Challenge 6
Future Indonesia–Japan Collaboration in Human Resource Development in Response to the Digital Revolution in Manufacturing and Services

Ari Kuncoro and T.M. Zakir Machmud

University of Indonesia

Introduction

This chapter aims to explore the future relationship between Indonesia and Japan in the field of human resource development as well as research and development (R&D) in response to the rapidly evolving digital world. The problem of ageing and the decreasing population with a low birth rate is the biggest challenge for the Japanese economy and society. While the development of technologies may help Japan to handle these problems, cooperation between Indonesia and Japan could provide the potential to address these problems more quickly and perhaps with lower costs and fewer disruptions. The chapter will discuss various potential efforts by both governments to improve productivity in Indonesia such that it would be more compatible with Japan's, especially in the areas of manufacturing, services, energy and resource management, and environmental issues. The urgent issue in improving productivity to narrow the gap with Japan is for Indonesia to upgrade its innovation system and technological capability, for which education is an integral component.

The Innovation System and Technological Capability

One way to graduate from being a low-value-added producer to a higher position in the value chain is through innovation. One of the common misconceptions regarding innovation in developing countries is that all R&D activities are 'too advanced' or at least not yet relevant for the development process. R&D activities are considered too luxurious

for countries in the early stage of the development process when incomes are still low and modern sectors beyond the primary sector do not exist.

At present, R&D has not been an important factor in affecting competitiveness (Kuncoro, 2002, 2014). Data from the United Nations suggest that Indonesia's average value of R&D expenditure between 2000 and 2014 was 0.07% of gross domestic product (GDP). Meanwhile, spending on higher education, an important element in the country's innovation system, was only 0.46% during the 2007–2014 period, the second lowest amongst Association of Southeast Asian Nations (ASEAN) and Group of Twenty (G20) countries. Only the Philippines had lower spending, at 0.29% of GDP.

The small figure for R&D expenditure is also reflected in Indonesia's total factor productivity (TFP) growth, which ranged from a negative value to a small positive value below 1%. This was below the norm for East Asian and Southeast Asian economies: Malaysia, Thailand, the Republic of Korea, and Taiwan recorded rates of 0.9%, 1.8%, 1.5%, and 2.0%, respectively (BAPPENAS–UNSFI, 2002). A more recent study yields more optimistic results, with 1.7% TFP growth in the 2000–2007 period (Van der Eng, 2009). However, the growth may have originated more from technology embodied in imported capital goods (process innovation) than from product innovation.

The Public R&D System

The public research system in Indonesia consists of the R&D institutes of the Ministry of Industry and research institutes under the supervision of the Ministry of Research and Technology. The Directorate General of Higher Education, formerly under the Ministry of Education in 2014 at the start of the Jokowi administration, was consolidated the under Ministry of Research and Technology and Higher Education. Two notable institutes under government control are the Indonesian Institute of Science and the Agency for Technology Assessment and Application.

The system's activities are mostly supply-driven, not linked to the needs of industries in general. Due to the lack of funding as well as their bureaucratic nature, the performance of the institutes often lags behind other typical R&D institutes in developed countries. Improvement of the organisational culture, linkages with industries, and professional

management are the keys to improving these institutes. Government-mandated linkages with foreign research institutes, such as a new policy that requires domestic universities to have some types of partnership with overseas universities, would improve performance. Japan could help in mapping the research institutes in Japan that are suitable to be partners for the Indonesian Institute of Science and the Agency for Technology Assessment and Application.

The Private Sector

For the private sector, even if R&D activities do exist, most are in the form of process innovation. Process innovation involves substantially improved or new production processes through the introduction of new processing equipment or the re-engineering of operational processes. There are three situations where process innovation may take place: setting up a new production line, introducing a new production system, or introducing new computer or information technology components to upgrade production facilities. This type of R&D may result in cheaper products and/or better products, but rarely new products. This is not to say that product innovation does not exist at all in Indonesia. There are some notable R&D firms in Indonesia, mostly dominated by the Japanese motorcycle companies, Honda and Yamaha. Due to its supply of researchers, its university system, and the availability of other supporting infrastructure, Thailand is preferred over Indonesia for the location of R&D units (Frankema and Linblad, 2006).

