

Location Strategy & Innovation Management Frameworks



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1. Introduction

'Organisation X' based in the mid Wales specialise in security systems, for domestic, commercial and industrial applications. Products range from home security cameras that can be viewed on a mobile device's app, to commercial CCTV equipment. Due to the impact of COVID-19, a very popular product is a body temperature scanner, the product is placed at factory entrances and scans people for body temperature, the machine will grant or deny access depending on the body temperature. The machine can also scan for a face mask and can be programmed via the friendly interface to check if the person is wearing a mask or not. Considering for a future past a COVID-19 environment, the company is also developing a retinal scanner for the same machines, so that an employee for example may be identified prior to being granted access to some buildings. 'Organisation X' wants to strategically position itself to control the manufacture and distribution of their products on a global scale, with the main headquarters being located in its existing facility in Wales. The organisation has conducted an initial investigation in terms of a manufacturing facilities, and has shortlisted the following possible locations for further consideration:

<u>South America</u>	<u>Asia</u>	<u>Africa</u>
Chihuahua (Mexico)	Shenzhen (China)	Durban (South Africa)
Montevideo (Uruguay)	Visakhapatnam (India)	Bulawayo (Zimbabwe)
São Paulo (Brazil)	Taipei (Taiwan)	Tunis (Tunisia)

The strategy of a business is the only consideration to be made when determining the prime location for manufacturing activity (Ketels, 2005). Business strategy can be classified under three broad headings (Porter, 2004) – **Cost Leadership** (developing a model to produce goods at the lowest cost), **Differentiation** (developing high quality unique products) and **Focus** (specialisation in a niche market through either differentiation or cost leadership). Porter postulated that businesses adopting a hybrid of these strategies would be caught in 'no man's land' without both a clear direction and a competitive edge. He argued that these organisations would be outperformed by businesses that concentrate on only one of these strategies – this has been supported by empirical evidence (Thornhill, 2007).

Organisation 'X' focuses on differentiation through technology leadership (see chapter 2). Strategies for technology leadership rely heavily on highly skilled resource i.e., knowledge-based staff. However, successful globalisation is not only dependent upon a highly skilled workforce. It also relies upon the businesses systems (in particular management) and its practices, to optimise results from the effective utilisation of the highly skilled resource through each different phase of globalisation.

There is an emerging view (Gabrielsson-et-al, 2016) that multi-national, high-technology companies can be disadvantaged through a strategy that focuses on a single competitive strategy. In the global alignment phase, a hybrid strategy can be the most effective strategy. For example, the cost benefits of locating manufacturing activity in a low labour cost country are obvious but supplementing this through alliances with clusters of research and innovation in the host country can facilitate the creation of 'state of the art' production processes in a low-cost country. It will be the flexibility and quality of the parent business management team and its systems and processes that will ultimately determine the success of the hybrid strategy (Reenan-et-al, 2010). The ISO 56000 series of standards

can support 'Organisation X' with its location decisions. In particular, the focus of ISO 56002 on management systems can help to maximise the benefits of a hybrid competitive strategy through clear innovation thinking and implementation that is integrated through all facets of the business operation. The focus of ISO 56003 on tools and methods for innovation partnerships can contribute to thinking, decision making and selection criteria with respect to suitable industrial and academic partners. The focus of ISO 56004 on the assessment of innovation management provides a framework for organisations to measure the effectiveness of their actions.

Location strategies for high-technology companies also present potentially damaging knowledge transfer risks. When studying the location decisions of 'first mover' organisations entering the United States, (Chung-et-al, 2007) subtle differences were observed in location choice that was dependent upon the technology status of the business. Low technology companies were attracted to areas with any level of academic activity, but high levels of industrial innovation - hoping to exploit informal knowledge spillover across organisations through shared supply chains, recruitment poaching, chance meetings etc. that are all facilitated by proximity. Conversely, they observed that high technology companies were attracted to areas of high academic activity (to maximise inward knowledge spillover) but low levels of industrial activity (to minimise the potential damage caused by outward spillovers). The location consideration for 'Organisation X' must be mindful of this nuance.

