ICT leader in Africa, but still developing ties beyond Africa; looking for investors	Small domestic market; willingness to expand to external market; labor demand for skilled engineers	Still developing but growing; easy to start a company; less access to finance; less collaboration	Low skill development; low business skill; good ICT infrastructure

- National vision and strategy: The Rwandan government has a clear vision and strategy, and has committed to them.
- International connections: Rwanda has strong connections in Africa, and its (mostly positive) international reputation allows it to build ties easily with potential sources of investment and global markets.
- Market and labor demand: The domestic market is limited, as is demand for ICT labor. Rwanda is consciously attempting to expand its international market through business process outsourcing.
- Software industry characteristics: Though Rwanda's policy environment seems to be generally business-friendly, there remain challenges, such as access to financing, management experience, and collaboration culture.
- Domestic input factors / infrastructure: Rwanda has laid a lot of physical infrastructure, but its workforce still requires significant technical and professional skill development. Entrepreneurship arguably requires these skills in excess, beyond those required for routine employment.

Again, what I see across these categories is that Rwanda has already accomplished much that can be changed in the short-term. Most of the remaining issues require sustained effort in the longer term.

ICT-based economic growth is often associated with the phrase "leap-frogging"—through rapid adoption of ICTs, countries are believed to be able to leap-frog intermediate steps of economic development, and arrive at a higher-income destination (Fong, 2011; Prakash, 2005; Sauter & Watson, 2008; Steinmueller, 2001). This phrase occurs partly in opposition to staged-based theories of development that suggest a more serial path to development (Rostow, 2017). While not inherently deterministic, staged growth theories require stepwise changes, explicitly disallowing any leap-frogging.

My work suggests that a more nuanced theory is required to reconcile the various ways in which ICT-based national development can occur. India is a case where at least a portion of its population benefited greatly through rapid ICT-led growth. Rwanda is a case where, in spite of a concerted effort for over 20 years, ICT-led growth remains an ongoing project. It shows the limits of ICT aspiration, even with strong commitment. Perhaps leap-frogging is a mirage—what India achieved was built on top of a well-educated elite class, and was not widely shared with its vast lower-income, undereducated population (Steinmueller, 2001). Any apparent leap-frogging was dependent on decades of intensive human capital investment and brain circulation, the latter itself requiring more than one generation to achieve. Rwanda's story suggests that ICT-based national development does not mitigate the need for foundations in education and innovation infrastructure.

Much of Rwanda's longer-term challenges can be explained by its history. Rwanda was among the least-developed countries in the early 1990s with per-capita incomes hovering at a dollar a day (The World Bank, 2019a). That was exacerbated by the genocide in 1994, which caused 800,000 deaths (over 10% of its population), and emigration rates numbering in the low millions (Encyclopedia Britannica, 2019). It is hardly surprising that a country emerging only a couple of decades from these circumstances would require time to lay a foundation for an information-based economy.

5.5.2 Policy Recommendations

As described, the challenges faced by Rwanda's ICT sector have deep roots that require continuing investment in quality universal education, improved institutions of higher education, and time for a nascent ICT economy to develop. Beyond those basics, I also suggest the following types of support that could benefit the country's entrepreneurial ecosystem in the short term.

Support for Existing Companies: In response to the apparent difficulty in continuing a start-up business, I recommend that the government shift more of its efforts toward existing companies. Support for additional training in technical, finance, and management skills might be particularly effective, as the need is clear. Such training can also be focused specifically on required skills for individual employees. Some of this support might come by way of events to introduce people with different skills.

*Practical University Education***:** It seems clear that university graduates could benefit from more practical forms of instruction. This could be done in a variety of ways. Curricula could be improved to include more practical exercises. Another suggestion is to promote internship

opportunities. An internship can simultaneously help students gain more practical experience while also allowing businesses access to lower-cost labor and improved hiring practices. The government could support these activities by hosting events that bring together tech-industry leaders with faculty from university ICT departments.

Promoting International Exposure: A potential opportunity to enrich student experience might be to provide scholarships and fellowships to send talented Rwandans abroad for further education or employment. Rwanda has the potential to enjoy the benefits of brain circulation, whereby a generation of educated adults leaves the country for employment, only to return years later to contribute to the home-country economy. Although brain drain is considered a problem in many African countries (Ng'ambi, 2006), Rwanda appears to have the right conditions to benefit from brain circulation—a stable political environment, a growing economy, and citizens who wish to contribute to national growth. For brain circulation to have strong effects, however, some patience is required. Individual Rwandans must be encouraged to seek their success elsewhere, possibly to stay outside the country for decades. The more successful they are abroad, the more their experience, connections, and possibly, finances, would be useful to the Rwanda economy when they return. Experience abroad in places like Silicon Valley might help kickstart the entrepreneurial culture that Rwanda appears to seek.

5.6 Conclusion

I present a qualitative study based on 31 semi-structured interviews that focused on Rwanda's strengths and weaknesses with respect to ICT-based national development. I found that the aspiration for ICT-led growth and national development is widely shared and is not limited to the Rwandan government. However, though government support for the ICT sector

has addressed short-term obstacles, longer-term challenges remain in basic education, higher education, financing, and entrepreneurial culture. Apart from this, I highlight the subjective perceptions of Rwandan ICT stakeholders, which have not been represented in previous studies. To continue growing Rwanda's ICT sector, I propose several recommendations: greater support for existing companies, more practical skill-building content in higher education, and opportunities for ICT students and workers to gain international exposure as a way to seed brain circulation. Future work should seek to confirm and extend these findings from other perspectives, and to understand related findings in other geographic contexts.

Chapter 6 Intangible Gains of International Exposure

Soft Factors as the Learning Outcomes of International Exposure

6.1 Introduction

A key factor in the growth of the information and communication technology (ICT) industry is human resource development. One major impediment to this talent development is "brain drain." Many low- and middle-income countries (LMICs) are challenged by a brain drain of higher education graduates who go elsewhere to apply their skills (Ng'ambi, 2006). By some estimates, 37.4% of Silicon Valley software engineers were born outside the United States (Joint Venture Silicon Valley & Institute for Regional Studies, 2016). For LMICs that desire high-quality human capital to assist in the development of their economies, the effects of brain drain are especially acute.

Contrasting with this loss of talent are the foreign-born or second-generation engineers who decide to return to their country of origin bringing with them broad skills and business networks. This return of cultivated talent is called "brain circulation" and plays a critical role in some countries' ICT-sector development—particularly countries such as India, Israel, and Taiwan (Saxenian, 2005). Saxenian asserted that the conditions that support brain circulation are (1) governments that have invested heavily in higher technical education and (2) stability of politics and economy. The second condition includes policies around investment and entrepreneurship, such as openness to foreign investment and a conducive business environment.

While the brain drain of educated citizens is a challenge in many African countries, brain circulation is also evident in some countries in Africa, where individuals have begun to return home because of increased opportunities in the technology sector. Avle (2014) interviewed 14 returnees who managed small- or medium-size companies in Ghana and found that returnees work as a catalyst for economic growth. They bring up-to-date technical knowledge and financial capital for business back to burgeoning economies. She also pointed out that international exposure is integral to obtaining management and strategic skills that can make individuals competitive on a global scale (Avle, 2014).

So, what are the actual gains of physical brain circulation, especially international exposure? Can the benefit of brain circulation be facilitated by technologies or local training? In this study, I sought to help answer this question by investigating the expectations and experiences of two groups of Rwandans: those planning to go abroad to study and those who had already been abroad. After presenting my findings, I discuss how the difference between my two groups of participants can be explained in the context of brain circulation and self-efficacy. Afterward, I discuss whether technology or local training can substitute for or mitigate the need for physical international exposure.

6.2 Methodology

For this study, I conducted face-to-face semi-structured interviews between 2017 and 2019 with two groups: (1) Rwandans who were planning to study abroad and (2) Rwandans who had some experience studying abroad. Henceforth, these groups will be called Group 1 and Group 2, respectively.

Group 1 was composed of 10 Rwandan participants (eight men and two women) who were about to depart for master's programs abroad. They were the candidates of a Japanese

government-funded program that consisted of a 2-year master's program and a 6-month internship in Japan. They were all in their 20s and had bachelor's degrees in ICT-related fields.

Group 2 was composed of nine Rwandan participants (seven men and two women) who had graduated from or were pursuing master's programs in the United States, South Africa, Belgium, and Japan. Three of them had already returned to Rwanda, and six of them were still studying in Japan at the time of the interviews. All of them majored in ICT-related subjects and were in their 20s or 30s.

As to interview questions, for Group 1, the questions consisted of open-ended questions regarding the expectations of studying abroad, such as "What do you want to gain from the study abroad?" For Group 2, the questions consisted of open-ended questions regarding the gains in studying abroad, such as "What was the main gain from your experience abroad?"

The participants were chosen through my personal contacts with both the Rwandan and Japanese governments and snowball sampling. In Rwanda, I conducted the interviews at the Rwanda ICT Chamber's kLab—an innovation hub in Kigali—or interviewee offices. In Japan, I interviewed participants at their university in Kobe. All of the interviews were individual interviews for 20-30 minutes each. After the interviews, the interview records were transcribed, and I thematically analyzed them for recurring themes.

6.3 Findings

I first make a general remark that all the participants abroad responded that they planned to return to Rwanda after their studies. This was somewhat surprising, and responses might have been influenced by the fact that someone affiliated with a donor organization for their programs was asking the questions; however, the Rwandan government has also cultivated a culture of citizens contributing to the country, which I found in the study discussed in Chapter 5. In any

case, I interpreted their responses to mean that the participants had at least some intention to gain something from studying abroad that they would like to take back to Rwanda.

The remainder of the findings are organized around the three most salient issues that emerged in a comparison of Group 1 and Group 2 participants.

6.3.1 Types of Skills Learned

Group 1 participants tended to highlight hard factors (technical skills)—either in engineering or business—as anticipated learning. For example, one participant noted:

> *I want to develop my capacity so that I can have solutions that can affect more people. – Group 1*

On the contrary, Group 2's answers highlighted soft factors, such as non-technical attitudes toward their work, the importance of time management, work quality, or customer service. One participant in Group 2 said:

> *When I had a task in Rwanda, I gave all my effort to finish that task as soon as possible. But here in Japan, the process is important. The quality of what I deliver is very important, so I must have time to think again and again. – Group 2*

One returnee from South Africa concluded that the higher education in Rwanda was overly theoretical, and that Rwanda universities could teach more practical skills.

Crucially, many of these insights on soft factors came from cross-cultural comparisons that participants made in their daily life, and not necessarily in their formal education or work. A current student in Japan was impressed by the country's customer service:

When I went to a post office, I saw how they treat customers. Even if they're busy, they come and tell me what they are doing and said, "Please wait." This small effort makes customers feel good. – Group 2

A returnee from Japan reported his surprise when he found innovative services in Japan:

Even small restaurants, even small bars, they're very innovative. If you want to order a beer, you don't need to ask. You just press buttons ... There are innovations in everything. – Group 2

6.3.2 Increased Motivation

Many Group 2 participants noted an increase in their motivation to work and to change Rwandan society. The same participant who was impressed by innovation in small bars said this:

When I came back here [to Rwanda], I wanted to focus on innovation. [Studying in Japan] changed me. – Group 2

Another student still studying in Japan found the motivation to influence local Rwandans by his behavior changes:

When I go back there [Rwanda], I change my working style. I meet my deadlines, and I improve the quality of work that I do. I think they will see huge change because of the switch of my working style. – Group 2

Another student studying in Japan had a similar attitude about work behavior:

What I can bring to Rwanda is to try to improve our behavior more. Try to get organized. People should be humble. – Group 2

From the interviews alone, it was not entirely clear what caused these increases in motivation. I hypothesize two possibilities that are hinted at in participant comments. First, the encounter with a foreign culture makes people aware of new possibilities, which they perceive to be exciting. Second, there is a mechanism similar to that which people feel when they encounter role models:

If this country can do it, I should be able to do it, too! – Group 2

6.3.3 International Social Capital

Both Group 1 and Group 2 participants noted the importance of meeting others and growing their networks. Here students' expectations were matched by their experiences abroad. A strong network is also one of five factors required for ICT export success according to Heeks and Nicholson (2002). One Group 1 participant said:

I'm looking forward to having different connections with different people. The connection is very important with maybe companies or individual people. – Group 1

One Group 2 participant noted an increase in social self-efficacy, which is defined as people's belief about their capabilities to organize and accomplish required tasks with a designated level of performance (Bandura, 1986):

I can cooperate with many people, even Japanese included. I'm still focusing on developing my start-up with partnering with other people. – Group 2

Internships can further boost these kinds of interactions. Another Group 2 participant had started a company based on a recent study-abroad experience, funded by his internship host company:

> *I wanted to develop applications around the Internet of Things, data-driven solutions. I found out that to be able to get good partners, like Japanese companies, or to get clients, it was good to have a business together rather than individually. – Group 2*

6.4 Discussion

I begin by discussing how the difference between these two groups of participants can be explained in the context of brain circulation and self-efficacy. Afterward, I discuss whether technology or local training can substitute for or mitigate the need for physical international exposure.

