Technology Adoption in Policing

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DEDICATION

This accomplishment is dedicated to my beloved parents: Muhammad Taimur Khan & Aqeela Taimur, and my siblings: Faryal, Haya, Ghazal, & Fatima, whose unwavering support, cooperation and guidance played an instrumental role in achieving this magnificent milestone.

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ABSTRACT

Technology in policing plays a vital role in maintaining law & order and helps in investigation and prevention of criminal activities. In this regard, Islamabad Capital Police (ICP) has been playing a tremendous role in revolutionizing the policing landscape. Among the plethora of technologies being employed are the Police Station Record Management System (PRMS), Criminal Record Management System (CRMS), Complaint Management System (CRM), IT labs, Call Data Record (CDR) system, geo-fencing, surveillance cameras, and public service provisions such as tenant registration, foreigner registration, character certificates, and e-challans. Moreover, this study focuses on police official's adaptation towards new technology. Primary research, conducted using questionnaire was distributed among 360 police officials including junior & senior police officials serving in Islamabad police. For this, Technology Acceptance Model (TAM), proposed by Davis et. al. (1989), was implemented in order to find officials' perception and usage towards technological system(s). The results showed that police officials have a positive attitude towards technology. The system(s) improve police official's efficiency and efficacy of work and job performance, polish their skills and capabilities that help them in getting the information more swiftly, and help them in monitoring the law & order situation of the city.

Keywords: Technology; Police & policing; Perceived usefulness; Perceived ease of use ; Attitude; Behavioral intension

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LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMS

A: Answer

AI: Artificial Intelligence

AT: Attitude

BI: Behavioral Intension

CCTV: Closed-Circuit Television

CDR: Call Data Record

CFI: Comparative Fit Index

CMS: Complaint Management System

CRMS: Crime Record Management System

DNA: Deoxyribonucleic Acid

FM: Frequency Modulation

FRT: Facial Recognition Technology

GPS: Global Positioning System

ICP: Islamabad Capital Police

ICT: Islamabad Capital Territory

IT: Information Technology

MOI: Ministry of Interior

PEU: Perceived Ease of Use

POC: Police Operation Center

PRMS: Police Record Management System

PU: Perceived Usefulness

Q: Question

RMSEA: Root Mean Square Error of Approximation

SEM: Structural Equation Mode**l**

TAM: Trucker-Lewis Index

VIS: Vehicle Identification System.

CHAPTER 1: INTRODUCTION

In contemporary era, the role of policing holds immense significance in maintaining law and order, ensuring safety and security, and providing efficient public services. In Pakistan, policing is carried out by various law enforcement agencies at different levels of government and serves as a tool for control and prioritizing service delivery. Various technologies and software solutions have been introduced to augment the capabilities of the police force. Notably, these technological advancements were initially implemented in the Punjab Police and are now being replicated in Islamabad Capital Territory (ICT) Police, signifying a noteworthy shift in the policing landscape. Recognizing the need, police force aims to replace traditional operations with the principle of modern policing. The Islamabad Capital Police (ICP), operated under Ministry of Interior (MoI), is dedicated to create a secure and citizen-friendly environment in the capital city, Islamabad, through utilization of cutting-edge technology in the field of surveillance, dispatch systems, and analytics. To achieve this goal, they have embarked on an initiative to effectively maintain law and order while enhancing crime prevention, detection, and investigation through the strategic integration of advanced technological systems. These systems are being implemented across various police stations, police facilitation centers, and the Safe City Islamabad project.

The vision of the capital police is to leverage technology advancement in the realm of public safety and law enforcement to enable the department to be a trend setter in the particular fields. Among the plethora of technologies being employed are the Police Station Record Management System (PRMS), Criminal Record Management System (CRMS), Complaint Management System (CRM), IT labs, Call Data Record (CDR) system, geo-fencing, surveillance cameras, and public service provisions such as tenant registration, foreigner registration, character certificates, and e-challans.

Importantly, these technologies-driven solutions are accessible and utilized by top to bottom level: Inspector General to Constable, of the police force, stationed at each precinct. This comprehensive integration facilitates more effective policy formulation and implementation, ushering in a transformative era for law enforcement in Islamabad

However, the utilization of technology within the law enforcement has yielded a mixed array of outcomes, as supported by existing evidences (Escamilla, 2019). On one hand, the integration of technology into policing operations has undeniably conferred several advantages. It has notably enhanced the effectiveness and efficiency of law enforcement agencies, enabling more sophisticated crime analysis (Scott, 2015). The advent of digital technologies has wrought a transformation in both modus operandi of the police and the perspectives of offenders, resulting in an improved capacity to combat criminal activities and unlocking myriad opportunities that bolster the competence of the police force (Bekir, 2015). Conversely, the application of artificial intelligence (AI) in policing has not always met the anticipated expectations. Concerns have arisen regarding the potential for AI systems to perpetuate bias and injustices, particularly when trained on pre-existing datasets (Matthew Guariglia,2018).

