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JAPANESE ECONOMY: FROM MIRACULOUS GROWTH TO

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The Japanese economy has been in recession for a very long time. To understand why, let's start with looking at some numbers about the Japanese economy. The Gross Domestic Product (GDP) in Japan was worth 4123.26 billion US dollars in 2015. The GDP value of Japan represents 6.65 percent of the world economy. The economy of Japan is the world third-largest after the United States and China. According to the OECD’s better life index survey in 2016, the average household disposable income per capita in Japan was $27,323, less than the OECD average of $29,016. The employment rate in Japan was 73%, while the OECD average was 66%. And the top 20% of the population earn more than six times as much as the bottom 20%.

Overall, the Japanese are less satisfied with their lives than the OECD average. On a scale of 0 to 10 the Japanese rated their life satisfaction at 5.9, lower than the OECD average of 6.5. Why? Japan has serious economic problems.

The most striking one is public debt. According to CIA (2011), Japan’s public debt as a percentage of GDP was 225.8% in 2010. We still remember the Greek government-debt crisis. Even for Greece, public debt was 144% in 2010. Then naturally one may ask why Japan does not default like Greece. There are two possible reasons – First, Japan’s interest rate is very low. Thus interest payments for debt are not so large. Second, most Japanese government bonds are held by Japanese institutions. According to the data from Bank of Japan, in 2010, approximately 7% is held by foreign institution. If Japan defaults, it would be catastrophic to Japanese institutions themselves, who hold a large portion of the debt. Thus there is no incentive for those Japanese institutions to be aggressive about repayments. So, Japan will not default for a time-being. However, when Japan’s government tries to use fiscal stimulus to boost its economy, for example, when the government tries to hire more people, this huge debt could become a big burden or at least, a source of default risk. Then what can Japan’s government do? How could their policy options work? To understand this, we start with Japanese economic history after World War II, because it will give us more clear understanding on how the Japanese economy has come to the current situation.

### After World War II and Economic Growth

When the war ended in 1945, the allied powers primarily led by the United States occupied Japan and took strong control over its government. Japan’s sovereignty was not fully recovered until 1952. The most amazing aspect of the postwar Japanese economic growth is its rapid rate. Often this economic growth is called the Japanese economic miracle. The following table (Table 1) shows Japan’s annual GDP growth from the World Bank, and also includes the same information for Australia, China and USA. Table 1 also compares the growth rates for 1960 to 1970 and the ones for the more recent years.

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<td>11.1</td>
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<td>...</td>
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</tr>
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<td>17.0</td>
<td>5.8</td>
<td>16.9</td>
<td>7.1</td>
<td>...</td>
<td>11.4</td>
<td>14.2</td>
<td>9.4</td>
<td>6.5</td>
<td>7.8</td>
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</tr>
<tr>
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<td>2.3</td>
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<td>1.8</td>
<td>1.7</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Unit: %

Source: World Bank


Viewed on 11 January 2017

As we can see from Table 1, very clearly Japan’s economic growth before the oil crises (1971) was phenomenal, while the Japanese economy has been struggling in more recent years. It sometimes records negative numbers. To understand the driving forces behind the economic growth, let’s look at Japan’s industrial policy and international trade.

During the high growth period of the late 1950s and the early 1970s, Japan’s industrial policy promoted high value-added industries. Ito (1996) explains that during the 1950s and 1960s, specific industries, which were identified to have great growth potential, were targeted and received favourable deals in foreign exchanges and subsidised loans. Those include the iron and steel industries. The administration led by Prime Minister Hayato Ikeda, who was in the office from 1960 to 1964, presented the plan for doubling national income. This plan aimed to increase productivity in the high-value added industries, shift the labour force to the heavy and chemical industries such as automobile manufacturing.
and ship-building, and improve export competitiveness in these industries by promoting trade liberalisation. Value-added is the difference between the final price of an output and input costs for intermediate goods. Japan’s government tried to divert resources toward high value-added industries and encourage exports and investment in targeted industries by using various tax deferrals and exemptions.