2. Location Considerations

The Global Innovation Index (WIPO, 2021) scores 132 countries against 7 pillars to capture the multi-dimensional facets of innovation. The first five pillars are the innovation enablers – defining innovation facilitators:

- Market Sophistication.
- Business Sophistication.
- Human Capital and Research.
- Infrastructure.
- Institutions.

The final two pillars are the innovation outputs:

- Creative Outputs.
- Knowledge & Technology Outputs.

The input score versus output score for a number of countries are plotted and represented in Figure 1. A picture of efficient innovators and inefficient innovators is presented from a consideration of position against the line of best fit for all of the data points.

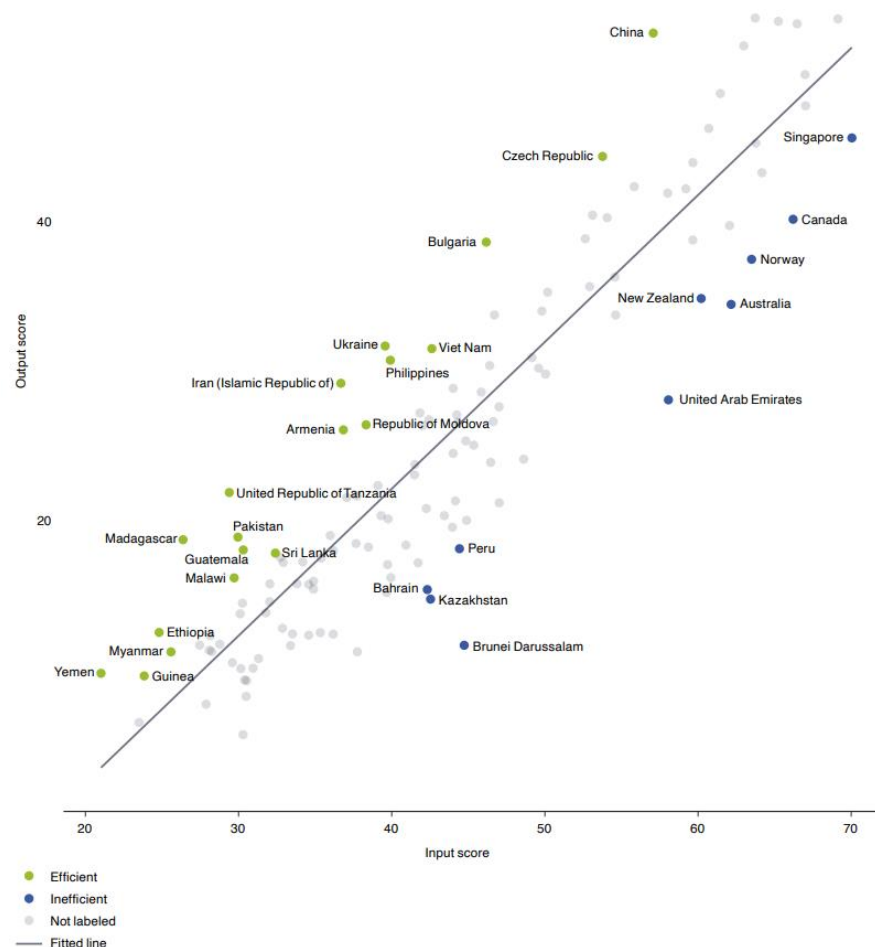


Figure 1: innovation Inputs v Outputs [source Global Innovation Index 2021]

A total of 81 indicators are measured to arrive at a score for each pillar. These indicators come from a number of different sources to provide a rich data set. Traditional measures such as R&D Investment, number of patents filed etc. are supplemented by broader and sometimes less-tangible indicators such as e-participation, technical creativity, social impact, the quality of universities and the type of organisational structure.

The United States holds first place for 13 indicators, including:

- Global R&D companies.
- QS University ranking.
- Patents by origin.
- Computer software spending, %GDP.

China holds first place for 9 indicators, including:

- Domestic market scale, bn PPP\$.
- Industrial designs by origin, bn PPP\$.
- Firms offering formal training, %.

The Global Innovation Index provides important insights for business's such as 'Organisation X' who are seeking to relocate some of their manufacturing operations as a part of their globalisation strategy.

