CamEd Open Access Repository
ACBSP Region 10, 2023, pp. 87 - 94
DOI: https://doi.org/10.62458/CamEd/OAR/ACBSP/87-94

Industrial Transformation and Skill Needs: Implications for Future Skill Development

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The Royal Government of Cambodia aims to upgrade the country's status to an upper-middle-income country by 2030; a high-income country by 2050 and human resource development is the key to this endeavor. Within this context, the study explores employers' perspectives on the relationships between worker development skill and industrial transformation. Particularly, the research applied case study methodology to examine how companies in Cambodia manufacturing industries mobilize their workforce to respond to changes in products, technology, and work organization. Interviews were conducted with 36 human resource managers and production heads at 18 companies in the electrical & electronic, garment, and food processing industries. Transcripts were thematically coded on NVivo 12 software. The findings provide employers' insights to facilitate training providers in designing skill training programs responsive to future labor market needs.

Keywords: *Industrial transformation, vocational skill development, TVET*

INTRODUCTION

The skills and knowledge of workers are critical contributors to the economic success of firms and nations (Abbas & Foreman-Peck, 2008; Benson et al., 2013) reflecting the inextricable linkage between human capital and a country's development. In Cambodia, skill development is the key to the national socio economic development (RGC, 2015; RGC, 2018). Therefore, without equipping the workforce with the skills and competencies necessary for the industry and labor market, Cambodia will not accomplish its vision of reaching upper-middle-income status by 2030 and high-income status by 2050.

Towards achieving its ambition above, Cambodia's government has embarked on several major policies including the Industrial Development Policy (IDP) 2015–25, National Employment Policy 2015–25, and National Technical and Vocational Education and Training (TVET) Policy 2017–25 in addressing skill development issues and challenges. To support the implementation of these initiatives, international development partners have provided financial and technical assistance to the government through diverse projects such as the Project for Improving TVET Quality to Meet the Needs of Industries 2015–20 (JICA, 2015) and the Skills for Competitiveness project 2019–2023 (ADB, 2019)

Despite the great efforts that have been made, the overall population has just 4.8 years of formal schooling on average, which is relatively low in the region (NIS, 2018; UNDP, 2018). Moreover, the skill mismatch is still a lingering issue as evidenced by the many employers reporting difficulties finding suitable candidates for their job vacancies (HRINC, 2010; NEA, 2018). As a result, employers seem to distrust graduates' qualifications, while most companies tend to hire job candidates with lower levels of education but at low cost to fill vacancies or to meet production workloads. Usually, the poor levels of skills and knowledge among the workforce demand urgent action from the government and relevant stakeholders to bridge the skill mismatch.

There are several recent studies focusing on the relationship between the skill supply and demand sides. The 2017 Cambodia Employer Survey of 605 businesses chiefly collected detailed information on labor market demand vis-à-vis skill supply, but also to learn about the skill shortage and skill gap in Cambodia (NEA, 2018). At the macro level, given the persistent skill mismatch (Sothy et al., 2015), ADB and ILO conducted an employment diagnostic study to examine constraints and opportunities for closing skill gaps and increasing productive employment in Cambodia (ADB & ILO, 2015). However, despite the urgency of the matter, research on the linkage between skills and transformation is still scant (Ven & Veung, 2020), the same research applies to employers' perceptions of skills and knowledge, especially in the manufacturing sector.

RESEARCH OBJECTIVES

In order to explore and develop a clear understanding of the linkage between VSD and transformation in Cambodia's manufacturing sector, we set these research objectives to examine how technological, product and work organization changes affect employees' skills and vice versa.

LITERATURE REVIEW

Skill development and industrial needs

A skilled workforce is central to a nation's socio economic development (Benson et al., 2013). Hence, skill development systems must develop human capital with the right skills and competencies at the right time to meet the labor market demand. According to (Becker, 1962) and (Schultz, 1960), human capital is one of the most important factors in a country's economic development through education and training. However, rapid changes in advanced technologies have increased the demand for higher cognitive skills and lifelong learning, reflecting the skills and knowledge received from school and the workplace can become obsolete quickly, while those changes in workplace technologies also demand new and complex knowledge and skills from workers (Kim & Park, 2020; WEF, 2020). Thus, nations need to take urgent and serious action to upskill and/or reskill their workforce to maintain their competitive edge.