Moving forward, law enforcement agencies are harnessing a diverse array of technologies to enhance their operational capabilities and investigative processes. These technologies encompass a wide-spectrum, including biometrics, facial & voice recognition, wiretapping, body-worn cameras, surveillance drones, gunshot detection systems, crime mapping tools, social media analysis, and the pervasive use of CCTV cameras, among others. The incorporation of these technologies is aimed at bolstering the efficiency and effectiveness of policing.

It is noteworthy that adoption of computer-based tools has garnered favor among police officers, as it empowers policy-makers to formulate comprehensive and data-driven policies and strategies (Manarvi, 2017). Furthermore, the integration of drone technology within policing has gained public support, and favors its usage. The rationale behind this endorsement lies in the ability of drones to ensure the safety and security of human life through vigilant surveillance and monitoring of public spaces, cities, and local areas (Miliaikeala S.J. Heen, 2016).

In developed nations, a substantial body of literature explores into the adoption and utilization of various technological advancements in policing. However, in developing world, particularly South Asia, the integration of technology within police forces is at moderate level or at preliminary stages. In Pakistan, there is limited literature available about technology in policing. The research gap specifically focused on technology adoption within Islamabad, Pakistan’s capital city. This explanatory study was primarily conducted in Islamabad Capital Territory (ICT) Police which includes police stations, police facilitation centers, and safe city Islamabad. Questionnaire survey

was distributed among 360 police officials of Islamabad Police. However, future studies can analyze police organizations in the other provinces of Pakistan and look for the diversity and commonalities across the country.

1.1 Objectives of the Study

The objective of the study is as following;

- To analyze the perception and adaptability of Islamabad Police towards innovation and technological advancement under the framework of technology acceptance model.

The research question explored that "Is the perception and adaptability of Islamabad Police towards innovation and technological advancement positive"?

1.2 Organization of the Study

The thesis is divided into total seven sections beginning with introductory section including background and technology adoption in policing. Section 2 contains review of the existing literature on the concerned topic of technology adoption in policing. Section 3 demonstrate the theoretical framework on which the study is based. Section 4 describes the data and methodology adopted to carry out this research. In turn, section 5 analyze and discuss results. Section 6 describes discussion and section 7 contains conclusion of the study.

CHAPTER 2: LITERATURE REVIEW

This section highlights the evidences of technology in policing. It is further divided into 4 sub-sections: role of technology in policing, types of technologies used by police force, attitude of police towards technology, and citizen's perception of technology used by police force. Literature gap is given at the last of the section.

2.1 Role of Technology in Policing

Technology plays a substantial role within law enforcement agencies. Innovation enhances the efficiency and effectiveness of policing landscape and operations by allowing them to monitor and investigate the criminal activities and help in prevention of crime (Scott, 2015). Artificial intelligence is considered as one of the important and valuable tools in smart policing. It brings significant approach in police functions and tasks, and helps in maintaining law and order situation of the country (Chaurpagar, 2022). The revolution of technology has bought commendable results in the police department as well as the criminal justice system, and improves its proficiency and competence (Marx, 2011).

Furthermore, the technology based cities i-e., smart cities influence police force in multiple ways: quick investigation and prevention of corruption, maintaining law and order and better regulation of police agency, and improved safety of citizens and governance of the cities (Slak, 2018). Besides, digitalization increases police accountability and legitimacy and robustly effect its restructuring and shapes the interaction between public and the police force (Rossler, 2019).

Moreover, the role of knowledge and the perception of standardization plays a pivotal role in separating and streamlining policing processes. This leads to increased control over the tasks undertaken at the frontlines and how they should be carried out (Helene OI Gundhus, 2022). Additionally, modern technology has been playing a transformative role in various facets of the police force and revolutionize the policing system in Pakistan, notably in Punjab Police, where multiple initiatives have been taken to implement the digital tools such as criminal and crime record management systems, crime mapping, and digital driving license (Taimur, 2021).

Contrary to this, some skeptics are of view that technology or innovations do not always plays a noteworthy role in policing and shows mixed results (Joh, 2017). The relationship between

technology and law enforcement may not always be harmonious. Sometimes, conventional and outdated systems are found to limit police performance and offer limited effectiveness in achieving improved outcomes in ongoing battle against crime; however, the advantages of technology cannot be simply ignored (Bekir, 2015). The applications of artificial intelligence (AI) in law enforcement falls short of expectations. AI often predicts outcomes based on preexisting data, leading to bias and injustice, and fails to deliver on its promises to assist law enforcement (Matthew Guariglia, 2022). Along with the benefits there are some complications and difficulties in digital use in policing, agencies often struggle with ramifications, implementations, complexities, and uncertainties while using technologies in their daily routine. However, proper management, training, planning, effort and active participation can bring desirable outcomes (Christopher S. Koper, 2014).