2.1 South America

2.1.1 Chihuahua (Mexico)

Mexico ranked 55th in the Global Innovation Index for 2021. Figure 3 shows the relationship between the innovation output and input score for Mexico. Mexico scores well for innovation indicators such as ease of getting credit, high tech imports, high tech exports and QS University ranking. The country scores poorly on political and operational stability, investment and labour productivity growth.



Figure 2: Chihuahua location map

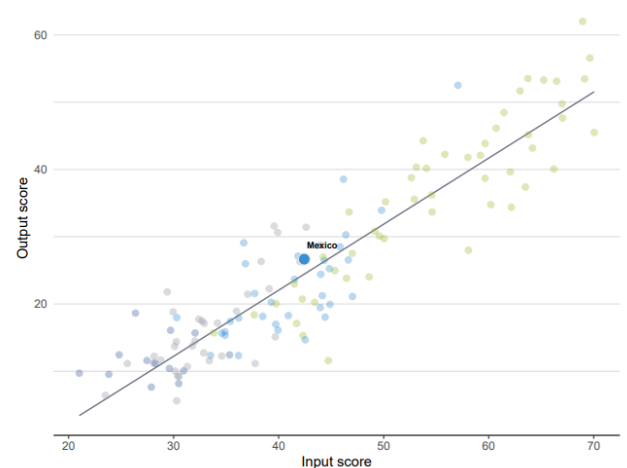


Figure 3: The innovation input and output scores - Mexico.

Chihuahua has seen an explosion of inward investment over the past decade (more than \$1.1bn since 2012), especially in the aerospace sector. Chihuahua's Aerospace Cluster is an impressive ensemble, including Zodiac Aerospace, Fokker-GKN Aerospace, Bell Helicopter, Textron Aviation and Honeywell Aviation. The aerospace sector employs 30% of all industrial staff in Mexico and in Chihuahua, the sector has invested locally to develop a highly skilled and flexible workforce – where more than 90% of employees are local people (Times, 2018).



Figure 4: Chihuahua Aircraft Manufacturing Hub

Chihuahua has strong engineering capabilities. This is supported by a highly respected research network that focuses on material development and processing, high technology training. There are also a number of highly respected Universities and technology colleges.

Drug-related violence in Mexico is a significant problem. According to UK Government travel advice, this is a particular problem in northern states such as Chihuahua (Gov.UK, 2022).

2.1.2 Montevideo (Uruguay)

Uruguay ranked 65th in the Global Innovation Index for 2021. Figure 5 shows the relationship between the innovation output and input score for Uruguay. Uruguay scores well for innovation indicators such as GDP/unit energy use, ISO 14001 environmental certificates/bn PPP\$ GDP, Firms offering formal training, political and operational stability. The country scores poorly on graduates in science and engineering %, general infrastructure and GERD financed by businesses, %.

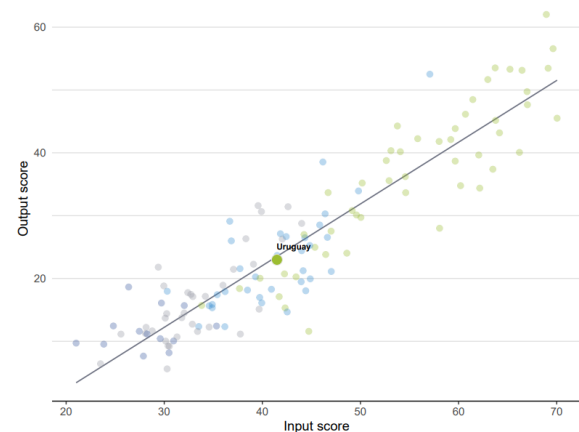


Figure 5: The innovation input and output scores - Uruguay.

Investment in Uruguay has been poor for decades despite public investment in innovation activities growing sixfold between 2008 and 2014 (Aboal-et-al, 2014). The innovation activity within industrial firms has remained low and flat. Manufacturing is mainly concentrated on capital goods acquisition to improve competitiveness (Cassoni, 2012).

Uruguayan manufacturers typically favour short term cost reduction actions that are profit driven. There is very little investment in programs that drive industrial innovation and technology advancement (Pintado-et-al, 2015).