In the 1950s, Japanese companies and technicians quickly absorbed technological advances and business models in the western world through imports. Japan’s government implemented industrial policies so that Japan could obtain a comparative advantage in production of the high-value added industries. And export-led growth followed and created the economic miracle.

What then is comparative advantage? To understand it, suppose that there are two products, apples and oranges, and there are two countries, country A and B. Suppose that in country A, 5 minutes of labour are necessary to produce one apple while 6 minutes of labour are necessary to produce one orange. On the other hand, suppose that in country B, 9 minutes of labour are necessary to produce one apple while 8 minutes of labour are necessary to produce one orange. Then by the amount of labour to produce one apple, in country A, 5/6 of an orange can be produced as it requires 6 minutes, and for 5 minutes, we obtain 5/6 of an orange, while in country B, 9/8 of an orange can be produced. In this situation, we say that country A has comparative advantage in producing apples, because when we have to allocate a limited amount of labour between apples and oranges production, in country A, compared to country B, we have to give up a smaller portion of orange for producing apples. In a sense, in country A, we can produce apples more efficiently than country B.

In the theory of international trade, each country exports the good, for which it has a comparative advantage. As the Japanese government planned, by restrengthening labour discipline, making production processes more efficient, and promoting investments in targeted industries, in the 1960s the comparative advantage shifted towards the heavy and chemical industries from the textiles and other light industries. Promoting investment in capital and technological advances, which indeed was the key principle in Ikeda’s plan of doubling national income, was one of the most important factors in economic growth. Technological advances decreased production costs and investment in R&D made production processes more efficient. To shift capitals from the soft industry to the heavy industry, investment in capital was essential. Japan’s saving rates were quite high as shown in Table 2 and made this investment possible.

### Table 2: Gross Domestic Savings

<table>
<thead>
<tr>
<th></th>
<th>'61</th>
<th>'65</th>
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<th>'75</th>
<th>'81</th>
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<tr>
<td>Japan</td>
<td>*36.3</td>
<td>*32.3</td>
<td>38.2</td>
<td>32.6</td>
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<td>Australia</td>
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<td>21.2</td>
<td>23.9</td>
<td>21.5</td>
<td>19.6</td>
</tr>
</tbody>
</table>

Unit: %
Source: World Bank and Statistics Bureau, Japan
Note: Gross domestic savings are calculated as GDP less total consumption. The entries marked by * were not available in the World Bank and the author computed based on the data from Statistics Bureau, Japan.
Viewed on 12 January 2017

Since 1960, when trade was liberalised, Japan’s major exports have been manufactured goods such as automobiles, and electronic goods. Figure 1 shows Japanese trade balance between 1955 and 1975. Until 1964, it had fluctuated between trade deficit and surplus. After 1965, it consistently shows trade surplus. This reflects the increased competitive power of Japanese industries in the international world. By 1968, the Japanese gross national product was ranked number 2 after the US in the western world.

### Figure 1: Trade Balance

Unit: Millions of US Dollars
Source: Statistics Bureau, Japan
Link: [http://www.stat.go.jp/english/data/chouki/18.htm]
Viewed on 28 January 2017

The strategy of growth led by exports has also been adopted by other countries, such as South Korea, Hong Kong, Singapore and Taiwan. These countries’ economic success during the post-war period serve as a model for other developing countries.
Student activities

1. Outline the effects of the long recession that is currently affecting the Japanese economy.
2. Briefly explain the constraints on expansionary macroeconomic policy currently affecting Japan.
3. Explain in detail how the Japan used export-led growth to achieve its economic development miracle from the late 1950s to the early 1970s.
4. Using the theory of comparative advantage as a basis, examine how Japan achieved its competitive power in international markets.
5. List other countries that have subsequently used export-led growth policies to guide their economic development path.

Bubble Economy and the Lost Decades

In the mid 1980s, the Japanese economy reached what is known as the Japanese bubble economy. The economics bubble was characterised by speculation and the rapid acceleration of asset prices.

Think about the following situation. Suppose that there was a piece of land in front of your house, which your neighbour bought last month. Now you found that somebody else bought the land from the neighbour at a much higher price than the level that the neighbour bought last month. If there is another piece of land available next to the land, wouldn’t you buy this land? In the days of bubble economy, the whole of Japan was like this. Almost everything was a target of speculation.