2.2 Types of Technologies Used by Police Force

Police force use plethora of hard and soft technologies to make their work easier and coherent. These systems not only help them in monitoring and prevention of crime, but also increase efficiency and transparency of the department. Technologies such as crime and police record management systems, drones, CCTV and surveillance cameras, biometric, global positing system, q-matic machines and many other have been positively contributing in improving police role in the society.

The adoption and diffusion of mobile technologies are important tools for police organizations as they implicitly support and enhance individual and group performance as well as transformed processes (Hackney, mobile technologies for public police force tasks and processes: A T-Government perspective., 2011). Besides, these systems help in identifying police officer performance, reliability, management style, and intellectual acceptance (Rachael Lindsay, 2011).

Furthermore, facial recognition technology (FRT) is another modern tool used by law enforcement agencies. Its precision and applications helps in identification and prevention of crime and suspects, and offers valuable evidence in legal proceedings (Smith, 2019). Computerized crime mapping is a fast growing technology used by police department. Using advanced systems tackle offences and disorder in specific places, and helps in incorporating geographic information in crime analysis and highlights the effectiveness of hot spots policing compared to traditional patrol methods (Lum, 2006). Also, gunshot detection system assists law enforcing agencies to

inspect, deter and combat crime, and report gunshots to police within few minutes (Lorraine Green Mazerolle, 1998).

O'Connor, 2018 examined the impact of social media on policing. Police services have embraced social media as a tool for communication, information dissemination, and community engagement. It serves as a surveillance tool for the police, enabling mass visibility, documentation, communication, and access to searchable and private information. It supports crowdsourced investigations and incorporates technologies like facial and voice recognition. Additionally, social media transforms how police interact with the public by facilitating risk communication, allowing police to present their organizational image, hosting Q & A sessions, and enhancing law enforcement transparency and legitimacy. However, the use of social media in policing also sheds light on injustices, including instances of police brutality and structural racism. Consequently, social media's relationship with policing presents dual nature.

2.3 Attitude of Police towards Technology

The attitude of police force towards technology varies widely depending on factors such as location, resources, training, and leadership. Generally, there is a trend towards the adoption of technology to enhance law enforcement capabilities, improve efficiency, and ensure public safety. However, specific attitude can differ among individual officers and departments.

Police officers view technology as a proficient tool that enhances the e-government policy makers to come up with broad based approaches and ideas that increases the competence and effectiveness of the department (Manarvi, 2017). Moreover, integration of innovation and digitalization support officers work and help them in maximizing productivity: accountability, investigation, reporting etc. (Chan, 2001).

The integration of various technological systems: police drones, enhance officer's confidence by assuring and protecting human life via vigilant scrutiny, safety of environmental elements, and enrich ideological considerations related to politics and authorities (Miliaikeala S.J. Heen, 2016).

On the flip side, some studies show uneven attitude of Police while utilizing technology. The research conducted in Netherlands Police force and other criminal investigation organizations in which questionnaire based research design was sent to employees of different investigation

departments. Questions were asked about the use digital innovations: wiretapping, GPS, tracking devices, fingerprints, DNA, CCTV, network and data analysis, weapons technology, biometrics, facial and voice recognition, polygraphs, virtual reality etc. Respondents responded differently to the prevalence of the mentioned technologies. When asked about satisfaction, they were highly satisfied with the use of some of the technologies, but on the other hand they were unclear about the usage because of inadequate knowledge and ill training techniques. However, there were legal, organizational and technological obstacles that were of major concern; for example, lack of clarity, deficient financing and guidance, insufficient technological availability and user friendliness. To sum up, police utilization of technology is a simple process but it requires basic skill and training. Without experience it would be difficult to achieve the desired outcome (Custers, 2012).

2.4 Citizen Perception of Technology Used by Police Force

Citizen satisfaction and citizen perception of police are mainly shaped by police performances (Rosenbaum et. al., 2015) and police transparency (White, 2014) during police-citizen interaction. In addition, technology plays a vital role in shaping opinion and have a significant impact on citizen's views of the police (Lorraine Mazerolle, 2013). Public perceive that utilization of advanced technology is well appreciated in prevention of cybercrime, while police see more benefits in investigation of these crimes (HyungBin Moon, 2017).

Digitalization has significantly increase citizen's perception with the encounter and citizens' general perceptions of the police (Kule, 2022). Adoption of information & communication technology (ICT) aims to increase transparency and accountability, problem solving, and built trust between citizens and police force. However, citizens should actively participate with police in order to overcome the complexities and challenges that arise in developing world (Tariq Maqsood, 2019).