6.4.1 Reassessing Development

Group 1 participants tended to expect short-term or direct benefits from their studies abroad. They emphasized knowledge, skills, and human connection. Many Group 2 participants, however, remarked on the gap between their home and host countries, and did so in a way that suggested internal changes as a result. International exposure and life in a different culture seemed to result in several types of epiphanies: (1) an outside perspective of their home country, (2) a recognition of the magnitude of the gap between the home country and the host country, (3) a sense of the social characteristics associated with economic development, and (4) new approaches to encouraging development based on host-country examples. In contrast to Avle (2014), who found that technical knowledge, financial capital, and global-level business skills are the benefits of brain circulation, I propose that a reassessment of what human development

means, as well as sensitivity to the everyday attitudes and customs that might be a cause of industrialized-national status, are also crucial benefits of brain circulation.

In addition, as I saw with Group 2 participants who returned with increased motivation to change their home country, the experience of international exposure seemed to improve self-efficacy. Bandura (1977) theorized that there are four ways to increase self-efficacy—through personal success, vicarious experience, encouragement, or positive mood. Studying or working abroad could enforce a sense of personal success, while seeing the everyday strengths of an industrialized nation could provide a vicarious experience.

6.4.2 Technology, Local Training, and Physical Brain Circulation

What are the key differences between the physical experience of studying/working abroad and other training that people can take without going abroad, such as online or through local training? It seems clear that technical skills and knowledge can be learned online or through local training. Unlike other educational contexts where lack of student motivation is a hurdle, there is plenty of motivated talent in Rwanda, as the Group 1 participants demonstrated. The fact that few of the Group 2 participants emphasized technical skills or knowledge also suggests that either (1) they did not see the technical skills they learned abroad to be beyond what they could have learned in their home country or (2) they recognized the greater importance of the new attitudes they gained abroad.

With respect to the gain of soft factors mentioned by the participants of Group 2, I believe it is not easy to replicate such an experience digitally or locally. First, some crucial cross-cultural experiences are not readily replicate in local or online experiences. Consider even the simple case of the participant who was impressed by Japanese customer service. In a sense, the mundaneness of an everyday transaction was required as a stage on which a striking customer

service event was experienced. Purchasing goods from Japan online or teleconferencing with a merchant overseas could not easily convey this combination of the everyday with the culturally distinguished. And attempts to contrive such an experience digitally would be just that—contrived.

Second, it is salient that none of the Group 1 participants mentioned any expectation of learning these kinds of soft factors. Simple online searches link to considerable information online about foreigners' experiences living and working in Japan (for example), but such information was not sought by any of my Group 1 participants. They did not even think to ask.

Third, it is not clear whether, even if the participants had the foresight to seek out such information, they would have found anything as powerful as the direct experience. Some of the Group 2 participants seemed to return from their study-abroad programs with a tinge of religious conversion. They had experienced a different world; they had new convictions; and they wanted others to feel what they felt. In our global age, all of us have seen video footage of life abroad in many countries, and with technology such as virtual reality, those experiences will be further heightened. But, they will still do not allow us to shake hands with locals, smell scents wafting in the air, or feel the loss of balance that comes when one is not anywhere near home.

These results suggest that the focus should not be on attempts to replace or substitute experiences abroad either digitally or locally but rather to sustain and capitalize on these experiences after they are had. Following recommendations by Maitland and Obeysekare (2015), maybe digital tools and online courses could be applied to support and buttress overseas experiences. Local training might help students to prepare for overseas experiences. But several questions remain with regard to capitalizing on the soft factors gained abroad. How can soft factors such as the new attitudes, social capital, and soft skills that are gained abroad be best

maintained at a distance and over time? Are there ways to make people abroad experience more frequent professional epiphanies while there? What might online or local courses do to best prepare a person for a study abroad experience so that people gain the most from their precious time overseas? In order to address some of these questions, Chapter 7 implemented local soft factors training and examined how its effectiveness and retention changed at the end of the training, after participants started working, and when participants obtained a foreign job.

In the end, good brain circulation seems to require physical travel, but there might be many ways in which local training can add value to time abroad.

6.5 Conclusion

A comparison between Rwandan participants before and after study/work abroad shows that the intangible gains from international exposures are the learning of individual soft factors, such as shifts in attitude toward professional work, new motivation to change society at home, greater self-efficacy, and international social capital. While it seems difficult to reproduce these benefits of direct international exposure without going abroad, online or local training seems likely to be able to augment foreign experiences. Future research could consider how the high-tech or low-tech approaches could better prepare people for international experiences, or how they could augment the value of such experiences during or afterward.

Chapter 7 Impact Assessment of Local Soft Factors Training

Preparing for a Change in Workplace Culture: Evidence from a Time Management Training Program in Bangladesh

7.1 Introduction

Today, many workers migrate abroad to work, or aspire to do so. One of their challenges is adapting to the workplace culture of another country. Scholars and policymakers concerned with this challenge have thus been focused on nurturing hard technical skills; however, there is increasing evidence that a range of soft factors are just as important. For the information and communication technology (ICT) sector in Bangladesh, for example, cultivating human resources with such enhanced abilities could not only contribute to fostering ICT engineers to work abroad but also strengthen the domestic ICT sector through increasing ICT export. On the other hand, although high-caliber ICT human resources with both hard and soft factors are a key contributing factor to ICT sector development in Bangladesh, limited talent and weak infrastructure hinder the growth of ICT firms in that country (Choudhury, 2019). Many low- and middle-income countries (LMICs), including Bangladesh, lack qualified personnel because their higher education institutions are unprepared for producing the required human capital for a thriving ICT sector (Garg & Varma, 2008; Kano & Toyama, 2020).

Alternative ways to cultivate internationally competitive ICT talent are studying/working abroad and online education, but both have some challenges for many LMICs. A study in Pakistan, for example, asserted that the benefits of studying abroad are professional recognition

and high-quality education (Javed et al., 2019). Other studies confirmed how returnees who worked in industrialized countries contributed to developing the ICT sector in their home countries (Avle, 2014; Saxenian, 2005). On the other hand, the chance to study/work abroad in ICT is a rarely obtained opportunity that does not impact the mass population. In Bangladesh, for example, only 1.6% of students in tertiary education had a chance to study abroad in 2018 (UNESCO, 2018).

While online education can provide another opportunity to experience foreign-level higher education without leaving one's home country, and professional courses offered by foreign universities can be accessed via the Internet, the educational outcomes do not seem to be equivalent to a physical international study, which provides not only knowledge-based learning but also crucial experiences that can shape understanding. Research shows that despite the rapid spread of online education services, which offer educational opportunities even in LMICs, the completion rate is low. For example, Coursera has a 4% completion rate, and few students believe online education can replace the learning of face-to-face lectures (Bates, 2018; Swinnerton et al., 2017; Zhenghao et al., 2015).

My research interactions with Bangladeshi and Rwandan ICT workers (in Chapter 6 and other research) suggest that some experience-based learning is difficult to obtain locally. My interviews with Bangladeshis and Rwandans who either planned to study in an industrialized country or who had returned to their home countries after studying in an industrialized country suggest that while most interviewees who planned to go abroad expected to learn hard skills, those who had already studied abroad and returned to their home countries found their most significant learning to be soft factors, especially experience-based mindset changes, such as a new understanding of the importance of work quality and time management.

To dig deeper into the learning of soft factors, in this chapter, I evaluated the impact of a lightweight training program for Bangladeshi ICT workers aspiring to work in Japan. This study specifically focused on varying issues of time management. I chose time management as the topic of the training workshop because time management is a type of soft factor gained from study abroad, as described in Chapter 6, and time management is recognized as one of the factors that influence job performance (Nonis et al., 2005). Moreover, a previous study on cross-cultural analysis suggested that Japan scores extremely high (11th among 76 countries) on uncertainty avoidance—a trait that relates to time management—compared to Bangladesh, which ranks 47th (Hofstede et al., 2010).

To understand the different kinds of knowledge that can be learned locally and those that require foreign exposure, I focused on how learning outcomes on time management change through training and job/life experiences. I verified the outcomes of time management in terms of personality, skills, and culture of Bangladeshi ICT engineers who were interested in working in Japan.

As a verifying method, I conducted a randomized controlled trial with 151 Bangladeshi ICT workers who were taking part in a training course to prepare them for working overseas. The treatment group participated in a series of experience-based workshops on time management, and the control group learned about life in Japan as a placebo intervention. This study contributes to the existing global human resource management and time management literature in three notable ways. First, the results of this randomized controlled trial add evidence to the existing literature on time management training. Second, the effectiveness of the training as well as when and where the effects of the intervention could be observed differed depending on three specific factors that contributed to time management: personality, time management

skills, and culture. And third, in line with the theory on the transfer of training, I propose social environments as a contributing factor to the retention of training in cross-border and cross-cultural environments.

7.2 Related Work

Understanding and adjusting to cultural differences is an essential soft factor for global ICT workers (see Chapter 2). This can be difficult because previous studies have found that cultural characteristics are highly dependent on contexts, which differs according to geographic, economic, and social groups. And some studies found risks in generalizing a national culture by observing only specific group of people in a country. I review some of these studies in this section. Further, among the required soft skills for global ICT workers related to cultural differences, this study focused on time awareness and management. To find the elements that influence people's time awareness and management, I also reviewed theories and practices in the literature that suggest that time management is affected by individual personality, individual skills, and surrounding culture.

7.2.1 Theories of Cultural Difference

Understanding theories of cultural differences is important to discuss the necessary traits for global software engineering. Hofstede (1991) theorized the difference in national cultures by comparing staff in an international tech company. The author categorized national cultures into six dimensions. The first category is power distance, which is about the relation to authority. The second category is collectivism versus individualism. This category is about the relationship between society and individuals. The third category is masculinity versus femininity as social culture. The fourth is uncertainty avoidance. This category handles how people deal with

conflicts. Hofstede et al. (2010) added two more categories after publishing the four dimensions. The fifth category, which was added in 1991, is long-term orientation versus short-term orientation. This category was set to distinguish whether people foster virtues toward future rewards or past. The sixth category is indulgence versus restraint.

On the one hand, Hofstede's theory is referred to in many papers on global software engineering. On the other hand, many papers critique Hofstede's theory. The main critiques were the age of survey data (the initial survey was 40 years ago), attributes of survey participants (well-educated and mostly men, English-based), and the lumping together of organizational, occupational, and national cultures.

The first critique is the difficulty of applying Hofstede's data to the current environment because of the data's age (Abufardeh & Magel, 2010; Signorini et al., 2009). Although the software development process has dramatically changed over time, Hofstede's model was built 40 years ago. To overcome this, Hofstede et al. (2010) made an effort to update their findings through adding data and criteria—long- and short-term orientation, and indulgence versus restraint.

The second critique is the selection bias of subjects. One of the claims is that Hofstede's data have a bias of participants being well-educated and male-dominant (Abufardeh & Magel, 2010). Abufardeh and Magel (2010) asserted that while the previous global software development was heavily English-based, current global software development is multisite, multilingual, multicultural, and globally distributed. Others argued, for example, that Asian countries have changed their education system and lifestyle significantly (more people go abroad) in recent decades, so Hofstede's dataset does not reflect current young people's behavior (Signorini et al., 2009).

The third critique is about the categorization of subjects. One study argues that although Hofstede categorized culture by countries, a country does not cover entire national cultures (McSweeney, 2002). For example, Great Britain consists of three countries—Wales, England, and Scotland—all with different cultures. And because all of the original survey participants worked at IBM, McSweeney (2002) claimed that Hofstede could not justify whether the difference was based on organizational or national culture; people who work in international companies or study abroad do not have the mindset of average people in a country. McSweeney asserted that cultural differences need to be differentiated among organizational, occupational, and national cultures. In addition, Hofstede's grouping in "Confucian culture" and "Socratic tradition" were dismissed as nonsense considering the complexity of Asian cultures (Signorini et al., 2009).

