The Enhanced GSMA Smart City Index
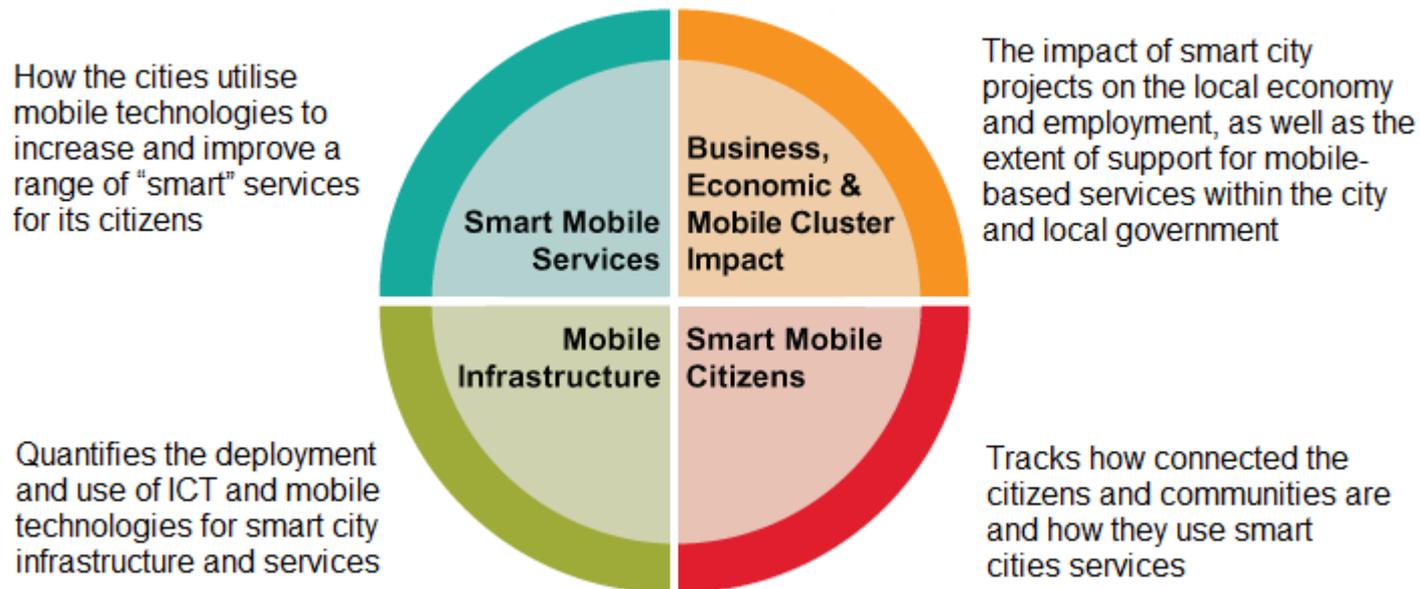
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GSMA Smart Cities Mobile Indicators

- The GSMA has developed a common set of indicators for measuring economics, infrastructure and social benefits of "mobile connected" smart cities.

How the cities utilise mobile technologies to increase and improve a range of "smart" services for its citizens

The impact of smart city projects on the local economy and employment, as well as the extent of support for mobile-based services within the city and local government

Smart Mobile Services

Business, Economic & Mobile Cluster Impact

Mobile Infrastructure

Smart Mobile Citizens

Quantifies the deployment and use of ICT and mobile technologies for smart city infrastructure and services

Tracks how connected the citizens and communities are and how they use smart cities services

http://smartcitiesindex.gsma.com/indicators/

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Data mining and searching

- 8 months of extensive search on relevant data for the established indicators by information experts.

- All data were retrieved from publically available resources.

- Challenges and solutions:
  - Information not available in English (tried Chinese and Arabic);
  - Only found potential organisation/department that may hold the needed data (dozens of emails were sent);
  - Only found data at country level but not for the specific city (the portion of the city was calculated);

Survey to determine indicator weights

- Survey to seek expert opinions regarding the importance of the 31 established smart city indicators.

