

Skills Mismatch and Information and Communications Technology Manpower Shortage in Singapore

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Introduction and background: Over the past few years, the global Information and Communications Technology (ICT) industry saw a boom. In a short span of time, Singapore’s ICT sector revenues grew, hitting S\$175.8 billion in 2016, double that of 2011. In the fourth quarter of 2016, the sector saw a 30% year-on-year increase in the number of ICT jobs available. Singapore with her goals to become a Smart Nation and Technopreneur Hub faces a challenge - a lack of ICT labour where Singapore’s ICT sector currently faces a job vacancy of 10%, a figure which is projected to rise to 20% by 2030. To meet the shortfall in labour, Singapore has relied on foreign ICT labour as a temporary measure. However, this stop-gap measure is contrary to the aims of the Singapore Government, to develop a “Singaporean Core”, an economy mainly driven by locals and supported by foreigners. This research aims to explore the dilemma of balancing economic growth and achieving domestic labour goals through systems modelling of the Singapore ICT sector’s labour market and propose effective policies to achieve the both economic and labour goals.

System Archetype: We first establish the interdependencies of the key variables and

identify the system archetype at play in Singapore’s ICT labour market in the form of Causal Loop Diagrams (CLDs). From our CLDs, we notice a conflict between the short-term interests of firms and the long-term projected ICT industry envisioned by the Singapore government. Firms want to quickly resolve their labour crunch by hiring the more readily available foreign labour while the Singapore government hopes to strengthen the “Singaporean Core” and build a strong domestic ICT labour force. We identify that the current heavy reliance on foreign ICT workers is an unsustainable solution in the long term as it depresses ICT wage growth and subsequently the growth of domestic ICT workforce, exacerbating the manpower deficit. The causal loop diagram is shown in Figure 1.

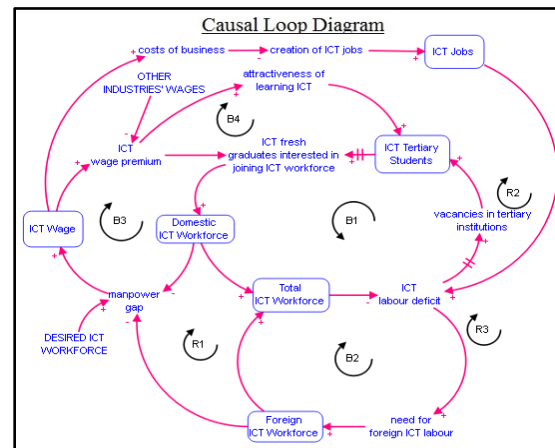


Figure 1. Causal Loop Diagram of Model

Model: With a model period of 2009 to 2030, our stock-flow model was built with four key sectors: Population of ICT Students and Graduates, Domestic ICT Workforce, Foreign ICT Workforce, and ICT Jobs and Wages. This time frame was chosen to avoid the skewing of data by the 2008 subprime mortgage crisis and 2030 was a common milestone for many official papers.

Model Validation: To test the fidelity and robustness of our model, we adopted the following validation methods: Comparison to Historical Data, Perturbations in Exogenous Factor, and Extreme Condition Testing. Through our model testing, we found our model to reflect historical trend (< 2% error) and behave as expectedly under various conditions and is thus robust.

Sensitivity Analysis: To identify the key leverages to decrease the ICT labour deficit, sensitivity analyses were performed and the most effective way was identified to address the ICT labour deficit in Singapore: increase the number of university graduates through university education, and increase the intake of foreign workers. However, increasing the intake of foreign workers is contrary to the local government’s goal of a “Singaporean Core”, hence foreign labour intake needs to be held constant.

Results and Conclusion: Using sensitivity analyses, we found the highest points of leverage in the system, University Admissions and Skills Upgrading courses. Armed with this knowledge, we propose policies to tackle these points of leverage. Our policy improvements are namely to expand the number of places in ICT related courses in Local Universities, as well as to develop more external skills upgrading avenues. The combination of these two policies would, as shown by our model predictions, be able to mitigate Singapore’s growing labour deficit, curbing job vacancies in the ICT sector from the current 10% to 5% by 2030.

After simulations, we found that Singapore’s universities have to enroll a total of 5,190 ICT students while 5,000 of the non-ICT workforce have to attain ICT skills through other skills acquisition means to achieve the 5% vacancy target. To achieve such numbers and capitalise on the high-value of

ICT, the Ministry of Education and skills-upgrading organisations such as SkillsFuture Singapore have to accept and advocate the large-scale supply-side changes needed to bolster the ICT industry. The chart below (Figure 2) shows the comparison of the simulation results. The dotted graph represents the current predicted trend of ICT job vacancy rate, while the green graph represents the predicted trend with our recommendations implemented. The chart in Figure 3 shows trends the ICT workforce, jobs, and job vacancies.

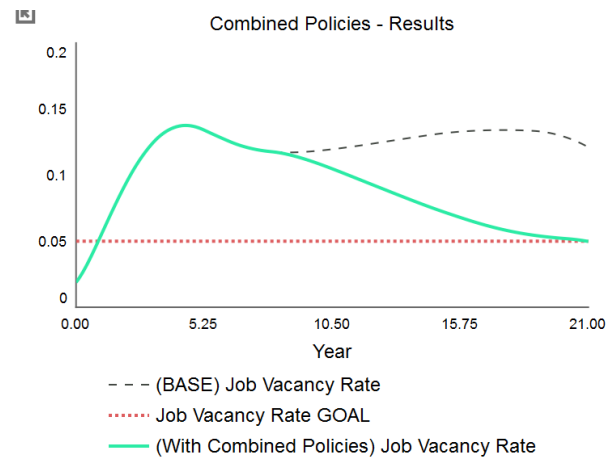


Figure 2. Results

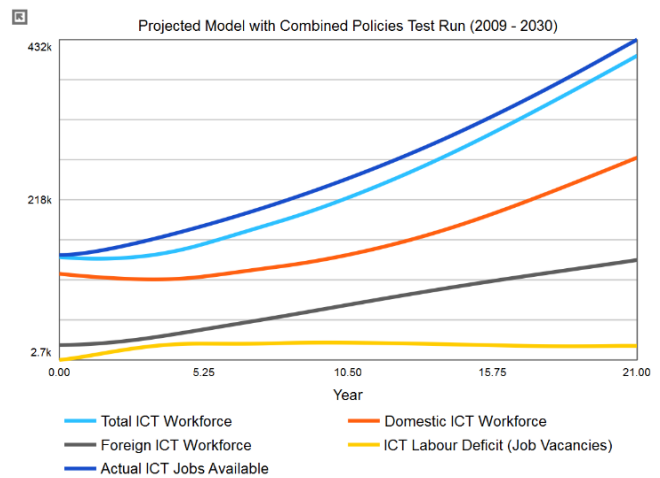


Figure 3. Projected Model