Some researchers are of view that adoption of technology creates both opportunities and challenges for citizens and police force. In community policing, web-based technologies not only enhance communication and exchanges information regarding crimes and built trust between public and police but also create confusion related to the behavior of officers, and rise insecurity and privacy concerns (Min Zhang, 2020). It is often perceived that police use of technology creates discrimination among different ethnicities. White ethnicity believes that police devices such as

body-worn cameras as an indispensable tool that contributes in transparency, legality and accountability; whereas, black individual have different perspective. Overall, the use of technology among officers has a positive impact on their demeanor (Headley, 2021). Moreover, public perception of technology in policing provides a good evidence of positive encounters that fosters their confidence, but conversely to this, at the same time lack of information or misinformation can lead to isolation among people (Andy Bain, 2014).

2.5 Literature Gap

In developed nations, technology has notably revolutionized the performance of law enforcement agencies. A substantial body of literature explores into the adoption and utilization of various technological advancements in policing. Conversely, in developing world, particularly South Asia, the integration of technology within police forces is at moderate level or at preliminary stages. In Pakistan, there is limited literature available about technology in policing. There is a gap in the research specifically focused on technology adoption within Islamabad, Pakistan's capital city. The city has relatively smaller geographical area as compared to the other major cities of the country. Besides, Islamabad Police is characterized by its diverse composition, drawing officials from various provinces who have been actively serving the public. Moreover, the capital city itself is home to people from different regions of the country. This unique blend of backgrounds and perspectives within both the police force and the population provides an enriching environment for studying and conducting research, offering a dynamic perspective on various issues The study aims to address this critical gap by focusing on technology adoption within unique context of Islamabad.

CHAPTER 3: THEORATICAL FRAMEWORK

The theoretical framework employed in this thesis offers a comprehensive analysis of the adoption of technology within the realm of policing. This analysis is grounded in the Technology Acceptance Model (TAM) initially introduced by Fred Davis in 1989. The fundamental aim of TAM is to delve deeply into the factors influencing the acceptance of technology, offering insights into the processes that underlie the adoption of technology. This, in turn, facilitates the prediction of behavioral patterns and provides a robust theoretical foundation for the successful integration of technology into policing practices.

Furthermore, TAM serves a vital role in equipping practitioners with invaluable guidance on the measures they can undertake prior to implementing new systems. By shedding light on the drivers and barriers to technology adoption, TAM empowers law enforcement agencies to make informed decisions, thereby enhancing the efficiency and efficacy of technological integration within the realm of policing.

The adoption and utilization of information technologies have the potential to yield a broad spectrum of both immediate and enduring advantages, spanning organizational and individual domains. These advantages encompass enhancements in performances, financial savings, time efficiency, and overall convenience (Foley Curley,1988; Sharda, Barr & McDonnell,1988). This compelling potential of technology to confer such benefits has served as a persistent driving force for research in information system management, particularly in the realm of assessing individuals' willingness to embrace innovative technology (Davis, 1989).

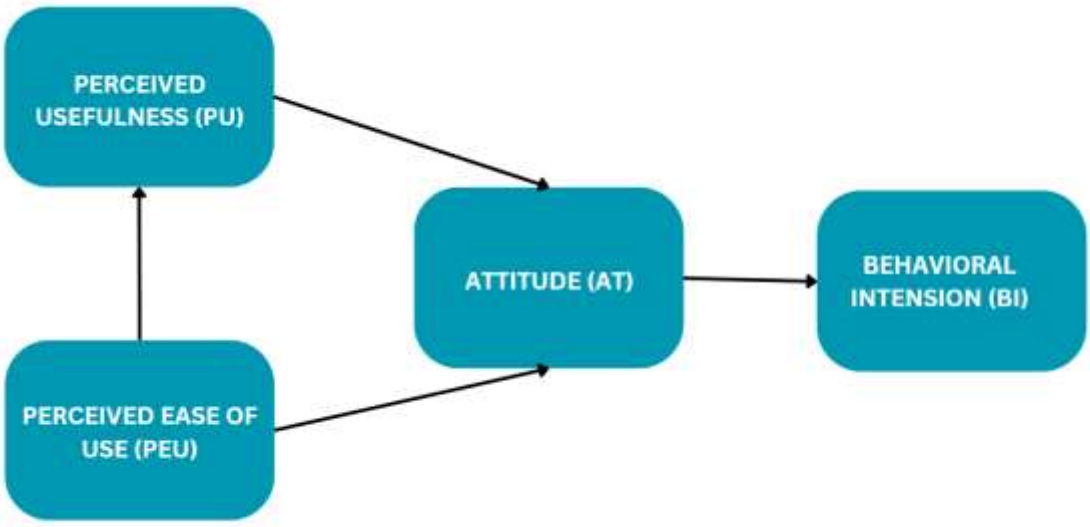
TAM and its extensions have been used in a wide range of applications in different disciplines, contexts and geographical locations. Apart from this, scholars tested the models of technology acceptance in different frameworks including Policing.