The commodity boom from 2004 to 2012 distracted Indonesia into choosing the path of industrialisation with less technological effort, while other countries in Southeast were able to embark on the path of high technological content in their manufacturing exports. Apart from this, the failure of Indonesia to sustain high-tech manufacturing exports after 2004 can be attributed to weaknesses in the country's innovation system. Amongst these weaknesses are the narrow technological capabilities for absorbing and improving imported technologies, the underdeveloped capital goods sector, and low technological effort (Lall, 1998). This also reflects Indonesia's stagnating if not declining involvement in international production networks (Ando and Kimura, 2013). As a result, manufacturing exports are dominated by resource-based industries, especially palm oil, that are characterised by low technological effort and low risk (Kuncoro, 2018).

There are four areas where Japan could enhance its compatibility with the Indonesian economy by raising the productivity of the latter through the process of technology development. The first is to improve Indonesia's access to foreign technologies, including through foreign direct investment. The second is to boost collaboration in education, including vocational and higher (university and college) education, to improve the quality of human resources. Collaboration amongst shop floor workers and managerial-level exchange at the firm level could fill the void for skilled workers brought by the demographic ageing of the population in Japan. This would also help the spread of technology and information spillovers for connecting the private sector, the education system, and the government (the triple or N-helix model). Next, it is equally important to assist in ensuring the availability of supporting services for technology development. Implementation could be delivered through government-to-government (at the ministry level), business-to-business, and institution-to-institution (universities) schemes. The final area is measures to ensure adequate finance for technology development.

Education

As do some other countries, Indonesia follows a system of duality between general and vocational education. The objective of general education is to provide pupils with general academic knowledge as a springboard for higher education and training. Vocational education, on the other hand, provides students with practical skills and knowledge useful in daily life in society. The vocational education curricula comprise a blend of general and occupation- or profession-specific knowledge. For the purpose of adaptability, the skills provided by schools can be transferable between occupations (Shavit and Muller, 1998).

In Indonesia, the argument to support both tracks of general education, particularly those at the university level and in vocational schools, is that as the easy phase of industrialisation has come to an end, Indonesia needs to continue to climb up the ladder in manufacturing and services. With the coming of the era of the Industrial Revolution 4.0, the government should provide a vocational system that teaches practical skills but that is also flexible enough to meet rapid technological changes or technological disruption. Higher education is essential since it is an integral part of the innovation system.

Higher Education

The process of globalisation has made higher education more important than before – even poor countries can no longer neglect the development of higher education. Higher education as a creator, adaptor, and disseminator of knowledge can be used as a vital tool for developing countries to benefit from globalisation. Knowledge accumulation in higher education allows developing countries to jump up the learning curve without having to undergo the lengthy and expensive process of discovery by accessing ideas and technologies developed elsewhere and putting them into practice after some modifications. In terms of higher education, Indonesia is definitely behind most of its nearest competitors in Southeast Asia, such as Malaysia and Thailand. Too many universities in Indonesia are just teaching institutes still locked into the old methods of learning.

Japan, with its well-established higher education system, could help Indonesia to reform its higher education system as entrepreneurial universities by adopting a corporate-like governance and management model and moving from discipline-based to thematic-based compartmentalisation. In this setting, higher education functions as a knowledge enterprise to be more responsive to social and economic demands and to make the country more economically competitive. Previous strategies to link the Indonesian innovation system with other partner countries can be replicated in Indonesia–Japan collaboration with some modifications. These are summarised in Table 6-1.

The Digital Revolution and Higher Education

The coming Industrial Revolution 4.0 (digital disruption) has put the relevancy of higher education into question. New technologies will swarm society in all aspects of life, including higher education. Meanwhile, there have been optimistic predictions that new technology will increase prosperity. On the other hand, with digitalisation and automation, many jobs will be eliminated or at least redefined. These include telemarketers, auditors, lecturers, and administrator in universities, etc.

Many universities around the world are aware of what is coming. However, unfamiliarity with the massive shift in technology as well the lack of vision and commitment mean many

may be caught unprepared. Unlike other industrial revolutions in the past, digital disruption is more difficult to anticipate, which will eventually make technological adaption difficult (Hill, 2017). This is due to its virtual characteristic as well as the pace of technological shift that is beyond the normal range of organisations' visions. Newly created technology, such as smart mobile devices, cloud-based information technology (IT), and advanced data analytics, are altering organisations' business models, including those of universities.

Table 6-1. Indonesia–Japan Collaboration Plan to Strengthen the Innovation System in Indonesia

Level of Collaboration	Actions
Government	• Increased or more targeted collaborative research funding should be a priority for both governments • Regulatory reform to streamline the procedures for research collaboration
Individual institution	• Investigate joint opportunities to improve research skills • Continue to host relevant forums and events to promote cooperation between institutions in the two countries
Government and individual institution	• Short-term, reciprocal researcher mobility projects, funded by either the government or by institutions to support capacity-building and the development of researcher cooperation • The creation of a research portal to connect Japanese and Indonesian researchers, promote the strengths and interests of the respective sectors, and become a repository of collaborative research • Conduct a mapping exercise that highlights Japan and Indonesia's research expertise

Source: Authors' compilation.

