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Jobs and the Bangladesh Enhancing Digital Economy and Governance Project

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Indirect Jobs Impact Estimation Series[1]

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[1] This report is part of the World Bank IDA19 Policy Commitment to better understand how to measure indirect jobs impacts of development interventions and policies. It is an exploratory exercise on the suitability of estimation methodologies. The results from this report are not official assessments of the performance of the interventions or policies being analyzed and should not be quoted as such.

Bangladesh: Enhancing Digital Government and Economy (EDGE) Project (P161086)

Ex Ante Evaluation of Indirect Jobs

Francisco Meneses and Laura Barasa

1. Introduction

The proposed Enhancing Digital Government and Economy (EDGE) project (the Project hereafter) will support the Government of Bangladesh (GOB) to build its digital government and digital enablers. Since 2009, the GOB has sought to digitalize government and public services to citizens and businesses and to prepare the overall economy for the country's next phase of growth and economic development and resilience. The Digital Bangladesh program is a central element of these efforts.

This Project will support the Digital Bangladesh program by focusing on investments that will strengthen the foundations for a digital government and service delivery and make the country more competitive in the global digital economy. Project investments will also support Bangladesh's ability to respond to the current COVID-19 pandemic and future health or climate-related crises by creating the means for the GOB to rely on digital technologies for business continuity. The Project will also help prepare young people for jobs in a fast-digitizing global economy, with trade flows influenced by the pandemic.

2. Project Details

The total Project cost is US$305 million, which will be financed through a US$295 million equivalent International Development Association Scale-Up Facility credit to the GOB. The GOB will provide an additional US$10 million in counterpart funds in the form of parallel financing for operating costs. The Project has four components, which are detailed below.

Component 1: Enabling Environment for Digital Government and Digital Economy (US$44 million)

- Subcomponent 1.1. Legal and Regulatory Enabling Environment for Digital Government and the Digital Economy (US$3.5 million)
- Subcomponent 1.2. Change and Stakeholder Management (US$5 million)
- Subcomponent 1.3. GOB Digital Capacity Development (US$35.5 million)

Component 2: Transforming Digital Government (US$138.5 million)

- Subcomponent 2.1. Integrated Digital Platform for Digital Government and Digital Economy (US$94 million). This subcomponent will support the establishment of an integrated digital cloud-computing platform for use by all GOB agencies.

- Subcomponent 2.2. Cybersecurity Strengthening for BCC (US$41.5 million).
- Subcomponent 2.3. Mainstreaming Bangladesh National Digital Architecture (US$3 million).

Component 3: Developing Digital Enablers (US$83.5 million)

- Subcomponent 3.1. Digital Enablers Coordination (US$15 million)
- Subcomponent 3.2. Hire and Train Program for Youth (US$28 million)
- Subcomponent 3.3. Strengthening and Promoting the IT Industry (US$15 million)
- Subcomponent 3.4. Digitalization of Small and Medium Enterprises (US$3.5 million)
- Subcomponent 3.5. Establish Training, Research, and Innovation (US$22 million)

Subcomponents 3.2 and 3.5 provide a greater opportunity for researchers to propose *ex ante* evaluations. Past research offers strong evidence on how to measure their expected impact. They represent a total investment of US$50 million or 16 percent of overall Project expenditures. These are discussed in more detail below. For the remaining subcomponents, it will be difficult to pinpoint the expected indirect jobs outcomes.