Figure 2 shows the historical data of Nikkei 225 from January 1980 to December 2004. Nikkei 225 measures the stock prices of a section of Tokyo Stock Exchange. Suppose that we have a basket of stocks listed in Tokyo Stock Exchange. Nikkei 225 basically measures the price of this basket.

In this figure, it is very clear that Nikkei 225 increased rapidly from 1980 to 1990. It increased by almost 8 times. However, the bubble economy ended suddenly. As described in Chapter 13 in Flath (2000), trying to deflate speculation and keep inflation under control, the Bank of Japan sharply raised inter-bank lending rates in late 1989. After this sharp policy change, the Japanese stock market crashed and the bubble burst. The decade after 1991 is known as the lost decades in Japan. Japan now has faced a very long recession after the collapse of the asset bubble.

Deflation

In the time of recession, economic activity shrinks. As we saw in Table 1, after 2000, Japanese GDP growth had been sometimes negative. Figure 3 shows how the price level that a typical consumer faces in Japan has changed over time. In some years after 2000, the inflation rates are sometimes negative. This is called deflation.

Consider the following situation. Suppose that you know that tomorrow’s price of one apple is $1 cheaper than today’s price. Do you still buy the apple today? Or wait till tomorrow? When you expect that the price level gradually goes down, you would keep money and tend not to use it on consumption. When consumption decreases, we would expect that production decreases because producers expect lower sales of their products and in the end, economic growth would be slower or even stop. Thus a major problem that the Japanese economy faces is deflation.

Unit: %
Source: World Bank
Link: http://data.worldbank.org/indicator/
Viewed on 11 January 2017
Macroeconomics Basics and Liquidity Trap

To incorporate the concept of inflation or deflation in our discussion, we have to consider the time frame. Economics distinguishes between the long-term and the short-term. In this article, we only consider the short-term, as we study a direct effect of economic policy on the economy and in economics, basically the long-run is a time frame in which everything takes care of everything else.

In addition to the time frame, two important concepts in economics are demand and supply. When demand equals supply, we call this an equilibrium. In equilibrium, we can see how much goods the market demands and what is a market price to clear the demand. This is true in both microeconomics and macroeconomics. In macroeconomics, which is more relevant in our discussion of the Japanese economy, we use the concepts of aggregate demand and aggregate supply (for a detailed discussion, see Bernanke et al (2008)).

In national accounts, the following relationship holds:
\[
\text{Output} = \text{Consumption} + \text{Investment} + \text{Government Expenditure} + \text{Export} - \text{Import}
\]

Aggregate demand (AD) is the total demand for final goods and services as given in the above equation in an economy at a given time. The AD curve is plotted with real output on the horizontal axis and the price level on the vertical axis. It is downward sloping for several reasons. Perhaps, most intuitively, a higher price level implies lower real wealth and therefore lower consumption spending, which yields a lower quantity of goods demanded in total.

On the other hand, aggregate supply (AS) is the total supply of goods and services that firms in a national economy plan on selling at a given price. The short term AS curve is upward sloping, because a higher price level implies a lower real wage level and thus an incentive to produce more output. Then the intersection between the AS and AD curves gives us the actual price level and real GDP of the economy. The relationship between aggregate demand and aggregate supply is presented in Figure 4.

Then what moves these curves? Generally speaking, aggregate demands depends on the nation’s money stock, which is the total amount monetary assets available in the economy at a given price. So governments’ policy to expand the monetary stock can move the AD curve. For instance, in Japan, expansionary monetary policy means that the Bank of Japan increases its ongoing purchases of securities from private banks (so that the money supply, which is the total amount of money in circulation in one nation, increases) or increases its lending to commercial banks.

Expansionary policy moves the AD curve to the right (AD1 to AD2 in Figure 4). Talking about the above equation, policy that increases any item can move the AD curve to the right. For example, the central bank lends more money to commercial banks, and then commercial banks in turn can lend more money to investors. This would increase investments. Thus this moves the AD curve to the right.