For universities to remain relevant in the digital age is not easy. IT is only a small part of the endeavour. More importantly, universities require an institution-wide strategic vision by the top management supported by departments and faculties, not just IT (PricewaterhouseCoopers, 2018). To be able to form a future university vision, the top management needs to be able to understand and overcome several hurdles (Table 6-2).

Table 6-2. The Lack of Vision in Higher Education

	Potential Obstacles
1	No understanding that universities have a new breed of customers that they need to cultivate
2	Unaware of competition from new competitors
3	Inability to come up with measures to adapt the existing working system to rapidly evolved new techniques, tools, and capabilities
4	Organisational culture that inhibits rapid development and the release of new technology
5	Technological phobia: a lack of trust in digital services and technologies
6	Technological phobia: overly concerned about reliability, security, and resilience
7	Digital literacy

Source: Adapted from PricewaterhouseCoopers (2018).

One important adaptation for universities in the digital age is to use data analytics in organisational planning. This requires building up data analytics capability within the organisation. This includes practising evidence-based management, building an evidence-based decision-making culture, and recognising the evolving landscape due to big data and the digital revolution. The next task is to identify the opportunities through which the decision-making process can be transformed with the analytic model and to embed the results of data analytics into the decision-making process for improving organisational performance. The final step is to measure the impact of analytical transformation through surveys and data collection in the feedback loop mode.

Vocational Education

The mobility of skilled and educated workers will increase under the ASEAN Economic Community (AEC). For Indonesia, in order to exploit this opportunity, the priority is to improve higher and vocational education. In the formal vocational education system, including polytechnics and vocational high schools (SMK), the problem is that the number of teachers or instructors with occupation-specific qualifications and work experience is relatively small compared to those with academic S1 or S2 degrees (ADB, 2012). Teaching laboratories and equipment are mostly outdated and have not kept up with the current technological progress. This suggests that the special characteristics of vocational schools are not addressed in their accreditation standards, which are basically the same as for general high schools. Reforms of the national accreditation system are needed.

The Japanese government could draw a comparison with the educational system in Japan in order to start a system for expatriate exchange. This could be accomplished through mutual exchange amongst officers from the Ministry of Education and the Ministry of Higher Education with their counterparts in Japan, as well as between individual education institutes (universities and schools). The Japanese government, through the Japan International Cooperation Agency (JICA), can also help to set the content and methodical settings of the productive activities in schools since schools are free to design their own context-related approaches, including the arrangement of apprenticeship blocks, the establishment of profit-oriented school production units and, more recently, also a model called 'teaching industry,' as demonstrated by Japanese companies like Honda and Toyota. These are basically project-oriented programmes that are planned and conducted in partnership with the industry and focus on the market-relevant products and services to be developed inside the schools jointly by industry experts, teachers, and students. Despite this, the programmes may differ considerably in quality, effectiveness, and sustainability since they depend on the characteristics of the companies that are involved.

To summarise, there are several steps that must be taken to make a successful vocational school, (Table 6-3). In the formal vocational education system, including polytechnics and SMK, the problem is that the number of teachers and instructors with occupation-specific qualifications and work experience is relatively small compared to those with academic

bachelor's or master's degrees. However, the bigger problem is that the special characteristics of vocational schools are not addressed in their accreditation standards.

Table 6-3. Measures for Successful Vocational Schools

Measures	Requirements
Ensuring relevant curricula	All stakeholders (government, employers, social partners, educational institutions) must be involved in the curricula development with clear assignments and responsibilities for each party
To make close engagement with the labour market	A continuous feedback system between employers, the private sector, and the education system
Ensuring high-quality schooling	Sufficient funding is needed to sustain the appropriate teaching materials and the availability of well-trained teachers
Incentives for training providers and creating competition between training providers	A mix of public and private funding is required in addition to providing autonomy in teaching and staffing decisions
Maintaining a high level of training quality	A decentralised system of accreditation and quality assurance as well as competition between training providers
Limiting the risk of establishing a dead-end vocational track	The competence and qualifications acquired should be comparable to allow for the possibility of switching or transfer

Source: Eichhorst et al. (2012).

