

Intentions of local governments and companies for transitioning to smart cities and related challenges

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1. Introduction

In order to assist local governments in examining the resolution of major urban problems (transition to smart cities) utilizing new technologies such as the IoT, NILIM has been engaged in research and development on the systematic arrangement of new technologies that can resolve urban problems and the method of evaluating plans related to the resolution of major urban problems through the use of new technologies.

This paper introduces some of the results of a questionnaire survey on urban problems and the use of new technologies that was conducted among local governments and companies in order to identify the actual situation for the systematic organization of urban problems and new technologies.

2. Summary of the questionnaire survey

The questionnaire survey was conducted with 61 local governments and 146 companies that applied in response to a call for proposals on needs and seeds for the realization of smart cities (hereinafter referred to as the "Needs and Seeds Survey") conducted by the Ministry of Land, Infrastructure, Transport and Tourism in FY 2018. The breakdown of the 61 local governments is: 5 prefectures; 34 government ordinance-designated cities, special wards, core cities, and special cities; and 22 other cities. (The questionnaire survey was conducted from December 2020 to January 2021 with a

response rate of 96.7% from local governments and 62.7% from companies.) The local governments were asked to choose from a list of urban problems they hope to solve by introducing new technologies, and they were also asked to answer with regard to new technologies they hope to introduce to solve each urban problem. On the other hand, companies were asked to choose from a list of new technologies that they possess, and they were also asked to answer with regard to urban problems that they hope to solve using new technologies. The list of urban problems and new technologies was developed after NILIM subdivided the items based on the major classifications (12) of the Needs and Seeds Survey. In addition, the questionnaire asked about introduction status and challenges in introducing new technologies. Figure 1 shows the breakdown of the contact departments of local governments that responded to the questionnaire, and Figure 2 shows the breakdown of industries of the companies.

3. Summary of the results of the questionnaire survey

(1) Differences in trends between local governments and companies in choosing a combination of urban problems and new technologies

The results obtained by classifying responses according to the major classifications are shown in Table 1 to indicate the difference between the combinations of urban problems and new

technologies chosen by local governments and the combinations chosen by companies. Among urban problems, many of the local governments and companies chose combinations including the items "(a) Transportation and mobility," "(c) Disaster prevention," "(d) Infrastructure maintenance and management," and "(k) Compact city development." On the other hand, many local governments chose "(e) Tourism" and "(f) Health and medical care," but a small number of companies chose them. Among new technologies to solve urban problems, many respondents chose "(1) Communication network and sensing technologies" and "(6) Applied technologies using (1) to (5)."

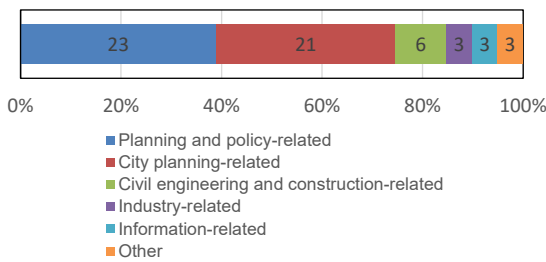


Figure 1: Breakdown of contact departments of local governments

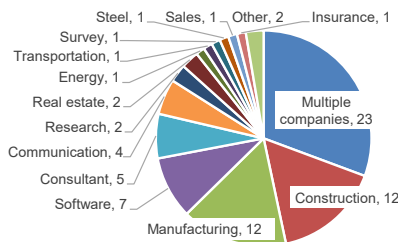


Figure 2: Breakdown of industries of responding companies

Table 1: Correspondence of responses between local governments and companies

Urban problem	New technology								Ratio of response from local governments	Ratio of response from companies
	(1) Communication network and sensing technologies	(2) Analysis and forecasting technology	(3) Data storage	(4) Data platform	(5) Data utilization (e.g., visualization technology)	(6) Applied technologies using (1) to (5)	(7) Automated driving technology, robots, and new technology (transportation)	(8) Other		
(a) Transportation and mobility	★	○	⊗	○	○	★	⊗	△	△	Example: ★ Areas where local governments and companies have the same intent ⊗ Areas that were less chosen by local governments and companies
(b) Energy	△	△	△	△	△	△	△	△	△	
(c) Disaster prevention	★	△	⊗	△	△	★	△	△	△	
(d) Infrastructure maintenance and management	⊗	△	★	○	○	⊗	△	○	△	
(e) Tourism	△	△	△	△	△	△	△	△	△	
(f) Health and medicare	△	△	△	△	△	○	○	○	○	
(g) Productivity improvement	△	△	△	△	△	△	△	△	△	
(h) Environment	△	△	△	△	△	△	△	△	△	
(i) Security	△	△	△	△	△	△	△	△	△	
(j) Logistics	△	△	△	△	△	△	△	△	△	
(k) Compact city development	⊗	△	○	△	○	⊗	△	△	△	
(l) Other	△	△	△	△	△	○	△	△	△	