On the other hand, government’s supply side policies target aggregate supply. These policies aim at increasing productive efficiency and hence national output. For example, providing better information about employments or better training and education for unemployed people. This will help reduce unemployment and increase outputs. Thus these policies move the AS curve to the right ((AS1 to AS2 in Figure 4).

Overall, through the mechanism described so far, we expect that expansionary policies will improve total output. However, is this that simple? Then why has Japanese economy in the recession so long? The current situation in which the Japanese economy is placed can be described in Figure 5. This is the situation called a liquidity trap. More formally, a liquidity trap is a situation in which expansion of the money stock simply enlarges the money holdings of the nation’s citizens, and does not therefore stimulate its aggregate demand. In this situation, supply side policies just simply decrease the price level as in Figure 5 and total output would not increase.
**Student activities**

6. Identify the main features of the Japanese bubble economy from the mid 1980s.
7. When did the bubble burst?
8. What is deflation and why is it such a problem?
9. What is a liquidity trap and how does influence the ability of central banks to implement expansionary monetary policy when interest rates are zero, or negative?
10. How does a liquidity trap affect the macroeconomic effects of microeconomic policies that influence aggregate supply?

**What’s happening now?**

For almost a decade, the Japanese economy has suffered from deflation while stuck in a liquidity trap. Japan’s current Prime Minister Shinzo Abe, who was elected in December 2012, wants to take radical steps to revive the national economy. The Japanese experience of long deflation or stagnation after the burst of a bubble economy could happen to any other economy. We have seen housing prices surging in many places of the world. Let’s talk about a set of policies that Abe proposed in the hope of stimulating macroeconomic growth. They are called “Abenomics.” Abenomics consists of expansionary monetary and fiscal policies, and aims at achieving growth through stimulating private investment. After Abe was elected, the Bank of Japan has taken bold monetary policy measures. The main policy instrument of the Bank of Japan is market operations. Market operations refers to the purchasing and selling of government securities in the market aiming at expanding or contracting the amount of money in the banking system. Through the market operations, the Bank of Japan has increased the money supply to attack deflation.

But how would this work? The quantity theory of money tries to establish this connection with the equation where $M$ is the money supply, $V$ specifies how many times money changes owners, $P$ denotes the price level and $Y$ denotes national income. When $M$ and $V$ do not change, more money in the market increases the price level.

Believing that Japanese economy is gradually recovering, the Bank of Japan has been implementing intensive monetary easing and bought a large amount of bonds. This injection of money into the Japanese financial sector is expected to flow into the rest of the economy and stimulate production and consumption. This could start to lift price levels and hopefully inflation starts to happen.

Since the beginning of 2016, the Bank of Japan has been charging a fee to the commercial banks on a portion of their reserves that they keep with the central bank. In this way, they try to encourage commercial banks to allocate money to other purposes such as investment in business.

Another aim for Abe is the depreciation of Japanese yen. When the yen depreciates, foreign people can purchase Japanese products at lower prices. So demand for Japanese products increases, which will shift the AD curve to the right. (Remember, we have the Export minus Import term in the total output equation.)

Itoh (2000) describes that the industrial structure has changed in Japan. Table 3 shows international comparison of work force distribution across the manufacturing and service sectors. We can see that the service sector is gradually expanding in every country in the table. However, we can see that in Japan, the manufacturing sector is still taking more than 20%. As mentioned earlier, Japan has a chronic trade surplus and Japanese yen soared over time. Japanese labour has become more expensive and many firms moved their factories abroad. Hollowing out of employment opportunities in the manufacturing sector became a very serious issue in Japan. The value of Japanese yen is an important determinant of firms’ investment decisions.

**Table 3: Comparison of Work Force Distribution across Sectors**

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</table>

**Unit:** %

**Source:** OECD Data

**Link:** http://stats.ukdataservice.ac.uk/#

**Viewed on 29 January 2017**

Figure 6 shows the historical data of Japanese yen’s exchange rate against US dollars. As we see, right after Mr Abe was elected in December, 2012, Japanese yen has depreciated dramatically. Here, the exchange rate specifies how much Japanese yen we need to purchase one US dollar. So, the trend such that the rate is going upward implies that Japanese is depreciating.
However, will Abenomics really work? The clues are in Table 1 and Figure 3. We see slightly increased GDP growth in 2013 while it decreased in 2015. Similarly, the inflation rate increased slightly as in Figure 3, but it went back to the previous level. Basically, what the Bank of Japan can do is limited and without boosting other economic activities, we cannot hope for a long-lasting effect in Japanese economy.

