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# Levels of Public Trust as the driver of Citizens' Perceptions of Smart Cities: the Case of Hong Kong

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## Abstract

Using Hong Kong's smart city development as the case study, this paper aims to discover the influence of public trust on citizens' perception of Hong Kong's smart city performance in an international dimension, comparing with the smart city ranking by research agencies. Our central investigation further focuses on the association of public trust and digital trust, using COVID19 contact tracing app as an example. This paper uses data from a Hong Kong-based territory-wide survey in 2021 to conduct the analysis. The result suggests a positive relationship between public trust, subjective perception and digital trust, and supports that public acceptability is a cornerstone of an effective public policy.

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*Keywords:* citizen perception; digital trust; public trust; smart city development; smart city ranking

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## 1. Introduction

Smart city assessment tools are currently gaining attention, as a consequence of the thriving popularity of the smart city concept [1, 2], and the ongoing smart city race between cities. City rankings are used by local municipalities as evidence to prove their success in this competition [3]. While most city assessments are conducted by analysing the cities' actual performance via real-time data, the local citizens' perceptions of their own cities in terms of development status and international comparison are rather overlooked. To remedy this deficit and fill in this research gap, this

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paper draws upon a territory-wide survey, conducted by the Hong Kong Public Opinion Research Institute from March to April 2021, on the topic of trust and the smart city. The survey aimed to understand the local citizens' current levels of trust in urban technologies and smart city providers, as well as in public authorities in general [4]. The question which forms the main basis of this article concerns how Hong Kong is perceived from the perspectives of local citizens in relation to the international image of the city, and how this supports or hinders Hong Kong's smart city development.

## 2. Literature Review

The article discusses smart city development in Hong Kong and its comparative perception alongside other Asian cities. After reviewing smart city definitions in general, the article then specifically focuses in the Asian context. At its heart, the article reviews the smart city indices produced by various research agencies and compares these indices with the survey results of the Trust in the Smart City project.

### 2.1. Smart city definition

The term “smart city” was first employed in the book entitled “The Technopolis Phenomenon” in 1992 [5]. It was initially used in the United States to present the increasing application of information and communication technology (ICT) in modern urban infrastructures in the 1990s [6]. It has increasingly come to encompass other aspects of urban society, such as embedding social justice in smart city initiatives, and promoting the growing sense of citizen participation enabled by urban technologies [2, 7, 8, 9]. The “fuzzy concept” of the smart city has produced numerous similar terms such as digital city, intelligent city, knowledge city, senseable city, and wired city [3, 6, 7, 10, 11, 12, 13, 14]. Smart city is indeed a multifaceted concept, and there is still no general agreement and standard definition of the term “smart city” [2, 3, 6, 14].

To build Hong Kong into a world class smart city, the Hong Kong government published the second edition of The Hong Kong Smart City Blueprint 2.0 in December 2020 (original in December 2017) [15]. The Blueprint outlines measures with regard to six major smart areas: mobility, living, environment, people, government and economy, which are the same as the general agreement on six smart city dimensions identified by the Centre of Regional Science at the Vienna University of Technology (2007) [16]. To review the citizens' common understanding on smart city definition, table 1 shows the descriptive statistics of a question in the survey regarding the six smart areas and the respectively deemed importance by the interviewees.

Table 1. Descriptive statistics of question 3

Smart areas (Q3*)	Valid number	Missing number	Mean	Standard deviation
Mobility (Q3a)	800	8	7.3	2.4
Living (Q3b)	796	12	7.3	2.5
Environment (Q3c)	797	11	7.4	2.4
People (Q3d)	789	19	7.1	2.6
Government (Q3e)	786	22	6.7	2.7
Economy (Q3f)	778	30	6.6	2.6

\*Q3: Please tell me how important or unimportant do you think these areas are respectively.  
 [“Don't know” and “Refuse to answer” as missing data]

The results show a general understanding of the smart area of mobility, living, environment, and people, as these four areas had the highest mean – deemed as the most important. In contrast with these four areas, government and

economy had relatively low means. This example shows that the democratized smart city concept in Hong Kong emphasizes the social dimension and sustainability.