(2) Challenges in introducing new technologies that local governments and companies recognize and their differences

Table 2 and Table 3 respectively show the results of summarizing challenges in introducing new technologies recognized by local governments and companies. First, for the introduction status of "Under consideration for introduction," the rate of "Unknown" is higher for new technologies that local governments hope to introduce. For the introduction status of "Under consideration for introduction," many companies also chose "Addressing urban problems" as a challenge, indicating that both have difficulty ensuring a correspondence between urban problems and new technologies. Next, an overall comparison of challenges in introducing new technologies between local governments and companies shows that many of them chose cost-related challenges in all new technologies. As the challenges of "(7) Automated driving technology, robots, and new technology (transportation)" and "(8) Robots and new technology (other than transportation)," both many local governments and companies chose "Current laws and regulations" in addition to cost-related items, which seems to be an obstacle in implementing them in society. For "(7) Automated driving technology, robots, and new

technology (transportation)," many local governments chose "Social acceptability," and it is expected that the understanding and experience of citizens with regard to using automated driving technology will mature.

4. Major issues for local governments in implementing smart cities initiatives

The results of this questionnaire showed facts including the following. Firstly, the correspondence of urban problems of local governments with new technologies of companies is making progress, such as in "Transportation and mobility," and so on; on the other hand, there are fields in which new applicable technologies are not sufficient, such as "Health and medical care," and in which urban problems that can be introduced are not recognized, such as "Analysis and forecasting technology," which reveals that information sharing on the correspondence of urban problems with new technologies is necessary. Secondly, the biggest challenge for the introduction of any new technology is the cost (introduction cost, operation cost, monetizing structure), and it is necessary to develop an evaluation method for quantitative forecasting and evaluation in the planning phase and during progress regarding the probability of solving urban problems with reasonable cost-effectiveness.

Table 2: Challenges for the introduction of new technologies (local governments)

Challenges in introducing new technologies	Desirable new technology to introduce to solve urban problems	Communication network and smart infrastructure	(1) Communication network and smart infrastructure	(2) Data storage	(3) Data platform	(4) Data platform (AI/Big data/Cloud computing)	(5) Data storage (AI/Big data/Cloud computing)	(6) Data platform (AI/Big data/Cloud computing)	(7) Other (new technology (other than transportation))	(8) Other (new technology (other than transportation))	(9) Other (new technology (other than transportation))	Unknown
Introduction cost	Introduced	34	9	9	14	16	46	20	4	7	0	
	Under consideration for introduction	20	18	20	9	13	42	9	6	3	6	
Operation cost	Introduced	3%	0%	0%	0%	19%	2%	5%	25%	0%		
	Under consideration for introduction	18%	12%	20%	22%	26%	26%	30%	23%	15%	33%	
Consensus building	Introduced	15%	22%	11%	7%	19%	20%	29%	0%	0%		
	Under consideration for introduction	19%	17%	19%	28%	32%	27%	22%	16%	54%	2%	
Social acceptability	Introduced	0%	0%	0%	0%	0%	0%	0%	0%	14%	0%	
	Under consideration for introduction	3%	3%	1%	9%	3%	5%	2%	3%	8%	2%	
Current laws and regulations	Introduced	0%	0%	0%	0%	0%	2%	5%	25%	0%	0%	
	Under consideration for introduction	1%	2%	1%	3%	3%	2%	12%	19%	0%	0%	
Installation place	Introduced	9%	0%	0%	0%	6%	7%	5%	0%	0%	0%	
	Under consideration for introduction	5%	5%	1%	0%	0%	2%	2%	0%	0%	0%	
Shortage of human resources	Introduced	0%	11%	22%	7%	0%	0%	0%	0%	0%	0%	
	Under consideration for introduction	3%	7%	5%	0%	0%	3%	1%	3%	0%	3%	
Concerns over Accuracy	Introduced	0%	11%	22%	0%	0%	0%	0%	0%	0%	0%	
	Under consideration for introduction	10%	15%	9%	0%	12%	3%	4%	3%	0%	0%	
Lack of index to measure effects	Introduced	6%	22%	0%	0%	6%	7%	0%	0%	0%	0%	
	Under consideration for introduction	3%	3%	2%	0%	3%	1%	4%	10%	8%	3%	
Ground for selecting products	Introduced	0%	0%	0%	0%	0%	0%	0%	0%	14%	0%	
	Under consideration for introduction	0%	5%	1%	3%	0%	5%	3%	3%	0%	0%	
Other	Introduced	12%	11%	0%	0%	19%	15%	0%	0%	45%	0%	
	Under consideration for introduction	8%	10%	20%	13%	6%	17%	4%	3%	15%	18%	
Blank	Introduced	66%	22%	44%	80%	25%	89%	10%	25%	29%	0%	
	Under consideration for introduction	24%	19%	9%	16%	15%	7%	4%	10%	0%	38%	