Subcomponent 3.2. Hire and Train Program for Youth

This subcomponent will provide demand-side support for the scaling-up of GOB's ongoing hire and train program to provide training to new hires in selected companies on emerging/disruptive technology or technology that enables the development of digital economy for selected public universities to conduct the training. This program is based on the successful job training and hiring program of the previous LICT Project and it will increase digital skills and digital-enabled employment for youth (a minimum of 30 percent of which will be women). The training will promote the use of emerging technologies to combat future pandemics or climate-related disasters. Previous training programs have covered IoT (Internet of Things), remote medical transcription, blockchain, machine learning, big data, and artificial intelligence. Beneficiary companies will have to provide guaranteed employment to at least 80 percent of the trainees for a minimum of 6 months. The Project will (a) sign memorandums of understanding with universities to provide this training; (b) assess local information technology (IT) companies' applications for training based on criteria to be detailed in the Operations Manual; (c) select beneficiary IT companies that meet the program's criteria, providing support on a first-come-first-served basis; and (d) arrange for relevant public universities to provide the training.

Subcomponent 3.5. Establish Training, Research, and Innovation Centers

This subcomponent will provide supply-side support for (a) the establishment of training, research, and innovation centers (TRICs) at selected public universities to improve students' digital skills, develop emerging technology strategies and plans for research and innovation, and build research and innovation capacities, including through technical partnerships; (b) the provision of fees to teachers from selected public universities for research and innovation initiatives; and (c) selection of public universities to provide digital skills training to students from relevant disciplines.

These activities include digital skills training for students (with a minimum of 30 percent women) from relevant university disciplines, particularly skills that can help improve Bangladesh's resilience to future health and climate-related shocks. These TRICs will also be set up in women-only universities such as Eden Mohila College. The Project will also encourage women's participation in the TRICs of mixed-gender universities as much as possible. This includes the use of a female spokesperson to promote women's awareness and participation in the training and promotional materials tailored to women.

3. Literature Review

The economic literature on IT analyzes the economic impact of interventions in communities (summarized in Table 1). Several authors assess the IT sector's capacity to generate employment and economic growth (Ahmed 2017; Government of India, n.d.; Hong 2017; Magtibay-Ramos, Estrada, and Felipe 2007; Mehta 2020; Mitra 2013; NCAER 2007; OECD 2010; Sudan et al. 2010; Toh and Thangavelu 2013) and promote development (Kurniawati 2021; Maji and Waziri 2020; Zhang and Danish 2019).

Using input–output tables, Sudan et al. (2010) estimated that the IT and IT-enabled services (ITES) sectors could create nearly 96,000 new jobs in Kenya, which would add an estimated US$333 million to the country's gross domestic product (GDP). The authors also estimated that these sectors could create 120,000 jobs by 2018 and contribute US$1.7 billion to Indonesia's GDP. In 2010, the Organisation for Economic Co-operation and Development (OECD 2010) reported that IT software and services employment nearly doubled from 830,000 in 2004 to 1,630,000 in 2007 in India. This increase would have helped decrease the brain drain and encouraged US firms operating in India to invest in the development of software services. The demand for IT and ITES professionals would have reached nearly 2.3 million, surpassing the new supply (OECD 2010).

The Government of India (n.d.) estimated that for financial year 2020–2021, direct employment in IT services and the business process outsourcing (BPO)/ITES segment could reach 4.5 million, with an additional 12 million indirect jobs. Mehta (2020) argues that in India, the sector provides direct and indirect employment for nearly 4 million people in the telecom and information and communication technology (ICT) sectors and maintains that the ICT sector has the potential to raise India's total output and employment levels.

Magtibay-Ramos, Estrada, and Felipe (2007) analyzed different scenarios to estimate the potential of the BPO sector in the Philippines. Under a conservative scenario, the growth of the sector created 315,000–515,000 new direct jobs from 2006 to 2010, and an additional 221,000 indirect jobs during the same period. Mitra (2013) demonstrates that full-time employment in the BPO sector grew from 100,000 in 2004 to 780,000 in 2012, exceeding the previous calculations. The author's estimation for 2016 was to reach 1.3 million jobs and generate 3.2 million indirect employment opportunities.

Hong (2017) reports that ICT research and development (R&D) investments drove long-term economic growth in Korea between 1988 and 2013. Moreover, Hong argues that an increase in private

R&D investment would boost public sector growth and national wealth, allowing the GOB to invest more in R&D.

