

## Highlights of “Our Digital World” exhibition

### i) Protection of data

Digital tools make it easier to share data and information between people and systems. A culture of data openness plays a key role in allowing government, industry and the public to create apps and online platforms to enhance the delivery of services. Against this backdrop, the protection of personal data has become paramount. There are legal safeguards such as the Personal Data Protection Act to govern the collection, use, and disclosure of individuals’ personal data.

The digital planning tools exhibited protect an individual from being identified by aggregating and anonymising data. Likewise, the government’s open data portal Data.gov.sg and the SingStat website provide aggregated data for public’s use and access. Everyone has a role to play to ensure a safe environment that protects personal data as we harness the benefits that data can bring.

#### Data.gov.sg (Infocomm Development Authority of Singapore)

Data.gov.sg is the government’s one-stop portal to make publicly available datasets from 70 public agencies in various areas, such as healthcare, education, transportation and the environment. It uses data visualisation and data-driven articles to make these datasets relevant and understandable to the public. Currently, the portal’s datasets have enabled the creation of over 100 applications.

#### SingStat (Department of Statistics)

The Singapore Department of Statistics provides reliable and relevant official statistics that are disseminated through the SingStat website, and mobile and electronic services to support Singapore’s social and economic development. Public agencies, policymakers, businesses, researchers, analysts and general public make use of the statistical information as inputs for their research, analysis, policy formulation and decision making.

## ii) **Connecting people and places**

Transport plays a big role in our lives. Analytical tools can help experts, policy makers and industry leaders better understand, visualise and simulate travel mobility patterns. More accurate knowledge of how people commute will allow planners to think of targeted strategies to improve the transport network.

### GeoAnalytics (Dataspark)

GeoAnalytics provides important insights for urban planners to understand commuters' travel patterns. Anonymised and aggregated cellular data is used to analyse MRT trips and report on the number of people on station platforms, flows of people transferring between lines at MRT interchanges, and the expected travel time for each possible route within the network. This information can be used to calculate train frequencies to minimise waiting time during peak hours, determine the direction of station escalators to facilitate commuter movement, and make other operational decisions.

### Future Mobility Sensing (Singapore-MIT Alliance for Research and Technology)

Transport surveys may not always accurately capture what people do as there may be mistakes in self-assessments of the travel times or wrong recollections of locations. Future Mobility Sensing removes this uncertainty by using a smartphone app to collect individuals' daily travel and activity data e.g. stop locations and times, travel modes taken between stops etc. Tested in Singapore with LTA's Household Interview Travel Survey, the pilot recruited over 1,500 users and produced a rich dataset that revealed people's travel and activity behaviour, and allowed planners to understand gain insights on how to improve the current transport system and urban developments to better support residents.

### MATSim Singapore (Future Cities Laboratory of the Singapore-ETH Centre)

The Multi-Agent Transport Simulation Toolkit (MATSim) Singapore is a transport demand model that provides planners with an in-depth understanding of the interaction and interdependency of land use, travel demand, transport supply and travel behaviour. A synthetic population representative of Singapore's actual population is generated, with everyone in the synthetic population assigned a place of residence and daily activity schedule. Their mobility flows are then simulated,

taking into account various factors influencing mode and route choice such as car availability, road network capacities and public transport schedules. The model, which is validated against actual traffic conditions, allows planners to evaluate and compare the transport system performance for future development scenarios and test the impact of new developments such as the use of autonomous vehicles and shared mobility solutions.

#### Urban Engines AWARE Dashboard (Urban Engines, Urban Redevelopment Authority)

Urban Engines uses sophisticated algorithms and big data infrastructure to process anonymised EZ-link data to reconstruct and visualise commuter flows, mode of transport and their utilisation. The Urban Engines platform also allows planners to map the origin and destination of commuter trips made via public transport. These functions allow planners to understand existing public transport constraints as well as commuter patterns and mobility choices better, in order to identify areas for improvement.

