

WHAT CAN BE LEARNED FROM SINGAPORE BY THE EUROPEAN UNION IN THE FIELD OF INNOVATION?

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As the world is changing in the fast pace and open global markets are making European companies understand that they need to innovate, the question is how the European Commission can best contribute toward the goal of making the EU the single most crucial supra-national body managing funding for innovation worldwide, thrive in this new but not surprising challenge. Open innovation is a very actual topic in the European Union. With the establishment of the European Innovation Council, the development of Open Innovation strategies, and the launching of a few calls dedicated to the creation of Open Innovation networks in the field of technologies, the European Union shows that it has grasped the importance of this approach to better address the innovation challenges in a world which are being transformed rapidly. Following extended research conducted for this work, it looks like Singapore represents a good case study worthy of considering as great examples for the further development of Open Innovation in the European Union. An enlightened governance system has created the framework, the environment, and the path for a small island with only the resources of its people to be transformed into a global city-state which is run based mostly on a technology-centered, engineering, top-down kind of social and economic model that is a marvel of efficiency and has produced success, social unity, educational superiority, and technological achievement.

Key words: *Innovation, Open Innovation, Singapore, the EU, Culture.*

ЧЕМУ МОЖЕТ ЕВРОПЕЙСКИЙ СОЮЗ НАУЧИТЬСЯ У СИНГАПУРА В ОБЛАСТИ ИННОВАЦИЙ?

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Поскольку мир меняется быстрыми темпами, а открытые глобальные рынки заставляют европейские компании понимать, что им необходимо внедрять инновации, вопрос заключается в том, как Европейская комиссия может наилучшим образом способствовать достижению цели превращения ЕС в единственный наиболее важный наднациональный орган, управляющий финансированием инноваций во всем мире, процветать в этой новой, но не удивительной задаче. Открытые инновации-очень актуальная тема в Европейском союзе. С созданием Европейского Совета по инновациям, разработкой стратегий открытых инноваций и запуском нескольких призывов, посвященных созданию сетей Открытых инноваций в области технологий, Европейский союз показывает, что он осознал важность этого подхода для более эффективного решения инновационных проблем в мире, который быстро трансформируется. После продолжительных исследований, проведенных для этой работы, похоже, что Сингапур представляет собой хороший пример, достойный рассмотрения в качестве замечательного примера для дальнейшего развития открытых инноваций в Европейском союзе. Данная система управления создала основу, окружающую среду и путь для того, чтобы маленький остров, располагающий лишь ресурсами своего народа, был преобразован в глобальный город-государство, который управляется Главным образом на основе ориентированной на технологии, инженерной, нисходящей социальной и экономической модели, которая является чудом эффективности и привела к успеху, социальному единству, превосходству в образовании и технологическим достижениям.

Ключевые слова: *инновации, открытые инновации, Сингапур, ЕС, культура.*

Introduction

Research related to R&D, Innovation, and economic growth in the EU show a positive link between R&D and Innovation. However not all research sectors are equally productive in terms of innovation production. When performed by the private sector, research tends to have higher returns because it is mainly applied and is connected to the registration of patents. On the other side, though, the link between innovation and economic growth does not seem to be so close between R & D investment and innovation. Research shows that innovation growth rates drive economic growth in peripheral regions. However, in non-peripheral regions, the situation looks differently, and no significant relationship exists between the two factors. Moreover, R&D investments need a relatively long time until they can lead to innovation /Rodriguez-Pose 2004, p. 434).

