Demand Survey Method for Commercialization of Police Science Technology and Equipment

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Abstract

This study is a demand research for the selection of public safety science and technology equipment and suggests an empirical research method. The technology demand survey is the beginning of the selection of innovative technology. And it is the basis of collecting information required for the technology required in the market and helping to apply it to the field. The demand survey for police science and technology can reduce the uncertainty of crime prevention and help the smooth implementation of security policies. However, in Korea, adoption of security science and technology equipment was centered on social issues or researchers' opinions rather than the demands of field users. Until, there was no research has been conducted on the demands of field police officers for selection of security science and technology equipment in Korea. Also, there was no preferential study for the demand for security science and technology equipment. Therefore, this study proposes a methodology that can systematically identify the needs for the technology and equipment of field experts suitable for the public security situation for the selection of security science and technology equipment. Specifically, we propose a sample design for a technology classification system and a survey tool for technology awareness and satisfaction. It is expected that this tool will provide a classification system for security science and technology equipment selected for the Korean police and will help determine the priority of equipment suitable for the field.

Keywords: Commercialization, Police science technology/equipment, Demand Survey, Pre-test methods, Korean police agency

1. Introduction

The development of science and technology brings new social problems. 'Digital sex crimes', 'virtual currency', drug transactions' using the dark web, and mobile remote control 'financial crimes' are emerging as new crimes in online. Diversification, intelligence, and specialization of criminal methods require new technologies in the security environment. The Korean police amended the Police Act in 2014 for technical application of the public security environment. After then, efforts were made to advance public safety science and technology in 2015, and R&D projects in the public safety field were continuously proposed. As a result, the Korean police are operating the "Public Security Field Customized R&D Project (Police Lab 2.0)". In addition, RDT&E(Research, Development, Testing & Evaluation) was introduced as R&D for demonstration. Currently, the Korean National Police Agency is actively trying to apply the excellent science and technology of private companies to the public safety field. Despite the efforts to introduce science and technology to the public safety field, there are many difficulties in putting it into practice. The public safety research and development project, which is being operated under the leadership of the National Police Agency, is the first practical effort for the public security situation. However, there are some problems in the process of applying the security field. First, R&D projects are focused on forensic science or forensic science. These scientific techniques are different from life safety techniques as methods for specific types of crimes [1]. The R&D project should focus on the overall policing activities of the police and verify various technologies. Therefore, a systematic approach is required from the stage of idea discovery so that it can be immediately applied to the public safety field. Second, the practical application of public security science and technology is influenced more by government policies than by the demands of the on-site police department. Therefore, many of the demands of the public security field and users are excluded from the priority selection of public safety science and technology. The purpose of the development project tailored to the public security field is to demonstrate and commercialize science and technology for public security. However, the development of public technology required throughout the 4th industrial policy is prioritized rather than considering the technology for working-level practitioners first. Currently, the police's R&D operation of public safety science and technology uses a '**bottom-up**' method, and intermittently conducts a technology demand survey for working-level personnel. Demand survey types are classified by technology, area, and region, but priorities are not considered. Therefore, regional characteristics with different security environments should be considered. The introduction of the autonomous police system in the future requires centralized technology that considers different security environments, and systematic R&D collection in the public security field can be a tool for the entire national police activity. To this end, it is necessary to develop technology that considers regional characteristics and community issues in the technology selection stage [1]. Third, there is no systematic demand survey for field application in the public security R&D project. On January 17, 2022, the Korean National Police Agency announced a plan to promote the 'Science Security Public Research Performance Promotion Demonstration Project (Science Security Practical Application Project)' to apply source science and technology to public security sites together with the Ministry of Science and ICT. The scientific policing commercialization project will run from 2022 to 2027, with a total project cost of KRW 19.6 billion [2]. The science policing commercialization project consists of three areas. (1) Short-term R&D technology commercialization, (2) Technology commercialization of source technology in the public security field, (3) Research support for discovering demand for scientific security. The science and security technology commercialization project aims to

support the application of science and technology possessed by academics and companies to the public security field. However, the evaluation of the superiority of the original technology was still the key in the course of the project. This project overlooked the application of the successful results of the original technology to meet the needs of experts in the field of security. The step of scrutinizing the needs of on-site police officers was excluded. Overall, the current public safety science and technology project is a technology-oriented project that excludes the opinions of on-site police officers, and the development of specific tools for the preliminary stage is urgently needed. The purpose of this study is to develop a technology selection tool that reflects the opinions of field experts for public safety.