These critiques on the theory of cultural differences suggest that researchers must (1) consider the influence of the passage of time since the studies; (2) specify the target group geographically, economically, and socially; and (3) understand the risk of generalizing a national culture by a portion of a country. As such, I referred to these points in the present study to extract the elements that constitute culture and avoid overgeneralization of cultures. The next section reviews the relationship between cultures and soft factors, particularly this study's intervention, time management, and the elements that consist of time awareness and management.

7.2.2 Time Awareness and Management

Among the required soft factors for global ICT workers, time awareness and management are important lessons to be gained from international experience, as described in Chapter 6, and time awareness and management have a strong relationship with cultural differences. For example, among Hofstede et al.'s (2010) six dimensions of cultural difference, two categories

related to time management. The first category is uncertainty avoidance, or how people deal with conflict. The second category is long- versus short-term orientation, or whether people foster virtues toward future or present rewards. In terms of cultural differences between Bangladesh and Japan—the top two countries of job destination in this study—Japan scored extremely high (11th among 76 countries) on uncertainty avoidance compared to Bangladesh, which ranked 47th (Hofstede et al., 2010). Regarding long-term orientation, the same study ranked Japan as higher than Bangladesh (4th and 11th, respectively, among 23 countries).

Another example of the difference in time perception is the definition of "rudeness." Although sometimes "African time" (students not showing up in time, not keeping deadlines) has been recognized as rude based on industrialized countries' time perceptions, this labeling is sometimes inappropriate because of the lack of local context and values (Fendler & Winschiers-Theophilus, 2010). In many African cultures, time is not as clearly defined as it is in the Western world. This misconception accounts for huge gaps in understanding in cross-cultural environments (Fendler & Winschiers-Theophilus, 2010). The difference in time perception between Eastern and Western cultures is also rooted in the view of the future. While Americans tend to think of the future as "limited to the foreseeable" (short-term orientation), Asians tend to think of a future that "may involve centuries" (long-term orientation) (Lee et al., 2011).

As these studies indicate, there are different time perceptions in each country, region, and group of people. The following sections break down existing theories of time awareness and management into three categories of influence: individual personality, individual skills, and surrounding culture.

Personality

One aspect that can determine people's mindset and behavior of time management is a personality trait, specifically conscientiousness. The Big Five Inventory is a well-known categorization of personality traits consisting of extraversion, agreeableness, conscientiousness, neuroticism, and openness (John & Srivastava, 1999). An experiment that consisted of a personality survey and the calculation of arrival time for the survey showed that, among the five categories, conscientiousness is the strongest predictor of punctuality, which is a part of time management, followed by agreeableness and neuroticism (Back et al., 2006). Conscientiousness was also identified as a predictor of job performance (Barrick & Mount, 1991; Dudley et al., 2006).

Given the importance of conscientiousness, other researchers have investigated how to modify people's level of conscientiousness. While one study reported how to do this, another study asserted that conscientiousness is difficult to change (Baranski et al., 2020; Roberts et al., 2017). One suggested way to improve conscientiousness is to change the relevant states that are associated with conscientiousness, such as social environment and appropriate timing with motivation to change (Roberts et al., 2017). As to the appropriate timing to increase conscientiousness, the study focused on the growth years between early life and adulthood. However, in an analysis of the effect of volitional personality change without therapeutic involvement, the desire to improve conscientiousness decreased in adults (Baranski et al., 2020). The authors cited this as evidence of the difficulty of changing personality traits purposefully.

In this chapter, I considered conscientiousness as one possible factor affecting time management. For this investigation, I designed a study to verify whether an intervention can increase conscientiousness when the cultural environment changes for adults, filling a gap left by

Roberts et al. (2017). I also tried to uncover how time management training affects the conscientiousness of transnational ICT workers, which was not covered by Baranski et al. (2020).

Skills

Some studies have asserted that time management is a skill that can be trained (Green & Skinner, 2005; B. L. Hall & Hursch, 1982), and multiple studies have investigated ways to obtain time management skills, but limited studies were based on evidence. Although many studies have found the effect of training at the end of the training, the results were mixed on the retention of those effects. Studies show that changes in time management capacity between before and after training have positive results. For example, half- or one-day training on time management showed positive changes for the majority of participants (Green & Skinner, 2005), and an investigation of whether time management training improves the perception of time management found that time management knowledge and the self-perception of time management skills were improved (Slaven & Totterdell, 1993).

On the other hand, studies on the retention of training outcomes, including job performance, have mixed results. One study showed that training and consultation on time management among poor-planning staff improved the amount of time spent on high-priority tasks (B. L. Hall & Hursch, 1982). However, other studies found no significant results on the retention of training outcomes. A study on time management training noted that while training improved the participants' knowledge and skills after training, participants did not exhibit behavioral change (Slaven & Totterdell, 1993). In a study of 353 people who had a half-day of time management training, the researcher found no correlation between perceived control over time and job performance (Macan, 1994). Macan (1994) speculated that this might be because

people who are self-aware (make a to-do list and prioritize tasks) are also correctly aware of their own time management challenges and limited skills in this area. In one of the limited field experiments on this topic, a 71-person, two-part randomized controlled trial resulted in positive effects on self-perception and time management but no significant differences in job performance following training (Häfner & Stock, 2010).

All these studies on time management skills were targeted within a specific sector of society, such as a company, municipality, or country. The goal of my study in this chapter was to understand the effects of training and skills retention outcomes in a cross-border and cross-cultural environment.

Culture

As a specific feature of cultural influence, time perception has been found to be a major variable among cultures in global software development (Fazli & Bittner, 2017). Given that time perception varies by culture (Fazli & Bittner, 2017; E. Hall, 1983) and time perception is strongly connected with business communication and commitments, cultural difference sometimes causes problems (Usunier, 1991). For example, because the definition of "on time" is different among countries, the flexibility of what is considered "punctual" varies depending on the situational and socio-cultural environment (L. T. White et al., 2011). For this reason, differences regarding the sense of time among countries/cultures require people to adjust to cultural perceptions when people conduct business beyond their own borders.

Another important cultural difference in business associated with time perception is the idea of monochronic time vs. polychronic time (E. Hall, 1983; Nonis et al., 2005). E. Hall (1983) argued that people from different cultures have different conscious and unconscious ways of orientation toward time, and this difference can be a potential misunderstanding in teamwork.

According to E. Hall, polychronic time culture areas, such as the Mediterranean, South America, and Africa, tend to do many things simultaneously and prioritize the present moment rather than a schedule. This is in contrast to monochronic time culture areas, such as North America and Europe, which tend to rely on time-keeping instruments like clocks and calendars and put a priority on a schedule. Monochronic time culture prioritize schedules, time management, and preciseness (Duranti & Di Prata, 2009). Bangladesh is categorized as having polychronic time culture (Nonis et al., 2005). Japan is categorized as a country that puts priority on punctuality (Hashimoto, 2001), but studies about time orientation in Japan found mixed results (Bluedorn et al., 1992; Nonis et al., 2005). For example, Bluedorn et al. (1992) asserted that Japanese tend to be monochronic in business with foreign companies but polychronic in most other cases.

Several studies that compared monochronic and polychronic cultures found that both cultures prioritize time management as an element of job performance, although with some differences. A study that compared these two time orientations, using the United States (monochronic culture) and Sri Lanka (polychronic culture) as representatives, found that there was a positive correlation between time management practice and job performance in both countries (Nonis et al., 2005) and that the importance of time management was not different between the two countries and two time orientations. However, the authors noted that polychronic time culture tended to have better improvement in job outcomes as a specific result of time management practices. In contrast, a literature review on time management implied the superiority of monochronic time in time management, with a caveat that more empirical comparison between monochronic and polychronic time orientations is required (Bluedorn & Denhardt, 1988). As these examples show, having a monochronic time mindset or having time management practice for polychronic culture may improve job outcomes.

The difference in time perception is important because time sense is prioritized by traditional customs, future plans, and present events (Fazli & Bittner, 2017; Hoda et al., 2017). This is especially relevant to international work. For example, the concept of monochronic and polychronic cultures was confirmed through an international collaboration study between universities (Marutschke et al., 2019). The study showed that while Germany—a monochronic culture—tended to start and end a meeting on time, Mongolia—a polychronic culture—showed up a bit later. In terms of global software development, these differences could trigger problems in an international software development team because of the different expectations of time and time keeping (Hoda et al., 2017).

While some studies have compared the different cultures of time perception, few studies have examined interventions that try to change time orientation. In the present study, my intervention on time management tested whether the mindset of time orientation changes through training.

7.3 Hypothesis Development

While working and studying abroad is an effective way to gain skills necessary for global human resources in LMICs (Avle, 2014; Saxenian, 2005), only a limited number of people have the opportunity to work or study abroad (UNESCO, 2018). Because prior studies claimed the importance of time management as a soft factor that is essential in the global ICT sector (Singh Dubey & Tiwari, 2020), I set a research question for this project to test the training effect of workplace time culture for workers who are interested in an international job:

Research question: Can lightweight training affect transnational workers' conception of workplace time culture and improve job performance when they work abroad?

Based on this research question and grounded in the literature findings that: (1) time management is a skill that can be trained and affects job performance (Green & Skinner, 2005; B. L. Hall & Hursch, 1982; Nonis et al., 2005) and (2) job-based training is an effective way to improve learning outcomes (Huang & Jao, 2016), I proposed the following main hypothesis:

Hypothesis 7: Training on time management for Bangladeshi ICT engineers improves their ability to manage time.

To measure improvement in the participants' ability to manage time, I proposed three sub-hypotheses, which I categorized based on prior studies on three aspects of time management: personality, skills, and culture.

The first sub-hypothesis focuses on personality. Among the Big Five Inventory, conscientiousness was listed as a personal trait related to punctuality (Back et al., 2006; John & Srivastava, 1999). On the other hand, a study on health-related exercise, which attempted to improve conscientiousness, did not show significant change in conscientiousness (Baranski et al., 2020). In addition, although researchers studied conditions that improve conscientiousness, the conditions were generated with a sample of non-adults only (Roberts et al., 2017). Based on these studies, the first sub-hypothesis is as follows:

H7-a: Training on time management does <u>not</u> improve conscientiousness.

The second sub-hypothesis focused on time management skills. While some studies have shown that time management is a skill and can be improved (Green & Skinner, 2005; B. L. Hall & Hursch, 1982), the effects on retention and job performance after the training were unconfirmed. Other studies on such training retention training were measured only within a

specific range of society (Häfner & Stock, 2010; B. L. Hall & Hursch, 1982; Macan, 1994; Slaven & Totterdell, 1993) rather than a cross-cultural sample. Building on those studies, I expected time management skills retention could be improved when training occurred in cross-cultural and cross-national environment. Therefore, I suggest the following hypothesis:

H7-b: Training on time management improves participants' time management skills, especially when the participants work abroad.

The third sub-hypothesis is about culture, especially on time orientation. Bangladesh is considered to be a polychronic culture (Nonis et al., 2005), and time management is considered to be close to monochromic thinking (Duranti & Di Prata, 2009). Therefore, I considered that training on time management and the experience of Bangladeshis working abroad, such as in Japan, where punctuality is considered important (Hashimoto, 2001), were likely to change participants' time management thinking toward monochronic time orientation. Therefore, the third sub-hypothesis is as next:

H7-c: Training on time management changes participants' mindsets toward monochronic time orientation, especially when the participants work abroad.

7.4 Methodology

I conducted a randomized controlled trial with 151 Bangladeshi ICT professionals who were taking part in an intensive Japanese language-learning program for potential jobs in Japan. After providing time management training to the participants, I analyzed the intervention effect by comparing data (1) before the training, (2) at the end of the training, and (3) after participants started working (several months after the training).

7.4.1 Experimental Design

Background

This experiment was conducted as a collaboration with a Japanese-government-funded project, the Bangladesh-Japan IT Engineers' Training, which is called as the B-JET. The B-JET was an 11-week training program for young Bangladeshi ICT engineers who were interested in working in Japan. The B-JET program organized the training three times (three batches) per year, from 2018 to 2020, in Dhaka, the capital city of Bangladesh. Each batch had approximately 40 trainees, who were selected from a public offering. The contents of the training were practical Japanese language training (75% of total classes), ICT-skills training (14%), and others (11%) such as business etiquette and resume writing. While the B-JET program did not guarantee job placement for the participants, Japanese companies periodically visited Bangladesh during the training to have interviews for recruitment. By the end of the training period, 69% of trainee obtained an ICT job in Japan, 29% of them obtained an ICT job in Bangladesh, and 2% were hired in other countries.