Non-formal Training

General high school graduates in Indonesia can match the wages earned by vocational school graduates only when they take additional training conducted by non-formal training providers, such as the government-sponsored training shop known by its Indonesian acronym as BLK (Kuncoro, 2012). However, this slight advantage could be nullified again if the vocational school graduates also take extra training through the non-formal track. This

demonstrates the high value of non-formal training. Nevertheless, private firms are reluctant to upgrade the quality of their workers since it is very hard to retain them in their companies.

For the government, however, the potential value of non-formal training for earning higher wages poses the dilemma of whether to prioritise only the general education stream and invest more into non-formal training opportunities, or to promote their more expensive formal vocational education system, e.g. by expanding and upgrading SMK. In the short run, the first option might appear to be more attractive (and cheaper) to flexibly bridge the skill gap through non-formal training programmes. However, improving and upgrading the formal vocational education system is also required for moving up the ladder towards a formal economy. With a clear focus on occupation-specific competency profiles and industry compliant qualification standards, this system may better promote long-term career options for graduates provided it addresses also the empowerment of lifelong learning capacities. Financial assistance from JICA could resolve this dilemma through the building-up of long-run technological capabilities.

Small and Medium-sized Enterprises

One of the beneficiaries of the upgrading of education quality in Indonesia is the small and medium-sized enterprise (SME) sector. SMEs are important for Indonesia for employment creation. In terms of numbers, SMEs comprise 99% of firms in Indonesia. In terms of employment, the smallest category of SMEs creates 91% of total employment, while the small and medium categories contribute 4% and 3%, respectively. The share of SMEs' exports is smaller than large firms but still significant. The latest figures show SMEs' share in total exports to be about 15%. This suggests that improvement in the national productivity would not be successful without the involvement of SMEs in national and international production networks (Sato, 2000). The linkages between large firms and small-scale industry clusters matter in developing countries. Clustering allows small-scale enterprises to share costs and risks through collaboration (Sandee and Rietveld, 2001).

The Service Sector and Urban Agglomeration

The share of trade-hotel-restaurant, transportation, communication, finance, and other services (the service plus sector) in GDP has taken over manufacturing since 2007. Meanwhile, the growth of the 'service plus' sector has also exceeded that of manufacturing. This is one of the most important developments in the growth dynamic as, since 2007, the service sector in a broad sense has started to be a growth driver for the Indonesian economy, and, in a way, it has compensated for the decline of manufacturing.

The rising role of services in cities is tantamount to urbanisation spillovers, in which cities form a conducive environment for firms due to information spillovers (Jacobs, 1969). It has been shown that firms' dynamics are closely linked to the overall changing environment in their respective cities because they have the potential to capture the efficiency gains from learning-by-doing as well as the increasing returns to scale due to urbanisation. But the relationship between firms' productivity and their environment is not always straightforward. Once an agglomeration passes a certain size, then new problems emerge. The Japanese government, through JICA, could help the Indonesian government to learn how to manage an agglomeration – how to deal with firm and population dynamics. The most challenging task is perhaps how to coordinate several agglomerations in terms of connectivity and complementarity to maximise their potential. Otherwise, if not properly managed, then negative externalities like congestion, pollution, and crime may start to reign.

The Japanese government's assistance for Indonesia could involve a combination of policy support, urban planning, and infrastructure investment. Rather than attacking all problems, the assistance may want to refocus efforts on policy support and urban planning for the simple reason of improving the capacity of local governments. The competitiveness of urban agglomeration will be determined largely by the configuration of industry and population location, the regulations pertaining to economic activities, as well as the connectivity within and between agglomerations.

JICA could assist the Indonesian government in reviewing the urban management and planning system in Indonesia. As a first step, this could perhaps be conducted through case studies of two or three cities. A review of urban management and planning is essential if

the benefits of the spatial division of labour are to be realised. The competitiveness emerging from the spatial division of labour may go to waste if the proper management and spatial planning do not exist – for example, industries may be wrongly located, or industrial and population centres may not have cohesive connectivity, preventing knowledge spillovers.

Environment

The growing concern for the environment has been incorporated into the medium-term development plan. One focus is on the manufacturing sector for industries like cement, steel, pulp and paper, petrochemicals, textiles, and garments. Preliminary exercises suggest that there is a trade-off to be made. The priorities, however, remain growth and employment creation for the good reason that these industries have shown improvements in energy efficiency due to the use of new technology in machinery (Kuncoro, 2014a, 2014b).

This is not an easy job since the government has a trade-off between economic growth and a cleaner environment. In reality, there is a rationale for greening key manufacturing industries due to the availability of modern and cleaner technology for manufacturing. The key step for the government is to formulate policies that support industries to modernise, become more efficient and cleaner, and do so at a faster pace than they would otherwise without such policies in place.