From a political economy perspective, according to Schumpeter, economic change is related to innovation, entrepreneurship, and market power, and better results can be achieved concerning the increase of the market power by using innovation than by using competitive pricing compared to the competition. On the other side, according to Porter, innovation, when defined as a process that allows the companies to produce more by using the same amount of resources or produce as much with a smaller amount of resources, leads to competitive advantage (Ciocanel and Pavelescu 2015, p.728)

It is only for a few years that Open Innovation has become a topic for the European Commission (2016, p. 11) while in countries within the EU Furthermore, outside it has been a topic addressed by private companies, universities, NGOs, and then at strategical levels from local and national governments. The measurable benefits of Open Innovation have been a topic for the OECD already in 2008 by identifying data on R&D investments, patent data (international co-invention and co-application), and data on licensing, meaning that the EU as a supranational body joins the race relatively late. Also, management play a crucial role in defining the appropriate budget plans (Horvat et al., 2019). The financial plan is the internal control in the planning of financial resources (Horvat, 2017, p.165). Management of a company must establish a good business process structure in order to achieve its business objectives (Horvat and Mojzer, 2019, p.11).

Little research has been conducted about Open Innovation in Europe/the EU compared to existing research related to non-European countries and Singapore. Thus, there is much potential even within this paper's framework to present findings and generate knowledge that might be of relevance for policymakers and researchers. How can open innovation help better address the challenges with which the EU will be confronted in a rapidly changing innovation environment with world powers arising from China and/or India? What might best practices be introduced and fostered to thrive in this to be a transformed map of the world?

Research question, methods of work and research approach

In general, the paper aims to emphasize the role of Open Innovation concerning the efforts that the European Commission is undertaking to cope with the rapid developments worldwide and what can EC improve in its approach toward open innovation. The paper's concrete objectives are to bring the best case of Open Innovation from Singapore and argue why this approach is worth receiving more EC support.

The specific research question is related to the specific objective presented above: What can the European Union learn from the best cases of Open Innovation worldwide, e.g., from Singapore?

The addressing of this question will be methodologically based on case study analysis and benchmarking.

The Case of Singapore

In only 55 years, Singapore has transformed itself from a developing economy with few natural resources to a thriving global metropolis. Its GDP per capita has risen from US\$516 in 1965 to US\$65 233 in 2019 (World Bank, 2019).

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The foundations of economic wonder and the vision of a smart nation

The financial results and positions it holds at the international level are the best proof of what Singapore has achieved with its economic development plans and a clear vision of where it wants to stand in the future.

Since 2007 Singapore has been part of the top 8 list in the Global Innovation Index, reaching two peaks in 2011 and 2012 by holding the 3rd place in this global ranking. More recently, in the GII 2019, it is ranked ^{eighth}.

According to the World Bank, 52% of Singaporean exports are high technology products (World Bank High-technology exports, Singapore, 2018). Furthermore, Singapore is the fourth-largest exporter (World Bank, 2018) of high-tech products as defined by the World Bank, following China, Germany, and the United States.

The digitalization efforts of Singapore can be grouped in (Smart Nation Singapore, 2020):

1. The national computerization from the 1980s to early 1990s, which aimed at transforming Singapore into a regional center for computer software development and services;
2. The transformation of Singapore into a hyper-networked, global hub for services came about with the growth of the info-communication industry starting from the mid-1990s.

The critical study of the Economic Review Committee, which focused on the topic of how to "re-make" Singapore to be able to better compete in the global knowledge economy, where the combination of advanced knowledge, technological innovation, artistic creativity, and entrepreneurial dynamism is becoming decisive sources of competitive advantage, was conducted in 2002. In that study, six broad areas of policy emphasis were identified (Wong, Ho & Singh, 2005):

1. Culture: to influence the cultural values of Singaporeans toward entrepreneurship by providing students and working professionals more opportunities to learn about entrepreneurship;
2. Capability building: to attract more entrepreneurial talents from overseas and encouraging greater mobility of talents between the public and private sector;
3. Conditions: to reduce government regulatory red-tape;
4. Connectivity: to enhance the global connectivity of Singapore to the world;
5. Capital: to improve start-up and SME access to capital;
6. Catalyst role of the government: to extend investment and tax incentives currently available to large MNCs and smaller enterprises.