Intervention Design

I conducted a randomized controlled trial as an optional course of the B-JET program. The course consisted of a series of workshops for two groups—a treatment group and a control group. Table 7-1 shows the experimental design for the treatment/control groups.

Table 7-1. Treatment/control group design

Type	Course contents
Treatment group	Workshop on time management
Control group	Placebo workshop (Sessions on life in Japan)

The intervention for the treatment group was a series of workshops on time management. I chose time management as the topic of the workshops because time management is a type of soft factor described in my Chapter 6 study as a lesson learned from international experience. The main instructor of the treatment group was a Bangladeshi research partner, and I was occasionally invited to teach work culture and time perception in Japan. The control group joined a placebo course—sessions on life in Japan—that was conducted by a Japanese facilitator and designed not to interfere with the effect of the intervention of the treatment group. The workshops took an hour per week for eight weeks.

Regarding details of the intervention for the treatment group, I designed the intervention mainly for immersive and experience-based classroom approaches, such as role-playing, hands-on workshops, and discussion. The reasons for this experience-based approach are based on previous studies' suggestions to blend on-the-job components into classroom training, combined with my interest in learning how experiences can change the mindset (Huang & Jao, 2016; Saks & Burke-Smalley, 2014). The following were the topics of the workshop for the treatment group:

- Business culture differences,
- The necessity of time management in business,
- Cultural differences (e.g., high- and low-context language),
- Time orientation (e.g., monochronic time and polychronic time),
- Estimation of your work,
- External tools for time management,
- Case study (negotiation of a deadline), and
- Case study (What makes Japanese trains on time?).

Participants

All the B-JET trainees were invited to the optional course, and all of them agreed to participate. The total number of participants who completed the course was 151; although 158

had joined the B-JET program in total, seven trainees dropped out of the program during the training period and were excluded from the study.

When I arranged the treatment and control groups for the trainees, I used a stratified random sampling method and created two groups only for the experiment to avoid the influence of other B-JET classes. I used three sub-categories for the randomization. The first category was gender. Because there were only 22 women (14.5%) for the experiment (on average, 5.5 women per batch), I randomized with balancing gender to minimize gender bias. Regarding the reason for the huge gender gap, women were less likely to study ICT in Bangladesh—only 27.8% of ICT graduates were women in 2016 (UNESCO, 2018). Furthermore, because the participants were ICT workers who were interested in working abroad, I speculated that the gender gap might be stronger. The second category was working experience. Because this intervention was about business mindset, I randomly split trainees who did not have working experience (36% of the trainees). The third category was the B-JET class arrangement. Because the B-JET program had two groups for its 11-week language training, I randomly assigned trainees to make the ratio even to avoid the existing groups' bias. Considering these strata of random sampling, I divided the trainees into two groups: 75 trainees for the treatment group and 76 trainees for the control group. Table 7-2 shows the results of balance-check between the treatment and control groups. Two-sided *t*-test results show that none of the three components—gender, work experience, or age—was significantly different between the treatment and control groups, with 5% alpha level.

Table 7-2. Balance-check

	Sample	Gender (p=0.67)		Work experience (p=0.91)		Age (p=0.89)
		Male	Female	Yes	No	
Treatment	75	65	10	51	24	24.45
Control	76	64	12	51	25	24.49

Procedure

Figure 7-1 shows the six steps of the experiment, which included one course and three surveys (Steps 2, 4, and 6) that used the same questionnaire to compare the differences among the surveys.

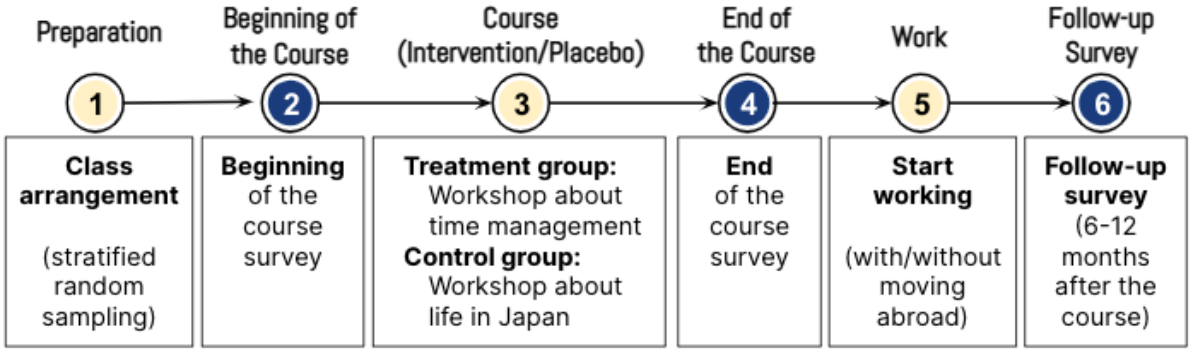


Figure 7-1. Steps of the experiment

Steps 1 to 4 were conducted during the B-JET program in Dhaka. Step 1 was class arrangement for the experiment, which is explained in the "Participants" subsection in detail. In Step 2, I conducted the first survey, at the beginning of the course for both the treatment and control groups; this comprised the baseline data of the analysis. Step 3 was the implementation of the intervention/placebo courses that are explained in the "Intervention Design" subsection in detail. In Step 4, I gave the second survey upon participants' completion of the course; these data were used to measure the effectiveness of the intervention. One hundred fifty-one trainees responded to the questionnaire (100% response rate).

Steps 5 and 6 were events after the course. For Step 5, the trainees started working either in Bangladesh or abroad after the B-JET program: 69% of the trainees started working in Japan, 29% of them in Bangladesh, and 2% of them in other countries. Then, Step 6 comprised the third survey, which I conducted 6-12 months after the course as the follow-up survey; these data were used to measure how the intervention effect changed after participants started working. Of the 115 participants who had already started working, 101 responded to the follow-up survey (87.6%

response rate). Along with the follow-up survey, I asked two questions about foreign life for those who got a job in Japan: “What surprised you the most in the workplace (or on the job) after coming to Japan?” and “Are there aspects of Japanese culture that you would want to bring back to Bangladesh?”

7.4.2 Measures

Instruments

As the main instrument for measuring the intervention effect, I used a questionnaire that consisted of 30 questions for all three surveys. To measure the effectiveness of the intervention, especially on the mindset change on personality, skills, and cultural perception on time management, the questionnaire consisted of the following three types of questions that were used in previous studies (Guillory, 2007; John & Srivastava, 1999; S. M. White et al., 2013).

The first type of question measured an aspect of personality (conscientiousness), one of the personality traits in the Big Five Inventory. Among John and Srivastava’s (1999) 44 questions in the Big Five Inventory, I chose nine questions that were labeled as conscientiousness. Participants responded using a 5-point scale, with anchors (1) = disagree strongly, to (5) = agree strongly. A higher score indicated a higher self-recognition of conscientiousness. An example question was, “I see myself as someone who does a thorough job” (John & Srivastava, 1999).

The second set of questions in the survey instrument measured time management skills (the awareness and use of time management strategies). For these questions, I used S. M. White et al.’s (2013) questionnaire that has 15 questions with a 4-point scale, with anchors (1) = none of the time, to (4) = all of the time. A higher score indicated a higher self-recognition of time

management skills. An example question was, “I feel competent about managing my time when I write down my appointments” (S. M. White et al., 2013).

The third set of questions in the survey instrument was from Guillory’s (2007) questionnaire to measure culture on time orientation (monochronic time and polychronic time). This section had six questions using a scale of 1-5 representing a range of responses. For example, one question was, “When working on a project, you find it most effective to: …” and the range of choices (each question had different choices) was between “(1) Works on many different parts of the projects at the same time” and “(5) Work through each part of the project in an orderly fashion” (Guillory, 2007). A higher score indicated the self-recognition of monochronic time orientation.

The questionnaire is included as Appendix B. I calculated the average score in each category and used it for the result analysis; some questions were counted in reverse order based on the instructions of the specific questions.

In addition to the questionnaire, I collected two other sets of data to reinforce the research findings. The first set included data on the number of times participants were tardy during the training period. By counting the number of tardies, I measured how the intervention affected actual behavior in a way that was not self-reported. The second set of data included qualitative data on business cultural differences obtained as part of the follow-up survey. The questions were, “What surprised you the most in the workplace (or on the job) after coming to Japan?” and “Are there aspects of Japanese culture that you would want to bring back to Bangladesh? If so, what?”

Analysis

The analysis compared the effects of time management training at three time periods in relation to the training—the immediate effect, post-effect, and combined effect—as shown in Figure 7-2.

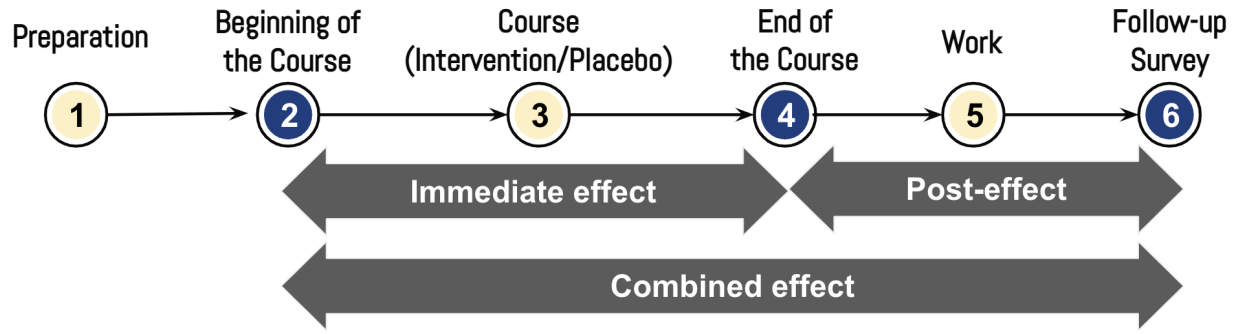


Figure 7-2. Three types of effects for the analysis

The "immediate effect" was the difference between the beginning and the end of the course; the difference indicates the direct effect of the intervention. In this regression analysis, I used an independent dummy variable of "Treatment" for the treatment group, as shown in the following regression model.

$$(1)\ Immediate\ Effect = \beta_0 + \beta_1 \times Treatment$$

The "post-effect" was the difference between the end of the course and the follow-up survey; the difference indicates how trainees' mindsets changed after starting a job or a new life. Because this period covers when participants started working, this regression analysis used "Treatment" and a dummy variable of "ForeignJob" for those who obtained a foreign job, and the interaction of the two as independent variables, as shown in the following regression models.

$$(2)\ Post\ Effect = \beta_0 + \beta_1 \times Treatment$$

$$(3)\ Post\ Effect = \beta_0 + \beta_2 \times ForeignJob$$

$$(4) Post\ Effect = \beta_0 + \beta_1 \times Treatment + \beta_2 \times ForeignJob + \beta_3 \times Treatment \times ForeignJob$$

The "combined effect" was the difference between the beginning of the course and the follow-up survey; the difference indicates how the trainees' mindsets changed throughout the experiment—from the beginning of the course to the follow-up survey. This regression analysis used the same variables as the post-effect, as shown in the following regression models.

$$(5)\ Combined\ Effect = \beta_0 + \beta_1 \times Treatment$$

$$(6)\ Combined\ Effect = \beta_0 + \beta_2 \times ForeignJob$$

$$(7) Combined\ Effect = \beta_0 + \beta_1 \times Treatment + \beta_2 \times ForeignJob + \beta_3 \times Treatment \times ForeignJob$$

7.5 Results

This section shows the results of the regression analysis of the immediate/post/combined effects of the experiment in the following three aspects: personality (conscientiousness), skills (time management skills), and culture (time orientation). The section also analyzes the behavior change (the number of tardies) and summarizes the qualitative analysis of the follow-up survey.

7.5.1 Personality (Conscientiousness)

Table 7-3 shows the results of the regression analysis on the questionnaire on conscientiousness, which is relevant to Hypothesis 7-a. A positive value indicates a positive change on the self-recognition of conscientiousness.

