Reaping the benefits of Industry 4.0 through skills development in high-growth industries in Southeast Asia: Insights from Cambodia

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What is “Industry 4.0”?

INDUSTRY 1.0

Mechanization of industry using water and steam-powered machines

18th Century

INDUSTRY 2.0

Mass production with assembly line powered by electricity

19th Century

INDUSTRY 3.0

The advent of computers, the Internet, robots and automation, and electronics

1980s

INDUSTRY 4.0

First conceptualized to describe data exchange technologies used in manufacturing, this term is now widely used to refer to technologies applied across all sectors; technologies include cyber-physical systems, the Internet of Things (IoT), Artificial Intelligence (AI), cloud computing and cognitive computing

Today

While several studies have analyzed the jobs and skills impacts of Industry 4.0, some important gaps remain which this study addresses

Area	Gaps in existing studies	This project's approach
Skill demand implications	Weak focus on **new jobs that could be created due to Industry 4.0 (I4.0)**	**Examine all channels of job creation** due to I4.0 – direct, indirect and at broad economy level
	Limited assessment of implications for **new skills demanded**	**Assess potential future skills required** through a through analysis of potential job and task shifts due to I4.0
Skill supply implications	No existing analysis of **training requirements by various channels** to gain in-demand skills with I4.0	**Assess total training hours required** to deliver the skills required, and break these down by the different learning channels **Understand quality** of different training options through surveys
Policy interventions	Few attempts to **map out policy interventions** for skills in response to I4.0	**Analyze relevant I4.0 and skills-related policy interventions** in the country and compare to best practice approaches
	Limited analysis of **implementation challenges of these interventions**	**Derive a comprehensive framework to assess the implementation challenges** of these policy interventions

This study's key question: What are the challenges and opportunities for skills and jobs posed by Industry 4.0 in Cambodia, Philippines, Indonesia and Viet Nam, and what are the policy options?

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The Garments and Tourism industries were selected for this study: Why?

Considerations for industry selection:

1. **Industries must be of high priority to the government, based on existing policies**
2. **Industries must fulfil the following criteria:**
   - a. Significantly contributes to national employment
   - b. Exhibits strong recent employment growth
   - c. Exports are internationally competitive
   - d. Relevant to Industry 4.0
3. **As far as possible, the two industries should be represented in both the manufacturing and services sectors**

Selected industries	Reasons
Garments	• Significant for national employment and exports • High potential for I4.0-enabled productivity gains • Increasing I4.0 adoption observed
Tourism	• Significant for national employment and international competitiveness • Significant as an enabler of growth in other sectors (e.g., infrastructure) • Strong potential for disruption by the digital economy

4 key insights emerge from our analysis of I4.0's impacts on jobs, tasks and skills in Cambodia's garment manufacturing and tourism industries

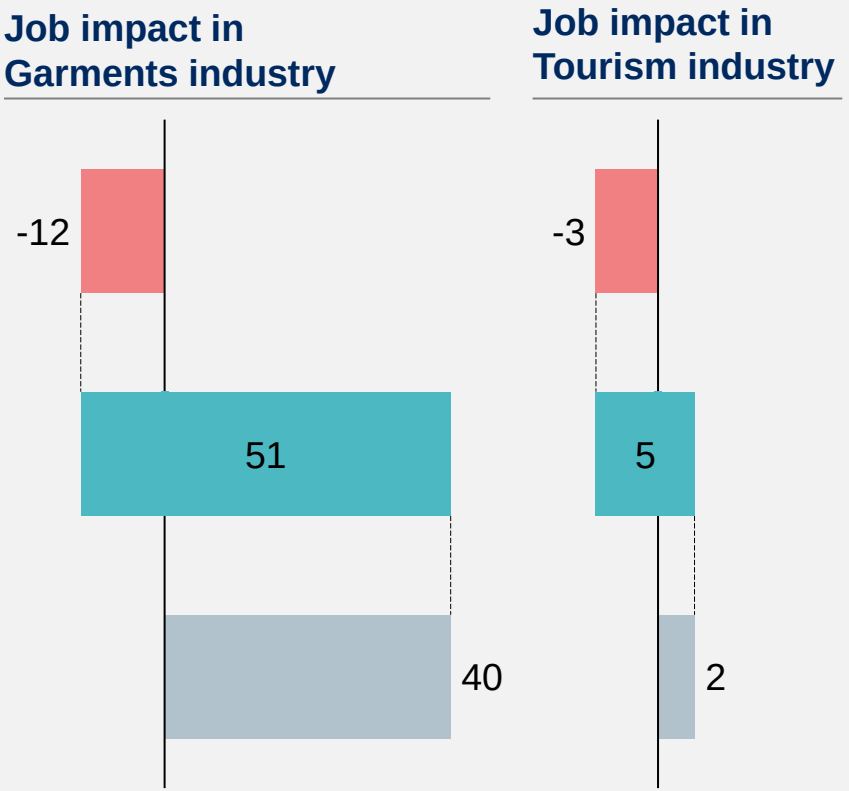
Insight	Findings in both industries
Understanding of I4.0 is limited	• **Less than a third** of employers in the garments industry, and **35%** of those in the tourism industry have a good understanding of I4.0
Though I4.0's impacts on overall job numbers is likely limited, the type of jobs performed will change, and women could be most impacted	• The overall impact of I4.0 on jobs is likely to be limited – however, there is likely to be a shift from manual jobs to managerial jobs • Women are likely to be most impacted, with **more than 5 times** as many jobs held by females being at risk of automation than those held by males in the garments sector – in the tourism sector, this is **2 times**
I4.0 will change the kind of tasks performed in jobs	• In the garments manufacturing industry, with I4.0 adoption, **23.7%** of the average worker's work week is likely to shift from performing routine physical tasks to analytical, interpersonal and non-routine physical tasks
Evaluation, communication and interpersonal skills will be on the rise – these will require both training on the job and formally	• In the garments industry, evaluation and critical thinking skills will gain relative importance. In the tourism industry, communication and social skills are likely gain importance • **57%** and **77%** of training requirements in the garments and tourism industries respectively are likely to be serviced by "on-the-job" training, followed by formal workplace training