Ahmed (2017) analyzes economic growth and the development of the ICT sector between 1965 and 2006 in China, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore, and Thailand. Overall, ICT had a positive impact on these countries' economic growth and productivity.

Another strand of the literature examines the adoption of IT technologies and their effect on development and economic growth. Zhang and Danish (2019) focus on cell phone usage, the development index, and economic growth in 29 developing Asian countries from 1990 to 2016. In countries that score higher on the Human Development Index, the use of cell phones promotes economic growth. Kurniawati (2021) also finds that cell phone penetration and telephone lines enhanced economic growth in middle-income Asian countries between 2000 and 2018. In high-income Asian countries, high internet penetration rates have promoted economic development.

Multiple programs across developing countries have sought to build IT-related skills. As part of the Egyptian National Initiative for Human Capital Development, EduEgypt started with a pilot in 2008 implemented in five faculties of Cairo and Ain Shams universities. The training was designed in coordination with representatives of the IT sector to meet industry expectations. The focus was on soft and technical skills for students with IT backgrounds. Industry partners offered 1,750 job opportunities to the 2,800 students in the pilot (Saleh and Nabil 2008). After the pilot phase, the program expanded to 10 universities, providing training to nearly 10,000 students in the ICT sector (Beschorner, Kuek, and Narimatsu 2015) and 30,000 students in the BPO and information technology outsourcing (ITO) sectors (Garcia and Bafundo 2014). The Mexico FIRST program aimed to increase talent readiness for the IT and ITES industries, connecting universities with the private sector (Beschorner, Kuek, and Narimatsu 2015). More than 65,000 students have received an IT certification. In 2014, the Government of Jamaica, in collaboration with the World Bank, launched the Youth Employment in Digital Animations Industries program (Beschorner, Kuek, and Narimatsu 2015), which was designed to train over 15,000 young people by 2020 to respond to a shortage in the digital animation industry.

The 3Edge Solutions program in India comprised four specialized finishing programs related to the ITO and BPO sectors. Between 2006 and 2011, 95 percent of the 5,000 trainees obtained a job placement (Garcia and Bafundo 2014). In South America, the Uruguay XXI Finishing School generated tailor-made training programs proposed by the private sector. In its first year of implementation (2013), the program served over 1,000 participants (Garcia and Bafundo 2014). The BPO training academy in the Philippines taught more than 6,300 students, all of whom were employed by 2012 (Garcia and Bafundo 2014). Gow et al. (2020) describe the implementation of a technology stewardship training program in Trinidad targeting small agricultural communities. The program's objective was to introduce extension advisors to the concept of technology stewardship and provide essential skills and competencies to promote ICT use in agricultural activities.

Lastly, for Bangladesh, the BD: Leveraging ICT Growth, Employment and Governance Project (P122201) included a training module that trained over 33,564 individuals, including 10,450 women, on marketable ICT skills. Later surveys show that 90 percent of the trained individuals obtained jobs, and overall in the country the IT/ITES industry employment increased from 12,000 jobs in 2013 to 47,000 jobs in 2019. However, it is not possible to directly attribute the increase of jobs in the ITES industry in the country to the program.

While there is a rich literature on the IT impact and the economy and jobs, there is a lack of large-scale causal evidence in this line of the literature. Therefore, it is only possible to make connections and correlation without strongly pinpointing the result and the exact magnitude of the interventions in the economy. Moreover, these papers do not have counterfactuals, as they do not follow the treated and the control groups, adding to the overall validity of the research. Therefore, the estimations found should be analyzed carefully and considered an upper bound of the expected effect.