To conclude, I present two sets of information about Japan. Figure 7 shows the ratio of non-regular workers in total employments. Non-regular workers include part-time workers as well as temporary workers. Table 4 shows a demographic problem that Japan faces. As we see, in 2015, the percentage of senior citizens who are older than 65 years old is quite high compared to other countries, while the birth rate is quite low in Japan. Given the high life-expectancy, we can see that Japan is a rapidly ageing society. Labour is a quite important factor in economic growth. Further, we can easily imagine that when jobs are not secured, the nation’s citizens would not spend money. Even if they receive some temporary earnings, they would just hold them preparing for future necessities. In the end, this can be the fundamental problem that the Japanese economy is facing. The important message here is that both fiscal and monetary policies only work in synergy with other policies that promote the quality of people’s life in Japan.
Student activities

11. Explain in detail how the policies of Prime Minister Shinzo Abe could lead to improvements in the Japanese economy.

12. Is Abenomics working? In what industries is Japan likely to develop a competitive advantage in the near future?

13. List the other world economies that have been facing similar structural changes and liquidity trap problems as Japan.

References


CIA (2011), The World Factbook, Central Intelligence Agency, USA.


CAN INTELLIGENT MACHINES IN THE WORKFORCE LEAD TO A NET GAIN IN THE NUMBER OF JOBS?

By Dr David Tuffley, Senior Lecturer in Applied Ethics and SocioTechnical Studies, Griffith University

A new wave of innovation is sweeping Australia. The age of intelligent machines has arrived and great opportunities exist for those who learn to ride the wave by making artificial intelligence our partner, not our competitor in work.

Throughout history, new technology has always done away with some jobs and created new ones. Productivity-improving technologies stimulate the economy through higher incomes and lower prices, which then create new jobs right across the economy.

Whether intelligent machines in the workforce will lead to a net gain in the number of jobs is an open question. We simply don’t know yet, however it is certain that intelligent machines will radically reshape the workforce of tomorrow, reducing the number of low-skill jobs but increasing the number of high-skill jobs.

According to a study from the University of Oxford, nearly half of U.S. jobs will become automated in the next two decades. Examining 702 occupations, the researchers concluded that about 47 percent of the U.S. workforce is at risk of becoming obsolete due to automation. Another study from the Boston Consulting Group echoes these results, predicting that up to a quarter of jobs will be taken over by smart software or robots by 2025.

Government Initiatives

To help Australia’s economy make the transition, the federal government in 2015 announced their $1.1 billion National Innovation and Science Agenda. This broad-based policy outlines a long list of initiatives relating to technology, innovation and entrepreneurship.

The National Broadband Network (NBN) is a key aspect of the innovation agenda that aims to provide broadband internet as a major contributing element of the innovation agenda.

State and local governments across Australia likewise recognise the importance of investing in creating the right conditions for economic growth in the age of exponential technology growth by enacting their own policy initiatives.

Innovation for jobs and growth

Australia is in its 25th year of economic growth but faces new challenges as the mining investment boom comes to an end.

Innovation is critical to improving Australia’s competitiveness, standard of living, high wages and generous social welfare net, but it is not the silver bullet. We must also build on the successful economic reforms of the 1980s and 1990s, lift government efficiency and improve competition, as proposed by the Government’s response to the Harper Review.

While historically high commodity prices have driven the growth in our living standards over the last decade, fostering innovation and commercialising ideas will be a key driver of future jobs and growth.

Innovative firms are more competitive, more able to capture increased market share and more likely to increase employment than their competitors. Over the period 2006-2011, 1.4 million new jobs were created by firms aged less than three years old. Employment in mature businesses, in contrast, fell 400,000.

Source: National Innovation and Science Agenda, 2015

Student activities

1. ‘Intelligent machines can perform tasks on their own and adjust to their environment.’ Name several tasks that can be performed by intelligent machines.