The overall impact of I4.0 on jobs in both sectors are likely to be limited, as negative displacement effects are offset by positive productivity effects

Modelled impact of I4.0 on number of jobs between 2018 and 2030 in Cambodia

Displacement and productivity effects of I4.0 on jobs, 2018-2030, %

Effect	Description
Displacement	Job reductions due to labor-substitution effects of I4.0
Productivity	Additional labor demand stimulated by revenue increases brought about by I4.0-enabled productivity gains
Net	Combination of displacement and productivity effects



Evaluation and judgement, communication, social, critical thinking, and technical skills are predicted to become more important with I4.0

Top 10 skills predicted to be required in the garments manufacturing and tourism industries in Cambodia due to I4.0 adoption

Skills of increasing importance due to I4.0 | Skills with decreasing importance due to I4.0 | Skills with no change in importance due to I4.0

Rank	Garments industry	Tourism industry
1	Evaluation, judgement and decision making	Written and verbal communication
2	Management	Evaluation, judgement and decision making
3	Numeracy	Social
4	Critical thinking and active learning	Numeracy
5	Written and verbal communication	Management
6	Social	Critical thinking and active learning
7	Technical	Computer literacy
8	Complex problem solving	Technical
9	Computer literacy	Complex problem solving
10	Digital/ICT skills	Digital/ICT skills

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5 key insights emerge from the survey of training institutions in Cambodia

Training institutions will require additional support to be prepared for I4.0	• **62%** of surveyed institutions indicate requiring additional support to be fully prepared for I4.0 • Training institutions provide courses to teach I4.0 relevant skills, but the uptake of I4.0 in the classroom is largely limited
Training curriculums do not appear to be designed to keep pace with changing technology needs	• **Two-thirds** of all training institutions review and update their curricula **less frequently than once a year** • There is a lower focus on workplace-based training than in leading international vocational training programs
While there is regular coordination with employers, training institutes require more access to industry equipment and knowledge	• **86%** of training institutions communicate with employers **at least 2 times a year** • However, few are able to get access to industry equipment or industry training for their teaching staff
There is scope to increase both on-the-job and formal training for workers – as well as quality assurance to uphold training standards	• Most training institutions do not allocate designated on-the-job time for staff to gain new practical knowledge • Employers in both the tourism and garments industries provide limited formal training options • Training institutions believe that quality assurance will be the most helpful policies for them
Employers do not seem to share training institutes' optimism about the skill levels of entry-level graduates	• There is a large discrepancy between training institutions' optimism about the preparedness of graduates for work and what employers report