Conclusion

The potential for synergy between the Japanese and Indonesian economies is enormous. Indonesia's attributes as a dynamic country with a relatively young population characterised by diversity, a growing middle class, plenty of room for innovation, and an increasingly competent workforce could energise Japan's economy and society. Meanwhile, the maturity of Japan, as evident in its advanced technology, sophisticated lifestyle, and its experience in managing its development, both its successes and failures, could help Indonesia exploit its demographic in the long term. For the benefits of cooperation to be maximised, however, some complementarity and a level playing field are needed. Indonesia needs to narrow its productivity gap with Japan.

From the Indonesian side, the government acknowledges that the country's problem is with the supply side of the economy. The most recent developments of Indonesia's deteriorating currency account and growth slowdown demonstrate the country's vulnerability to external shocks. Prudent macroeconomic management, a flexible exchange rate, external creditworthiness, and assistance from development partners have helped to mitigate the impacts. In the longer run, however, the country needs to improve its productivity. Until 2012, the commodity boom had masked the country's weakness in its supply side. Improving productivity in Indonesia's supply side will require not only infrastructure but also the upgrading of the country's human resources and innovation system as the world has moved into a digital economic revolution. From the production side, Indonesia needs to revitalise its manufacturing and services sectors as well as its resource-based sectors, treating them as part of the value chain to be integrated with the global network.

References

Ando, M. and F. Kimura (2013), 'Production Linkage of Asia and Europe via Central and Eastern Europe', *Journal of Economic Integration*, 28(2), pp. 204–240.

Aswicahyono, H., H. Hill, and D. Narjoko (2010), 'Industrialisation after a Deep Economic Crisis: Indonesia', *Journal of Development Studies*, 46(6), pp. 1084–1108.

BAPPENAS–UNSFIR (2002), 'Indonesia 2020: Long-Term Issues and Priorities', unpublished manuscript.

Erichhorst, W, N. Rodriguez–Planas, R. Schmidl, and K.F. Zimmerman (2012), 'A Road to Vocational Education around the World', Institute for the Study of Labour (IZA).

Frankema, E., and J.T. Linblad (2006), 'Technological Development and Economic Growth in Indonesia and Thailand', *ASEAN Economic Bulletin*, 23(3), pp. 303–324.

Hill, J.B. (2017), *Leading through Digital Disruption*. Gartner.

Jacobs, J. (1969), *The Economy of Cities*. Vintage Books.

Kuncoro, A. (2012), 'Aligning HRD Planning with Economic Development and Investment

Plans in MPE3EI Economic Corridor', paper prepared for the Asian Development Bank.

Kuncoro, A. (2002), 'Competitiveness in Indonesian Manufacturing: A Study of Three Manufacturing Subsectors in Indonesia', Asian Development Bank unpublished paper.

Kuncoro, A. (2014a), 'Sector Brief: The Greening of Indonesian Manufacturing', paper prepared for World Bank and BAPPENAS (National Economic Planning Agency).

Kuncoro, A. (2014b), 'Small and Large Performance Gaps in the Era of Globalization: Evidences from Micro data on Manufacturing Establishment', paper prepared for ERIA.

Kuncoro, A. (2018), 'Manufacturing Trend under the Jokowi's Presidency: Legacy of Past Administrations', forthcoming in *ASEAN Economic Bulletin*.

Lall, S., (1998), 'Technology Policies in Indonesia', in *Indonesia Technological Challenge, edited* H. Hill and T.K. Wie. Institute of Southeast Asian studies.

PricewaterhouseCoopers (2018), *The 2018 Digital University: Staying Relevant in the Digital Age*, PricewaterhouseCoopers, www.pwc.co.uk/publicsector

Sandee, H. and P. Rietveld (2001), 'Upgrading Traditional Technologies in Small-scale Industry Clusters: Collaboration and Innovation Adoption in Indonesia', *Journal of Development Studies*, 37(4), pp. 150–172.

Sato, Y. (2000), 'Linkage Formation by Small Firms: The Case of Rural cluster in Indonesia', *Bulletin of Indonesian Economic Studies*, 36(1), pp. 137–166.

Shavit, Y. and W. Muller (1998), *From School to Work: A Comparative Study of Educational Qualifications and Occupational Destinations*. Oxford Clarendon Press.

Van der Eng, P. (2009), 'Total Factor Productivity and Economic Growth in Indonesia', Working Paper 2009/01, Australian National University.