2. Background

2.1 Technology for Demand Survey

Demand survey research is the key to decision-making on the direction of technology development. It plays a decisive role in implementing policies and tasks by predicting user needs and reducing technology instability [3]. The first stage of technology development is a demand survey, and it is selected as an essential factor for decision-making. The demand survey supplements the understanding between users and developers, and helps in the ranking of technical equipment for practical use [4]. Failure to accurately understand the needs of users may result in a waste of time and resources as well as change the direction of crime prevention. Conversely, identifying the exact needs of users can determine the priority of technology that can be applied immediately in the field. The demand survey is helpful not only to the function of identifying the needs of users, but also to the policy of the public safety science and technology R&D project. Jung. et. al explained that the technology demand survey is the beginning of commercialization, and the collection of information on the source technology and market demand is a key factor [5]. Park. et, al emphasized that demand forecasting of technology introduction minimizes economic costs and emphasizes the development of systematic application standards at the stage of industrial development. Also, the causality of demand and technology means the degree of prediction of future technology [6]. The problem of demonstrating security technology in Korea is that the process of 'user's request → technology development → field application' is not being properly implemented. In order to minimize structural problems and for convenience of demonstration, first, each function for the security needs. It is necessary to accurately identify regional trends. If users' perceptions of technology are quantified and an investigation tool is developed and an easy measurement tool is used for analysis, limited resources and manpower can be effectively applied to the demonstration of public safety science and technology. Overall, the demand survey for public safety science and technology equipment is a research and development that should be prioritized for the public safety environment. In the past research, which was conducted only on the utilization of technology, a scientific approach that meets the purpose of the public safety science and technology R&D project should be taken in the future [7].
It is known that public safety science and technology R&D went through a step-by-step process to establish a system based on demand surveys and competitions [8]. However, the previous demand survey had limitations as it was only conducted as an open-ended survey as shown in Fig.1. The demand survey of this study is structured so that practitioners directly participate in public security issues and technology or equipment proposals from the present time. On the other hand, as an expert in policing, the police may lack understanding of science and technology. Therefore, prior education is needed to overcome passive participation. For

example, the 'science and technology-based future security strategy establishment study' [9] conducted by the Korean National Police Agency also showed limitations in using an open-ended questionnaire without considering the level of understanding of on-site police officers. Therefore, in the demand survey, a closed-type survey should be devised to identify the level of understanding of the public safety science and technology of the subjects who used the preliminary survey, and to increase the convenience of the respondents and the reliability of the survey tool.
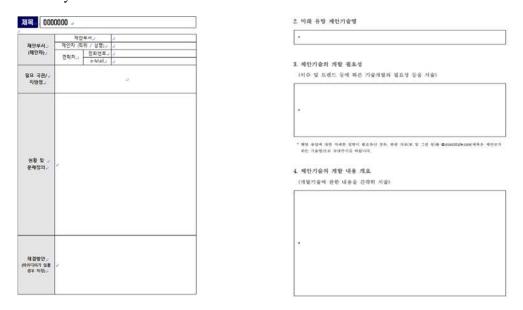

Fig. 1. Pre-Demand Survey(Open Survey Tool)

2.2 Pre-Test Survey

Pre-test survey is not a method of interpreting results through probabilistic reasoning. This is the process of verifying the validity and reliability of the user's decision-making tool necessary to determine the classification system for technology introduction. It is the stage of examining the logical error in the composition of the research tool through questions about science and technology and verifying the *bias* of the response. Pre-test survey has a preemptive error search function that targets a relatively small number of specialized groups prior to investigating the expanded user needs. It is an essential process necessary for designing a sample that minimizes economic costs and represents the characteristics of the population before applying it to a large number of samples. If an error is found during the complete survey, the demand survey will fail. Therefore, the function that can review errors step by step through the pre-survey test should be utilized. This study has the characteristics of a preliminary research tool, and focuses on the preliminary work of a complete survey tool. It is a process of exploring the perception of police officers working in the public safety field on the acceptance of public safety science and technology step by step. In general, the pre-test is conducted through literature research and expert opinion collection. However, this study aims to minimize the economic loss in science and technology selection and to specify the pre-survey tool elements for the systematic classification of science and technology. The survey method is a methodology optimized to evaluate respondents' consistent answers and appropriateness of concepts. It is the development of a tool to evaluate the validity and reliability of users' opinions.