Table 7-3. Conscientiousness regression analysis

	Conscientiousness						
	Immediate		Post			Combined	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	0.164*	-0.070		-0.160	0.030		0.099
	(0.090)	(0.131)		(0.211)	(0.108)		(0.178)
	p = 0.071	p = 0.595		p = 0.451	p = 0.782		p = 0.578
Foreign Job			0.102	0.015		0.075	0.133
			(0.134)	(0.196)		(0.111)	(0.163)
			p = 0.446	p = 0.938		p = 0.503	p = 0.420
Treatment:Foreign Job				0.158			-0.108
				(0.270)			(0.224)
				p = 0.561			p = 0.633
Constant	-0.136**	0.049	-0.049	0.039	-0.064	-0.095	-0.148
	(0.064)	(0.093)	(0.104)	(0.156)	(0.078)	(0.088)	(0.131)
	p = 0.034	p = 0.603	p = 0.640	p = 0.805	p = 0.417	p = 0.284	p = 0.259
Observations	142	102	102	102	99	99	99
Note:	*p<0.1; **p<0.05; ***p<0.01						
	The parentheses under the coefficients indicate standard errors.						
	Treatment in model (1) shows a statistically significant difference.						

The immediate effect (Model 1) was positive and marginally statistically significant (p=0.07). In any case, the result is suggestive that the intervention positively changed conscientiousness during the course. On the other hand, because there are no significant differences in the post and combined effects, I could not find explicit changes on conscientiousness after participants started a job regardless of the treatment and job location.

7.5.2 Skills (Time Management Skills)

Table 7-4 shows the result of regression analysis on the questions covering time management skills, which is relevant to Hypothesis 7-b. A positive value indicates a positive change on the self-recognition of skills for time management.

Table 7-4. Time management regression analysis

	Time Management Skill						
	Immediate		Post			Combined	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	0.050	0.136**		0.030	0.156**		0.126
	(0.042)	(0.057)		(0.091)	(0.061)		(0.101)
	p = 0.235	p = 0.019		p = 0.740	p = 0.013		p = 0.217
Foreign Job			-0.012	-0.094		0.026	0.003
			(0.060)	(0.084)		(0.065)	(0.092)
			p = 0.838	p = 0.269		p = 0.695	p = 0.978
Treatment:Foreign Job				0.172			0.050
				(0.116)			(0.128)
				p = 0.142			p = 0.697
Constant	-0.026	-0.094**	-0.017	-0.034	-0.084*	-0.019	-0.086
	(0.029)	(0.040)	(0.046)	(0.067)	(0.044)	(0.052)	(0.073)
	p = 0.365	p = 0.023	p = 0.712	p = 0.616	p = 0.060	p = 0.707	p = 0.246
Observations	145	102	102	102	101	101	101
Note:	*p<0.1; **p<0.05; ***p<0.01						
	The parentheses under the coefficients indicate standard errors.						
	Model (1) and (2) indicate that the course effect of Treatmentis not						
	statistically significant but the application effect is significant.						

I did not find a positive difference in the immediate effect in Table 7-4. This suggests that although the value of treatment in Model 1 was positive, the intervention did not prove the mindset change of the treatment group.

On the other hand, a difference started appearing after participants started a job. Model 2 shows that the post-effect of time management skills existed for the treatment group (p=0.02); in other words, it seems that the intervention effect emerged once the treatment group started working. In addition, Model 4 shows that the interaction between treatment and foreign job had a stronger positive coefficient than other variables (p=0.14). Although the p-value of 0.14 is not statistically significant, the coefficient of interaction of 0.172 is much higher than other coefficients. This result is suggestive that among the trainees in the treatment group, those who got a foreign job might have demonstrated a higher intervention effect at the follow-up survey. In other words, the intervention effect might appear after trainees get a job; further, for those who got a job outside of Bangladesh, the intervention effect became stronger.

7.5.3 Culture (Time Orientation)

Table 7-5 shows the results of regression analysis on time orientation, which is relevant to Hypothesis 7-c. A positive value indicates a change toward monochronic time orientation.

Table 7-5. Time orientation regression analysis

	Time Orientation						
	Immediate		Post			Combined	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treatment	0.147	-0.250		-0.145	-0.201		0.167
	(0.196)	(0.314)		(0.518)	(0.319)		(0.525)
	p = 0.455	p = 0.428		p = 0.781	p = 0.531		p = 0.751
Foreign Job			0.211	0.270		0.111	0.404
			(0.323)	(0.479)		(0.329)	(0.479)
			p = 0.516	p = 0.575		p = 0.738	p = 0.401
Treatment:Foreign Job				-0.145			-0.580
				(0.655)			(0.663)
				p = 0.826			p = 0.384
Constant	0.142	-0.254	-0.513**	-0.432	0.151	-0.021	-0.111
	(0.138)	(0.225)	(0.255)	(0.389)	(0.227)	(0.260)	(0.385)
	p = 0.306	p = 0.263	p = 0.047	p = 0.270	p = 0.509	p = 0.938	p = 0.775
Observations	146	103	103	103	104	104	104
Note:	*p<0.1; **p<0.05; ***p<0.01						
	The parentheses under the coefficients indicate standard errors.						
	A larger value means monochronic time orientation.						
	The model (1) and (2) show that the course effect is positive						
	and the application effect is negative, regardless of the intervention.						

According to the result, while there was a positive immediate effect, I did not confirm the difference statistically. Also, I did not find any statistically significant difference in all three timings. The result indicates that I cannot claim that the intervention changed the mindset on time orientation.

On the other hand, Model 1 shows the positive value in both the treatment group ("treatment") and the control group ("constant"), and Model 2 shows the negative value in both "treatment" and "constant." A two-sided *t*-test was conducted to compare the immediate effect and the post-effect for all the trainees regardless of the treatment. There was a statistically significant difference between the immediate effect (mean [M]=0.21, standard deviation

[SD]=1.19) and the post-effect (M= -0.38, SD=1.59) conditions; $t(103)=3.23$, $p<0.01$. This implies that regardless of the treatment, the B-JET training (Japanese language training) might change the trainees' mindset toward monochronic time orientation, and working experience might change the trainees' mindset toward polychronic time orientation.

7.5.4 Counting the Number of Tardies

Throughout the B-JET program period, the average tardiness days of the treatment group was 1.21 (n=75), and that of the control group was 1.42 (n=79). The average tardiness days of the treatment group was lower than for the control group, but the two-sided t-test showed the difference was not statistically significant (p=0.27). This result is suggestive that the intervention might change the actual behavior (fewer tardies) of the treatment group, but I cannot conclude the effect statistically.

7.5.5 Qualitative Questions at the Follow-up Survey

Results of the analysis of the qualitative questions for those who got a job in Japan are described next, broken down per question. Table 7-6 lists the top four themes that participants mentioned in their answers.

Q1: What surprised you the most in the workplace (or on the job) after coming to Japan?

The two most common themes were "helpful" and "overtime work". The third was "time management" and the fourth was "punctuality."

Q2: Are there aspects of Japanese culture that you would want to bring back to Bangladesh? If so, what?

The first theme was “time management” and the second was “punctuality.” Other common themes included “discipline,” “cleanness,” and “politeness.”

Table 7-6. Questionnaire at the follow-up survey

	Q1. A surprising point in Japan	Q2. Things that you want to bring back to Bangladesh
1st	helpful / overtime work	time management
2nd	-	punctuality
3rd	time management	discipline
4th	punctuality	cleanness / politeness

7.6 Discussion

7.6.1 Verification of Hypotheses

This study tested the effectiveness of a time management intervention by measuring three categories (personality, skills, culture) of time management, which is recognized as an important soft factor for success in international business.

Personality (Conscientiousness)

H 7-a: Training on time management does <u>not</u> improve conscientiousness.

As shown in Table 7-3, the immediate effect of the course was positive and marginally statistically significant, and the post-effect was negative and not statistically significant. These results did not show strong proof for Hypothesis 7-a, but it is suggestive that although the course positively changed the participants’ conscientiousness during the course, the improvement faded after they started working.

There are two possible explanations for these results. One is that conscientiousness can, in fact, change under some circumstances, which is different from what Baranski et al. (2020)

asserted about the difficulty of changing conscientiousness. As Roberts et al. (2017) argued, social environment and appropriate timing are conditions for changing one's conscientiousness; in this case, training in different cultures (social environment) and the timing of going abroad (appropriate timing) might be applied to this condition. Because the participants joined the B-JET program to seek an opportunity to work abroad, their motivations and timing seem to have worked effectively to transfer the contents of the time management intervention.

Another possibility is that the positive immediate effect occurred as a temporary knowledge improvement or social desirebility, and the intervention did not change the participants' behavior. The negative post-effect, which indicates the learning was not retained after the training, supports this argument. In addition, my finding on the number of tardies, which was not statistically significantly different between the treatment and control groups, also supports this argument. Further research is required to understand the real intervention effect on conscientiousness.

Skills (Time Management Skills)

H 7-b: Training on time management improves participants' time management skills, especially when the participants work abroad.

Hypothesis 7-b was partially proved, and a modification with a latent impact is suggested. As shown in Table 7-4, the experiment partially verified the sub-hypothesis, with the training appeared to have no immediate effect at the end of the intervention, but in the follow-up survey, the treatment group showed improved time-management skills compared to the end of the course. The results show that the intervention effect was not statistically significant during the intervention but that the effect seemed to emerge after the intervention (after participants started working), with a statistical significance of p=0.02. Furthermore, for participants who got

a job abroad, the interaction of the treatment group and foreign job also showed a decent *p*-value, 0.14, although it did not reach significance. Although the *p*-value of 0.14 is not strong, the coefficient of interaction (0.172) was much higher than other coefficients. These results suggest a modification of the hypothesis to add the latent impact.

Modified H 7-b: Training on time management improves the participants' time management skills after participants started working, especially when the participants work abroad.

With regard to the training effect after the intervention, the related work showed mixed results, with several studies finding positive retention and several not finding retention of time management skills. My results might suggest a reason for the prior literature's mixed findings on training retention. I discuss the predictive reason using the five elements of the condition to generalize and maintain learning in the theory on the transfer of training by Baldwin and Ford (1988); these include three trainee characteristics (*ability, personality, motivation*) and two work environment factors (*support, opportunity*).

Among the five elements, which elements might influence the finding between the immediate effect and post-effect for the treatment group? First, *ability* and *personality* seem to make no difference because there was no intervention on ability and personality after participants finished the training period. Next, *motivation* might be improved because of the environmental change from training to work. Especially if the participants have a chance to work abroad, motivation would be improved because all of the participants were interested in working abroad. Then, *support* of a supervisor is difficult to compare because all of the participants had different work environments (e.g., location, colleague). And finally, *opportunity* of use would increase because of the environmental change from training to practical experience.

This analysis implies that motivation and opportunity of use emerge or amplify the intervention effect, especially with foreign experience. Moreover, this difference is also suggestive that training is not enough to retain the intervention effect, and this might be why the related work findings were mixed on the effectiveness of time management interventions.

Culture (Time Orientation)

H 7-c: Training on time management changes participants' mindsets toward monochronic time orientation, especially when the participants work abroad.

Hypothesis 7-c was not proved because there was a lack of significant difference between the treatment and control groups, as shown in Table 7-5. On the other hand, regardless of the treatment, the immediate effect for both the treatment and control groups was positive, and the post-effect for both groups was negative. The difference between the immediate effect (for both groups) and the post-effect (for both groups) was statistically significant ($p<0.01$).

In this study there were two possible reasons for the changes: mindset changes caused by the B-JET program effect, and working experience. Because all of the participants in the intervention also participated the B-JET program (10 weeks, 60-hours-a-week; not my 1-hour-a-week intervention), it might have caused the shift toward monochronic thinking because of the exposure to Japanese business culture in the setting.

On the contrary, after starting work, regardless of the working location and treatment, the trainees' mindsets moved toward polychronic. This might be because of a real job situation. Although trainees understood the monochronic way of thinking during the intervention, it is possible that the instrument measured the actual nature of the work (which requires a lot of multi-tasking) rather than participants' orientation toward a fixed number of tasks. For example,

one of the participants said the following is answer to the question on a surprising moment in the workplace:

> *Japanese people in my company like to involve one person in multiple projects at a time which makes it hard to concentrate well on projects.*

While the participants shifted to polychronic orientation after they started working, I cannot claim any causal relationship. But, this result might cast doubt on claim of the superiority of monochronic time (Bluedorn & Denhardt, 1988), and I suggest that an actual job experience could trigger change toward polychronic time orientation, considering contemporary multi-tasking job environments. Further research is required to differentiate the polychronic mindset and multi-tasking.

Verification of Main Hypothesis

Hypothesis 7: Training on time management for Bangladeshi ICT engineers improves their ability to manage time.