2.1.3 Sao Paulo (Brazil)

Brazil ranked 57th in the Global Innovation Index for 2021. Figure 6 shows the relationship between the innovation output and input score for Brazil. Brazil scores well for innovation indicators such as E-participation, ICT services imports, Domestic market scale, bn PPP\$. The country scores poorly on general infrastructure, investment and joint venture/strategic alliance deals bn PPP\$ % GDP.

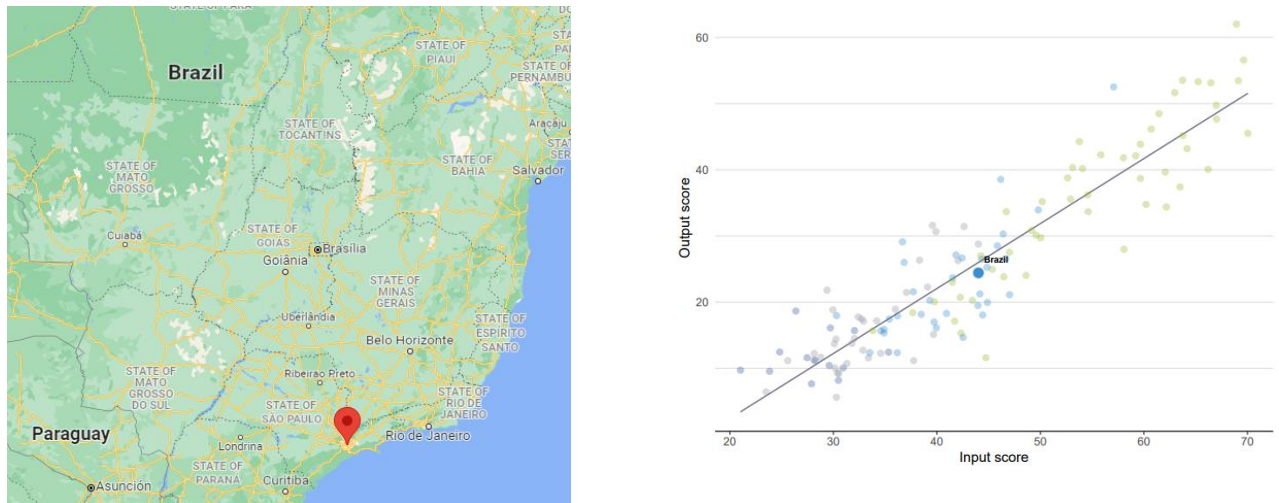


Figure 6: The innovation input and output scores - Brazil.

Brazil has been noted for its lack of investment in innovation for some time (Fleury-et-al, 2013). Brazilian firms have concentrated on technology and knowledge acquisition through inward investment with very limited success (Rodriguez-et-al, 2008). Brazilian organizations typically have excessively hierarchical structures with a totalitarian leadership style. Brazilian culture is characterized by high power distance (Davila-et-al, 2019) which in turn results in a population that is predominantly risk averse. However, Brazilian national culture does possess some qualities that are desirable for an innovative society – these include pride, loyalty, cohesiveness, commitment and 'jeitinho brasileiro' – the ability to improvise in the face of challenging circumstances (Amando-et-al, 1991)

2.1.4 Location Selection South America – CHIHUAHUA (MEXICO)

Excellent connectivity to the USA, with a highly skilled workforce supporting the Aerospace sector (non-competing sector for 'Organisation X'). Highly respected research network. Low labour costs.

2.2 Asia

2.2.1 Shenzhen (China)

China ranked 12th in the Global Innovation Index for 2021. Figure 7 shows the relationship between the innovation output and input score for China. China scores well for innovation indicators such as trade diversification and market scale, firms offering formal training, Patents by origin, Industrial designs by origin. The country scores poorly on regulatory environment, GDP/unit use of energy, environmental performance.