2. How can the use of intelligent machines boost productivity and lead to higher incomes and lower prices?

3. How is the use of robots and smart software likely to affect the labour market in the United States?

4. Why is the use of intelligent machines important for Australia’s future and what steps have governments taken to encourage this process?
**Jobs of the future**

A recent report sponsored by the National Broadband Network (NBN) and the Regional Australia Institute makes the case that by 2030 fully half of Australians will need advanced IT skills, in addition to having well-developed soft skills like communication, creativity and critical thinking if they are to flourish in the labour market.

The report predicts three classes of work in the world of 2030

Future jobs -- those based on specialist technology skills and which do not currently exist,

Changing jobs – those that exist now but which have evolved beyond their current form, sometimes radically, through the integration of technology, and

Fading jobs – those replaced by intelligent machines.

The report emphasises that almost everyone will need to be digitally literate, allowing them to communicate, find information, interact with government services and perform a wide range of other on-line activities like booking travel, banking and finance, buying and selling goods and services etc. This applies to 90% of the population.

Becoming skilled on-line will not be too difficult to achieve, given the time and effort being put into improving the “user experience” by technology companies.

**Hard and soft skills**

The key to success in the future labour market is to combine hard and soft skills into a well-integrated package, tailored to your individual talents.

Being able to combine skills like this is the advantage that humans have over machines. Intelligent machines can be taught procedural skills, but it will be many years before they are capable of having a well-rounded set of soft skills. A car-building robot does one thing very well, but has no idea how to interact with people.

So our challenge will be to learn how to program computers to do the things we want them to do. With later generation programming languages it is quite possible for regular people to program computers. You do not need to be a hard-core techie, though there will always be work for these.

What you will need if you are to interact with computers is a solid grounding in Science, Technology, Engineering and Maths (STEM) subjects. This foundation is then enhanced with a range of people skills not traditionally associated with STEM. Skills like communication, critical thinking, novel and adaptive thinking, entrepreneurship, design, social intelligence, cross-cultural competency, new media literacy, transdisciplinary, cognitive load management and virtual collaboration. This is the full package of skills for success in the future labour market. The more of these you can acquire and demonstrate, the greater your perceived value to an employer will be.

**What jobs will be needed?**

Employment specialists compile lists of what they think will be in demand, based on trends. These are some of the jobs that appear on multiple lists.

**The IT sector is likely to need**

Information security analysts, big data analysts, artificial intelligence and robotics specialists, applications developers for mobile devices, web developers, database administrators, business intelligence analysts, gamification designers, business/systems analysts and ethicists.

**In other disciplines, there will be a need for**

Engineers of all kinds, accountants, lawyers, financial advisers, project managers, specialist doctors, nurses, pharmacists, physical therapists, veterinarians, psychologists, health services managers, schoolteachers (K-12), market research analysts, sales reps and most trades (particularly bricklayers, carpenters, plumbers, electricians).

**What jobs are going?**

Theoretically, any job that can be described as a “process” could be done by an intelligent machine. In reality though, many such jobs will continue to be done by humans because people still prefer to be served by other people.

Those that will be automated will tend to be those that can be done on-line at lower cost or for free, or those that are physically-demanding, boring, dirty, dangerous or remotely located.

Agricultural workers, miners, postal service workers, librarians, sewing machine operators, switchboard operators, typists, data entry clerks and word processor typist, video store clerk, travel agent.

**Flexible work**

The workers of the future are likely to have not one job but a flexible portfolio of part-time or casual jobs that they operate in a more fluid way.

With virtual and augmented reality, jobs can be more location-independent, not tied to a city office. You can have a balance of living somewhere pleasant and affordable while working at your desired job(s). You could be living in a big city or somewhere more regional or even on a ship at sea – anywhere with broadband internet.

Success is limited only by your creativity and entrepreneurship. Prosperity will come to those who find...
These robot ethicists will have the important job of mediating between people and robots, advocating on behalf of the robots. Why? Because the general population may need some convincing that robots are a good thing to have around, and to counter the perception that they are dangerous. In 2016 Germany allocated €200 million to research this area with other countries set to follow suit.