For example, the platform can show the breakdown of all the destinations for commuters travelling from Tampines in the mornings. These largely correspond to the work and school locations of Tampines residents. It can also outline the percentage of commuters who have travelled from Tampines to these destinations. The platform can show the reverse during evening peak hours, when large numbers of workers in the CBD travel home.

#### SimMobility (Singapore-MIT Alliance for Research and Technology)

SimMobility is an integrated simulation platform for investigating how possible transport scenarios such as new MRT lines, autonomous vehicles and ERP adjustments can induce in shifts in the distribution of people, activities, and in land use and transportation networks in the short-term, mid-term and long-term. It helps urban planners test and understand the implications of these different scenarios.

#### Public transport monitoring (Land Transport Authority)

LTA uses data analytics to calibrate and improve policy and planning processes. Using anonymised transit card data, LTA monitored changes in travel demand

following the opening of the Downtown Line 2 by analysing both road and rail travel data to deduce changes in travel behaviour. Insights gained, such as commuters switching from long bus journeys to train journeys, enable LTA to adjust bus deployment and better serve commuters.

Integrated public transportation visualisation and simulation platform of Singapore (A\*STAR Institute of High Performance Computing)

This platform showcases a full-scale, agent-based model of Singapore's public transportation system that captures and visualises existing dynamics on the system. Planners can run simulations, looking at various scenarios such as train overloading and platform overcrowding to identify potential bottlenecks in the system. This platform can serve as a decision-support tool for transport planners to assess strategies to improve the efficiency of the MRT system with regard to changes in infrastructure, demographics and public transportation ridership.

**iii) Potential of information for city planning**

Planning for a city requires planners to anticipate future demand by understanding how different factors shape the way we live, work and play. Digital planning tools allow planners to overlay and stitch different datasets together to see new patterns and uncover new insights. Such tools allow for greater accuracy in planning and confer the ability to test alternate scenarios quickly to explore new possibilities in planning.

GEMMA (Urban Redevelopment Authority, Institute for Infocomm Research)

The GIS-Enabled Mapping, Modelling & Analysis (GEMMA) platform provides planners across agencies with rich, comprehensive planning data assembled from multiple sources to generate and assess different land use planning scenarios. GEMMA's advanced spatial and statistical tools allow planners to compose and test multiple development scenarios quickly, assess the scenario's implications on infrastructure, transport, land development and redevelopment, and measure the performance of different options. Planners can then identify more optimal strategies to deliver better planning outcomes.

For example, planners can review the future development plans around public transport nodes, such as MRT stations, with GEMMA. GEMMA is used to develop land use scenarios that reflect different mixes of land use around these public transport nodes, and the scenarios are assessed based on liveability criteria, such as the proximity of housing to parks, rail stations and retail. Planners can then make a more informed decision on which development strategy to adopt.

#### **iv) Modelling our comfort**

Like other densely built-up areas, Singapore is susceptible to temperature increases due to global warming and the urban heat island effect. Climate change has led to less stable environmental conditions. It is important for planners to understand the environment and plan ahead to mitigate the effects of climate change.

#### QUEST (Urban Redevelopment Authority, National Environment Agency, A\*STAR Institute of High Performance Computing)

With the Quantitative Urban Environment Simulation Tool (QUEST), planners can simulate the combined impact of external climate conditions and urban developments on people's thermal comfort levels at multiple planning scales. Global and regional climate information such as temperature and wind patterns is downscaled using a global climate model for Singapore's context. This model is then integrated with an urban-scale computational fluid dynamics model that simulates the impact of the localised urban environment on temperature, wind, and thermal comfort levels. The simulations can be done at multiple planning scales, ranging from island-wide to local housing estates, to a single building. Besides current environmental conditions, future climate change and urban development scenarios can also be simulated to guide long-term plans.

For example, planners can use QUEST to assess the impact of land use plans for large development areas such as Tengah and Paya Lebar on temperature and wind for surrounding towns and identify possible mitigation measures such as retention of greenery and safeguarding of wind corridors. At the district and site level, planners can analyse how new developments affect ambient temperature, and simulate how various planning and design interventions can alleviate the urban heat island effect. Mitigating measures such as increasing greenery and adjusting building orientation

and massing can then be considered early in the planning and design stage for better shading, ventilation and a cooler environment.