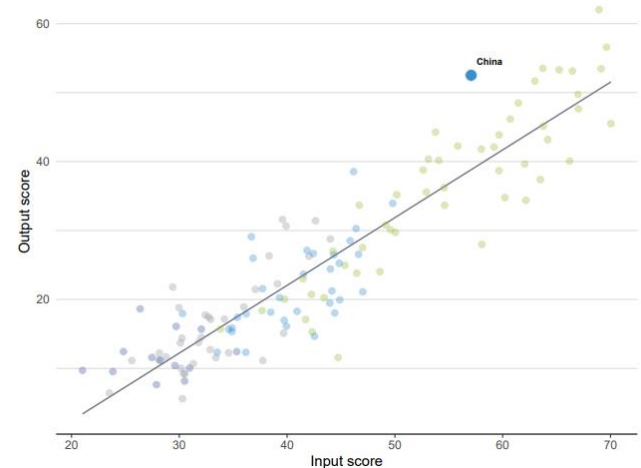
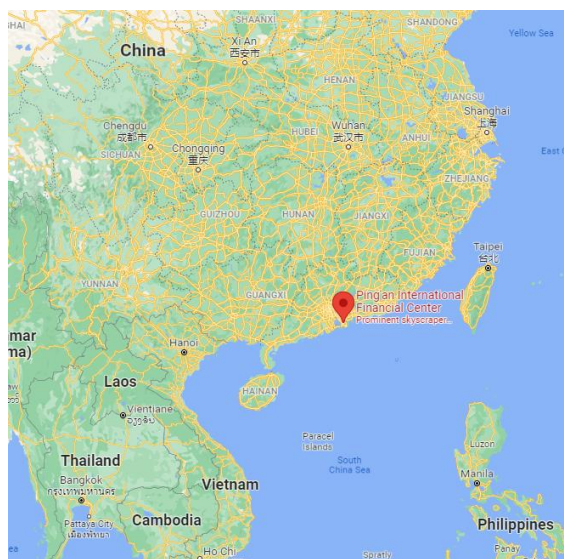


Figure 7: The innovation input and output scores - China.

Since China opened up its economy in 1978, Shenzhen has attracted significant direct foreign investment (Lee-et-al, 2021). Shenzhen is classed as a 'special economic zone' with a dedicated customs zone that allows manufacturers duty-free benefits. When marking the 40th anniversary of this 'special economic zone' (in 2020), President Xi Jinping tasked Shenzhen to become a world-class innovation powerhouse, offering autonomy for reforms (Ma, 2020). In 2018, GDP for Shenzhen reached \$366bn but that has come at an environmental and public health cost. Due to carbon emissions, particularly from aviation kerosene and LPG, Shenzhen suffered up to 100 haze days/yr that were linked to mortality (Gu-et-al, 2017). Despite some government led initiatives to use greener fuels and more energy efficient production methods, air pollution and haze is still a concern.

2.2.2 Visakhapatnam (India)

India ranked 57th in the Global Innovation Index for 2021. Figure 8 shows the relationship between the innovation output and input score for India. India scores well for innovation indicators such as trade diversification and market scale, domestic market scale, ICT services exports, graduates in science and engineering. The country scores poorly on ICT access, females employed with advanced degrees, environmental performance.

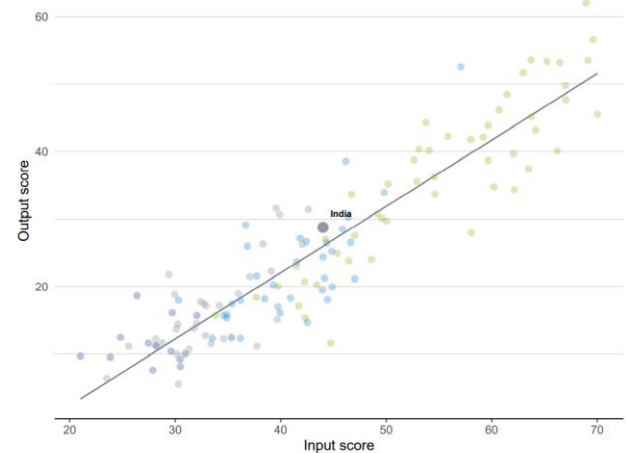
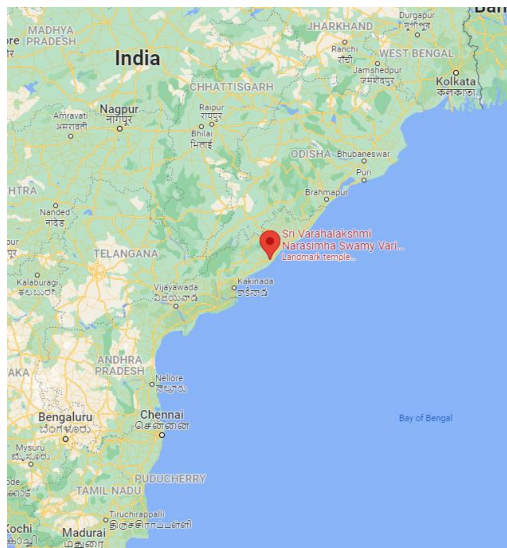
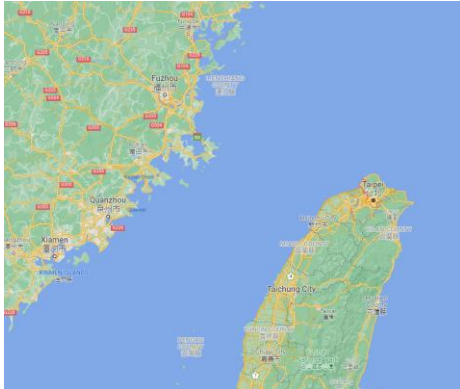