Table 1. Literature Review

IO estimations			
Kenya	World Bank Report - *The Global Opportunity in IT-based Service*s	In 2010, IT and ITES were estimated to create 22,000 jobs by 2013 and nearly 96,000 by 2018—an increase in GDP of US$333 million in 2013 and US$1.2 billion in 2018.	Sudan, Randeep, et al. 2020. *The Global Opportunity in IT-based Services: Assessing and Enhancing Country Competitiveness.* World Bank.
Indonesia	World Bank Report - *The Global Opportunity in IT-based Services*	In 2010, IT and ITES were expected to create 33,000 direct jobs by 2013 and nearly 120,000 by 2018—an increase in GDP of US$467 million in 2013 and US$1.7 billion in 2018.	
India	OECD - *Information and communication technology sector in India*	Total employment in IT software and services increased from 830,000 in 2004 to 1,630,000 in 2007. This rapid growth helped decrease the brain drain and more expat Indians were returning. Indians residing abroad and working in US firms invested in Indian subsidiaries to develop software for their US operations. NASSCOM estimated the demand for 850,000 IT and 1.4 million ITES professionals in FY 2009–2010, exceeding the new supply.	Organisation for Economic Co-operation and Development. 2010. "The Information and Communication Technology Sector in India: Performance, Growth and Key Challenges." OECD Publishing.
India	Analysis of IO tables of Indian economy	The telecom segment of the ICT sector directly and indirectly employs 4 million people. The ICT sector generates a demand of 3.6 man-years' employment for every 10 lakhs of output. The demand for ICT services as an input and supplier thus has high potential to increase India's total output and employment.	Mehta, B. S. 2020. "Inter-Industry Linkages of ICT Sector in India." *Indian Journal of Human Development* 14 (1): 42–61.
India	Employment Generation IT services and BPO/ITES segment	Direct employment in the IT services and BPO/ITES segment is estimated to reach 4.47 million in 2020–2021. Indirect job creation is estimated to be over 12.0 million.	Government of India. n.d. *Employment Generation: Ministry of Electronics and Information Technology.* Government of India. https://www.meity.gov.in/content/employment.

Philippines	BPO impact analysis using IO tables	Analyzing different scenarios of growth of the BPO sector, the authors estimated that 315,000–515,000 new jobs would be directly created (and 221,000 indirect jobs) from 2006 to 2010. Yet the sector would require 296,000 to 1,560,000 new employees in 2010. "The sector can provide 7–11% of the jobs for new labor force entrants between 2007 and 2010."	Magtibay-Ramos, N., G. Estrada, and J. Felipe. 2007. "An Analysis of the Philippine Business Process Outsourcing Industry." ERD working paper series, No. 93.
Philippines	BPO - new jobs	Full-time employment in the sector grew from 100,000 in 2004 to 780,000 in 2012 and was estimated to reach 1.3 million jobs and produce 3.2 million indirect jobs by 2016.	Mitra, Raja M. 2013. "The Information Technology and Business Process Outsourcing Industry: Diversity and Challenges in Asia." Asian Development Bank Economics Working Paper Series No. 365. https://ssrn.com/abstract=2321535 or http://dx.doi.org/10.2139/ssrn.2321535
Singapore	Study of the extent of ICT sector on Singapore (1990–2000) using a left causative matrix model, with an IO framework	The information sector grew along with the electronics sector, which in the late 1980s was the most relevant industry in Singapore, employing 7 percent of the labor force.	Toh, M. H., and S. M Thangavelu. 2013. "An Input–Output Study of the Singapore Information Sector." *Economic Systems Research* 25 (2): 233–244.
Singapore	iN2015	Aimed to create 80,000 jobs in the ICT sector	Mitra 2013.
India	India e-Readiness Assessment Report 2005	The ICT sector employs 0.36 person-years for every Rs 1 lakh of output. The output multiplier indicates that the IT sector could be treated as a key sector for economic growth.	Department of Information Technology (DIT), National Council of Applied Economic Research (NCAER), 2007.
Korea	Impact of R&D ICT on economic growth	ICT R&D investment is driven by economic growth and vice versa. Based on the short-run causality from economic growth to total ICT R&D investment and the short- and long-run causality from total ICT R&D investment to economic growth, Korea's long-term economic growth appears to be driven by R&D in ICT. Private R&D investments have generated more economic growth than public R&D investments. An increase in the latter will increase the former, boost public sector growth, and contribute to national wealth, which can fund more public R&D investment. It also has the potential to create secondary added value.	Hong, J. 2017. "Causal Relationship Between ICT R&D Investment and Economic Growth in Korea." *Technological Forecasting and Social Change* 116: 70–75.
China, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Thailand	ICT and human capital spillovers on economic growth	"Positive contribution of ICT and human capital (intensities) to TFP and TFP per unit of labor and capital growth of the economies of these countries during all the periods of study (1965-2006). ICT has a positive impact on economic growth for the countries in the study."	Ahmed, E. M. 2017. "ICT and Human Capital Spillover Effects in Achieving Sustainable East Asian Knowledge-Based Economies." *Journal of the Knowledge Economy* 8 (3): 1086–1112.