- 101 responses were received – a big THANK YOU ☺:
    - 67% of the respondents has more than 5 years (45% has over 10 years) of working experience in the field;
    - 80% of the respondents felt confident with their answers;
    - Respondents are from many different sectors and all parts of the world.

- The weights of the 31 indicators were then determined and calculated by using the expert opinions.

The 6 chosen indicators

- The 6 indicators presented in the GSMA microsite map were selected due to 1) their importance and high weights in the smart cities index and 2) the current availability of data in all 11 cities involved:
  - NFC Point-of-Sale (POS) devices
  - Mobile feedback mechanism
  - Mobile apps
  - Mobile broadband
  - Smart video surveillance
  - Open datasets

Data transformation & normalisation

- To allow fair and reasonable comparison of smartness across different cities, all raw data collected were normalised through three steps/methods:

  Step 1: Data cleaning

  Step 2: Standard scores (z-score)
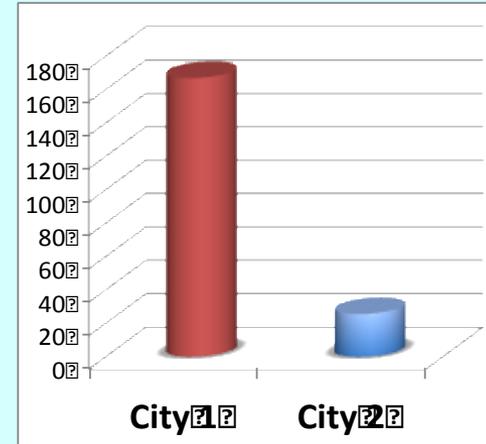
  Step 3: Cumulative distribution function (CDF)

Step 1: data cleaning

If the total number of NFC POS devices is 162,000 in City 2 and 17,000 in City 1 – Can we say City 2 is smarter than City 1 in this case?
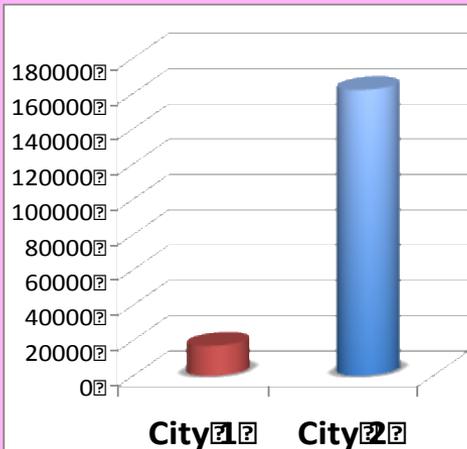
No, because the size of the two cities are very different.

When dividing the number by local area, in each square km, City 1 actually has many more NFC POS devices than City 2.

Note: further to POS, other aspects (e.g. number of users, transaction volume) should also be looked at in order to get the city's standing in the area of mobile commerce and NFC.

As the industry is so young and relevant data are limited, the current index just covers a few key components.

Step 1: data cleaning

In another example of smart meters in household, City 2 is far leading the way in total number.