Allen, 2019 undertook a comprehensive research endeavor that centered on evaluating the Technology Acceptance of the ICOP application within the context of police officers in Ventura Country. This research aimed to discern the levels of perceived usefulness and ease of use that officers associated with the ICOP cell phone application and its accompanying database technology. The research findings culminated in a significant revelation: field officers exhibited a

high degree of acceptance and derived tangible benefits from the ICOP cell phone application and the database technology. This acceptance has profound implications for the social change, particularly in policing. It reflects a positive ripple effect stemming from the influence of Crisis Intervention Team (CIT) training, wherein police officers have ingeniously devised strategies to assist officers in coping with CIT-related encounters by harnessing evidence-based care technology.

So, basically TAM (Davis, 1989) is a relevant model for this study that is specifically designed to explain or predict the individual-level technology acceptance, across a wide range of computing technologies and user groups. Besides, Technology Acceptance Model (TAM) was proposed to determine Police official's technology acceptance/adoption decision is determined by his or her behavior intention which is largely underpinned by his or her attitude toward the technology. In particular, TAM theorizes that attitude of an official is determined by beliefs towards a technology's usefulness and ease of use, as perceived by an individual. Perceived usefulness refers to an individual's perception that using a particular technology will increase his or her job performance. Perceived ease of use, on the other hand, refers to the degree to which an individual expects his or her use of the technology to be free of effort.

Given below figure is the representation of Technology Acceptance Model (TAM)



Figures (1) Technology Acceptance Model (Davis et. a., 1989)

CHAPTER 4: DATA & METHODOLOGY

4.1 Data Collection

This study involved analyzing the adoption of technology in Policing. Data collection was based on primary data with the help of questionnaire survey by using convenience sampling technique. The proposed data was collected from the sample of 360 Police officials including senior and junior The targeted officials were from Islamabad Capital Police (ICP). Islamabad Police is characterized by its diverse composition, drawing officials from various provinces who have been actively serving the public. Moreover, the capital city itself is home to people from different regions of the country. This unique blend of backgrounds and perspectives within both the police force and the population provides an enriching environment for studying and conducting research, offering a dynamic perspective on various issues. Moreover, the questionnaire survey was distributed among officials in Safe City Islamabad, Police Facilitation Centers, and different Police Stations of Islamabad.

4.2 Questionnaire Design & Reliability

The study employed primary research and collected data using a questionnaire. Questionnaire is basically a research tool featuring multiple questions to get useful information by the respondents. The questionnaire was composed of five sections. Initially, it involved name replacement of the technology in order to facilitate the respondent , for instance, Online Record Management System which includes Criminal Record Management System (CRMS), Police Station Record Management System (PRMS), and Complaint Management System (CMS), Islamabad Safe City: police operation center (POC), intelligent video surveillance, police analysis center, safer Islamabad through smart cars, surveillance through drone technology, digital forensic laboratory, helplines, and vehicle management system, vehicle identification system, wireless call network TETRA, facial recognition system, FM 106 etc.. IT labs include geo-fencing and CDR system, Public Services: character certificate, tenant registration, and foreigner registration, others include CCTV cameras, Eagle Squad and 15 PUKAAR. The first section consisted of eight questions related to Perceived Usefulness (PU) about the technology. The second section comprised of seven questions regarding Perceived Ease of Use (PEU). The third and fourth section was attempted to assess the Attitude (AT) and Behavioral Intension (BI) towards the proposed technology. The last section was consisted of the demographic characteristics for the purpose of this study and future

research. These sections employed a five-point Likert scale (1: strongly disagree; 5: strongly agree). Finally, there was a question regarding suggestions from officials on how to improve these technological system(s).

A pilot study with 22 individuals from the targeted population of Islamabad Capital Police were chosen using the convenience sampling technique, was conducted. The final survey consisted of a total of 360 Police officials of Islamabad Capital Police (ICP).

Reliability of the questionnaire was tested to increase the accuracy of the findings and to allow for the greater confidence in its finding. Reliability refers to the degree of consistency between the scores obtained, and the Cronbach's Alpha was employed for estimating this. Table (1) summarizes the Cronbach's Alpha coefficients for the pilot and final study, the values displayed indicate high inter-term consistency and are acceptable.