Use of IT and development			
29 developing Asian countries, 1990 to 2016	Impact of ICT on economic growth and development	"The results summarized that in countries with better human development index, the mobile phone uses promote economic growth, although Internet use does not seem to do so. Higher human development index is crucial for the mobile phone to promote economic growth; however, it looks inappropriate for Internet usage."	Zhang, J. 2019. "The Dynamic Linkage between Information and Communication Technology, Human Development Index, and Economic Growth: Evidence from Asian Economies." *Environmental Science and Pollution Research* 26 (26): 26982–26990.
25 Asian countries from 2000 to 2018	Impact of ICT on economic growth	"High-income Asian countries have achieved positive and significant economic development from high Internet penetration. Additionally, the middle-income countries have started to benefit from ICT Internet. The findings show that the telephone line and mobile phone penetration is highly capable of promoting economic growth in middle-income Asian countries."	Kurniawati, M. A. 2021. "Analysis of the Impact of Information Communication Technology on Economic Growth: Empirical Evidence from Asian Countries." *Journal of Asian Business and Economic Studies* 29 (1): 2–18.
SSA	ICT impact on environmental sustainability	"Increasing ICT penetration and renewable energy use reduce CO_2 emissions and improve environmental sustainability. Economic growth and population growth also mitigate CO_2 emissions. These findings imply that increasing penetration of ICT facilities and renewable energy in the region will promote inclusive environmental sustainability."	Ibrahim, K. M., and S. I. Waziri. 2020. "Improving ICT and Renewable Energy for Environmental Sustainability in Sub-Saharan Africa." *Journal of Research in Emerging Markets* 2 (3): 82.
Training programs			
Egypt	EDUEGYPT	Pilot program implemented in five faculties of Cairo and Ain Shams universities. The trainings were designed in coordination with representatives of the IT sector, to meet industry expectations. The focus was on soft skills and technical skills for students with IT backgrounds. For the 2,800 students in the pilot, the partners from the industry offered 1,750 job opportunities.	Saleh, H., and H. Nabil. 2008. "EDUEGYPT: The Egyptian National Initiative for Human Capital Development." *2008 ITI 6th International Conference on Information & Communications Technology* 33–35. IEEE.
Mexico	Mexico FIRST: main provider of training grants for the country's IT industry	"A total of 102,527 trainees received international standard certifications. Approximately 40,000 students moved on to new jobs in the IT industry after attending MexicoFIRST training programs."	World Bank. 2017. *Moving toward a Knowledge-Based Economy: Improving Competitiveness in Mexico's Information Technology Industry*. World Bank, Washington, DC. https://www.worldbank.org/en/results/2017/11/01/moving-toward-a-knowledge-based-economy-improving-competitiveness-in-mexicos-information-technology-industry.
Egypt	EDUEGYPT	The program expanded to 10 universities, providing training to nearly 10,000 students.	Beschorner, N., S. C. Kuek, and J. Narimatsu. 2015. "Information and Communication Technologies for Jobs in the Pacific." Working Paper, World Bank, Washington, DC. https://openknowledge.worldbank.org/handle/10986/22963.
Mexico	MexicoFIRST: increase talent readiness for the IT and ITES industry	The program connects universities and the IT industry and has provided more than 65,000 certifications. Critical to build a skilled pool of personnel for the IT sector.	
Jamaica	Youth Employment in Digital Animations Industries	With an estimated shortage in the digital animation industry, the program aimed to benefit over 15,000 young people by 2020 (no program results available).	
Mauritius	ICT academy	Objective: train 10,000 workers with internationally recognized IT/BPO skills (international certification). Failed due to lack of funding.	
India	Finishing school programs: 3Edge Solutions	Four specialized finishing programs related to the ITO and BPO sectors. Achieved 95 percent of job placements for 5,000 trainees (2006–2011).	Garcia, P. M., and F. Bafundo. 2014. "Best Practices in Finishing School Programs for the Global Services Industry." IDB Technical Note, 565.

