

The lessons we learned from a Smart Nation – Germany

A study trip to Germany by a group of Singapore Management University students offers insights into how this European nation has built its cities sustainably and innovatively **BY THOMAS MENKHOFF AND JONAS SCHORR**

GERMANY and Singapore have many commonalities, such as their strategic interests in creating liveable cities, nurturing startups and entrepreneurship, as well as value creation through innovation. This was confirmed during our study trip to Germany with 25 Singapore Management University (SMU) undergraduates last month; the theme for the trip was "Living in Smart Cities: Innovation, Sustainability and StartUps in Germany".

Besides examining general aspects of business management and innovative entrepreneurship in Berlin and Stuttgart (Baden-Wuerttemberg), a key objective was to expose Singapore youth to one of the "secrets" of Germany's economic success: the country's operational (engineering) excellence, which enables German export-oriented multinationals such as BMW or Daimler Benz, as well as *Mittelstand* firms such as Mann+Hummel, to maintain and expand their global market leadership.

GERMANY'S NEW STARTUP HUB

In 2014, Berlin adopted its official Smart City Strategy, aimed at becoming one of Europe's leading smart cities. With an emphasis on quality of life, climate projection and citizen participation, it has become a booming centre of innovation for solutions in future urban mobility, renewable energy and circular economies.

Many of these projects are pilots driven by the city's strong research community and funded as a combination of public grants from Germany's federal ministries and the European Union (Horizon 2020, Climate-KIC, EIT Digital), and complemented by third-party, private funding.

But there is also innovation coming from ordinary Berliners, who have launched successful petitions to lobby for a better bicycle infrastructure and a new mobility law; they have also won a public referendum to keep the site of the former Tempelhof airport to be kept open as a public park and ecological conservation area.

A visible result of Berlin's smart-city aspirations is the large number of startups there. One of the Top 100 startups (in terms of funding) in the city is SoundCloud, a social networking service for music established in 2007 with a user base of about 175 million active music fans.

One location where startup founders have access to an inspiring work environment, networking events and knowledge creation opportunities is The Factory. Located near the site of the former Berlin Wall, its campus in Berlin Mitte was inaugurated by Google chairman Eric Schmidt and Berlin mayor Klaus Wowereit in 2014.

Like Singapore, Berlin has attracted several international accelerators such as NUMA (located in Paris, France), which builds future-proof tech startups and supports both corporates and public institutions on their innovation journey. NUMA's innovative DataCity programme matches the entrepreneurial passion of startups with the know-how of established companies to better manage urban challenges, such as in the area of mobility through the promotion of green(er) modes of transport such as cargo bikes.

An interesting smart mobility initiative is Berlin's Radbahn (Cycle Track) Project. The goal of its founders, a society called paperplanes eV, is to transform the unutilised space below Berlin's famous U1 elevated subway line into a major urban cycling path. They recently launched a competition for innovative ideas around their U1 track vision "to make Berlin's urban spaces more people-oriented and environmentally friendly".

Berlin's 5.Sha Euref (European Energy Forum) campus (a business, research and education hub built on a former industrial site) hosts several clean-energy-related companies and organisations such as the Green Garage, a cleantech accelerator that helps startups turn the climate challenge into a business opportunity.

Another Euref tenant is InfraLab Berlin, a long-term co-working project of leading infrastructure and energy companies such as waste management firm BSR (Berliner Stadtreinigung), BVG (Berlin's main public transport company) and Vattenfall (a major power company), to develop innovative smart-city solutions.

One project under discussion is aimed at upgrading BVG's public bus fleet with moving sensors that scan the environment for necessary maintenance works in order to avoid costly spillovers of man holes after heavy rainfall. It is a pilot measure of Greenbox Global Holding GmbH (<https://www.greenbox.global/>) aimed at creating innovative value in the areas of environmental protection, infrastructure, energy supply and di-



The SMU study group in front of the Reichstag in Berlin, one of Europe's leading smart cities.

gitalisation. With Berlin as a reference case, there are already talks ongoing to export the InfraLab approach to cities in Asia.

The Berlin leg of our journey also included a visit to ECF Aquaponic Farm Systems, which has built Europe's largest urban aquaponic farm in the city, producing fish and high-quality vegetables.

ECF stands for efficient city farming. Its aquaponic farm systems ensure efficient food production because the water is used for both fish cultivation and subsequent vegetable production. Waste products from fish fertilise the plants in the greenhouses, and due to ECF's closed water cycle and its location, emissions from transportation and cooling chains are minimised.