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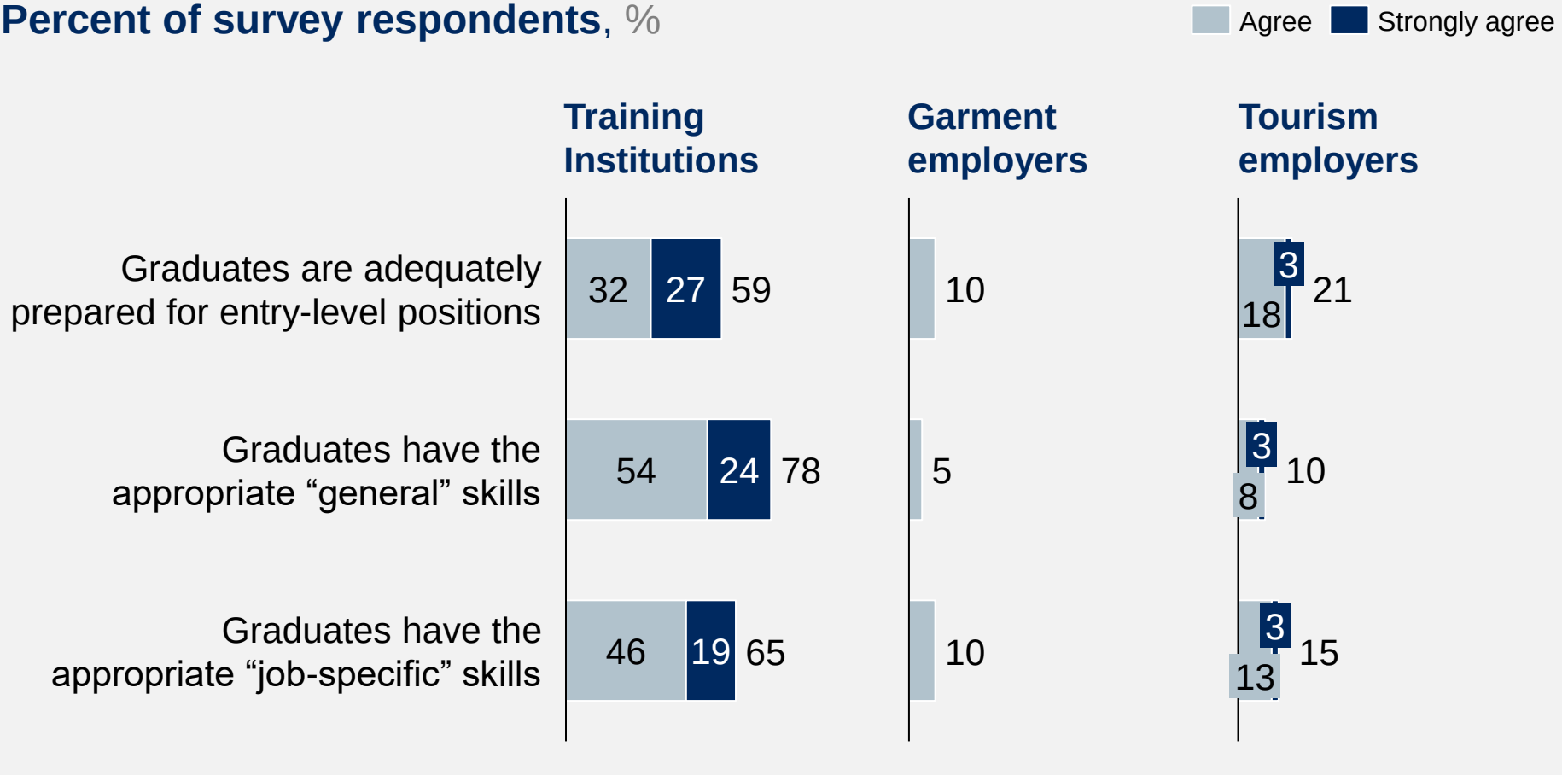
Perception of graduates' preparedness for entry level positions

Percent of survey respondents, %



SOURCE: Training institution survey on impact of I4.0 in Cambodia, n = 37; Employer survey on impact of I4.0 on the garment manufacturing industry in Cambodia, n = 20; Employer survey on impact of I4.0 on the tourism industry in Cambodia, n = 39

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I4.0 and skills related policies in all four countries in the study were assessed in terms of “the what” and “the how”

Policy assessment	Description
“The What”: ***What is Cambodia doing today?***	▪ Analysis of Cambodia’s **broad approach to Industry 4.0**, including targets, strategies and actions ▪ Analysis of Cambodia’s **policies for jobs and skills related to Industry 4.0**, and possible gaps
“The How”: ***How is Cambodia doing it?***	▪ Analysis of **implementation approaches of Industry 4.0 job and skill policies**, taking into account the roles of different actors such as government, industry and training institutions

Cambodia's policies seek to improve industry tech adoption and TVET quality, but could go further in several areas