Egypt	EDUEGYPT	Trained nearly 30,000 students by 2013 in skills for the BPO and ITO sectors.	
Uruguay	Uruguay XXI Finishing School	Tailor-made training programs that were proposed by the private sector. In its first year of implementation, (2013) it served over 1,000 participants.	
Philippines	BPO Training Academy	Up to 2012, the academy had trained more than 6,300 students, with a 100 percent employment rate.	
Trinidad	In-service training course on technology stewardship for agriculture	Training for 20 participants from agricultural and fishing organizations. Results: training material matched with learning objectives. No evaluation of outcomes in the communities.	Gow, G., A. Chowdhury, J. Ramjattan, and W. Ganpat. 2020. "Fostering Effective Use of ICT in Agricultural Extension: Participant Responses to an Inaugural Technology Stewardship Training Program in Trinidad." *The Journal of Agricultural Education and Extension* 26 (4): 335–350.
Bangladesh	Top-up IT training of science graduates for IT services segment, foundational skills for ITES segment, middle management training.	Trained over 33,564 individuals, including 10,450 women, who were trained with marketable ICT skills. Later surveys show that 90% of trained individuals obtained jobs.	Independent Evaluation Group (IEG) Implementation Completion Report (ICR) Review BD: Leveraging ICT Growth, Employment and Governance Project (P122201)

4. Theory of Change

The literature on IT interventions has shown that the IT training programs can promote a change or create new jobs in the IT sector (Saleh and Nabil 2008; World Bank 2017). As the experience of the World Bank with the LICT Project (P122201) proved to be successful (IEG, n.d.) and there is indicative evidence of a shortage of IT workers in the country,[2] it is likely that training individuals for the IT sector will allow a proportion of them to obtain new IT jobs. Moreover, the IT sector generates jobs directly and indirectly as other services expand in the economy. Table 2 illustrates the theory of change for Subcomponent 3.2. Newly hired and trained individuals get a job in the IT sector, generate an increase in production in this economic sector, and later indirectly create other jobs.

Table 2 also details the theory of change for Subcomponent 3.5. The supported educational institutions should start training individuals to prepare them for the IT sector. At least some of these students should enter the IT sector, generating a growth in this economic sector. These new IT jobs should also generate an indirect effect in the economy, increasing jobs.

Table 2. Theory of Change

	Constraint	Intervention	Direct recipient/ beneficiary of support	Intermediate outcome	Direct jobs outcomes	Indirect jobs outcomes
Subcomponent 3.2. Hire and Train Program for Youth	**Lack of IT Training**	Directly train individuals in firms	Individuals	Hire and train individuals on IT jobs	Increase the number of IT Jobs	Increase in the number of nontechnical jobs due to an increase in the

[2] https://www.lightcastlebd.com/insights/2019/05/skills-gap-in-the-it-sector-utilizing-the-power-of-youth/