The increasing importance of low-emission and market-driven, sustainable mobility of the future became obvious during our company visits in Stuttgart, capital of the state of Baden-Wuerttemberg (hub of Germany's innovative automotive firms such as Porsche and Daimler-Benz). Despite increasing competition among local and international car makers, leaders in business and government work hand in hand to advance electric mobility and fuel-cell technology.

One driver in terms of cluster governance and cooperative competition is e-mobil, an innovation agency of the state of Baden-Wuerttemberg. It coordinates the cluster "Electric Mobility South-West" (within the Karlsruhe-Mannheim-Stuttgart-Ulm region) to leverage the expertise of large, medium-size and small enterprises in vehicle construction, energy engineering, information and communication technology and the interdisciplinary field of production engineering with local research institutes.

Collaborative R&D projects for enhanced interlinked mobility or wireless charging are funded by the High-Tech Strategy 2020 of the Federal Ministry of Education and Research, BMBWF.

While in Stuttgart, we also took a closer look at the strategic business and innovation management systems of the Mann+Hummel Group. The company produces various filter elements for the local and international automotive and mechanical engineering industries.

Due to the entry of new types of electronics into the engine compartments in cars and respective space requirements, there is a need to adapt air filter systems to this new trend. The firm employs hundreds of research-and-development experts to ensure that it can respond to changing installation conditions and future electromobility trends with novel product solutions.

One major current concern is the need to develop cleaner solutions for both people and machines to combat the high levels of air pollution in cities, in particular pollution caused by particulates.

The World Health Organisation says that particulates are responsible for the deaths of around 47,000 people every year in Germany. Besides the usual culprits such as nitrogen dioxide and nitrogen oxides (NOx), sulfur oxides (SOx), carbon dioxide (CO₂), carbon monoxide (CO), ammonia (NH₃), volatile organic compounds (VOC) and ozone (O₃), research is focused on understanding small particulates, which are fine enough to penetrate deep into human lungs, causing chronic lung and heart diseases.

Particulate vehicle emissions come not only from the exhaust but also from braking and tyre and road ab-

rasion.

Electric vehicles are not entirely pollution-free, although they are often labelled as zero emission vehicles. Mann+Hummel's so-called "Fine Dust (*Feinstaub*) Eater" project, with test vehicles operating in the air-polluted city of Stuttgart is a response to this threat. One commercial challenge is to figure out how to monetise fine dust-related data collected via test cars and stationary particulate matter filtration stations.

'DUAL TRAINING'

At the Mercedes-Benz Training Centre in Esslingen-Bruhl, we gained deeper insights into Daimler's "dual" training and higher education approach. A key feature of the German dual system of vocational training is the close integration of both companies and educational institutions in teaching and training, so that apprentices can apply newly acquired competencies within their companies.

As we saw during a tour of the Mercedes Benz plant in Sindelfingen, the success of the German automotive cluster and participating firms depends on the country's high-quality technical and vocational training system. Trainees are well paid and acquire core skills in an environment conducive to learning through highly skilled master craftsmen and on the basis of systematic training plans.

One of the outcomes is a high-performance work culture (a hallmark of Germany's *Mittelstand*), which acknowledges the wisdom of older employees and the need to respond to automation and digitalised (Factory 4.0) production systems trends with a "human" work regime. This in turn provides fertile ground for both greater production efficiency and technology innovation as we observed during plant visits in Stuttgart and Berlin.

The study tour was instrumental in appreciating the reasons behind Germany's transition to a low-carbon, environmentally sound, reliable and affordable energy supply. The focus on renewables has become an important driver behind the success of "Berlin Valley" as an increasingly dynamic hub for digital entrepreneurs and startups driven by deep smarts, low rents and a vibrant alternative innovation culture.

Besides a better understanding of the roots of Germany's economic success, the importance of engineering excellence as a source of national wealth creation and competitive challenges ahead, such as the rise of the autonomous vehicle, the Stuttgart visit reminded us that there can be no smart city without clean air.

It is perhaps ironic that the authorities in this traditional automotive hub are increasingly forced to trigger fine dust (*Feinstaub*) alerts when pollution is particularly high, nudging commuters to use public transport, car pools or electric taxis. Here, we note that how fine dust affects Singaporeans has yet been studied.

We were further humbled by Germany's deposit and return system for non-refillable beverage containers, a core element towards a truly zero-waste country where all discarded materials are resources for others to use.

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