1) Percentage divided by the total number of respondents for each new technology
2) Questionnaires to local governments only

Table 3: Challenges for the introduction of new technologies (companies)

Challenges in introducing new technologies	New technologies in possession	Communication network and smart infrastructure	(1) Communication network and smart infrastructure	(2) Data storage	(3) Data platform	(4) Data platform (AI/Big data/Cloud computing)	(5) Data storage (AI/Big data/Cloud computing)	(6) Data platform (AI/Big data/Cloud computing)	(7) Other (new technology (other than transportation))	(8) Other (new technology (other than transportation))	(9) Other (new technology (other than transportation))	Unknown
Introduction cost	Introduced	88	27	61	36	38	89	15	14	4		
	Under consideration for introduction	26	12	15	12	9	32	5	4	3		
Operation cost	Introduced	63	13	62	18	19	97	41	8	0		
	Under consideration for introduction	19%	26%	18%	25%	21%	24%	27%	7%	25%		
Consensus building	Introduced	26%	30%	25%	25%	26%	25%	0%	0%	25%		
	Under consideration for introduction	5%	7%	22%	6%	5%	5%	16%	25%	0%		
Social acceptability	Introduced	2%	4%	2%	3%	5%	4%	0%	7%	0%		
	Under consideration for introduction	5%	0%	0%	0%	0%	2%	5%	0%	0%		
Current laws and regulations	Introduced	3%	0%	3%	0%	3%	3%	7%	0%	0%		
	Under consideration for introduction	1%	4%	0%	3%	0%	2%	0%	29%	0%		
Installation place	Introduced	4%	0%	0%	0%	0%	5%	15%	13%	0%		
	Under consideration for introduction	7%	4%	2%	0%	3%	3%	0%	0%	0%		
Shortage of human resources	Introduced	4%	0%	0%	0%	0%	1%	0%	0%	0%		
	Under consideration for introduction	2%	0%	2%	5%	5%	1%	0%	0%	0%		
Addressing to urban problems	Introduced	0%	0%	1%	11%	0%	0%	0%	13%	0%		
	Under consideration for introduction	1%	0%	2%	3%	5%	3%	7%	7%	0%		
Advantages over other companies	Introduced	10%	29%	6%	6%	10%	10%	0%	0%	0%		
	Under consideration for introduction	3%	0%	7%	0%	8%	7%	13%	7%	0%		
Earning structure	Introduced	0%	7%	3%	0%	0%	4%	2%	0%	0%		
	Under consideration for introduction	12%	30%	21%	23%	21%	19%	27%	14%	0%		
Other	Introduced	10%	29%	25%	22%	29%	35%	18%	0%	0%		
	Under consideration for introduction	5%	0%	8%	3%	0%	4%	7%	21%	50%		
Blank	Introduced	18%	14%	10%	28%	10%	12%	9%	0%	0%		
	Under consideration for introduction	21%	4%	11%	13%	3%	4%	13%	7%	0%		

1) Percentage divided by the total number of respondents for each new technology
2) Questionnaires to companies only

5. Conclusion

Currently, we are working on developing technical data by incorporating prior examples of ensuring the correspondence between urban problems and new technologies as well as information on their evaluation indicators, with reference to efforts in model projects by the central government.

☞ For more information:

Survey on Demands for New Technologies towards Smart Cities to Solve Urban Problems -
Questionnaire Survey for Local Authorities Having Use Cases and Demands and Companies Holding Smart City Technologies -

https://www.jstage.jst.go.jp/article/journalcpj/56/3/56_1413/pdf-char/ja