Figure 8: The innovation input and output scores - India.

There has long been a concern that the senior management of manufacturing businesses in India are only focused on cost and profit. There is evidence that poor technology utilisation is endemic and that it is fuelled by archaic human resource management practices and a lack of commitment to skills development and organisational change (Singh-et-al, 2010). These deficiencies are still present and were recognised by District Collector, N Yuvara, when confirming that Visakhapatnam has many positive attributes for the 'make in India' campaign (good air and rail networks, the construction of the Visakhapatnam – Chennai corridor, a strong maritime eco system), but that much was work to be done in terms of management practices (Newstex, 2016).

2.2.3 Taipei (Taiwan)

Taiwan was not considered in the Global Innovation Index for 2021.



Taiwan dominates the semi-conductor market, producing more than 50% of total global output (Lee, 2021). Taiwan has a robust policy for attracting foreign investment and the number of universities has grown from 28 in 1986, to 147 today. Despite this impressive growth in the number of universities, there is a serious concern that many Universities lack innovative course structures and do not provide students with the skills required by a modern workforce (Tawan-Today, 2016). The fractious relationship between Taiwan and China will always be a concern for foreign investors.

2.2.4 Location Selection Asia – SHENZHEN (CHINA)

Ambitions to become a world-class innovation powerhouse. Skilled workforce, low labour cost. Industrial innovation at its core.

2.3 Africa

2.3.1 Durban (South Africa)

South Africa ranked 61st in the Global Innovation Index for 2021. Figure 9 shows the relationship between the innovation output and input score for South Africa. South Africa scores well for innovation indicators such as market capitalisation % GDP, expenditure on education % GDP, investment, software spending % GDP. The country scores poorly on the ease of starting a business, graduates in science and engineering, FDI net inflows % GDP.

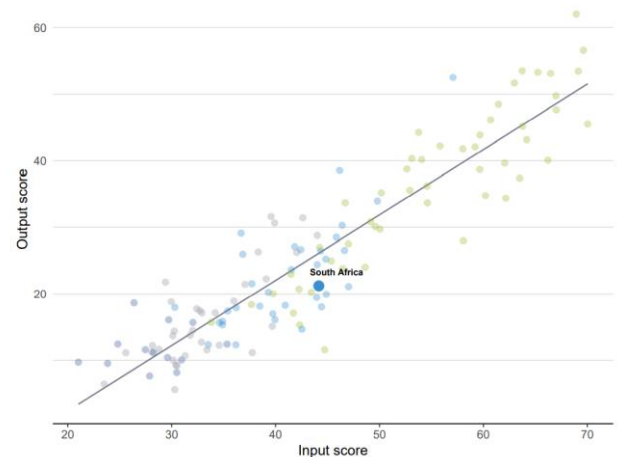
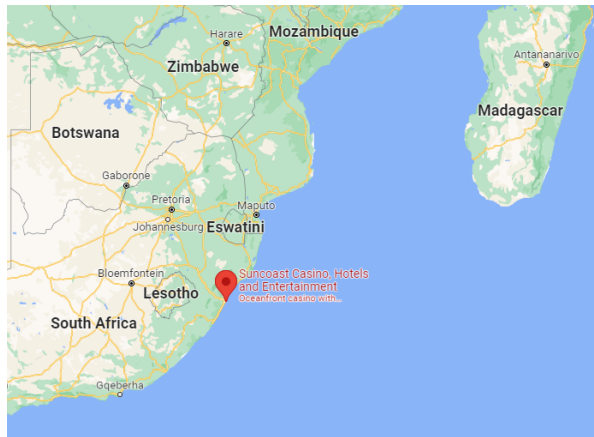