A pre-survey is absolutely necessary for the public safety science and technology demand survey. Because the on-site police lack professional information on science and technology, their purpose is to use equipment rather than to understand technology. **Table 1** shows the subjects of the technology demand survey of overseas police and law enforcement agencies.

Table 1. Demand survey Subjects and Methods

Research(year)	Subjects	Methods
Law Enforcement technology needs assessment(2009)	PERF members	Survey, Workshop
High Priority Information Technology for Law Enforcement(2015)	LEAP, TWGs, Law enforcement managers	Survey, Workshop

Law enforcement technology needs assessment is a study that identifies the primary source technology for public security activities and determines the order of introduction [10]. The subjects of the demand survey were 298 police officers belonging to the PERF (Police Executive Research Forum). PERF is a research and policy support organization for the police, providing management services and technical support leadership training. Members of PERF must 1) have more than 100 employees, more than 50,000 people in charge of national/autonomous police agencies working in jurisdictions, and 2) complete a 4-year university degree program. It is explained that institutions belonging to PERF have a lot of interest and knowledge in the use of technology because they are leading in the utilization and innovation of science and technology compared to institutions that do not. In addition, a workshop was held for members during the research process so that they could acquire information on various public safety science and technology.

High priority information technology for law enforcement [11] is a study that prioritizes the prospects and demand for IT technology of law enforcement agencies. To this end, a survey and workshop were conducted for managers of LEAP, TWGs, and 25 law enforcement agencies. Specifically, LEAP (Law Enforcement Advisory Panel) is a set of investigation subjects for technology development and application of RAND's police and law enforcement agencies in the United States. There are already face-to-face groups first formed in 2013 and non-face-to-face (online) groups formed in 2014. Since RAND has continuously provided education and workshops on the technologies of police and law enforcement agencies to the groups, it can be said that they have a high level of technical understanding of cutting-edge science and technology. In addition, TWGs (Technology Working Groups) were formed in 2011 and have been used as an expert group in technology research research like LEAP. They are a group of technical experts and are composed of experts in each field such as IT, simulation, and operating system.

To sum up, in the case of overseas studies [10] [11], the subjects of the demand survey appear as experts in technology or managers of police and law enforcement agencies. Although a small number of field practitioners were included, the survey was conducted while acquiring information about promising technologies used in the police and law enforcement agencies by providing them with a number of workshops.

However, this study differs from previous overseas studies in that the focus is on practitioners who actually use the technology necessary for public security activities. However, there is no basic information about the level of understanding or utilization of the technology by practitioners who do not have background knowledge on public safety science and technology. Also, it is practically impossible to hold a workshop as in previous overseas studies [10] [11] because the number of survey subjects (about 20,000) is quite large. Therefore, this study intends to produce a survey tool at a level that field workers can accurately respond to the questionnaire by identifying the technical understanding of field workers and the problems of

current technology/equipment through a preliminary survey.

3. Methods

3.1 Structure of Demand Survey

Demand surveys should be systematically classified according to source technology and application fields. In the absence of a taxonomy, an enumerated description makes ranking for introduction difficult. Moreover, it is difficult to understand what role the source technology plays in the field of security. **Fig. 2** shows, categorizes security science and technology and equipment based on the function of the police. However, since the classification is centered on the task, not the purpose of the technology, overlapping of the technologies corresponding to each classification occurs. In addition, it is not suitable for the science and technology classification system of the Ministry of Science and Technology, weakening cooperation with other ministries in the stage of technology development and commercialization. Therefore, in this study, a new classification system for investigation was established and used for the investigation.

Fig. 2. Classification to police function[9]

Table 2 shows, based on overseas studies [10][11][12][13], it is a classification that reflects the functional characteristics of the Korean police.