#### UM-MIST (Housing & Development Board)

The Urban Microclimate Multi-physics Integrated Simulation Tool (UM-MIST) is a modelling tool that uses hi-res 3D city models to simulate the interaction of environmental conditions with the urban landscape. This tool is able to model how various environmental factors such as wind, temperature, and solar radiation impact each other individually, as well as their effects on buildings, water bodies and vegetation. With UM-MIST, HDB town planners, architects and engineers can visualise and analyse the effects of microclimatic conditions such as wind flow, solar irradiance and shaded areas within a HDB town. This will help determine how best new HDB flats can be designed and sited to provide maximum thermal comfort and a more conducive living environment for residents.

#### **v) Empowering the community**

The growth of GIS technology and availability of digital information play key roles in the creation of apps and online platforms. These empower the community by giving them room to create ground up initiatives that can develop niche products and services to unlock social value and build relationships within communities.

#### Food from the Heart Volunteer Broadcast System (Food from the Heart)

Food from the Heart is a non-profit organisation that collects and redistributes unsold, wholesome bread from bakeries and hotels to welfare homes, senior activity centres, and other under-privileged families under their Self Collection Centres programme. It relies on 1,700 active volunteers to deliver bread to 156 locations all over the island. Five friends came together for GeoHackathon 2014 to create a mobile app called the "Volunteer Broadcast System", with OneMap as its base. The GeoHackathon initiative was organised by the Singapore Land Authority to encourage greater use of geospatial technology in solving societal issues. When regular volunteers are not available, the app sends notifications and alerts available volunteers to delivery routes that are in need of volunteers. The process is made possible by geo-tagging the availability of volunteers according to specific areas.

### myResponder (Singapore Civil Defence Force and Infocomm Development Authority of Singapore)

The SCDF myResponder mobile app uses geolocation to help SCDF's 995 dispatchers notify users to cases of cardiac arrest in their immediate vicinity. The app also directs users to the nearest available automated external defibrillator (AED) based on the national AED registry. These Community First Responders are able to render assistance before the arrival of emergency responders, thereby increasing the chances of survival for the victims.

### HoodChampions (HoodChampions)

HoodChampions is an internet platform that connects people in the same neighbourhood through competitions. Residents in the same neighbourhood can take part in the competitions to make friends and give back to the community. Since the platform launched in March 2016, it has organised two national events; Singlish Charades and The Morning Greeters Run.

### **vi) Sensing the city**

Planning and policies need to be responsive to the needs and views of the people. Smart tools can help planners and policymakers gather and analyse the sentiments to add a richer layer of information in the planning process.

### National Science Experiment (National Research Foundation Singapore, Ministry of Education, Singapore University of Technology and Design)

The first phase of this island-wide outdoor science experiment was conducted in 2015 and involved over 43,000 students from primary and secondary schools and junior colleges carrying a specially-designed sensing device to collect mobility data as well as environmental data such as temperature, humidity, atmospheric pressure, light intensity and sound pressure levels. The data was transferred wirelessly to an online portal where students could view their results as well as the aggregated data of fellow participants. From this experiment, students learnt about big data and how it can be applied to manage real world issues. The data also offered meaningful insights for urban planners in terms of environment maps, Wi-Fi coverage and participants' travel patterns.

Social media analysis for informed public response (A\*STAR Institute of High Performance Computing)

Understanding public opinion can improve the quality and timeliness of information which agencies use to base their policy-making. In this project, researchers conducted social media analysis for an avian influenza outbreak originating overseas where they discovered, among other findings, that the reporting of new influenza cases on Sina Weibo was significantly faster than traditional channels. Having access to such timely information can facilitate the understanding of the patterns, causes and effects of an unknown disease, which is crucial for developing effective prevention and control measures.