One notable finding of the study is that the effectiveness of the training, as well as when and where the effects of intervention could be observed, were different in all three sub-hypotheses. These findings indicate that I cannot state a unified conclusion for Hypothesis 7. More specifically, there was no significant effect of the training on *culture*, but there might to be an intervention effect on *personality* between the treatment and control groups only during the training period. As for *skills*, while participants showed no significant difference during the training period, the effect of time management seemed to emerge after participants started working.

The results have other important implications. One is about the steps of learning. A time management intervention effect emerged only after the participants started working, which suggests that while learning does occur through training, the lessons are further evidenced only through practical or cross-culture experience. In particular, the modified Hypothesis 7-b indicates that through the trigger of experience (opportunity of use), participants could actually change their time perception. So, what triggers the intervention effect? Although there is no proof of the direct reason, some participants who changed their perception of time management mentioned their experiences on time-sense after going abroad. Interestingly, they mentioned the experience not only in the workplace but also in their daily lives.

> *I was surprised about the planning of things way before it is carried out. Japanese like to plan things to minute details.*
>
> *After coming here to Japan, I became sick suddenly. My Japanese roommate called the ambulance and they said they will come within 8 minutes. And surprisingly they had come exactly after 8 minutes!*
>
> *The train schedule surprised me; it is always on time. Japanese people's punctuality towards time is surprising.*

Therefore, in addition to the conditions for generalizing and maintaining in the theory on the transfer of training (Baldwin & Ford, 1988), which propose trainee characteristics (ability, personality, motivation) and work environments (support, opportunity), I propose that *social environment* is another factor that can transfer the contents of training for the long term, especially in a cross-cultural or cross-border job environment.

7.6.2 Study Implications

With regard to my research question—"*Can lightweight training affect transnational workers' conception of workplace time culture and improve job performance when they work abroad?*"—the short answer is "yes," but the effect depends on the design of training contents, as well as when and where the effects of the intervention are expected to be observed. This study suggests that some aspects of workplace time culture, such as conscientiousness, might be changed by the training in Dhaka. But, some aspects of workplace time culture, such as time management skills, had latent effects, which changed only after participants experienced a real job environment, even more so in a foreign country. Regarding the training for improving job performance, just as prior studies claimed an influence of time management on job performance (Nonis et al., 2005), training can contribute to job performance as a result of the improvement in time management skills.

The results of this intervention on time management can be generalized to some extent. In previous literature, Hofstede's (1991) study on national institutions and culture was criticized as not being generalizable for the following reasons: the study's age, selection bias, and the grouping together of subjects. I used these critiques to consider the generalizations of my findings. The first critique, the age of the study, does not apply to my study because the intervention took place in 2017–2020, which is relatively recent. As for the second critique, selection bias, the target group of my intervention was ICT engineers who were interested in working overseas. Therefore, it is important to note that the results do not apply to ICT engineers in general, but to those interested in working overseas. As for the grouping of subjects, my study did not focus on a specific country, Bangladesh, but rather on the surprises and learnings when Bangladeshi participants interacted with a country with a different business culture. In addition,

because the training participants were recruited from the general public, the influence of a specific organizational culture is not applicable. For these reasons, I assert that the findings from my study are mainly generalizable to ICT engineers who want to do business with foreign countries that have different business cultures.

7.6.3 Limitations and Caveats

This study has several limitations. First, in this experiment, both the treatment and control groups were the participants in the B-JET program. This means that even the control group received considerable exposure to Japanese workplace culture through the instructors of the main course; this might have weakened the effect of the intervention. Second, while I used the follow-up survey data to analyze the intervention effect after participants started working, they all joined a different company and went to a different country. So, noise in the follow-up survey might be bigger than during the intervention. Third, because job interviews were conducted during the B-JET program, the intervention might have influenced the result of the job interviews. However, I believe there was little intervention effect on the possibility of getting a job abroad because the job interviews were conducted during early to middle of the training periods. Data also showed little difference in who was hired in a foreign country; more specifically, while 59 % of the participants in the treatment group got a job in a foreign country, 64% of participants in the control group were hired in a foreign country. Fourth, all of the trainees were Bangladeshi, and 90% of the foreign destinations were Japan. This limits the generalization of the results. Although I believe my findings and discussion have implications about how to cultivate human resources for international business, the implications might be associated with Bangladeshi and Japanese contexts.

7.7 Conclusion

ICT professionals with soft factors have been recognized as potential leaders for ICT-based economic growth in LMICs, and international experience is an effective way to obtain these soft factors. On the other hand, only a limited number of people have the opportunity to go abroad. Based on this situation, I tried to replicate the learning of soft factors, which can be obtained by international experience, in a domestic training course. To verify the effectiveness, I conducted a randomized controlled trial for ICT professionals in Bangladesh who aspired to work abroad. The results showed a mix of immediate effects of the training and latent effects that could be observed only after participants started working, especially when they worked abroad. The major difference between many previous studies and my study is that while previous studies examined the impact within a specific range of societies, I examined the effects of training when participants were in a cross-border and cross-cultural environment. Moreover, the most important difference is that training alone seems to be insufficient—actual experience with the new environment seems to play a critical role. This study found evidence that the effectiveness of training strategies depends on the design of the training contents, as well as when and where the effects of the intervention are expected to be observed.

Chapter 8 Discussion

The findings and conclusions in each project contain country-specific lessons as well as broader ones. This chapter mainly discusses findings and conclusions for ICT workers and the ICT sectors that may be applicable in other LMICs. Overall, my dissertation provides new evidence for the value of focusing on initial migration as a prerequisite for brain circulation and the importance of individual soft factors for global information and communication technology (ICT) workers. One consequence of the analysis is that while I found a certain effect of training soft factors domestically, the effect might be enhanced when it is accompanied by working and overseas experience. Therefore, identifying groups interested in going abroad as the initial migration of brain circulation and motivating their career aspirations to cultivate potential leaders might lead to the development of global ICT workers equipped with soft factors and fueling future brain circulation. This discussion also discusses leap-frogging in ICT human resource development and the broader implications of the findings. This section concludes with limitations and caveats of the dissertation and some overall and country-specific policy recommendations.

8.1 Soft Factors for Global ICT Workers' Development

Brain circulation is a widely acknowledged contributor to the rise of national ICT sectors. However, brain circulation requires an initial outward migration of ICT talent. My research uncovered some of the key barriers to that outward migration and investigated possible means to mitigate them. Significantly, I found that a range of soft factors—and not more technical

training—is integral for global ICT workers. While the theory of brain circulation is well-developed from the perspective of what causes ICT workers to return home (Saxenian, 2005), previous work has not examined how soft factors, such as career aspirations, are linked with the initial emigration of ICT workers.

Soft factors are essential elements for global ICT workers beyond hard technical skills (Berglund, 2018; Garousi et al., 2020), but there is a perception gap between industry and educational institutions/individuals. In industry, the importance of soft factors is highly recognized, which is evidenced by the fact that soft factors are increasingly used in job descriptions and hiring conditions (Ahmed et al., 2013; Cimatti, 2016). On the other hand, the importance of soft factors has not been appropriately recognized at higher educational institutions, by policymakers, or by individuals in low- and middle-income countries (LMICs). For example, in my interviews with engineers in the ICT industry in Rwanda, I heard a substantial focus on hard factors, even though there was a lack of practical workplace training in university education (Chapter 5). In addition, while many of the interview participants who planned to study or work abroad listed hard skills as elements they wanted to acquire in industrialized countries, those who had returned to their home countries pointed out the importance of soft factors (Chapter 6). As these examples show, a challenge to obtain soft factors exists in LMICs because of a perception gap between a strong demand from the industry and a weak supply given the lack of educational contents and awareness of soft factors' importance.

If soft factors are what many ICT workers in LMICs are missing, then a key question is how that gap can be filled. One tried-and-true method is through foreign exchange programs. As I found with Rwandan students in a study-abroad program in Japan, most of them mentioned soft factors as the main learning during their study and life experiences abroad (Chapter 6). Another

option is immersion in a quasi-foreign cultural environment on domestic soil (Chapter 5). In my Chapter 5 study, I found that graduates of a domestic campus of a foreign university (Carnegie Mellon University Africa) were seen by industry to have more practical value than graduates from the local national universities. On the other hand, because this learning is limited to the on-campus environment, those students cannot expect to learn through the surprises and epiphanies of daily life in another culture, as described by interviewees who experienced life abroad.

For most people, though, foreign exchange programs are too expensive, and hosting foreign universities is not a simple undertaking. Are there easier ways to teach specific soft factors? One possibility that I examined is a 10-hour training program focused on the effects of domestic soft factors training (in this case, time management) by comparing the mindset changes of participants who subsequently obtained a job abroad and those who remained in their home country (Chapter 7). While the training had a certain effect on soft factors for both groups, a latent impact was observed especially for participants who went abroad after their training. This result suggests that there might be ways to inculcate critical soft factors domestically, but that something about actual experience abroad is critical. In any case, more research on other ways to teach soft factors seems worthwhile.

Furthermore, given that international experience is not a realistic solution for all ICT workers to gain soft factors, understanding career aspirations is critical to find out which workers to focus on. As the term “brain drain” implies, there are concerns about losing talented people by sending them overseas (A. M. Abdullah & Hossain, 2014; Ng’ambi, 2006). However, something like brain drain needs to happen initially for brain circulation—which is extremely helpful for ICT sector development—to occur (Saxenian, 2005). In this dissertation, I investigated who should be targeted to effectively support initial emigration to promote brain circulation in the

ICT industry. My results from Chapter 4 showed that there are different subgroups within a country's ICT workforce. That suggests two things: First, for the purposes of encouraging outward migration for brain circulation, it is worth figuring out who is most amenable to going abroad; my study in Chapter 4 suggested that the suitable group is ICT workers who have high-income parents, attained a top university level, and role models. Second, different subgroups might require different kinds of support to encourage outward migration. These results also suggest that supporting the group with career aspirations to go abroad would increase the potential for brain circulation and lead to future development of the ICT industry. In addition, this could accelerate the development of entrepreneurs who understand global business culture, which was mentioned as a challenge of entrepreneurial mindset in Rwanda (Chapter 5).

In sum, there is a recognition gap between the ICT industry and educational institutes/individuals on the importance of soft factors for global ICT workers. While I found a certain effect of training soft factors domestically, the effect was enhanced when it was accompanied by working and overseas experience. Therefore, my research suggests that identifying groups interested in going abroad as the initial migration of brain circulation and motivating their career aspirations as potential leaders might accelerate the development of global ICT workers equipped with soft factors and the potential for future brain circulation. Whether these conclusions are more broadly applicable requires future research.

8.2 Leap-frogging and ICT Human Resource Development

ICT-based economic growth is often associated with the phrase "leap-frogging"—through rapid adoption of ICTs, countries are believed to be able to leap-frog intermediate steps of economic development and arrive at a higher-income destination (Fong, 2011; Prakash, 2005; Sauter & Watson, 2008; Steinmueller, 2001). This phrase occurs partly in opposition to staged-

based theories of development that suggest a more serial path to development (Rostow, 2017). So, can LMICs leap-frog in terms of ICT human resource development? Is it possible to cause a rapid leap in the capacity of ICT workers? The results of my dissertation suggest that leap-frogging is unlikely, but that ICT human resource development can be accelerated.

My results from Chapter 5 showed that while some institutional changes can be made in a short period of time through strong government leadership, human resource development itself takes a long time because it requires not only reforms in the education system but also the cultivation and mindset changes of educators, all of which can take more than a generation. My study on soft factors training also indicated an important component of ICT human resources development (Chapter 7). The results showed a difference in the retention of training effects for personnel who went abroad after training versus those who remained in their home country. This suggests that learning based on real-life cross-cultural experiences remains important. Such experiences are not necessarily easy to convey quickly, especially to a large cohort of workers in the ICT industry.

These results suggest that leap-frogging in ICT human resource development might be a mirage. On the other hand, because some interviewees showed interest in going back to their home country after studying abroad to contribute to their country's economic development (Chapter 6), I believe that brain circulation remains a way to accelerate the development of ICT human resources. When done well, human resources development can be accelerated by increasing opportunities for domestic ICT workers to experience global ICT business culture through returnees. Specifically, returnees could create a domestic replication of their foreign learning and become role models for domestic ICT workers.

8.3 Broader Implications

While I have focused my research on ICT workers in this dissertation, I want to discuss whether this learning can apply beyond ICT workers and the ICT sector, to consider the broader implications of my study. In considering the application to other sectors, one must first acknowledge that the ICT industry is characterized by traits such as a skilled labor force (i.e. required educational background), a highly paid labor force, international business, office work, and the location of market leaders (often based in the United States, Western Europe, and East Asia). If any industries match these conditions, we could conceivably extend the findings from this study to those industries.