(US$28 million)						economic sector*
Subcomponent 3.5. Establish Training, Research, and Innovation Centers (US$22 million)	**Lack of IT Training Facilities**	Fund training Centers	Institutions	Increase capacity to train individuals on IT jobs	Increase the number of IT Jobs	Increase in the number of nontechnical jobs due to an increase in the economic sector*

5. Estimation of Impact

With the increase of students in the IT training programs, a proportion of them will likely find a job in the IT sector. Subcomponent 3.2 plans to train 25,000 students and expects 20,000 of them to obtain an IT job. This is an apprenticeship/internship model program with on-the-job training and 80 percent of the trainees need to be employed by the organizations providing the apprenticeship.

Subcomponent 3.5, the Research and Innovation Centers (RICs), will support research across 10 universities with the target of creating commercial products and startups. Under this component, the program is also developing a virtual platform which will help students develop skills in these advanced technologies. The program plans to train over 100,000 students through various university activation programs. While the proportion of students that will be taught online is unclear, a few approximations can be made. At the OECD level, 44 percent of students who entered a short-cycle tertiary programme graduated at the expected time (OECD 2018). On the other hand, the literature shows that massive open online courses have a completion rate of 13 percent (Onah, Sinclair, and Boyatt 2014). For Bangladesh, we will assume an interval of possible scenarios of education and labor market integration from a lower bound of 13 percent to an upper bound of 44 percent.

According to the Bangladesh Association of Software and Information Services (BASIS) survey from 2017, there are 102,717 workers in the IT/ITES industry, of which 39,761 workers (or 39 percent) are nontechnical employees (BASIS 2017).

Using the above numbers, it is possible to estimate the impact of a new IT job on indirect jobs. Table 3 shows the total number of expected IT jobs created by Subcomponents 3.2 and 3.5, assuming that for Subcomponent 3, 25,000 students reach 20,000 jobs, and for Subcomponent 3.5, from the total 100,000 students, only 13,000 obtain IT jobs. We can assume that in the IT/ITES industry, there will be a set of non-technical jobs that will be needed for the newly hired IT/ITES workers. Using the estimations from the BASIS 2017 survey, we can estimate that for every six IT/ITES newly hired individuals, four nontechnical jobs will be generated. This means that the hire and train program would be expected to generate 13,333 indirect jobs and the training and research centers would be expected to generate 8,666 indirect jobs.

Table 3. Data and Estimation

	Number of students	Expected Outcome Number of Jobs	Expected Outcome: Indirect jobs created	Total Cost	Indirect Jobs Per Million
Subcomponent 3.2. Hire and Train Program for Youth	25,000	20,000	13,333	US$28 million	476
Subcomponent 3.5. Establish Training, Research, and Innovation Centers	100,000	13,000-44,000	8,666-29,333	US$22 million	393-1,333
Total	125,000	33,000-64,000	22,000-42,666	US$50 million	440-853

Table 3 also shows the total cost of the programs and the estimated impact on indirect jobs per million dollars spent. While Subcomponent 3.2 is expected to generate 476 indirect jobs per million dollars spent, Subcomponent 3.5 is expected to generate a lower bound of 393 indirect jobs per million dollars spent and an upper bound of 1,333 indirect jobs generated per million dollars spent.

6. Discussion

The current document analyzed the possible effects of the Enhancing Digital Government and Economy (EDGE) Project on the indirect labor market outcomes. Following the example of the literature, this paper estimates the effect that two subcomponents of the EDGE project will have on the indirect labor market.

IT/ITES training programs worldwide have been associated with better wages and high labor market integration. Moreover, the technology sector's growth has been related to indirect jobs in the industry. Two subcomponents of the EDGE program are training programs expected to train over 125,000 individuals and generate between 22,000 to 42,666 indirect jobs or 440–853 indirect jobs per million dollars spent.

This research shares the weakness of the current literature, as there is a lack of causal papers that identify treated and control groups and compare their results. Nevertheless, the presented results indicate the magnitude of the estimated impact.

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