The formula for Cronbach's Alpha was;

$$\alpha = \frac{k}{k-1}\left[1 - \frac{\sum s^2 y}{s^2 x}\right]$$

Where;

α = reliability coefficient

k = number of test items

$\Sigma S^2 y$ = sum of item variance

$S^2 x$ = variance of total score

Variables	**Cronbach's Alpha**
Pilot	
Section 1 : Perceived Usefulness (PU)	0.831363
Section 2 : Perceived Ease of Use (PEU)	0.769333
Section 3 : Attitude (AT)	0.874615
Section 4 : Behavioral Intension (BI)	0.772645

Final Study	
Section 1 : Perceived Usefulness (PU)	0.933881
Section 2 : Perceived Ease of Use (PEU)	0.922124
Section 3 : Attitude (AT)	0.954118
Section 4 : Behavioral Intension (BI)	0.939217

Table (1) Reliability Test

4.3 Variable Description

The table given below highlights the description of variables;

Variables	**Description**
Perceived Usefulness (PU)	The **Perceived Usefulness (PU)** section included 8 questions. The questions included in this are as follows; 1. This technology enables me to find relevant information quickly. 2. This technology allows me to interact digitally with citizens. 3. The technology is useful in getting information swiftly. 4. This technology saves my time. 5. Effective tracking of Police performance will be implemented using this technology. 6. Using this technology improves my job performance. 7. This technology increases work efficiency and productivity. 8. This technology supports my work.
Perceived Ease of Use (PEU)	The **Perceived Ease of Use (PEU)** section included the following; 1. I find this technology useful. 2. It is easy for me to learn how to use this technology. 3. It is easy to become skilled in using this technology. 4. I have been trained to use this technology. 5. My interaction with this this system is understandable.

	6. It will be easy for me to get information through the system. 7. The system helps me in my daily work.
Attitude (AT)	The **Attitude (AT)** section included 13 questions which are as follows; 1. This technology is valuable contribution to the functioning of Islamabad Capital Police. 2. I feel no stress while using this technology. 3. I am sure it will help to deal with crime and to be more engaged in investigation. 4. I generally support the use of this technology for crime prevention. 5. I believe it is a good idea for me to use it for the future. 6. I am completely satisfied with the performance of this technology. 7. I feel confidant using this technology. 8. I can perform various official functions using this system. 9. I found it easy to share information with my colleagues using this technology. 10. Using this technology does not cause any problems in my daily work. 11. I did not face any challenge while using this technology. 12. Using this technology has improved my skills and abilities. 13. This technology helped me to collect information related to my work.
Behavioral Intension (BI)	The **Behavioral Intension (BI)** section included the following questions; 1. I plan to use this technology frequently. 2. I plan to use this technology throughout my career. 3. I plan to use this technology as often as possible. 4. I found the various functions in the technology to be well integrated.

	5. If given the choice to use this technology or not, I would like to use it in near future. 6. This technology is working well. 7. I am satisfied with the cyber security of this technology. 8. I am satisfied with the ability of this technology to integrate with other technologies. 9. The response time of this technology is very good.
Demographics	Gender, Age, Education, Tenure/Experience in Service, Designation, Interest in IT,

Table (2) Variable Description

4.4 Coding of Variables

After data collection, the responses were imported into excel sheet and codes were assigned to them. Table (3) summarizes the code of each variable.

Name of Variable	**Code**
Gender	
Female	0
Male	1
Age	
25 or < than 25 years	1
26 – 39 years	2
40 years & above	3
Education	
1 – 10 years	1
11 – 14 years	2
More than 14 years	3
Tenure/Experience in Service	
1 – 10 years	1

More than 10 years	2
Designation	
Junior Police Official	1
Senior Police Official	2
Interest in IT	
High	1
Low	2
Likert Scale	
Strongly disagree	1
Disagree	2
Cannot decide	3
Agree	4
Strongly agree	5

Table (3) Variable Coding

4.5 Construction of Variables

The questions measuring the same aspects were combined together into sections to allow for their easy analysis. For the construction of these sections, the sum of each respondent's responses of all questions measuring a specific variable was calculated. Following this, the range was calculated, and divide into three equals intervals. The sums were divided into three cut points such as low, medium and high. These points were coded as 1,2 and 3.