Two initiatives of the government started as a result in the early 2000s which intended to strengthen the innovation capacity of the economy and business' ability to undertake product, process, and application development (Beh, 2017):

1. Expand the research capabilities of the universities and research institutes of the Agency for Science, Technology, and Research (A*STAR);
2. Encourage "technopreneurship" and foster a vibrant start-up ecosystem.

Apart from the government's efforts in this respect, in the period 2000-2015, business spending on research and development grew from \$ 1.866 billion to \$ 5.825 billion (Beh, 2017).

Following all initiatives of the recent past, Singapore is considered to be able and ready to shift to an innovation-led economy. The government is partnering with corporates, including extensive local companies and MNCs, to push for innovation. There are three reasons for this (Beh, 2017):

1. The rise of Asia: According to predictions from the Brookings Institution, 40% of global middle-class consumption by 2030 will stem from Asia, and due to expected urbanization trends, US\$ 11.5 trillion of infrastructure investment will take place there between 2013 and 2020;
2. Business talent concentration: There is a unique concentration of Fortune 500 companies in Singapore, and independently from the kind of business sector, US and European companies are placing their Asian regional headquarters in Singapore, and the same also holds for companies from Japan, China, and India who are placing their Southeast Asian headquarters in the city-state. This is expected to lead Singapore to become an attractive market for B2B business as well as where to start a new business;
3. Private capital: According to data from the Singapore Venture Capital and Private Equity Association, annual levels of VC funding being invested into Singapore-based companies have been overpassing US\$ 1 billion in recent years while the Singapore-based VCs have doubled their managed assets to up to US\$ 3.6 billion in 2016.

While in countries such as Germany, Switzerland, and many others, the research and innovation systems have grown organically out of centuries-old research-intensive universities or industries. Singapore's R & D has predominantly been a directed, government-led effort to upgrade the domestic economy's competitiveness and growth. Even today, its research and innovation policies continue to emphasize economic outcomes and impact (Poh 2019, p.134).

Following the trends, the Research, Innovation, and Enterprise Plan (RIE 2020) extends these efforts by including, specifically also innovation and enterprise. Furthermore, and related again to R&D, the government has developed a robust intellectual property regime that helps the companies with their innovation efforts. For instance, it usually takes two to four years to procure a patent. It takes only three months to obtain an AI patent in Singapore (EDB Singapore 2019, p.16).

A particular focus has been put on innovation, especially since 2010, in the aftermath of the global crisis. The government took another review of its economic strategies to position itself for the new post-crisis environment and achieve sustained and inclusive growth. R & D efforts had to be extended by a high interest in business innovation and R & D's commercialization to include creating customized platforms that would support the integration of the capabilities of research institutions, companies, and public-sector agencies to deliver innovative solutions. Starting from here, the R&D framework of Singapore was decided to be based on open innovation (Poh 2019, p.135).

As a small economy with reduced geographical space, no natural resources, and too open economies, Singapore aims to advance its conducive environment, international linkages, capabilities in intangible asset management, IP commercialization, and skilled workforce to be a center of innovation and a key node along the global innovation supply chain where innovative firms thrive based on intellectual property and intangible assets.

Thus, the facilitation of a culture of (open) innovation and entrepreneurship is based on the following pillars (EDB Singapore 2019, p. 19):

- Provision of open data – data sets collected by public agencies have been made available and accessible to the public through online portals, so anyone can participate and co-create citizen-centric solutions;
- Facilitation of living laboratory – the government wants Singapore to be the ideal location for companies and researchers to develop, prototype, and pilot. Research, Innovation, and Enterprise 2020 and AI Singapore are two initiatives in this direction.
- Support for the Industry and Start-up Ecosystem. Initiatives such as JTC Launchpad – a facility that offers a variety of spaces that are in proximity to knowledge-based companies (JTC Launchpad), institutes of higher learning and research institutes that are at the forefront of innovation, SG Innovate – a private organization wholly owned by the Singapore Government which has the function to help the scientists build Deep Tech start-ups (SG Innovate), and PGG – Punggol Digital District – the most anticipated smart district where digital technology and innovation create new possibilities for a smart nation are three essential initiatives to mention;
- Investments in cybersecurity and data privacy;
- Development of computation capabilities and digital inclusion for the whole population of Singapore;
- Enabling of cross-border collaborations.