## 2.2. Smart city indices

Differing in theme, level of measurement and scope of coverage, various smart city indices from different agencies are available for evaluating cities' performance, strength, and weakness [2, 3, 14, 17, 18, 19]. Several scholars have also sought to build a system of indicators and statistical methods as the benchmark of evaluation [20, 21]. Despite the questionable validity of smart city indices as a new assessment tool due to the distinct interpretations of the smart city, Hong Kong is ranked in a high position by the best performed smart city index – the Cities in Motion Index (CIMI), identified by Lai and Cole (forthcoming) [22, 23]. Nevertheless, the survey demonstrated that Hong Kong was rather negatively perceived by local citizens, who viewed its smart city development as being below that of neighbouring Shenzhen. This finding challenges the ostensibly objective evaluations of the existing smart city indices, based on actual city data. In addition to CIMI, table 2 demonstrates the brief results from the survey and the rankings obtained from other smart city indices.

Table 2. City ranks and comparison with question 11

City	Smart City Survey		Cities in Motion Index [23]		Innovation Cities Index [24]		Smart City Governments [25]	
	Q11 result* (%)	Rank	Out of 174 cities	Rank	Out of 500 cities	Rank	Out of 235 cities	Rank
Hong Kong	6%	5	10	3	49	6	41	6
Singapore	28%	1	9	2	5	2	1	1
Taipei	5%	6	27	5	23	4	19	3
Tokyo	13%	3	4	1	1	1	22	4
Seoul	7%	4	19	4	7	3	2	2
Shenzhen	23%	2	109	6	26	5	25	5

\*Q11: Which of the following cities do you think are doing the best in the development of smart city? ["Don't know" and "Refuse to answer" as missing data]

The comparison shows a significant difference between the survey and the other smart city indices. Except for Singapore which has consistent high rank, inconsistency can be observed for all the other cities. Hong Kong's image with local interviewees in the survey was worse than the assessment from the CIMI, while that of Shenzhen was much better than its actual performances from the three indices. In other words, the subjective perceptions of these two Chinese cities from local Hong Kong citizens are inconsistent with their objective assessments, as measured by the smart city indices. This paper hence explores the reason for this expectation discrepancy, discovers why Hong Kong has a bad international image among its own local citizens, and how this relates to the levels of public trust and subsequently the acceptancy on urban technologies.

## 3. Methods

The findings presented here are drawn from a survey on trust and the smart city, mainly centred on Hong Kong. A territory-wide survey (n. 808) formed a key part of the primary data collection (and analysis) of the research project upon which the article is based. Ultimately, the project aimed to test the importance of public acceptability for an effective public policy [4]. The survey was conducted between 24 March to 16 April 2021 in Hong Kong via random telephone interviews by real interviewers. The target population was Cantonese-speaking Hong Kong citizens of age 18 or above. Eventually, there were 808 successful cases, including 400 landline and 408 mobile samples, which made

the effective response rate 48.5%. There were thirteen questions in this survey, covering the citizens' attitudes to the six smart areas of the Hong Kong Smart City Blueprint [15], citizens' perceived features of smart city development, citizens' acceptancy of technologies, and the citizens' trust in public and private institutions. Table 3 presents the three questions involved in this paper, including question 11 as the main question, question 7 about the citizen trust in public authorities, and question 4 about the viewpoints on the COVID19 contact tracing app.

Table 3. Three questions for analysis

No.	Question	Measure	Valid number	Missing number
4	How important or unimportant do you think it is to use innovative technology to cope with the epidemic, such as launching "LeaveHomeSafe", health codes, etc.?	Scale	798	10
7	How much do you trust or distrust the following organizations or modes in providing smart city-related services?	Scale		
	[Hong Kong Government] (Q7a)		794	14
	[Legislative Council] (Q7b)		776	32
	[District Council] (Q7c)		784	24
11	Which of the following cities do you think are doing the best in the development of smart city?	Nominal	664	144
	[Hong Kong, Singapore, Taipei, Tokyo, Seoul, Shenzhen]			