This process is contained in the table below;

Variables	**Categories**		
Perceived Usefulness (PU) (Questions:8,	**Low (1)** 19 – 25 → "1"	**Medium (2)** 26 – 32 → "2"	**High (3)** 33 – 40 → "3"

Minimum score:19 Maximum score:40 Range: 21			
Perceived Ease of Use (PEU) (Questions:7 Minimum score:17 Maximum score:35 Range: 18	**Low (1)** 17 – 22 → "1"	**Medium (2)** 23 – 28 → "2"	**High (3)** 29 – 35 → "3"
Attitude (AT) (Questions:13 Minimum score:32 Maximum score:65 Range: 33	**Low (1)** 32 – 42 → "1"	**Medium (2)** 43 – 53 → "2"	**High (3)** 54 – 65 → "3"
Behavioral Intension (BI) (Questions:9 Minimum score:24 Maximum score:45 Range: 21	**Low (1)** 24 – 30 → "1"	**Medium (2)** 31 – 37 → "2"	**High (3)** 38 – 45 → "3"

Table (4) Variable Construction

CHAPTER 5: ANALYSIS & RESULTS

This section provides an in-depth analysis of the research objective put forward at the start of the study.

5.1 Descriptive Statistics

Descriptive statistics of the variables we included in the study are presented in Table (5). Majority of the respondents were male officials and belong to age category 26 – 39 years. Most of them had education level from 11 – 14 years with more than 50% of experience in less than 10 years of the service. Besides, the majority were junior police officials and had high level of interest in information technology. Moreover, the perceived usefulness, perceived ease of use, attitude, and behavioral intension is mostly high among the officials.

Variables	Percentage (%)
Gender	
Female	26.11
Male	73.89
Age	
25 or < 25 years	5.28
26 – 39 years	71.67
40 and above	23.06
Education	
1-10 years	33.61
11-14 years	60.28
More than 14 years	6.11
Tenure/experience in Service	
1-10 years	54.45
More than 10 years	45.55
Designation	
Junior Police Official	88.34
Senior Police Official	11.67
Interest in IT	
High	84.72
Low	15.28
Perceived Usefulness (PU)	
Low	6.94
Medium	28.89
High	64.17
Perceived Ease of Use (PEU)	

Low Medium High	10.00 28.06 61.94
Attitude (AT)	
Low Medium High	8.61 26.67 64.72
Behavioral Intension (BI)	
Low Medium High	9.72 28.06 62.22

Table (5) Descriptive Statistics

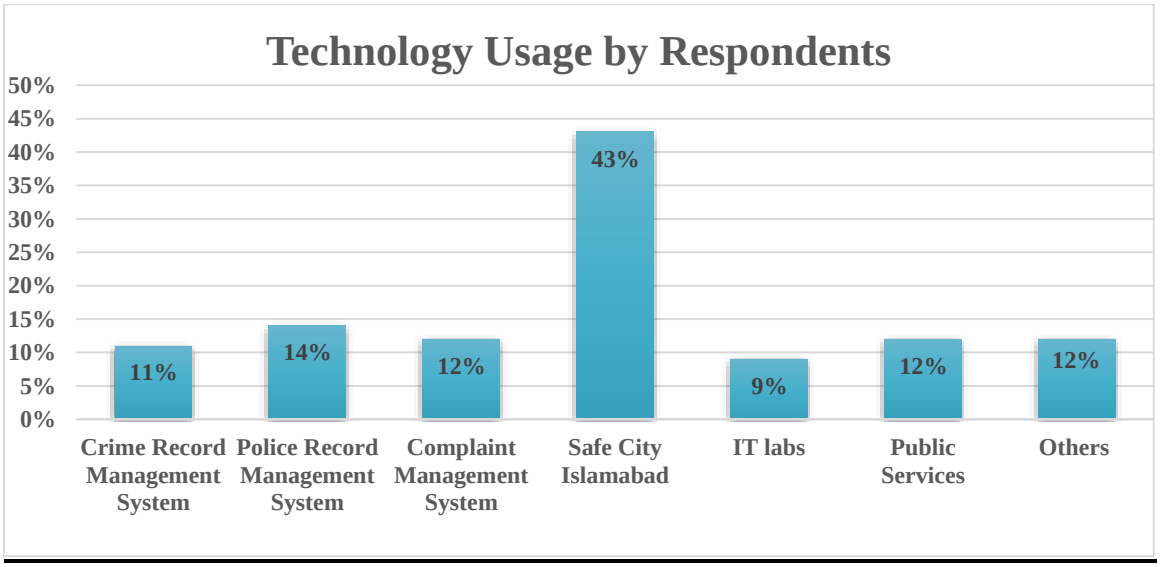


Figure (2) Technology Usage by Respondents

According to the above mentioned figure, majority of the officials in Safe City Islamabad have been using various technological systems such as police operation center (POC), intelligent video surveillance, police analysis center, safer Islamabad through smart cars, surveillance through drone technology, digital forensic laboratory, helplines, and vehicle management system, wireless call network TETRA, Vehicle Identification System (VIS), facial recognition system, FM 106 etc. The

ratio of safe city is high because of its tech savvy nature as well as respondents, zero human interaction, higher level of education and specialized staff for training. Whereas, IT labs are the least used technological system(s) among the respondents.