**Student activities**

1. Identify the three classes of work that are likely to exist in Australia in 2020 and what skills are likely to be needed most?
2. Explain why intelligent machines will still depend on people.

**Tomorrow’s Jobs**

When The Future Laboratory teamed up with Microsoft to bring some clarity for career planners they produced Tomorrow’s Jobs, a report that predicts some of the more important IT-related jobs of the future.

The Future Factory used a method that all of us can use to good effect. First you look at the patterns coming forward from the past ten or twenty years, and then make predictions by projecting the same patterns into the future. This is how to be proactive about seeing where the world is heading.

**Virtual habitat designer**

Virtual reality is already gaining ground on conventional gaming. It is likely to become a major force in consumer electronics into the future. In China alone around 200 VR companies are absorbing the most talented designers, creating demand globally that have jumped 800% since 2014.

VR designers will become integral members of product design teams in the creation of new VR experiences running on ever-cheaper but more powerful equipment.

The designers most in demand will be those who combine the narrative skill of the game designer with the spatial awareness of the architect, urban designer and landscape architect. These are the folks who will create fascinating virtual worlds that people will not want to leave.

**Ethical technology advocate**

Much has been written about robots replacing humans, some of it quite scary and sensational. Some process-driven jobs will certainly be automated. But what of the jobs that robots and artificial intelligence (AI) will create?

The robotics engineer, AI specialist and maintenance worker will all be in demand. But we will also need people who advise on how humans and robots should act towards each other. We will also need to teach robots about our strange behaviour so they can react to us in the way that another human might.

These robot ethicists will have the important job of mediating between people and robots, advocating on behalf of the robots. Why? Because the general population may need some convincing that robots are a good thing to have around, and to counter the perception that they are dangerous. In 2016 Germany allocated €200 million to research this area with other countries set to follow suit.

**Digital cultural commentator**

Digital communication is evolving from text-based to being visual (pictures and video). This is already happening as Pinterest and Instagram are growing faster than text-based platforms such as Facebook and Twitter.

By the 2020s, visual communication is likely to be dominant, with multimedia artists, animators and illustrators being in greater demand by organisations wanting to communicate with a mass audience.

Visual skills such as animation will be complemented with music, text, object-oriented programming and augmented reality.

The ideal worker in this field blends advanced technology skills with the humanities. They understand human nature and know how to use the latest technology to create compelling narratives.

**Freelance biohacker**

Open-source software platforms combined with a tremendously information-rich internet is putting the tools of science within the reach of millions who were previously unable to participate in research.

This is giving rise to the citizen scientist, who is already proving that remarkable things are possible by motivated amateurs.

Beyond this, we will see the growth of crowd-sourcing to find solutions to complex medical and technological challenges.

For example, the open-source gene-editing tool CRISPR is being used by thousands of scientists to collaborate in search of cures for depression, schizophrenia, autism and Alzheimer’s to name just a few.

By the 2020s, citizen science will have evolved into a viable career for millions of bioscience graduates with an entrepreneurial attitude.

**Internet of things data creative**

By 2025 there will be billions of pervasively embedded devices in everyday objects that gather data about many things, the sheer quantity of which defies imagination.

We already call this Big Data but it is going to get much bigger.

Internet of things data creatives are analysts with
creative flair. They not only find the useful information buried in the data, they also know how to tell an engaging story with it.

The job will combine the technical skill of the data scientist with the communication skills of the digital cultural commentator mentioned earlier. Their work will have a major impact in tomorrow’s hyper connected world.

**Tough policy decisions**

According to the Future Workforce report sponsored by the Committee for Economic Development of Australia (CEDA) our nation faces some tough policy decisions to reshape its economy and prepare for a future in which technology is integrated into almost every aspect of life. CEDA predict that up to five million jobs are likely to be automated by 2030. These challenges are not confined to Australia either, they face every developed economy.

But we are a resourceful and resilient nation, more than capable of not just meeting the challenge, but being a world leader.

**An example from Denmark**

The CEDA report recommends the policy framework used by Denmark. Their approach has three aspects that Australia might put to good use:

- flexibility around hiring and firing
- decent unemployment benefits
- seriously good re-skilling programs.