Question 11 focused on the perception of Hong Kong in the international comparison, by asking the interviewees to choose their perceived best developed smart city out of the six provided Asian cities. Since Hong Kong, as one of the four Asian tigers, is always compared with the other three tigers (Singapore, South Korea and Taiwan), especially Singapore due to their similarities including colonial history, culture, and economy [26], all four cities were selected as the comparable cities when designing the survey questions. Tokyo was added due to its constant comparison with Seoul [27]. Under the similar reason, Shenzhen was selected also because of its neighbouring location with Hong Kong and its current branding strategy positioning itself as a high-tech city [28]. Question 7 is selected to reflect the current levels of public trust as an independent variable on citizens' perception (question 11). This question required the interviewees to rate their degree of trust in Hong Kong government, Legislative Council, and District Council as the public authorities providing smart city-related services. Question 4 was about the acceptancy of epidemic-related technology, which asked interviewees their opinions on "LeaveHomeSafe" app – the COVID19 contact tracing app in Hong Kong.

Our first research question centers on the perception of Hong Kong. Citizens' perception of their home cities could be interpreted as reflecting the efforts of city promotion, a strategy to increase cities' competitiveness [29]. In a further extrapolation, the subjective feeling towards the city might manifest the citizens' pride of the city. While some scholars affirm the positive linkage between local pride and public trust, confirmed by studies in Japan, South Korea, and China [27, 30], we aim to discover this relationship in the content of Hong Kong. Could this subjective feeling, related to the pride of the city, be influenced by the degree of citizens' trust in public authorities? In addition, we extend our research question to the digital trust. During the epidemic, the implementation of "LeaveHomeSafe" app sparked off the discussion of privacy and the trust issue regarding smart city policies in Hong Kong [31]. Using this as an example, our second research question studies the linkage between public trust and digital trust: is there any direct association between trust in the public authorities providing smart city-related services and the trust in the effectiveness of urban technologies? The two hypotheses of this paper are as below:

*Hypothesis 1: High levels of public trust induce a better "subjective" image of Hong Kong by improving citizen's perception of Hong Kong*

If the Hong Kong citizen trusts the Hong Kong government, the Legislative Council or the District Council, then the citizen also perceives Hong Kong as doing the best in the development of smart city compared with other Asian cities.

*Hypothesis 2: Acceptancy of urban technologies as the outcome of public trust in Hong Kong*

If the Hong Kong citizen trusts in the Hong Kong government, the Legislative Council or the District Council, then the citizen also embraces the implementation and usage of urban technologies.

**4. Results**

Table 4. Multinomial logistic regression of trust in public authorities and international comparison

Trust (Q7)	The best city in the development of smart city (Q11)					
	Hong Kong	Singapore	Taipei	Tokyo	Seoul	Shenzhen
Hong Kong government (Q7a)	0.269*	0.027	-0.335*	-0.196*	-0.158*	0.260*
Legislative Council (Q7b)	0.233*	0.059	-0.326*	-0.181*	-0.140*	0.245*
District Council (Q7c)	0.257*	0.06	-0.039	-0.07	0.091	0

\*p<0.05

Table 4 shows the coefficients as the analysis result of question 7 and 11 by multinomial logistic regression (dependent variable: nominal; independent variable: scale), while the values marked with an asterisk are significant. The positive value indicates a positive association: the higher trust in that public authority, the more likely to perceive that specific city as the best developed smart city. Our results show that if the interviewees had higher trust in the Hong Kong government or legislative council, they would choose Hong Kong or Shenzhen as the best developed smart city. In contrast with these two cities, Taipei, Tokyo and Seoul would be more likely to be chosen if the interviewees had lower trust in the Hong Kong government or legislative council due to the significant negative value. Trust in the district council only had a positive significant association with Hong Kong. In summary, the higher trust in the Hong Kong government, legislative council and district council leads to the higher possibility of perceiving Hong Kong as the best developed smart city. Therefore, boosting the public trust in these three public authorities can improve the international perception of Hong Kong from the view of local citizens, which supports the hypothesis 1.