Table 2. Classification of Functional Characteristics

M. C	S.C
Activation	➢ Patrol car ➢ Special vehicle ➢ Vehicle protection ➢ Sensor for car
Police Protection	➢ Protective gear ➢ Suppression equipment
Evidence Acquisition/Analysis	➢ Biometric acquisition/analysis ➢ Image recognition acquisition/analysis ➢ Digital Acquisition/Analysis ➢ Monitoring/Detection

Criminal Data Analysis	➢ Crime Prediction Analysis
Information Processing	➢ Information Security ➢ Information record ➢ Information sharing
Communication Network	➢ Intra- communication ➢ Out-communication ➢ Victim Communication
Education	➢ simulation training ➢ Police practice knowledge development training ➢ Management/leadership knowledge development training ➢ Social/legal knowledge development training

Activation encompasses transportation means that practitioners can access to the site and equipment such as various sensors built into the transportation means. Specifically, patrol vehicles (passenger vehicles, motorcycles and bicycles), special purpose vehicles (explosives disposal, forensic investigation), vehicle protection equipment (bumpers, bulletproof glass), and in-vehicle sensors are included. In particular, in the case of in-vehicle sensors, various technologies and equipment that can be applied to transportation means such as warning lights and sirens for performing security work in the field, vehicle positioning system, radar, and night monitoring functions.

Police Protection is divided into wearing equipment and suppression equipment. Wearable equipment means clothing and armor worn by police officers for physical protection, and means that can identify their identity. And suppression equipment restricts actions such as lethal and non-lethal weapons and handcuffs used to carry out the task of arresting and suppressing criminals.

Evidence Acquisition/Analysis of criminal evidence is divided into four major categories according to the type of evidence. Biometrics is a technology that collects and analyzes biological evidence of suspects and victims, such as DNA, fingerprints, iris recognition, and bloodstains, in connection with police investigations. It also includes techniques for collecting and analyzing behavioral evidence derived from human behavior, such as handwriting and voice patterns. Image recognition refers to technology/equipment that detects and analyzes objects, tracking, and abnormal behavior by using images such as CCTV for crime prevention for the arrest of criminals. Digital (Cyber) is a technology and equipment that collects, preserves, transports, analyzes, emerges, and manages electronic information existing in cyber and utilizes it as evidence. Lastly, surveillance/detection refers to equipment used for the purpose of observation and monitoring of individuals, multiples, or the environment by using CCTV for crime prevention or traffic enforcement cameras and drones. It also includes technology and equipment for detection purposes that can detect weapons, drugs and alcohol.

Criminal Data Analysis means technology and equipment related to crime prediction. In particular, it refers to technology and equipment for preemptively responding to crimes by identifying potential criminal activities through information such as the suspect, victim, environment, and time of the crime. For example, there is a GIS (spatial analysis system) for a crime prediction program, a crime hotspot program, and the like.

Information Processing is a subdivision of technology and equipment necessary for the process of information processing. The security information record includes a DB and technology to manage crime information, regional security information, and personnel and administrative information within the police. Security information security is a system that corresponds to authentication and access management to protect security-related information secured by the police. The sharing of security information is a technology and equipment for

transmitting internal police intelligence and security information, such as disseminating a 112 report command such as a walkie-talkie or allocating an incident.

Communication Network is a subdivision of necessary technologies and equipment according to the target of communication. Intra-organizational communication refers to systems such as intranets and messengers within an organization for communication between police organizations. Non-institutional communication is a system for communication between individuals/institutional officers, not the police, such as firefighting or local governments, which are external public organizations including citizens. Crime victim communication includes a system for identity protection and various support in investigations and counseling for crime victims.

Education is the skill or equipment needed to provide the necessary training to police officers. Skill-based simulation training refers to the technology and equipment required for simulation that enables the use of force or the command of an incident to be smoothly performed in the actual field. Police Practical Knowledge Development Training includes skills and equipment used in computer-based (CBT) and distance learning tools to train incident command, protest/crowd control, and use and application of personal equipment. Management/leadership knowledge development training is the necessary skills and equipment to train police commanders/managers to establish organizational and personnel policies for organizational management and operation, and to train policing mission performance policy strategies. Lastly, social/legal knowledge development training is the technology and equipment that can train the social and legal knowledge necessary for police officers' work and public support.