For example, the finance industry has very similar characteristics, so we could expect that conclusions similar to the ones I have drawn through my dissertation might also apply to the financial industry. Similar to Silicon Valley in the ICT sector, the financial sector has hubs where information and human resources gather, such as New York and London. Therefore, the findings on the impact of brain circulation and the importance of understanding career aspirations might be applied to the financial sector, as well.

8.4 Limitations and Caveats

The first limitation of this dissertation is the generalization of findings. It should be noted that this dissertation focused on ICT workers in Bangladesh and Rwanda, so the findings are not generalizable to all types of ICT workers. Specifically, throughout this dissertation, I have focused on the potential leaders who aspire to study/work abroad, which is one of the bimodal career aspirations identified in Chapter 4. The second limitation is national bias. For this dissertation, I chose Rwanda and Bangladesh as representatives of LMICs that focus on the ICT industry by contrasting (1) regions, (2) population size, and (3) focus areas in the ICT industry.

Because economic and cultural situations differ from country to country, my findings do not generalize to other LMICs in either region. In addition, this dissertation focused on Japan as an example of an industrialized country in Chapters 7 and 8. Therefore, some of my findings on business cultural differences might be biased toward Japan's unique business culture rather than encompassing all global ICT business cultures.

Finally, I emphasize again that this dissertation does not argue the superiority or inferiority of business cultures in specific countries. Given the global ICT economy as it exists, however, there appear to be merits to ICT workers in LMICs learning the ways of international business cultures.

8.5 Policy Recommendations

These findings lead to some country-specific recommendations for the focal research sites—Rwanda, Bangladesh, and Japan. They also suggest two high-level recommendations for cultivating global ICT workers in LMICs more generally.

8.5.1 Country-specific Recommendations

Rwanda

This dissertation found that Rwandan ICT workers tended to have strong aspirations of contributing to their home country (Chapters 5 and 6). This implies that a healthy possibility for "brain circulation" exists in Rwanda. Therefore, I suggest that the Rwandan government proactively support the outflow of human resources to absorb foreign knowledge and business cultures effectively. In addition, insufficient practical training at universities and the gap in human resource development between the demand from industry and the supply from education were also mentioned as challenges for the ICT industry (Chapter 6). To overcome these

challenges, it is desirable to strengthen practical training, promote internships, and reform the education system by strengthening cooperation between industry and education institutes.

Bangladesh

This dissertation found that some Bangladeshi people aspire to migrate abroad, and some Bangladeshi aspire to contribute to developing the ICT industry in Bangladesh through global business (Chapters 4 and 7). To involve those populations as potential contributors to brain circulation, I suggest that the Bangladeshi government build a system and policy that encourages them to return to their home country or do business abroad with Bangladesh as brain circulation. One approach to promote brain circulation is to invest in the technically more demanding end of the ICT business, as mentioned in the previous subsection. Another approach is to build policies that makes such global business possible. For example, as anecdotal information obtained in connection with this dissertation, a Bangladeshi entrepreneur living in Japan commented that "restrictions on taking funds out of Bangladesh hinder investing in overseas companies and developing international business. The government of Bangladesh needs to design a system that eliminates these barriers to international business development, so that human resources with overseas experience can be effectively utilized, leading to brain circulation and business investment in the ICT industry.

Japan

While many interviewees from the studies in Chapters 7 and 8 were positively affected by their work and life experiences in Japan, some negative points about Japan's unique business culture were also noted. For example, several participants complained about the overtime work culture in Japan. Although this dissertation has emphasized the importance of learning ICT business cultures from industrialized countries for ICT workers in LMICs, it is also crucial for

ICT firms and workers in industrialized countries to understand the business cultures of other countries. More specifically, Japanese firms also need to learn about other countries' business cultures and understand what they value to accept more foreign ICT workers and build relationships as business partners.

8.5.2 Recommendations for Cultivating Global ICT Workers

The first recommendation for LMICs aiming to cultivate global ICT workers is to provide training on individual soft factors related to the global ICT business community. Findings from my studies in Chapters 6 and 7 suggest the importance of providing immersive and experience-based soft factors training for local ICT workers, with plenty of opportunity to interact with professionals who have international experience, so that workers can learn about international ICT business cultures without going abroad. Although this dissertation mainly covers potential leaders of the ICT sector, this recommendation extends to all other ICT workers, which are the majority of the population of ICT workers. At the same time, domestic ICT workers could be a focus of future research to verify the effectiveness of applying the findings from this dissertation for a wider population as bottom-up capacity development.

The second recommendation is to support the career development of potential leaders based on their career aspirations to encourage brain circulation. Because brain circulation requires both an outflow and inflow of talent, it is crucial to encourage ICT talent to work abroad and encourage ICT talent to return. With regard to encouraging ICT talent to work abroad, an approach is to support making role models abroad because my study found that career aspiration and the existence of role models are correlated, and role models would improve their self-efficacy through vicarious experience (Chapter 4). One possibility, then, is to encourage programs in which ICT workers working abroad visit universities in their home country to

lecture about their experience, and perhaps more importantly, to establish ties with students. Such a program could be run inexpensively by taking advantage of times when expatriates return home to visit. Once such ties are established, social media platforms could be used to help maintain relationships that allow domestic students to remain in touch with role models abroad.

With regard to encouraging ICT talent to return, I recommend that governments in LMICs make investments in the higher end of the ICT industry because people who aspire to work abroad tend to put their highest priority on job contents (Chapter 4), and a certain number of people who experienced abroad have an aspiration to contribute to the economic development of their home country (Chapter 6). As India has successfully added a layer to the industry that focused on innovation and novel entrepreneurship, policymakers and the ICT industry in LMICs could similarly invest more in advanced offerings in higher education, technology research and entrepreneurship, focusing on recent trends in the technology world such as social media, artificial intelligence, information security, and so on (CompTIA, 2016). Doing so could kick-start a virtuous cycle whereby capable ICT workers working abroad return to join the ICT industry that itself moves upward in the engineering hierarchy.

These two strategies, which approach both a larger number of local ICT engineers and a limited number of potential leaders, contribute to fostering globally competitive ICT human resources in LMICs.

Chapter 9 Conclusion

Information and communication technology (ICT) professionals with international experience have been recognized as potential leaders for ICT-based economic growth in low- and middle-income countries (LMICs) because of the existing challenges in domestic higher education. To understand what aspects of international experience changed their mindsets as global ICT professionals, I investigated their learning outcomes from international experience and found that the main learning outcomes were not only hard technical skills and network creation, which were highlighted in prior studies, but also soft factors, such as time management, that were obtained through direct experiences working and living in different cultures. To see whether such learning could happen without an actual experience abroad, I conducted local training on a soft factor (time management) for ICT professionals in Bangladesh who aspired to work abroad to verify the effectiveness of the local replication of such learning outcomes. The results showed that the immediate effects of the training were different from the post-effect of the training that were observed only after participants started working, especially in a foreign country. These findings support the critical role of experiences abroad in cementing soft factors among ICT workers, and point to these workers' potential value in their home countries' national ICT sector development. Given my dissertation findings, I suggest that governments in LMICs identify and support the career aspirations of ICT professionals who aspire to work abroad, provide soft factors training for them, and make policies that encourage brain circulation for the

type of long-term ICT human resource development that will lead to ICT-based economic growth.

Appendices

Appendix A. Questionnaire for IT Career Aspirations in Bangladesh

Part 1. General and Household Information

1. What is your nationality? *a. Bangladeshi* *b. Other:*_____
2. What is your date of birth? _____ *(DD/MM/YYYY)*
3. What is your gender? *a. Male* *b. Female*
4. Were you born in Bangladesh?

   IF YES, in what district were you born?

   Division: _____ *District:* _____

   IF NO, in what country were you born? *Country:* _____

If you still live in the district where you born, **GO TO QUESTION 8**; otherwise continue.

5. What was your age (in years) when you left the above district (or country)? _____
6. In what district are you living now?

   Division: _____ *District:* _____

7. What was your age (in years) when you moved to your current district? _____
8. Which of the following items do **your parents** own? (*Check **ALL** that apply.)*

   ☐ *Non-smartphone mobile phone*
   ☐ *Smartphone*
   ☐ *Refrigerator*
   ☐ *Washing Machine*
   ☐ *Air conditioner*
   ☐ *Scooter / Motorcycle*
   ☐ *Automobile (car)*

9. What is your parents' highest level of education? (*Check one for each*)

	Mother's Education	*Father's Education*
Less than high school	○	○
High school	○	○
College	○	○
University	○	○

10. What is your parents' combined monthly income?
    Please make your best guess. *(Circle one)*

    a. Less than 10,000 BDT
    b. 10,000 BDT – 20,000 BDT
    c. 20,000 BDT – 40,000 BDT
    d. 40,000 BDT – 80,000 BDT
    e. 80,000 BDT – 160,000 BDT
    f. 160,000 BDT or more

Part 2. Job Information
The next few questions ask about your most recent full-time job experience.

If you don't yet have any full-time job experience, GO TO PART 3; otherwise continue.

11. Job Title: _____ (System engineer, sales manager, etc.)

12. Name of organization or employer: _____

13. Type of employment: *(Circle one)*
    a. *Employee (staff, etc.)* *b. Owner* *c. Self-employed (freelancer, etc.)*

14. Type of organization that you work for: *(Circle one)*
    a. Educational Institution *b. Aid Agency (United Nations, JICA, etc.)*
    c. Public sector (Government) *d. Private sector (Company)*
    e. NGO *f. Other:* _____

15. How long have you worked (did you work) for the organization? _____ *Years*

16. How much is (was) your monthly income? _____ *BDT*

Part 3. Educational Information

If you are **currently a university student**, fill in the following blanks.

17. Name of university: _____

18. Major: _____ *(Computer Science, Physics, etc.)*

19. Type of degree: *(Circle one)*
    a. Undergraduate (Bachelor) *b. Master, MBA*
    c. PhD *d. Other:* _____

20. In what year of the program are you in? _____ *(3rd year, 4th year, etc.)*

If you have **completed an undergraduate (bachelor's) degree**, fill in the following blanks.

21. Name of university: _____

22. Major: _____ *(Computer Science, Physics, etc.)*

If you have **completed a postgraduate (Master, MBA, etc.) degree**, fill in the following blanks.

23. Name of university: _____

24. Degree: _____(*Master, etc.)* 25. Major: _____(*Physics, etc.*)

Part 4. Aspirations

For the following questions, think of your future about 5 to 10 years from now.

25. Would you like to work in the information technology (IT) sector? *(Circle one)*
    Strongly agree *Agree* *Neutral* *Disagree* *Strongly disagree*

26. Which of the following elements is **most important** to you when choosing a job? *(Circle one)*

a. Salary / Benefit	*b. Location*	*c. Long term job security*
d. Job content	*e. Work-life balance*	*f. Colleagues (including manager)*
g. Job title	*h. Social impact of job*	*i. Other: _____*

27. Where would you be **willing to** work? (*Check **ALL** that apply*. Remember that you are answering this question for 5-10 years in the future.)

    ☐ *In Bangladesh, outside of Dhaka (Chittagong, Rajshahi, etc.)*

    ☐ *In Bangladesh, Dhaka*

    ☐ *Foreign country (Please specify your top choices, **up to 3** countries.)*

    1._____ 2. _____ 3. _____

28. Where is your **most desired (dream) place** of work? (*Select exactly **ONE**. Remember that you are answering this question for 5-10 years in the future.*)

    ○ *In Bangladesh, outside of Dhaka (Chittagong, Rajshahi, etc.)*

    ○ *In Bangladesh, Dhaka*

    ○ *Foreign country (**Please specify**)* _____

29. **Realistically**, where do you think you will be working 5-10 years from now? (*Select **ONE***.)

    ○ *In Bangladesh, outside of Dhaka (Chittagong, Rajshahi, etc.)*

    ○ *In Bangladesh, Dhaka*

    ○ *Foreign country (**Please specify**)* _____

30. Of those things that you have some control over, what aspect of your life would you most like to change over the next 5 to 10 years?

_____

31. If you succeeded in getting a job outside of Bangladesh, how likely are you to **stay abroad permanently**? Why? (*Circle one, and provide explanation*)

    Extremely likely *Likely* *Neutral* *Unlikely* *Extremely Unlikely*

    Reason: _____

For the following questions, think of someone whose career you admire. The person should be a person whom you know directly or through your friends or family.