Action agenda	Current policies	Further areas to consider
Stimulate Industry 4.0 adoption and worker re-skilling efforts	▪ **2017 TVET policy** aims to provide career guidance and vocational skills ▪ **Sector skills councils** established by govt and industry to identify skill gaps and plan training ▪ **'Skills Development Fund'** jointly developed by the ADB and MEF provides access to training funds for upskilling of workers and youth	▪ Investment in R&D talent ▪ Industry-research partnerships ▪ Job-to-skill mapping exercise ▪ Training subsidies
Create new flexible qualification pathways	▪ **Competency-based qualifications** under 'skill bridging programs' aimed at high school dropouts ▪ **Refreshment of educational curricula** in consultation with industry ▪ **Student apprenticeship** programs	▪ Cultivate lifelong learning Measures to improve TVET quality ▪ Increase recognition of competency frameworks by private sector
Build inclusiveness to extend I4.0 benefits to all workers	▪ **TVET scholarships for marginalized communities** planned under 2017 TVET policy ▪ **Basic employability skills training for low-income communities** offered by Provincial Training Centers and Vocational Training Centers	▪ Targeted programs for underserved communities ▪ Social protection for gig economy workers

While Cambodia is at an early stage of I4.0 policy, there is opportunity to strengthen linkages with skills policies and stakeholder incentives

Dimension	Effective areas in current policy	Areas for improvement
Clarity and robustness of plans	▪ Clear articulation of national I4.0 vision and strategies ▪ Forward-looking I4.0 plan incorporating I4.0 plans, backed by local evidence	▪ Integration between I4.0 adoption and skills policies
Strength of coordination	▪ I4.0 strategy under 'Cambodia Trade Integration Strategy' a good start as a single national roadmap for I4.0	▪ Coordination between different I4.0-relevant policies ▪ Central organizing framework for all TVET institutions ▪ Alignment on curriculums across institutions
Alignment of financing & incentives	▪ Increasing public investment in education	▪ Funding for science and technology development ▪ Incentives for private HE institutes, employers, and students

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Recap of 5 key challenges facing Cambodia in relation to I4.0 and skills

Key Challenge	Findings
1 **Limited understanding of I4.0 by industry**	• Only **28%** of garment manufacturing employers have a good understanding of I4.0 technologies • This share is also relatively low for the tourism industry, at **35%**
2 **Large shifts in tasks and skills required due to I4.0**	• I4.0 technologies could lead to **>20%** fall in worker time spent on routine physical tasks by 2030, triggering changes in skill needs • Especially important given current misalignment on skills - while **59%** of training institutions believe graduates are well prepared for entry-level positions, only **10-21%** of employers feel so
3 **Lack of integrated I4.0 and skills policy and coordination within government**	• The *Cambodia Trade Integration Strategy 2019-2023* outlines a well articulated vision for I4.0 and technology adoption, but there is limited integration between this and the country's skills development strategy
4 **Lack of incentives for investment by firms in worker training**	• Financial support is critical as 2017 survey by the National Employment Agency reflects that **72%** of firms had developed training plans, but **75%** were unable to allocate budgets to them
5 **Limited robust quality certification processes for courses**	• **65%** of training institutions surveyed in Cambodia believe that developing more robust quality certification processes will be required to maintain the quality of training

The study outlines 5 key recommendations to address these challenges

Recommendations	International best practice examples
1. **Develop I4.0 adoption roadmaps outlining sector-specific measures for tech adoption and upskilling**	Co-created by government, industry and civil society, Singapore's "Industry Transformation Maps" charts I4.0 tech adoption for each industry, including the specific skills required to support adoption, and the training options for it
2. **Develop a series of industry-led TVET programs for I4.0 skills**	IL&FS in India offers jobseekers 2- to 3-month vocational boot camps, coupled with job placement programs McKinsey's "Generation Program" runs industry bootcamps in 14 countries for entry-level and mid-career workers
3. **Implement an incentive scheme for firms to train employees for I4.0**	The Singapore government subsidizes employee training course fees and absentee payroll salary costs, with higher subsidies for government-certified courses (i.e., in industries that are high-growth, relate to I4.0 skills)
4. **Upgrade training delivery through I4.0 technology**	The African School for Excellence in South Africa incorporates free online courses from sources like the Khan Academy, as well as personalized and adaptive learning tools to monitor students' learning progress
5. **Strengthen quality assurance mechanisms for training institutions**	Quality of training programs can be validated on a regular basis through a variety of ways – e.g., surveys indicating demand (Austria), employers' opinions of programs (Denmark and Lithuania), agreements with employers to provide traineeship places (Hungary), and evidence of alignment with skills gap (Ireland)