Singapore's economic agencies, such as A*STAR and Economic Development Board and Info-communications Media Development Authority, make coordinated efforts to leverage open innovation to strengthen the critical industry clusters. Collaborations are undertaken with MNCs who transfer their capabilities and expertise to the local ecosystem while creating good jobs in the local economy (Poh 2019, p.137). Furthermore, they proactively support companies by equipping them with the resources to realize their business goals (Forbes 2018).

Openness has been crucial for Singapore's survival and its R & D and innovation system as it has allowed foreign investments, ideas, and talent to enter Singapore. MNCs and foreign direct investments were accepted in Singapore far earlier than in other countries. The same was true for international scientists who were recruited to seed capabilities and mentor young scientists to create a basis for R&D capabilities. On par with Sweden and the UK, Singapore is the most internationally diverse R&D ecosystem globally, with 30% of the Singaporean research community composed of foreigners, who bring in research ideas, expertise, and networks worldwide (Poh 2019, p.136).

Furthermore, in the 21st century, the lines between economy sectors are increasingly blurred, and the need to solve multi-disciplinary problems grows. Traditional mechanisms will no longer be able to lead to the solutions that are needed. Open innovation is considered an acceptable method and inclusive approach to

enable collaboration to transform today's problems in future success opportunities and match the supply and demand for innovation through a crowd-sourcing platform (SGTECH, 2020).

To narrow the gap between research and commercialization, an Open Innovation Platform has been created that operates under the Digital Economic Framework. The companies gain first-hand visibility of real business challenges and opportunities in the region. The calls are launched a few times a year. Problem owners present their challenges, which are then open to global and Singapore-based individuals, research providers, and companies with digital technological expertise and innovation capabilities. The problem solvers can bring in ideas, develop concepts, and/or create prototypes that may be extended to larger deployments in the Problem Owners (EDB Singapore 2019, p.16).

Among the most impressive foreign investments in the area of innovation and innovation promotion, worth to be mentioned here, is the factory of the future, one of five digital model factories which will serve as a showcase and teaching ground for the emerging technologies of "Industry 4.0" – advancements in data and analytics, robotics and automation, and production methods such as 3D and 4D printing (McKinsey, 2017). This Singapore Digital Capabilities Center, a McKinsey project, recreates the environment of a manufacturer of industrial gearboxes. The fictional \$2 billion company has 8000 employees, and during workshops, participants can watch as plant workers use digital technologies to manage scenarios (McKinsey, 2017). Each employee in organisation is accountable for their areas of work in accordance with the definitions in employment agreements or the act on the classification of assignments and duties and in compliance with these rules (Horvat, Lipičnik, 2016, p. 31). When local communities are concerned, the economic effects of international capital flows in principle should not differ from the national economy (Maček et al, 2020).

Research discussion: What can the European Union learn from Singapore in the area of innovation?

The case study of Singapore gives another perspective on how a country can be run and how state bureaucracy does not necessarily need to be inefficient (Wong et al., 2020). The public service is one of the largest employers, which in 2020 counts 145 000 civil servants in 16 government departments and over 60 statutory boards (Wong et al., 2020). In 55 years, they have managed to increase their GDP by over 100 times, and the participation of the government in this achievement has been paramount. The European Union is not a state. It is also not a federation of state, still in its loose form of structuring it is based only on bureaucracy, which is rather criticized in the media. From this perspective, the Singaporean example could be considered to see how the many agencies, especially those dealing with innovation, can make the best out of the funding they receive from the EU budget. Similar to the European Union, which is criticized for the lack of democracy in how it is run, also Singapore has been seen as not a democratic country, "a curious anomaly within a political scene" (Andrews, 2015) or "the wealthiest non-democracy in history" (Andrews, 2015), but out of this anomaly they have made the best to turn the country into a very wealthy and prosperous one. This chance also exists for the European Union.