BUT, when dividing the total smart meter number by the number of local households, only 40% of City 2's households got smart meters in contrast with 80% in both City 1 and City 3.
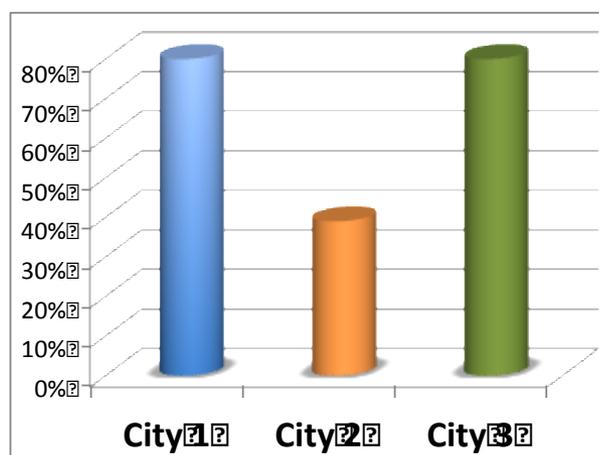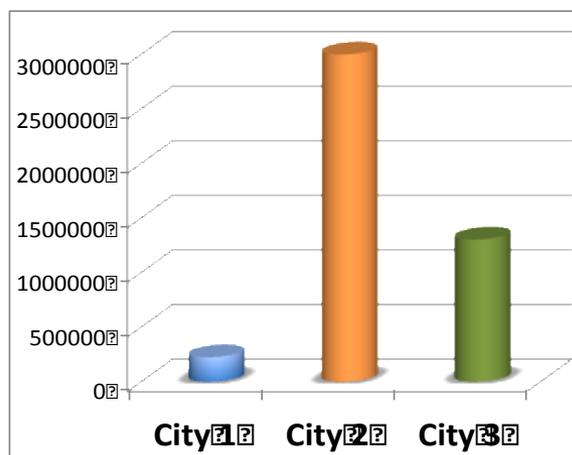
'Smart' highlights:

• Smartness is more easily to be achieved in smaller cities.

• Larger cities however may offer a larger market size and more opportunities for business.

• The smartness of a city and its potential market size should both receive high attention.

Step 2: the use of z-scores

- Data of different indicators have different formats:
  - NFC POS per km^2, values ranging from 0.22 to 166;
  - % of mobile broadband usage;
  - Number of city-sponsored mobile apps;
  - Number of open datasets, etc.

- Aggregating these numbers into a single score will be like adding *Apples* with Oranges.

Step 2: the use of z-scores

- The method of standard score (z-score) is used to normalise the data by using the formula:

$$z = \frac{x - \mu}{\sigma}$$

- All data of different indicators were transformed into z-scores, which are in the same format - no longer have percentages, numbers of devices/applications, etc.

	City 1	City 2	City 3
% of Mobile broadband	50.70%	19%	100%
z-scores	-0.191786	-1.379636	1.655563
No of city-sponsored apps	15	12	76
z-scores	-0.827582	-0.935956	1.376019

Step 3: the use of CDF

- Cumulative Distribution Function (CDF) is a very widely used probability theory in statistics.

- CDF scores are generated based on z-scores and shows the probability/percentage that a city is performing 'smarter' than the other cities under comparison:

  - CDF scores have values between 1 and 0 – so no extreme values;

  - For the deployment of NFC POS devices, Barcelona receives a CDF score of 0.96 (can be read as about 1), it means that in this indicator Barcelona is performing better (or 'smarter') than all other (100%) of the cities involved in the analysis.

GSMA Microsite Map

http://smartcitiesindex.gsma.com

Highlights of results

- Barcelona is doing particularly well in NFC POS (with a CDF score of 0.96 or 96%) and smart video surveillance (0.92)

- Hong Kong is particularly good at city-sponsored mobile apps (0.91) and mobile broadband (0.96)

- Singapore is very good at open data set (1) and city-sponsored mobile app (0.96)

- Shanghai is very strong in smart surveillance (0.95) and city-sponsored mobile apps (0.88).

- Dubai's achievements in many indicators are above average (e.g. 0.64 in city-sponsored mobile app, 0.65 in mobile broadband, 0.57 in smart meter in household) - Dubai has a well balanced development in different smart city aspects.

Conclusions

- All 11 smart cities have their own strengths but also areas required further development.

- Many new projects have been initiated in different cities - so the rankings of smart cities are expected to be changed rapidly and constantly.

- Studies of smart cities will need to be done from multiple angles (e.g. index to show current smartness of cities, estimation of market size of smart cities).

Thank you for your attention

Any questions?

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