3.2 Sampling

Pre-test survey requires strict representation in order to grasp the understanding of the police's original technology and application. Thus, in this study, the sample was designed so that the function and type of police in the population could be included in the survey. It does not provide a standard item for a sample of about 130,000 police officers. Therefore, samples according to the institution were extracted through the police organization and work-related regulations, and two managers and two working-level officers were selected as the research subjects.

Police agencies are divided into national police agencies and autonomous police agencies in Korea. In this study, the population was selected by dividing the National Police Agency and the Metropolitan/Provincial Police Agency, and samples were extracted from each population.

National Police Agency: The national police selected the sample as a department function of the National Police. Bureau was selected as the primary extraction unit and division was selected as the secondary extraction unit. In fact, a separate probability sampling method was not used because the investigation was conducted on managers and practitioners of all divisions existing in the National Police Agency. There are a total of 36 divisions of the National Police Agency, and since two managers and two working people participate in the survey in each division, a total of 72 people are subject to the survey (Appendix A).

Community police: It is divided into a sample of departmental functions and the police branch office to which it belongs (region-oriented). The reason why departments that exist within each city/province police agency were not sampled is that local police are police stations and city/province police agencies perform planning-oriented tasks. In addition, when the police branch office was selected, community policing was carried out in consideration of the characteristics of each region, and it was estimated that the demands of science and technology would be different. In this study, considering the economic feasibility of the preliminary

investigation and the convenience of police agencies, 50 police stations, 19.4% of the total 258 police stations, were extracted as the target. In addition, the police branch office did not use a separate sampling method, and all 50 police branch offices belonging to the extracted police stations were selected as sample subjects.

1) There is a difference in the number of police stations in each city/province national police station, and the police stations are classified into grades 1 to 3 according to their size (Appendix B). Therefore, in this study, when there is a difference in the size of each group, the size-proportional allocation sampling method was used, which allocates the number of samples to each group that is proportional to the size. In order to secure the representativeness of the police branch office, it was designed to include one or more for each city/province police office. In Sejong Provincial Police Agency, there are two police stations, and when proportional to the size, 0.39 is allocated. For this reason, in the case of Sejong Provincial Police Agency, one or more affiliated police stations were forcibly assigned to be included in the sample. 49 police stations, except for one police station, were allocated in proportion to the number of police stations belonging to each city/province, and again, taking into account the ratio of paper supplies. Here, in the case of Gyeonggi Bukbu Provincial Police Agency, Gangwon Provincial Police Agency, Chungbuk Provincial Police Agency, Chungnam Provincial Police Agency, and Jeonbuk Provincial Police Agency, three police stations were assigned to each of the first, second, and third class police stations. Therefore, the above five provincial and provincial police agencies allocated one each so that all police stations for each district could be included in the sample rather than the ratio by district. **Table 3** shows the selected police station.

Table 3. Sampling result (number of police station)

Police agency	Sample size		Sample size (grade)		
			1st grade	2nd grade	3rd grade
Seoul Metropolitan Police Agency	5	(10.0)	5(100.0)		
Busan Metropolitan Police Agency	3	(6.0)	3(100.0)		
Daegu Metropolitan Police Agency	2	(4.0)	2(100.0)		
Incheon Metropolitan Police Agency	2	(4.0)	1(50.0)		1(50.0)
Gwangju Metropolitan Police Agency	1	(2.0)	1(100.0)		
Daejeon Metropolitan Police Agency	1	(2.0)	1(100.0)		
Ulsan Metropolitan Police Agency	1	(2.0)	1(100.0)		
Gyeonggi Nambu Provincial Police Agency	5	(10.0)	3(60.0)	1(20.0)	1(20.0)
Gyeonggi Bukbu Provincial Police Agency	3	(6.0)	1(33.3)	1(33.3)	1(33.3)
Gangwon Provincial Police Agency	3	(6.0)	1(33.3)	1(33.3)	1(33.3)
Chungbuk Provincial Police Agency	3	(6.0)	1(33.3)	1(33.3)	1(33.3)
Chungnam Provincial Police Agency	3	(6.0)	1(33.3)	1(33.3)	1(33.3)
Sejong Provincial Police Agency	1	(2.0)	1(100.0)		
Jeonbuk Provincial Police Agency	3	(6.0)	1(33.3)	1(33.3)	1(33.3)
Jeonnam Provincial Police Agency	4	(8.0)	1(25.0)	1(25.0)	2(50.0)
Gyeongbuk Provincial Police Agency	5	(10.0)	1(20.0)	1(20.0)	3(60.0)
Gyeongnam Provincial Police Agency	4	(8.0)	2(50.0)	1(25.0)	1(25.0)