Learnings concerning influencing the economy

One notable feature which has shown to be crucial in the development of Singapore have been the reviews on the economy that the Economic Review Committees have realized throughout the years, especially the one in 1986 which gave a new direction for the country leading to investments in R&D and the one in 2002 which aimed at re-making Singapore which nowadays is reflected in the vision of a smart nation where the digital economy, the digital government, and the digital society are being built in a fast pace. As presented, Singapore considers itself ready to make a shift to an innovation-led economy. With all the investments that have been planned in the European Union for this next 2021-2027 period, is, or will Europe be ready to make a shift to an innovation-led economy? Or better asked: How can the European Union make sure that at least at the end of this new period, it will have made it more possible for its member countries to have come closer to being innovation-led economies?

Learnings concerning investing in people and the involvement of people

The EU is already doing much concerning investment in education and science. What might be learned from Singapore is the focus on individuals as a workforce related to the country's advancement. European scholarships that could be offered to individuals from each member country to go outside Europe to learn another way of doing business, technology science, and to be hired by the EU institutions for a

certain number of years to bring and share this knowledge would be an idea. Furthermore, in light of the COVID-19 pandemic and the effects, it will have on the job market, a similar initiative such as the one related to mid-career PMETs in Europe might be something of interest to bring to the European reality.

Learnings concerning supporting R&D and (open) innovation

Open innovation is the required method of doing innovation right now in Singapore, not only concerning business innovation but also to R&D. The way that the Singapore government is facilitating a culture of open innovation and entrepreneurship including also open data, living laboratories, digital inclusion, and cross-border collaborations is worth to be seen as an example also for the EU area.

The establishment of an Open Innovation Platform serving the needs of EU-based businesses and EU state governments, and the EU institutions would be another actual example to be brought to Europe. Instead of having Nation Innovation Challenges, the EU could organize the European Innovation Challenges following the same pattern. In the case of challenges that address an issue of interest for the EU area or a considerable amount of businesses or other entities, funding could be planned by the EU, while in the cases that single businesses are interested in bringing forward challenges that help them address their own single needs for innovation, then the businesses can use the platform but afford the funding of the solutions on their own. Furthermore, how the IP issue is solved in the cases of open innovation in Singapore could be considered. European Innovation Challenges could, for instance, be tested in this COVID-19 pandemic period.

Also, an identification of the kind of innovation focused institutions working at EU level and how they could work with the innovation focused institutions in the single EU countries, with the goal to better structure the innovation efforts in the EU area would be something which could take inspiration from the example of Singapore. In this respect, The EU has the opportunity to act as a steering body to make the Innovation Union a reality by understanding what kind of synergies are possible among the countries and the businesses operating in the EU area to stimulate collaborations aiming at furthering R&D and innovation.

Furthermore, the EU could focus more attention on creating alliances such as the Global Innovation Alliance run by Singapore, which enables participating start-ups and more developed companies to gain access to cities in other parts of the world.

Learnings concerning entrepreneurship

The creation of a Start-up EU brand following the example of the Startup Singapore brand could be something that could be taken as an example in the entrepreneurship field. EU-based start-ups, accelerators, incubators, investors willing to co-finance start-ups operating in Europe and which might partly be winners of EU grants could be present there, to create a one-stop platform for everyone interested to understand what is going on in the EU area in the field of entrepreneurship and also give a single face of EU-made entrepreneurship.

Learnings in cultural terms

In a cultural perspective, the importance of the nation as the highest power on whose behalf also the following of the rules imposed by what is considered an enlightened government is more comfortable to implement, a collectivistic approach to reality combined with long-term orientation has in the case of Singapore shown to be a right mix leading to outstanding results, also in terms of R&D and (open) innovation.

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