Figure 9: The innovation input and output scores – South Africa.

Productivity within the manufacturing sector of South Africa is low and productivity growth between 2010 and 2016 was much lower than the OECD average (OECD, 2018)– see Figure 10. This was considered by the OECD to be reflective of a skills shortage and a high cost of doing business in South Africa.



Figure 10: Labour Productivity Growth – South Africa 2010 – 16 [source OECD Jobs Strategy 2018]

The excellent port facilities at Durban have for a long time contributed to the city being an important industrial spoke within South Africa (Lombard-et-al, 2017). Manufacturing remains a significant contributor to national GVA (see Figure 11) and that is reflected in municipality policy decisions in Durban such as the excellent cluster development programmes (particularly around the automotive sector).

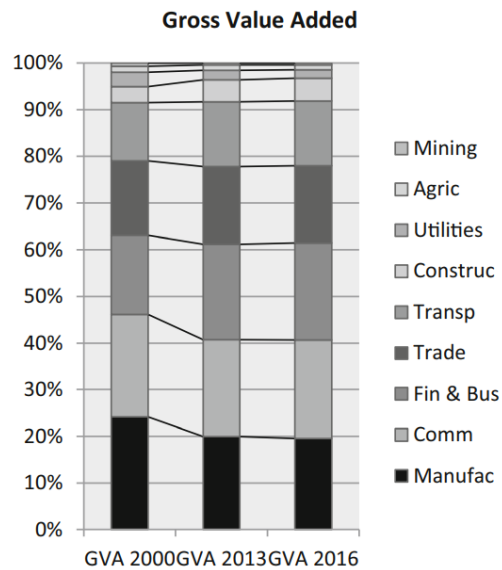


Figure 11: GVA per sector – South Africa

2.3.2 Bulawayo (Zimbabwe)

Zimbabwe ranked 113th in the Global Innovation Index for 2021. Figure 12 shows the relationship between the innovation output and input score for Zimbabwe. Zimbabwe scores well for innovation indicators such as graduates in science and engineering %, joint venture/strategic alliance deals/bn PPP\$ GDP. The country scores poorly on QS university ranking, political environment, rule of law, general infrastructure, government effectiveness, logistics performance, ICT's and organisational model creation.

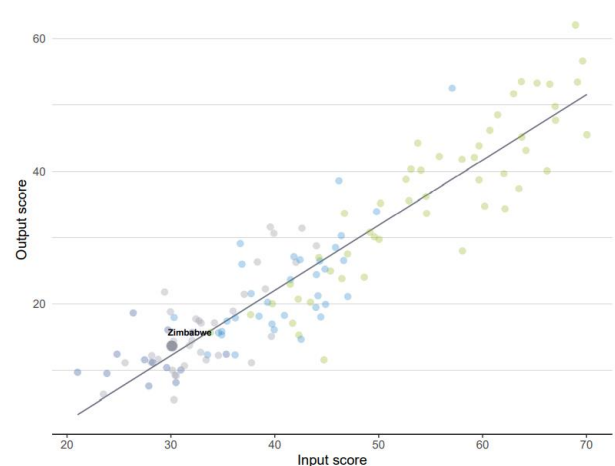
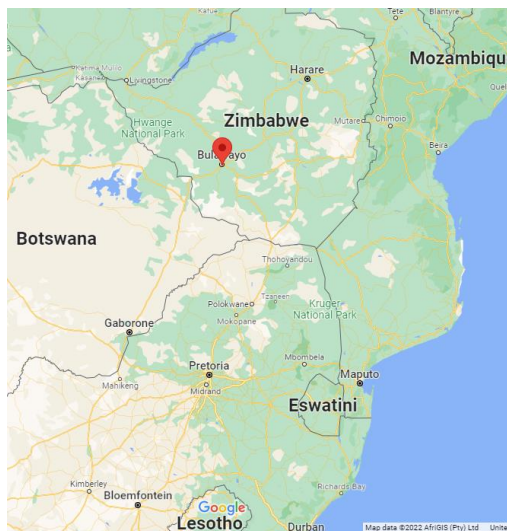