Jeju Special Self-Governing Provincial Police Agency	1	(2.0)	1(100.0)		
Total	**50**	**(100.0)**			

2) The sample is a division by function of the police station with the primary extraction unit as division and the secondary extraction unit as the team targeting 50 police stations. The police station has a maximum of 12 division 27 team and a minimum of 7 division 18 team. In the same way as the national police sample selection method, all teams in 50 police stations were investigated. A total of 1,057 teams were selected as a sample, and the total number of survey subjects was 2,114 because the survey was conducted on two managers and two practitioners for each team.
3) For the police branch office, all police branch offices belonging to the 50 sampled police stations were selected as sample subjects. It appears that there are as few as 8 and as many as 52 police branch offices in each police station. Therefore, a total of 388 police branch offices were selected as sample subjects (Appendix C). Since the survey is conducted on two managers and two working-level officials at each institution, the total number of survey subjects is 776.

 Table 4 Shows, total of 2,962 people, 76 people from the National Police Agency, 2,114 people from the police station, and 776 people from the police branch office were selected as the subjects of the preliminary investigation.

Table 4. Subject of pre-test survey

	1st stage	2nd stage	Number of subjects
National police agency	Bureau	Division	72
Police station	Division	Team	2,114
Police branch office	Police station	Police branch office	776
Total			**2,962**

3.3 Survey Development

The pre-test survey for the selection of public safety science and technology is divided into 5 sessions. The questionnaire was developed as an online system to recognize and respond to definitions according to technical classification. Detailed technology and equipment according to classification were not presented. Because it can interfere with the correct cognitive level. For example, in the surveillance/detection area, there is a difference between a police officer who only knows CCTV-video and a police officer who knows the source technology. This is because there is a difference in the perception of how to use the breathalyzer and the degree of understanding of the original technology. Therefore, in the pre-test survey, we tried to derive various types of public security technology through index classification.

1) *Awareness level of current security science technology/equipment* (**Table 5**) The subjects were asked to select the technology and equipment possessed by the organization to which they belong (the National Police Agency and the department of the police station) or the institution (the police department/police box). In order to write all the specific technologies and equipment possessed by the selected middle category, we tried to understand the level of awareness of the technologies and equipment related to public safety science.

Table 5. Awareness level of current security science technology/equipment

	1.1. Do you own the following technology/equipment within your organization/office?	1.2 What is the specific technology/equipment name you own?
Police safety		
Protection	☐	
Suppression	☐	

2) ***Utilization of current security science technology/equipment*** (**Table 6**) This is a question to understand the degree of utilization of technology and equipment possessed by the organization or institution to which the subject of investigation belongs. We asked how much technology and equipment included in the categories that answered that they had in possession or not were used in their work. The response format was presented on a Likert 7-point scale. In addition, the respondents were asked to respond to technologies and equipment that had low utilization or were not used, and the questions were structured to describe the reasons in detail.

Table 6. Utilization of current security technology/equipment

	2.1. How much technology/equipment are you using in your organization/office? (1= never, 7= always)							2.2 what is the name of the underutilized technology/equipment? And why not utilize the technology/equipment?	
								Technology/equipment	Reasons do not utilize
Police safety									
Protection	1	2	3	4	5	6	7		
Suppression	1	2	3	4	5	6	7		

3) ***Satisfaction with the current security technology/equipment*** (**Table 7**) We tried to figure out how satisfied people are when their current technologies and equipment are used for field work. A Likert 7-point scale was used.

Table 7. Satisfaction with the current security technology/equipment

	3.1 How satisfied are you with the technology/equipment you are using? (1= never satisfied, 7= very satisfied)						
Police safety							
Protection	1	2	3	4	5	6	7
Suppression	1	2	3	4	5	6	7

4) ***Problems and improvement plans for security science technology/equipment currently in use*** (**Table 8**) This is an open type to understand the problems of the technology and equipment currently owned or used and the improvement plan. The opinions gathered through the questions are used as basic data for deriving technologies and equipment that can supplement the problems in the next stage of FGI. In addition, the priority of technology and equipment can be used as a weighting factor for selection according to the type and importance of the problem. Additionally, it can be used as a basis for confirming whether the problems of technology and

equipment have been resolved in the practical evaluation of technology after the demand survey.

