
Smart cities in South East Asia: Singapore concepts - an HCI4D perspective

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Abstract

In this paper we discuss the concept of smart city in the context of South East Asian (SEA) countries focusing on ideas with potential applications in HCI4D. We argue that smart city concepts can also be introduced in developing SEA countries despite technological challenges and moderate basic infrastructures. We take Singapore as a reference and try to identify HCI applications with “translation” potential. Singapore, despite being a developed country is a good source of inspiration as it shares similar contextual problems with other developing SEA countries from the region.

Author Keywords

Smart cities, ICT infrastructure, HCI4D

ACM Classification Keywords

H.5.m.Information interfaces and presentation (e.g., HCI): Miscellaneous; Management; Design

Introduction

By 2050, more than two-thirds of the world’s population is expected to live in cities [1]. This growing trend is more prominent in developing countries, and in particular in Asia. The shift from a rural to an urban-dominant planet signalizes more strongly than ever the need of the cities to be supported in their struggle with

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the challenges imposed by the growth. In this context, in 2008, the smart city concept was introduced as part of IBM's Smarter Planet initiative [2]. The smart city builds around the idea that trillions of digital devices are connected daily through the internet and produce a vast amount of information. Such devices can be computers, laptops, tablet, mobile phones, but also cars, home appliances, house monitoring and transportation systems. The information gathered from these devices can be turned into knowledge by using computational power and data analytics. Further, the knowledge can be used by a smart city to reduce costs, improve productivity and communicate more effectively with its citizens [3].

What makes a city smart?

In order to build up a smart city, urban planners need to take into account the needs of the city. Cities around the world have different needs and as such, there are no prescriptive ways on how a smart city concept should be built. However, regardless of implementation there are some ICT requirements essential for a city to be called smart. These are [4]:

- 1. Deployment of fiber optic and wireless broadband internet** available through the city to all citizens. This requirement is crucial for continuous data exchange between city and devices, as well as for the use of smart digital applications.
- 2. Use of smart devices, sensors and agents embedded in the physical space** to ensure that real-time data is provided to the city administration.
- 3. Developing infrastructures of web-based applications and e-services** across various sectors

such as local business, tourism, transportation, education, health services etc.

These requirements are important to create smart urban spaces, such as energy efficient buildings, Wi-Fi hotspots and information kiosk in the cities. An influential role has the local government, as well as service providers, policy makers and urban planners.

Can we have smart cities in developing SEA?

The key features described above suggest that smart cities are a developed world concept. Can such concepts be implemented in developing countries as well? Potentially yes! SEA developing countries are still facing challenges concerning broadband penetration especially in rural areas. But, in the urban areas the situation is improving: major cities are now connected to a broadband internet. Also, wireless 4G broadband is currently available in Thailand, Indonesia, Philippines, Brunei and Cambodia [5]. In terms of smart phones ownership, recent statistics show that, for example Indonesian, Vietnamese and Thai markets are reporting high growth of more than 30 per cent in generated revenue and even more in sales volume in 2014 [10].

However, despite the rise of internet in households and smart phone ownership one problem remains, and that is: people don't make use of the full broad band capabilities; many deploy the internet only to search for personal information, check emails or use messaging applications. According to survey data, the main reasons for this poor internet usage are the lack of relevant content and highly fragmented online information [6]. As such, we believe there is strong need for HCI4D approaches to design applications for the population served, such as e-government, e-education, e-health, e-business or e-agriculture service.

What can be done?

At this stage a good starting point would be to study the experience of other cities in collecting big data and implementing smart city concepts. In this context, we propose Singapore as reference. The city offers an interesting example on how to develop and implement urban solutions for different sectors. Transportation, energy management, health, environmental sustainability are just a few economic sectors in which Singapore has done substantial work towards creating a smart city network. Also, due to its geographical location and mixed Asian population (Chinese, Malay, Indian) Singapore shares many commonalities with neighboring SEA countries representing a good test bed for the Asian market. Surely, technological advances cannot be achieved over night, but there are areas in which immediate actions can take place [7]. These are:

- **Monitoring energy consumption** – due to population growth the energy consumption is increasing in Asia and Pacific faster than other parts of the world [9]. As such, quick solutions need to be found. In terms of water consumption, Singapore has done exemplary progress towards water self-sufficiency applying low cost desalinization, catchment and recycling methods. Besides, the government is planning to install real-time meters in household to enable people to visualize their energy consumptions on the spot. Also, since January 2015 a new app is launched to enable Singaporean resident to compare their own energy and water consumption levels against the average and/or most efficient consumption of their neighbors [10]. These two initiatives, i.e. real time consumptions meters and persuasive applications are technological examples for possible HCI4D solutions.

- **Transportation**– insufficiently developed public transport, lack of effective road systems and heavily congested roads are frequent issues in many cities across SEA. Even though Singapore has a very efficient road network of roads and probably one of the best public transportation systems in the world, it does experience daily traffic jams during peak hours. An effective solution to release traffic congestion proved to be the Electronic Road Pricing (ERP) system, introduced in Singapore in the mid '80s. The system is based on a pay-as-you-use principle: motorists are charged when they use priced roads during peak hours [11]. At the beginning, the traffic data collection was done manually. Only later, sensors and infrared cameras were introduced. Currently, online updates are made accessible, enabling traffic applications to provide travelers with logistical information: examples include information about public transport arrival, traffic maps, taxis availability or parking space occupancy. Such traffic applications could also be introduced in developing SEA countries by using simpler technological solutions - for example, using a manual scanner instead of sensors and infrared cameras. Further, social media and text messaging could be used to disseminate and propagate the traffic information.

- **Monitoring pollution** – Most SEA countries are affected by haze, water and industrial pollution. Singapore is not an exception. As such, managing pollution has been a key priority on the local development agenda. The pollution level is usually monitored by the Singapore National Environment Agency (NEA) which constantly assesses the levels of environmental impact and discloses the information to the public. Apart from the NEA, there are also initiatives coming from the private sector: for example,

uClim is a web based service developed by a private start-up company. The service provides real-time information concerning temperature, relative humidity and air quality. Additionally, it enables users to visualize micro-climates across the island. Such online services combined with public monitors display of pollution discharges could be used in developing SEA countries to raise awareness towards environmental pollution.

- **Disaster management**– SEA is prone to frequent natural disasters, such as earthquakes, tsunamis, storms and floods. After the Japanese tsunami in 2011 several smart phone applications were developed for the SEA countries: *NOAH* for the Philippines, *Flood patrols* for Indonesia, *Water4Thai* for Thailand and *Tsunami Tracker* for the whole Asia pacific area; also *Disaster Alert* and *ubAlert* are useful tools for global disaster monitoring information. Apart from such services, in case of a disaster Singapore can make use of an internal alert system: the city has a network of civil defense sirens installed over 2000 strategic points around the island; the sirens can be activated in case of imminent danger, such as a natural disaster or a military invasion. This simple alert approach could be also useful in other SEA developing countries.

Conclusions

Building smart cities in SEA developing countries is still a challenging task due to moderate internet broadband coverage, technology costs and a less developed infrastructure. However, first steps towards creating a more integrated city concept are possible. A good starting point would be to study suitable ideas with “translation” potential from other countries that have already started building smart cities. Creativity and

adaptability to the local context are key requirements. Additionally, the successful implementation of a smart city concept will however depend, not only on governmental policies, but also on citizens’ willingness to become actively involved in the proposed legislative strategies and adoption of new technologies.

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