Figure 12: The innovation input and output scores – Zimbabwe.

Zimbabwe cannot be seriously considered as a manufacturing location for 'Organisation X' because of the poor general infrastructure, ineffective government, poor logistics, weak ICT, futile rule of law, low standard of university education and inefficient environmental policy.

2.2.4 Tunis (Tunisia)

Tunisia ranked 71st in the Global Innovation Index for 2021. Figure 13 shows the relationship between the innovation output and input score for Tunisia. Tunisia scores well for innovation indicators such as graduates in sciences and engineering, % GDP, ease of starting a business, scientific and technical articles/bn PPP\$ GDP, education. The country scores poorly on general infrastructure, QS university ranking, innovation linkages, ICT's and organisational model creation.



Figure 13: The innovation input and output scores – Tunisia.

Despite immigration concerns, there is good cause for Europe to look to Tunisia for manufacturing. In particular, Tunisia has over 200 businesses in the electronics sector employing over 100,000 people (Ghiles.F, 2020). Production costs in Tunisia are on a par with China, but foreign direct investment in Tunisia has the best outcome when it is targeted at young and not mature businesses (which are traditionally family owned and not innovative) (Arouri-et-al, 2020).

2.3.4 Location Selection Africa – DURBAN (SOUTH AFRICA)

It was difficult to choose between Tunisia and South Africa. The final determinants in the selection were the skilled workforce (automotive focus), investment in software and investment in education. The excellent port facilities in Durban were also a deciding factor.

3. Innovation Management Framework – ISO 56000 series

The ISO 56000 series is an important set of standards. At the very least, it provides a framework that businesses can reference to support their considerations of innovation. If fully embraced and implemented correctly, the standards can support the redefining of a business's strategy, organisational structure, partnership development and culture – where people, products and processes are continuously challenged and developed for maximum impact i.e., improved efficiencies, better management of different types of opportunity and risk, better alignment with customer needs, a more resilient business, a more productive and sustainable business.

ISO 56002 provides guidance about the innovation management system (IMS) that would be beneficial to 'Organisation X'. As stated in the introduction, 'It will be the flexibility and quality of the parent business management team and its systems and processes that will ultimately determine the success of any hybrid strategy that combines cost leadership and differentiation. ISO 56002 emphasises a commitment from leaders and managers to develop structure and culture that facilitates good innovation practices and behaviours – through carefully defined vision, strategy and policy. The first step to developing the successful IMS is to contextualise innovation for the business – determining the internal issues, external issues and areas of opportunity, innovation intent, customer and stakeholder needs/wants. The next step is to define the necessary culture and the types of desirable collaborations. It is then possible to develop a '**PLAN** (using the information and insight garnished from steps 1 & 2) - **DO** (determine competencies, identify resource and implement through operations) – **CHECK** (monitor, measure, analyse and evaluate) – **ACT** (continuously refine and improve)' cycle for the IMS framework.

ISO 56003 provides guidance about collaborative innovation that would support 'Organisation X' with its decision making with regard to new manufacturing locations. Once the opportunity for collaboration is identified, gaps within the organisation should be investigated using business management tools such as SWOT analysis, balanced score card, value chain analysis, product lifecycle management, benchmarking etc. The best way to fill the gap internally, or through collaborations can then be assessed. ISO 56003 also provides guidance on the tools that can be used to identify the most suitable partnership using a 'selected decision matrix'.

ISO 56004 provides guidance about how to effectively assess the performance of the innovation management system. This is an essential step to provide transparency across the organisation about the impact achieved through the collective efforts.

Word Count: 3300 (excluding the extract from the project brief in the introduction)

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