Table 5. Correlations between trust in public authorities and importance of “LeaveHomeSafe” app

Trust (Q7)	Importance of the COVID19 contact tracing app (Q4)
Hong Kong government (Q7a)	0.714**
Legislative Council (Q7b)	0.664**
District Council (Q7c)	0.110**

\*\*p<0.01

The coefficients of the correlation analysis of question 7 and 4 (dependent and independent variables: scale) in Table 5 show the positive relationships between the trust in those three public authorities (Hong Kong government, the legislative council and, to a lesser degree, the district council) and the presumed importance of the COVID19 contact tracing app “LeaveHomeSafe”. The higher the level of trust in these three public authorities, the more likely citizens were to consider the COVID19 contact tracing app to be of high importance, and the more likely they were to use the app. The results support the hypothesis 2.

## 5. Discussion and Conclusion

The analysis positively supports the two hypotheses in this paper, indicating the positive relationship between public trust, subjective perception and digital trust. Figure 1 demonstrates the relationships of these three elements.

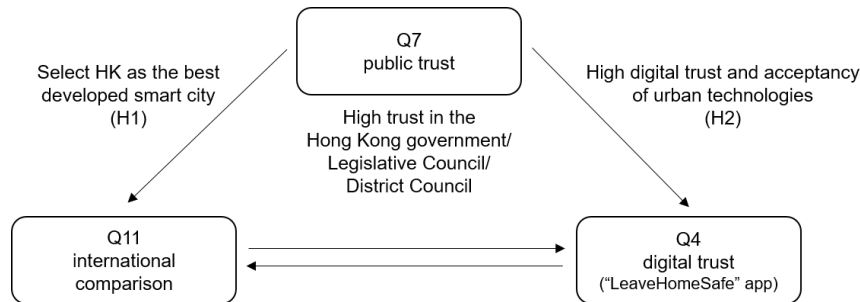


Fig. 1. Relationships of public trust, subject perception and digital trust

The relationships entail the outcome of raising levels of public trust: if the Hong Kong citizens have high trust in the Hong Kong government, legislative council or the district council, then they perceive Hong Kong as the best developed smart city in the comparison with other Asian cities, and they also have high trust in the implemented urban technologies (e.g. “LeaveHomeSafe” app). Although there is no directly proven association between the citizens’ perception and the levels of digital trust, we can assume the better perception of Hong Kong could lead to higher levels of digital trust due to the induced high public trust.

Coming back to the expectation discrepancy in chapter 2, the reason why Hong Kong has a worse international image among the local citizens than its actual performances in other smart city indices could be related to the levels of citizens’ trust in the public authorities. Having a closer look at the descriptive statistics of question 7 (in table 6), while “10” stands for “Trust very much” and “0” stands for “Distrust very much”, the direct interpretation of the survey data shows a below mean negative tendency from the interviewees, indicating that the current situation of citizens’ trust in the public authorities is quite low.

Table 6. Descriptive statistic of question 7

Trust (Q7)	Valid number	Missing number	Mean	Standard deviation
Hong Kong government (Q7a)	794	14	4.6	3.2
Legislative Council (Q7b)	776	32	4.1	3.1
District Council (Q7c)	784	24	4.5	2.7

Following the association established in the hypothesis 1, the current low public trust in Hong Kong leads to the bad citizens’ perception of Hong Kong, and thus explains the expectation discrepancy when comparing with the other smart city indices, in particular CIMI. We argue the same reason could also apply to Shenzhen to explain its much better subjective image with the local interviewees than the objective assessment from the other smart city indices, due to the possibly high trust in the Chinese government [30].

Based on the territory-wide survey regarding Hong Kong smart city development in 2021, this paper concludes that citizens’ trust in the public authorities, related to the public acceptability, is of key importance in ensuring an effective public policy, the embrace of technologies, and thus successful smart city development. We urge the city managers,

as well as the other research agencies and smart city stakeholders, to pay extra attention to perception as the subjective dimension during evaluation. The Smart City Index, from the IMD Competitiveness Center [32], is a good example of a city assessment tool using perceptions from residents as the basis for planning and evaluation.

We recommend that future studies should explore other factors influencing the citizens' perceptions of international smart cities. In table 2, differences are observed for Taipei, Tokyo, and Seoul. It is certain that we cannot explain this observation by the citizens' trust in the respective governments because of their residency, as we surveyed only Hong Kong residents. We would study the other angles such as city branding and cultural impacts in a future paper.

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