Table 8. Problems and improvement plans for security science technology/equipment

	3.2 What was the problem with the utilization of the technology/equipment?	3.3 What are the improvements to the technology/equipment?
Police safety		
Protection		
Suppression		

5) ***Equipment that needs to be selected and reason*** (**Table 9**) This is a question to identify the technologies and equipment that the user belongs to and that they think need to be introduced among the technologies and equipment not possessed by the organization or institution to which the user belongs. Based on the middle classification, the questions were structured to check the classification that includes the necessary skills and equipment. In addition, the names or types of specific technologies and equipment were to be described, and the necessary reasons were also written in detail.

Table 9. Equipment that needs to be selected and reason

	4.1 Which of the technology/equipment do you think needs to be introduced?		4.2 Why is the technology/equipment required?
	Check technology/equipment	Specific technology/equipment	
Police safety			
Protection	☐		
Suppression	☐		

4. Conclusion

This study suggested a pre-test survey method for the selection of security science and technology equipment for the Korean police. The commercialization of science and technology in the field means the development of an important tool for crime prevention. This study is significant in that police science and technology, which is focused on post-crime resolution, can be used as a preemptive response to policing activities as a crime prevention tool through systematic classification and selection.

In fact, Korean police agencies did not systematically investigate users' understanding of technology. It was used as the basis for the selection of security equipment as a question about the inconvenience of use and the equipment that needs to be introduced. Classification system research and commercialization for technology introduction are being carried out in various business fields. In line with this trend, the Korean Police intends to develop a user demand survey as the first step in the classification system necessary for technology selection.

This study referred to the overseas technical survey classification system and sample design method for the pre-test survey. Also, it is very meaningful that a sample suitable for the Korean

police structure was designed and applied.

This study will derive priorities for science and technology selection through the opinions and perceptions of the police who directly respond to the security situation. In the future, research on the technology selection classification system will be conducted in stages through FGI (Focus Group Interview) and full survey. This study has limitations as a pre-test survey. As a follow-up study, a study on validity and reliability is needed.

Appendix

Appendix A. Sampling result (national police agency)

1st stage	2nd stage
Spokesperson's Department	Public Relations Division
Planning and Coordination Bureau	Division of Innovation, Planning and Coordination, Finance Division, Regulation and Legal Affairs Division, Autonomous Police Division, Policy Support Division, Science and Technology Policy Team
Police Administration and Human Resources Bureau	Police Administration Division, Human Resources Division, Education Policy Division, Welfare Policy Division, Gender Equality Policy Division
Audit and Inspection Department	Audit Division, Inspection Division, Human Right Protection Division
Department of ICT and Equipment Policy	ICT and Equipment Planning Division, ICT Management Division, Police Equipment Division
Department of Forensic Investigation Management	Forensic Investigation Division, Crime Analysis Division
Community Safety Bureau	Department of Women and Juvenile Safety Planning, Crime Prevention Policy Division, Community Order Division, Juvenile Affairs Division, Women's Safety Planning Division
Investigation Bureau	Economic Crime Investigation Division, Anti-Corruption and Public Crime Investigation Division, Criminal Intelligence Division, Special Investigation Division
Detective Bureau	Major Crime Investigation Division, Narcotic and Organized Crime Investigation Division, Juvenile Crime and Gender-based Violence Investigation Division
Cyber Investigation Bureau	Cyber Investigation Planning Division, Cybercrime Investigation Division, Cyber Terror Response Division, Digital Forensics Center
Traffic Bureau	Traffic Planning Division, Traffic Safety Division, Traffic Operation Division
Public Order Management Bureau	Public Order Management Division, Crisis Management Center, Protective service Division, Aviation Division
Total	**36**

Appendix B. Number of police station (grade)