Technology continually advances towards non-human operating systems (Sharma & Jain, 2020), but the skill shortage and gap in developing countries such as Cambodia could be even worse, while they are also facing a daunting challenge to upgrade and deploy new technologies and their ability to absorb foreign technologies rests largely on the availability of human resources (Abbas & Foreman-Peck, 2008). It even worsens when simple routine tasks can be done or replaced by automatization, therefore enhancing the capabilities and skills of the workforce through responsive skill training and skill upgrading since the essential skills and competence is highly needed to respond to industrial skill needs.

Skills and qualifications from formal education and training systems vary in terms of market values and effectiveness (Müller & Gangl, 2003). These skills and qualifications are seen as one viable resource available for fresh graduates to enter the labor market (Ashton & Sung, 1992). However, only a few highly competent individuals tend to enjoy many employment opportunities, while many others with poor or low skills and qualifications seem left behind (Brown et al., 2011), creating employment inequality across most economic sectors. This is because the education and training systems in developing countries are weak and not meeting industrial needs. Further issues include a poor basic education system and unequal access to quality education, which is a foundation for TVET (Spaull, 2013; Spaull & Kotze, 2015). Developing economies, due to scarce resources, face the dilemma of investing in general education leading to higher education, or investing in TVET leading to the world of work (Pefianco et al., 2003).

Despite the noticeable expansion of access to TVET across the developing world and the corresponding rise in enrollment rates, there are still many issues and problems in making formal education and training responsive to the labor market. Linking skill development to the industrial needs would require an effective coordinating mechanism among relevant stakeholders that ensures highly effective linkages among skill development policies, TVET providers and firms (Allais, 2012; McGrath, 2012).

Forms of workforce skill development

TVET, according to UNESCO's definition, covers formal, non-formal, informal, and workplace training, giving learners a wide range of and flexibility in learning experiences relevant to the world of work. It includes both initial skill development prior to employment and reskilling and upskilling through further education and training during or after employment (UNESCO-UNEVOC, 2006, as cited in Catts et al., 2011). In some contexts, vocational education, technical and vocational education, vocational education and training, workforce education, vocational skill development (VSD) are used as equivalent terms for TVET (Hollander & Mar, 2009; OECD, 2010).

In this paper, VSD is used with a focus on formal, job-specific pre- and in-employment education and training programs. Pre-employment VSD caters for workers of all skill levels – lower, medium and higher, include short-term training as much as industry-oriented higher education and lead to some kind of certification and the acquisition of industry-specific skills, while in-employment programs cater for workers across different skill levels, but after they join an industry, and could also be provided or certified by a third party, also leading to industry-specific skills. Initial education and training and workplace skill training below capture the features of pre- and in-employment VSD of the study.

Initial education and training are a crucial part of the workforce skill development. It serves as a foundation upon which workers' skills are built. This education is usually considered a key to unlock workers' full potential for the world of work, complemented by further education and training after they enter the labor market (Senker, 2000; Wolbers, 2005).

Workplace training is usually intended to enable workers to improve their job-specific skills and knowledge through on-the-job training and off-the-job training and informal learning (ECDVT, 2014; Selesnick, 1981). Specifically, on-the-job training is a popular form of workplace training incorporated into workers' normal work, in which workers learn a particular skill by doing a specific job or task, whereas off-the-job training usually requires them to be away from their normal work to participate in designated training outside of the firm or workstation (ECDVT, 2014).

Skill attainment and educational levels of the Cambodian workforce

Although there is a large proportion of workers in low-skilled and unskilled low-wage jobs in agriculture, manufacturing, construction and services dominate Cambodia's labor market, with only a small minority in high-skilled and professional jobs. According to the 2017 Cambodia Socio-Economic Survey, 12 percent of the workforce had no education, 26 percent had completed and about 32 percent had not completed primary education, roughly 16 percent had completed lower-secondary and about 8 percent had completed upper-secondary education, and only about 7 percent had completed postsecondary education (NIS, 2018). The low level of educational attainment and skill acquisition in the workforce is a tremendous challenge to implementing Cambodia's ambitious development agenda (RGC, 2015) as the Cambodians attend 3.6 fewer years of basic education than the average of 8.4 years for developing countries (UNDP, 2018). These statistics indicate the limited availability of human resources for Cambodia's industrial transformation (RGC, 2017).