32. What is the person's occupation? _____

33. In what city and country is the person based? _____

34. What is your relationship to the person? _____

35. Why do you admire the person?

    _____

Appendix B. Questionnaire for Soft Factors' Training

Part I

This instrument is designed to assist you in understanding your personal cultural preferences, and therefore, how naturally adaptable you might be in certain organizations and global regions. You will derive the greatest value from this survey if you answer each statement as honestly as possible, *based upon your own thinking and behavior*.

(এই জরিপটি আপনার ব্যক্তিগত সাংস্কৃতিক পছন্দগুলোকে বুঝার জন্য পরিকল্পিতভাবে প্রনয়ন করা হয়েছে। যেমনঃ কিছু নির্দিষ্ট প্রতিষ্ঠান ও আন্তর্জাতিক পরিমন্ডলে আপনি কীভাবে নিজেকে স্বাভাবিকভাবে মানিয়ে নিবেন সে সংক্রান্ত বিষয়বস্তু নিয়ে প্রশ্নপত্রটি সাজানো হয়েছে। এই জরিপ থেকে সর্বোচ্চ সুবিধা পেতে পারেন যদি আপনার নিজস্ব চিন্তা ও স্বভাবের এর উপর ভিত্তি করে প্রতিটি প্রশ্নের উত্তর যথাসম্ভব সততার সাথে প্রদান করেন।)

Circle the letter that best describes your *preferred* opinion or *preferred* behavior in an *organizational situation*. The two endpoints of the scale, **1** and **5**, are defined as written, The midpoint, **3**, represents that position occurring about equally between the two endpoint descriptions. The designations **2** and **4** favor **1** and **5**, respectively, though not as strongly in inclination or frequency of occurrence. As best you can, determine where *your* opinion or behavior would occur most consistently on the scale for each of the situations below.

(যে বর্ণের অধীন বিবৃতি প্রাতিষ্ঠানিক পরিবেশে আপনার পছন্দসই মতামত অথবা পছন্দসই আচরণকে সবচেয়ে ভালোভাবে প্রকাশ করে, সে বর্ণটি পরিবৃত করুন। মাত্রার দুটি প্রান্তসীমা ১ আর ৫ বিবৃতি লিখিতভাবে দেয়া আছে। মধ্য বিন্দু ৩ এ আপনার অবস্থান, দুটি প্রান্ত বিন্দুর বিবৃতি থেকে আপনার অবস্থান মাঝামাঝি বিন্দুতে অবস্থিত হিসেবে পরিগনিত হবে। ২ এবং ৪ বিন্দুতে আপনার অবস্থান যথাক্রমে ১ ও ৫ বিন্দুর নিকটবর্তী হিসেবে পরিগনিত হবে। যদিও এ দুটি বিন্দুতে আপনার অবস্থান আপনার মতামত কে আপনার আগ্রহ কিংবা ঘটনা সংঘটনের সংখ্যাকে যথাযতভাবে বোঝাবে না। নিচের প্রতিটি অবস্থার জন্য, আপনার মতামত কিংবা আচরণগত অবস্থানকে যে মাত্রায় প্রকাশ করে যথাসম্ভব ঠিক সেই মাত্রাটি নির্ধারন করুন।)

1. When working on a project, you find it most effective to:
(যখন কোনো প্রকল্পে কাজ করেন, তখন প্রকল্পের কোন পর্যায়ে কাজ করাকে আপনি সবচেয়ে কার্যকর মনে করেন।)

1 **2** **3** **4** **5**

Work through each part of the project in an orderly fashion. (নির্ধারিত ছক মেনে প্রকল্পের প্রতিটি ধাপে)	Work on many different parts of the project at the same time. (একই সময় প্রকল্পের ভিন্ন ভিন্ন অংশে)

2. When you are assigned a project that is due at a specific time, you:
(যখন আপনাকে এমন একটি প্রকল্পের দায়িত্ব অর্পণ করা হয়, যা একটি নির্দিষ্ট সময়ের মধ্যে শেষ করতে হবে, তখন আপনিঃ)

1 **2** **3** **4** **5**

Establish a specific plan for achieving the project by the deadline, if not before. (যদি পূর্বে করা না হয়ে থাকে, তাহলে নির্ধারিত সময়ে প্রকল্প অর্জন করার জন্য নির্দিষ্ট পরিকল্পনা প্রতিষ্ঠা করেন।)	Create a flexible plan which may or may not accomplish the project by the *exact* deadline. (একটি নমনীয় পরিকল্পনা প্রনয়ন করেন, যার মাধ্যমে নির্ধারিত সময়ে প্রকল্প অর্জন সম্ভব হতে পারে নাও হতে পারে।)

3. The best project results are produced when everyone agrees:
(প্রকল্পের সর্বোচ্চ সাফল্য অর্জন সম্ভব হয় যখন সবাই সম্মত হয়ঃ)

1 **2** **3** **4** **5**

To a detailed plan which is executed and completed according to the original design. (একটি পরিকল্পনায় সম্মত হয় যা মূল নকশা অনুযায়ী বাস্তবায়িত ও সম্পাদিত হয়)	To an informal plan that is adjusted as the project proceeds. (একটি অনানুষ্ঠানিক পরিকল্পনায় সম্মত হয়, যা প্রকল্পের কর্মকান্ড অগ্রগতির সাথে সাথে পরিবর্তিত হয়।)

4. When you want to discuss something with a co-worker whose office door is closed, you would probably:
(আপনি যদি এমন কোনো সহ-কর্মীর সাথে কোন বিষয়ে আলাপ করতে চান, যার অফিসের দরজা বন্ধ রয়েছে, তাহলে আপনি সম্ভবতঃ)

1 **2** **3** **4** **5**

Walkaway, assuming he or she does not want to be disturbed. (এমন ধারনা করে চলে যান যে তিনি সম্ভবত বিরক্ত হতে চান না।)	Knock, open the door, and ask for a few minutes to discuss your concern. (নক করেন, দরজা খোলেন এবং আলোচনার জন্য কিছু মিনিট সময় চান।)

5. When you are late for a scheduled appointment, you feel that:
(যদি আপনি নির্ধারিত সাক্ষাৎকারে দেরিতে উপস্থিত হন, আপনি মনে করেন যেঃ)

1 **2** **3** **4** **5**

| | |

You should apologize for being late.
(আপনার উচিৎ দেরি করার জন্য ক্ষমা চাওয়া।)

You should not apologize, assuming he/she will understand that something important came up.
(এটা অনুমান করে আপনি মনে করবেন যে আপনার ক্ষমা চাওয়া উচিৎ হবে না, কারন তিনি বুঝতে পারবেন গুরুত্বপূর্ণ কিছু একটা ঘটেছে।)

6. Your business presentation style tends to be:
(আপনার ব্যবসায়িক উপস্থাপনা শৈলী সাধারণত হয়ে থাকেঃ)

1 **2** **3** **4** **5**

| | |

Orderly, sequential, and logical.
(সুশৃঙ্খল, অনুক্রমিক ও যৌক্তিক)

Flexible, spontaneous, and adaptable.
(নমনীয়, স্বতঃস্ফূর্ত, এবং অভিযোজ্য।)

Part II

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please circle the number next to each statement to indicate the extent to which you agree or disagree with that statement.

(এখানে এমন কিছু চারিত্রিক বৈশিষ্ট্য রয়েছে যা আপনার সাথে মিলতে পারে অথবা নাও মিলতে পারে)। উদাহরণ স্বরূপ, আপনি একমত যে, আপনি এমন একজন যিনি অমুকের সাথে সময় ব্যয় করতে পছন্দ করেন? বিবৃতির যে পর্যায়ের সাথে আপনার সম্মতি কিংবা অসম্মতির মিল খুঁজে পাবেন, সেসকল প্রতিটি বিবৃতির সাথে সংশ্লিষ্ট নম্বরটিকে চিহ্নিত করুন।)

I see Myself as Someone Who…. (আমি নিজেকে এমনভাবে দেখি যে.....)		Disagree Strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree Strongly
7	Does a thorough job (পুঙ্খানুপুঙ্খভাবে কাজ সম্পন্ন করেন)	1	2	3	4	5
8	Can be somewhat careless (কিছুটা উদাসীন)	1	2	3	4	5
9	Is a reliable worker (একজন নির্ভরযোগ্য কর্মী)	1	2	3	4	5
10	Tends to be disorganized (বিশৃঙ্খল প্রবণ)	1	2	3	4	5
11	Tends to be lazy (অলস প্রকৃতির)	1	2	3	4	5
12	Perseveres until the task is finished (কাজ সমাপ্ত হওয়া পর্যন্ত লেগে থাকেন)	1	2	3	4	5
13	Does things efficiently (দক্ষতার সাথে কর্ম সম্পাদন করেন)	1	2	3	4	5
14	Makes plans and follows through with them (পরিকল্পনা প্রনয়ন করেন এবং সে অনুযায়ী কাজ করেন)	1	2	3	4	5
15	Is easily distracted (সহজে বিভ্রান্ত হন)	1	2	3	4	5

Part III

For each statement below, please circle the number that indicates how often the statement applies to you. (None of the time : 1, Some of the time : 2, Most of the time : 3, All of the time : 4)

(নিম্নের যে বিবৃতিটি আপনার চরিত্রের সাথে বেশি যায়, অনুগ্রহ করে সে বিবৃতি সংশ্লিষ্ট নাম্বারটি পরিবৃত্ত করুন। (কোনো সময় নয়= ১, কিছু সময়= ২, অধিকাংশ সময়= ৩, সব সময়= ৪))

		None of the time	Some of the time	Most of the time	All of the time
16	I feel I manage my time well. (আমি মনে করি আমি আমার সময় ঠিকভাবে পরিচালনা করি)	1	2	3	4
17	I look at the calendar or appointment book during the day to keep track of my daily schedule. (আমার দৈনন্দিন কর্মকান্ড কর্মসূচির গতিপথ ঠিক রাখার জন্য আমি দৈনিক পঞ্জিকা অথবা সাক্ষাতকার বুক রাখি)	1	2	3	4
18	I stop and plan out the steps before I start something new. (নতুন কিছু করার আগে আমি থামি এবং প্রতিটি ধাপ নিয়ে পরিকল্পনা করি)	1	2	3	4
19	I plan my daily activities. (আমি আমার দৈনিক কর্মকান্ডের পরিকল্পনা করি)	1	2	3	4
20	I rush while completing my work. (কাজ সম্পাদনের সময় তাড়াহুড়া করি)	1	2	3	4
21	I do my most difficult work at the time of the day when I have the most energy. (দিনের যে সময়ে আমার সবচেয়ে বেশি শক্তি থাকে, তখন আমি সবচেয়ে কঠিন কাজটি করি)	1	2	3	4
22	I find that, even though I want to be on time, I am often late. (আমি দেখতে পাই যে, সঠিক সময়ে আসার ইচ্ছা সত্ত্বেও আমি প্রায়ই দেরি করি।)	1	2	3	4
23	Even if I do not like to do something, I still complete it on time. (আমি কোন কাজ অপছন্দ করলেও নির্ধারিত সময়ে তা সম্পাদন করি।)	1	2	3	4
24	I make to-do lists. (আমি কাজের তালিকা তৈরি করি)	1	2	3	4
25	I wait until I feel better before taking on important tasks. (কোন গুরুত্বপূর্ণ কাজ শুরু করার পূর্বে ভালো অনুভব করা পর্যন্ত অপেক্ষা করি।)	1	2	3	4

		None of the time	Some of the time	Most of the time	All of the time
26	I put off things I do not like to do until the very last minute. (যদি কোন কাজ অপছন্দ হয়, তাহলে সর্বশেষ সময় পর্যন্ত অপেক্ষা করি।)	1	2	3	4
27	I can correctly estimate the time I need to complete my tasks. (আমার কাজ সম্পাদনের জন্য প্রয়োজনীয় সময় আমি ঠিকঠাক নির্ধারণ করতে পারি ।)	1	2	3	4
28	I feel competent about managing my time when I write down my appointments. (যখন আমি সাক্ষাতকার লিখে রাখি তখন সময় ব্যবহারে আমি নিজেকে উপর্যুক্ত মনে করি।।)	1	2	3	4
29	I feel confident that I can complete my daily routine. (আমার দৈনন্দিন কর্মসূচি সম্পনাদনে আমি নিজেকে আত্ববিশ্বাসী মনে করি।)	1	2	3	4
30	I run out of time before I finish important things. (গুরুত্বপূর্ণ কাজ সম্পাদনের সময় আমার অতিরিক্ত সময় লাগে।)	1	2	3	4

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