While more expensive, it is arguably a better long-term solution than our current policies are likely to provide. It is investing in the human capital of a nation, taking the view that our people are our most valuable resource.

The emphasis is on educating and re-educating people for the jobs that exist now and which are likely to exist in the future. This proactive approach will keep the emerging, technologically focused economy of the future well supplied with the skilled workers it needs for economic growth.

But won’t dole bludgers send us bankrupt? No, not necessarily. Australia, like Denmark, already has the same values of mutual obligation. Society will look after you, and you have an obligation to contribute in the best way you can.

In Australia, we call this a “fair go”. We are all capable of contributing in some way, and with the proper training we can have the opportunity to do so.

Australia is a resilient nation, its people are resourceful and imaginative. With the technology to network our minds together, there are few problems that cannot be met and overcome.

**Universal Basic Income**

One idea that is gaining recognition in the information age is that of the Universal Basic Income (UBI).

The idea is that the very expensive and complicated welfare system could be replaced by a single, non-means-tested monthly payment to everyone. If our greatest asset resides in the human capital of our citizens, the UBI would allow people to start-up their own business, do volunteer work in their community, look after children and the elderly and do many other things besides. The UBI would be given on the basis of a social contract that says if the community looks after you, you have an obligation to contribute to the community in whatever way you are best suited to do.

Economists have estimated that it could be paid for through the savings gained by dismantling the welfare system combined with the many indirect savings from a healthier, better educated and possibly more law-abiding population. By 2020 and beyond, the number of unemployed people may reach the point where a UBI is a sensible way forward.

If implemented wisely, a UBI would help facilitate the knowledge economy of the future.
The bottom line

To prepare well for the future, Australia needs to adopt a top-down and bottom-up approach. Governments can provide the top-down input in the form of well thought-out and funded policies. Individuals and communities can provide the bottom-up by focussing on acquiring the skills we know they will need. These include being able to look at problems in new ways, seeing different angles and finding workable solutions that no-one has thought of before.

Be skilled in more than one discipline and combine these skills in ways not thought of before. Being curious about the world in general is a big help here. Most people limit their curiosity to only those areas they are interested in, but you should become someone who is interested in everything, whether you can see the point of it or not. The “point” will often become apparent later.

Know how to use the latest technology tools to model ideas and create prototypes, then test those prototypes again and again until you have something really useful. That brilliant end-product never emerges fully formed from the initial idea, it always has to go through repeated prototyping cycles.

Having an open mind and being open to new and unfamiliar ideas is vital. You should have few fixed ideas about how things should be done, realizing that orthodox thinking is a straight-jacket for the mind.

You have a strong conscience and can operate outside of your comfort zone to bring about win-win outcomes. You are known for your integrity, someone who knows the difference between right and wrong, and is not afraid to advocate for what is right. And you resist “group-think” and do what is right even when those around you do not. Your conscience is your reliable guide, you don’t need others to tell you.

You are resilient; you bounce back from failure and set-backs knowing that it is not possible to succeed every time at everything you do. Learning lessons from failure and trying again is the essence of resilience. This is one of the defining characteristics of the successful technology entrepreneurs in Silicon Valley whose motto is “fail early and fail often” because how else will you discover what works?

In the coming age of intelligent machines, it is these very human qualities that will be more important than ever. Some things will never change because human nature is what it is. Acquire these skills and be ready for the future when it arrives.

Remember, the way to do this is to be proactive about seeing where the world is heading and taking action now to position ourselves to be ready when the future arrives.

Student activities

1. Describe the types of structural change that are likely to occur in the economy as intelligent machines are adopted in greater numbers.
2. Discuss the tough policy decisions that Australia is likely to face as technology increasingly becomes integrated into every aspect of life.
3. Assess the proposition that a universal basic income could be used to share the benefits of the greater use of technology in the workplace.
4. What are the benefits of using both a top down and bottom up approach to prepare for the future?
5. What more could the Australian government be doing to prepare for the greater use of intelligent machines?
References:


Source

1: S Castellano, Intelligent Machines at Work, TD Magazine, 8 January, 2016