Education and training are of great importance, but it is not the whole story in Cambodia. Employers need workers with more than academic and vocational qualifications. They look for candidates with specific practical skills and work experience. Even so, the relevance of education and training is a top priority for most employers when recruiting new employees (NEA, 2018), as the skills and knowledge obtained through formal education and training might not meet their expectations. Consequently, employers have to use different hiring tactics and recruitment methods to attract talented employees. Most employers are keen on an optimal method for recruiting new employees or promoting existing employees and conforming with corporate business and human resource strategies (Lepak & Snell, 1999).

RESEARCH METHODS

This research applied case study methodology to understand how companies or employers perceive the skills and knowledge of their workforce in relation to the skill needs required for a certain level of transformation within manufacturing companies

Data collection

This study used data gathered from 36 qualitative face-to-face interviews with 18 firms with senior managers and a production head or representative in each firm. The participants were purposively sampled for their comprehensive knowledge of their firm's practices and experience, especially in the areas of hiring and training, growth and transformation, and TVET programs. The heterogeneous sample consists of three industries: garments, electrical & electronic (E&E), and food processing. The companies were selected to cover a range of characteristics, such as firm size and type.

Data analysis

This study used Nvivo 12 for coding. The main codes and subcodes were created based on the interview question structure and emerging themes. The themes have also been coded to compare and contrast with case numbers.

FINDINGS

Transformation in production technology, products and work organization took place in a variety of forms in the interviewed companies, and was believed to be intertwined with human capital, specifically the skills and knowledge of employees. The direction of the relationship between transformation and skills is not clear, because it is difficult to identify whether employees' skills and knowledge enabled transformation or vice versa. In other words, the changes in production technology, products and work organization require a set of new or additional skills and knowledge, or that having a skill set allows for or even drives transformation.

Technological change and its implications for skills

Almost all respondents viewed employees with TVET qualifications positively in terms of facilitating changes in technology, but some companies seemed to indirectly report their changes in technologies. Not all changes in technology led to new or additional skills and knowledge of the employees. Those changes were also different depending on the type, size and ownership or the location of companies. For example, several E&E and food processing companies reported that the introduction of new, advanced technologies or machines helped reduce the number of production line workers, while most garment companies did not mention anything about labor reduction. One crucial implication of this transformation in production technology in relation to skill utilization is that in some company's manual work or labor was replaced with new or advanced fully or semi-automated machines, allowing those companies to allocate the remaining employees and resources to other tasks.

Upgrading technology or machines generally helped companies reduce the number of manual operators or employees on production lines, but that did not mean the total number of employees in those companies has decreased. For example, company CFE45EE, where technological change took place, the number of employees remained the same, but losses related to defects and waste were reduced, therefore the company was able to efficiently use its employees and other resources to improve production. In another example, machine upgrading in company CE5913F reduced the workload of production line operators, and the leftover remaining employees from the production section were assigned to other tasks. As such, the installation of automated machines has not only helped reduce manual labor but also improved the quality and quantity of the products.

While technology upgrading was reported as a main reason for reducing labor and costs in some interviewed companies, the installation of new or additional machines did not reduce the number of production line workers as those companies needed workers to operate the new machines in order to fulfill orders. Only a few companies said they recruited more employees for new machines or new production lines. Most companies relied on their existing workforce and did not hire new or extra employees for new machines or technology upgrading. Instead, most of them seemed to rely on machine experts from outside the company when they upgraded or changed their technology.

When adopting advanced machines or technologies, most firms relied less on their employees' skills and experience or local experts. Companies were dependent on outside specialists or technical experts from abroad if any technology changes occurred, except for a very few cases in which the respondents mentioned that their companies considered the skills and knowledge of their existing employees before introducing any major changes in production technology. Furthermore, most companies did not require their existing employees to have a completely new skillset as they could rely on technical and human resource support from their parent companies abroad.