Police agency	Sample size (Police station)		Sample size (grade)		
			1st grade	2nd grade	3rd grade
Seoul Metropolitan Police Agency	31	(12.0)	31(100.0)	-	-
Busan Metropolitan Police Agency	15	(5.8)	15(100.0)	-	-
Daegu Metropolitan Police Agency	10	(3.9)	10(100.0)	-	-
Incheon Metropolitan Police Agency	10	(3.9)	9(90.0)	-	1(10.0)
Gwangju Metropolitan Police Agency	5	(1.9)	5(100.0)	-	-
Daejeon Metropolitan Police Agency	6	(2.3)	6(100.0)	-	-
Ulsan Metropolitan Police Agency	5	(1.9)	5(100.0)	-	-
Gyeonggi Nambu Provincial Police Agency	31	(12.0)	25(80.6)	5(16.1)	1(3.2)
Gyeonggi Bukbu Provincial Police Agency	13	(5.0)	7(53.8)	4(30.8)	2(15.4)
Gangwon Provincial Police Agency	17	(6.6)	3(17.7)	4(23.6)	10(58.8)
Chungbuk Provincial Police Agency	12	(4.7)	3(25.0)	2(16.7)	7(58.3)
Chungnam Provincial Police Agency	15	(5.8)	4(26.7)	5(33.3)	6(40.0)
Sejong Provincial Police Agency	2	(0.8)	1(50.0)	1(50.0)	-
Jeonbuk Provincial Police Agency	15	(5.8)	4(26.7)	4(26.7)	7(46.7)
Jeonnam Provincial Police Agency	21	(8.1)	3(14.3)	5(23.8)	13(61.9)
Gyeongbuk Provincial Police Agency	24	(9.3)	6(25.0)	6(25.0)	12(50.0)
Gyeongnam Provincial Police Agency	23	(8.9)	10(43.5)	3(13.0)	10(43.5)
Jeju Special Self-Governing Provincial Police Agency	3	(1.2)	3(100.0)	-	-
Total	258	(100.0)			

Appendix C. Sampling result (police station and police branch office)

Police agency	Police station	Number of police branch office
Seoul Metropolitan Police Agency	Seoul Gangbuk Police Station, Seoul Seocho Police Station, Seoul Seobu Police Station, Seoul Eunpyeong Police Station, Seoul Yongsan Police Station	32
Busan Metropolitan Police Agency	Busan Dongbu Police Station, Busan Yeongdo Police, Busan Saha Police Station	15
Daegu Metropolitan Police Agency	Daegu Seongseo Police Station, Daegu Dalseong Police Station	13
Incheon Metropolitan Police Agency	Incheon Yeonsu Police Station, Incheon Ganghwa Police Station	22
Gwangju Metropolitan Police Agency	Gwangju Nambu Police Station	6
Daejeon Metropolitan Police Agency	Daejeon Daedeok Police Station	4
Ulsan Metropolitan Police Agency	Ulsan Jungbu Police Station	5
Gyeonggi Nambu Provincial Police Agency	Ansan Sangnok Police Station, Suwon Seobu Police Station, Bundang Police Station, Uiwang Police Station, Anyang Manan Police Station	40
Gyeonggi Bukbu Provincial Police Agency	Namyangju Police Station, Guri Police Station, Gapyeong Police Station	17
Gangwon Provincial Police Agency	Chuncheon Police Station, Donghae Police Station, Chuncheon Police Station	22
Chungbuk Provincial Police Agency	Cheongju Heungdeok Police Station, Jecheon Police Station, Boeun Police Station	21
Chungnam Provincial Police Agency	Cheonan Dongnam Police Station, Geumsan Police Station, Buyeo Police Station	25
Sejong Provincial Police Agency	Sejong Police Station	4
Jeonbuk Provincial Police Agency	Gunsan Police Station, Muju Police Station, Jinan Police Station	36
Jeonnam Provincial Police Agency	Mokpo Police Station, Gwangyang Police Station, Gangjin Police Station, Hwasun Police Station	49
Gyeongbuk Provincial Police Agency	Gumi Police Station, Mungyeong Police Station, Cheongdo Police Station, Seongju Police Station, Gunwi Police Station	44
Gyeongnam Provincial Police Agency	Gimhae Jungbu Police Station, Jinhae Police Station, Tongyeong Police Station, Sancheong Police Station	26
Jeju Special Self-Governing Provincial Police Agency	Jeju Seobu Police Station	7
Total	**50**	**388**

Acknowledgement

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