One stand-out finding is that most technological changes in the interviewed companies were smoothed by specialists or experts from parent companies abroad or from machine suppliers. This suggests that the roles of internal technicians, mechanics and engineers were not that important for technology upgrading. Instead, the companies were merely followers or recipients of skills and knowledge transferred to them by outside experts, and that those transferred skills and knowledge were usually limited or operations-related. The skills and knowledge related to operation and safety were transferred to operators by technicians, mechanics and engineers through peer learning or on-the-job training.

In the food processing sector, respondents indicated that the introduction of new machines meant their companies had to improve the skills and competencies of the workforce, not only to ensure that employees could operate the machines, but also to produce better quality products and increase productivity. In short, they needed to upskill their workforce in order to get the most out of their investments in technology. In general, technicians and mechanics encountered more difficulties than operators when getting to grips with completely new machines or technology; to do so, it required more time to learn and observe. The same result shows for other sectors.

In the garment sector, new modern semi-automated machines required additional skills and knowledge. However, the operators in most garment companies faced few or no problems operating those new machines as they had worked in the sector for years and used various types of machines. Because they already had relevant practical skills and knowledge, and because the new machines were not completely different, the operators were able to learn and adapt

quickly. Sometimes, garment sector workers resisted change because having worked in the sector for many years they were familiar with the old ways of operating. Companies sometimes had to force their workers to use new, advanced machines.

Although almost none of the interviewed companies said anything about the introduction of new technologies requiring employees to acquire new or additional skill sets from the outset, they point out that changes in technology could eventually lead to new skills and knowledge. In practice, employees learned new skills or knowledge through working with their peers or operational processes when new machines were adopted. Thus, to some degree, changes in production technology had an impact on existing skills and knowledge, employees had no option other than to adjust to those changes as required.

Product change and its implications for skills

In this study, only the E&E companies had many employees with TVET qualifications, whereas most of those in the other sectors did not. In fact, it seems that the garment companies did not require employees with higher TVET qualifications for their product changes. For E&E companies, employees' skills and knowledge changed depending on product type, meaning new product types resulted in changes in existing skills and competencies. Employees' skills and knowledge were gradually improved over time through the work process. Improving the skills of E&E employees, and especially less-educated operators, often faced difficulty in making those products, but the introduction of new product types and technology allowed existing employees to gradually gain specific skill sets to improve their overall skills and knowledge over time.

Likewise, food processing companies reported that product changes caused difficulties for production employees in terms of complexity and workload, but their employees could adapt to those changes over time with support from higher-level employees (e.g. supervisors and leaders) who had practical skills and experience. Ultimately, with the skills transfer and practical training from experts and technicians, the employees could learn and perform better due to their increased skills, knowledge and experience with the products. For example, employees gained skills and experience from making new product types.

Garment companies also reported that their employees had to improve their skills and knowledge to meet the complexity of new styles or fashions. However, those changes were manageable for the employees because they had to develop their sewing skills using various machines and amassed work experience in producing diverse styles of clothing. Additionally, creating new styles were not much different; workers improved their skills and then they were able to produce good quality products.

According to some long-established garment companies, the skills and work experience of their employees have improved over time, even though they have employed many workers with low education and skills in the beginning. This could be because those companies invested time and resources in employee training when they first began operating in Cambodia. This shows how low-skilled workers have learned and improved their skills and competencies through on-the-job training.

In most garment companies, higher-level employees, including (foreign) supervisors and some leaders, were the key enablers of product change. They were at the forefront of testing products or making samples with guidance from experts or machine technicians, and they made sure their teams knew what the product should look like and what the quality should be. Therefore, product changes were possible due to the practical skills, knowledge and experience of those supervisors and leaders as the front-line force. This also shows that most garment companies did not recruit supervisors or leaders from outside when introducing new products, since their internal employees could deal with the changes.

Work organization change and its implications for skills

Changes in work organization are usually related to changes in production technologies and products as all production arrangements complement one another in response to company goals and customer demands. In this study, as work and tasks were re-organized to meet those needs; changes were made to the skills, knowledge and experience of existing production employees. When new advanced machines were introduced, production line workers were required to gain new skills and knowledge to operate them and any remaining workers were moved to another task. In tandem with this labor reduction, the workload of higher-level employees increased, also a result of the changes in the work process.

In the garment sector, some companies re-arranged or created new high-level positions, such as production line supervisors, to manage and support line leaders and operators because their products were always changing and orders were increasing. A major change was the transfer of leadership and management positions from foreign to high-level Cambodian employees. This demonstrated that Cambodian employees had gained and improved their practical skills and experience in leadership and management. The Cambodian supervisors were able to communicate well with line operators and other workers.

In E&E companies, changes in work organization also contributed to reducing employee resignations and increasing employee productivity and skills. New working arrangements with automated machines was important for saving time and resources in production. Likewise, in food processing companies, new working arrangements led to improvements in employee work performance due to the more efficient use of employees in production.

In some companies, it was important to have contingent employees with the required skills and knowledge who could lead the production lines when mid- or high-skilled employees might leave unexpectedly. This work arrangement could happen across the sectors as companies prepared for skills transfer and work rotation. However, such task or workstation rotation most often happened in garment companies with more experienced, skilled operators and leaders who could perform multiple tasks and work roles on the production line. In contrast, operators and other employees in E&E and food processing companies were rather new to the work and production processes, meaning it took time and effort for them to learn how to rotate production line tasks and work roles.

In the garment sector, aided by incentive schemes and target setting, new working arrangements helped improve employees' performance, leading to productivity growth, skills upgrading, and mindset change in many garment companies. The incentive or reward system was an important stimulus to motivate all employees to work as well as possible in order to meet targets in exchange for a monetary bonus. In fact, this practice was applied across all three sectors, where product quality and quantity were the ultimate goals of the companies and buyers.

DISCUSSION

As the literature shows, human capital is key to industrial productivity growth and to the success of firms (Becker, 1994; Benson et al., 2013; Schultz, 1960). The linkage between that transformation and the skills and qualifications were illustrated by companies, but not many companies explicitly stressed the importance of their employees' skills and qualifications as a main factor for consideration when introducing changes in technologies, products, or work organization. A few E&E and food processing companies emphasized the contribution of their employees' skills and knowledge to company transformation, while the rest of the companies, particularly in the garment sector, did not consider the existing skills and knowledge for their company transformation.

Most changes were dependent on their company headquarters abroad, machine suppliers or buyers offering technical support to make all the change processes possible. This indicates that technicians, mechanics for engineers, and the existing skills and knowledge within the companies, were not the main determinants of technology upgrading or product changes. High and mid-level employees were merely recipients of the skills and knowledge transferred by the technicians and experts from outside, while general workers and operators were the followers of those high- and mid-level employees.

Changes in technology, product types or work arrangements required a certain change in employees' skills and knowledge. In the long run all the employees were involved in the change process and had to adapt to those changes to improve their skills and knowledge. However, only a few companies in the E&E, garment and food processing sectors clearly indicated improvement in their employees' skills and knowledge, and the employees learned new skills or knowledge when they worked with their peers or operational processes.

CONCLUSION

Transformation happened to some extent in most companies, driven by different factors such as market factors, increased product quality and quantity, skills and knowledge improvement, labor and cost reduction. Most importantly, the transformation in most companies depended on their parent companies abroad, machine suppliers or main buyers for technical support and expertise, due to the lack of high skills and knowledge in their companies or the

Cambodian labor market. The changes in technology, product types or work arrangements required a certain change in employees' skills and knowledge. The existing employees were also affected physically or emotionally depending on the magnitude of the changes. Noticeably, while depending largely on outsourcing in terms of technology and skills, most firms in all the sectors adopted in-house training as a major skill transfer mechanism; additionally, high and mid-level employees including managers, supervisors and some experienced team leaders were the key players in this skill transfer process.

RECOMMENDATIONS

TVET institutions ought to improve their recruitment and training of technicians for mid- and high-level employment. In this study, most companies tried to recruit the workforce with industry- or company-specific skills and knowledge. Thus, training providers should fulfil this skilled labor needs. The best model could be collaborations between industries, or even companies, and institutions in developing training programs. Future-minded industry associations should reach out to traditional TVET institutions for cooperation. Likewise, it is urgent that the Ministry of Labor and Vocational Training and other line ministries increase the quantity of technicians and improve the quality of TVET institutions so that Cambodia can achieve its visions 2030 and 2050.

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