5.2 Cross Tabulation

The association between the variables was checked by cross-tabulations and analyzing Pearson's chi² and p-values. For this purpose, once indexes were made and coding process was completed, cross-tabulations of all the variables were made using the software Stata 17.0 and analyzed descriptively.

5.2.1 Cross Tabulation in Two Ways

Perceived Usefulness (PU)

Variables	**Perceived Usefulness (%)**		
	Low	**Medium**	**High**
Designation Pearson's chi² value = 18.2776 P-value = 0.000			
Junior Police Official	5.35%	27.04%	67.61%
Senior Police Official	19.05%	42.86%	38.10%
Interest in IT Pearson's chi² value = 33.5285 P-value = 0.000			
High	4.59%	25.57%	69.84%
Low	20.00%	47.27%	32.73%
Perceived Ease of Use Pearson's chi² value = 404.0.477 P-value = 0.000			
Low	66.67%	3.56%	2.78%
Medium	0.99%	77.23%	21.78%

High	0.00%	6.73%	93.27%
Attitude Pearson's chi² value = 416.1913 P-value = 0.000			
Low	74.19%	19.35%	6.45%
Medium	2.08%	80.21%	17.71%
High	0.00%	9.01%	90.99%
Behavioral Intension Pearson's chi² value = 344.3469 P-value = 0.000			
Low	62.86%	31.43%	5.71%
Medium	1.98%	73.27%	24.75%
High	0.45%	8.48%	91.07%

Table (6) Two Way Cross Tabulation with Perceived Usefulness

The p-value for the mentioned variables is less than 0.05 i.e., designation (p = 0.000), interest in IT (p = 0.0000), perceived ease of use (p = 0.000), attitude (p = 0.000), and behavioral intension (p = 0.000); therefore, they all are significantly associated with the perceived usefulness. Moreover, the ratio of junior police officials exhibits a high perceived usefulness rate of towards technological systems, while senior police officials demonstrate a moderate perceived usefulness rate. This shows that junior police officials tend to view technological systems more favorable as compared to the senior counterparts. Similarly, the respondents with high level of interest in IT have high perceived usefulness which means they view technology as more beneficial; whereas, those with low interest have medium perceived usefulness. Also, the individuals who reported a high perceived ease of use also exhibited a high perceived usefulness. It means that respondents who find system easy to use are more likely to perceive it as useful. Specifically, among those with a high attitude towards system reported high perceived usefulness which shows a positive

relationship between both variables. Additionally, it can be observed that officials who express a higher behavioral intension, reflecting their inclination to engage with technology, are more likely to perceive it as usefulness.

Perceived Ease of Use (PEU)

Variables	Perceived Ease of Use (%)		
	Low	Medium	High
Designation Pearson's chi² value = 16.9630 P-value = 0.000			
Junior Police Official	8.18%	26.42%	65.41%
Senior Police Official	23.81%	40.48%	35.71%
Interest in IT Pearson's chi² value = 28.8342 P-value = 0.000			
High	7.21%	25.57%	67.21%
Low	25.45%	41.82%	32.73%
Perceived Usefulness Pearson's chi² value = 404.0477 P-value = 0.000			
Low	96.00%	4.00%	0.00%
Medium	10.58%	75.00%	14.42%
High	0.43%	9.52%	90.04%
Attitude Pearson's chi² value = 353.6638 P-value = 0.000			
Low	83.87%	12.90%	3.23%
Medium	8.33%	72.92%	18.75%

High	0.86%	11.59%	87.55%
Behavioral Intension Pearson's chi² value = 337.4741 P-value = 0.000			
Low	74.29%	20.00%	5.71%
Medium	7.92%	72.28%	19.80%
High	0.89%	9.38%	89.73%

Table (7) Two Way Cross Tabulation with Perceived Ease of Use

Likewise, in the case of perceived ease of use, since the p-value for all categories is less than 0.05 i.e., designation (p = 0.000), interest in IT (p = 0.000), perceived usefulness (p = 0.000), attitude (p = 0.000), and behavioral intension (p = 0.000), they are all significantly associated with perceived ease of use. In case of designation and interest in IT, it can be seen that junior police officials and officials with high interest level have high perceived ease of use as compared to the other categories: senior police official and low IT interest, that have medium level of perceived ease of use. Moving forward, there is a meaningful connection between individuals' perception of how easy it is to use the technology and their assessment of its overall usefulness. In simple terms, those who find the technology easy to use are more likely to perceive it as useful. Besides, 83.87% of officials with low attitude towards technology report a corresponding low level of perceived ease of use. Conversely, among those with a high attitude towards technology, a substantial majority (87.55%) express a high perceived ease of use. So, the officeials with a more positive attitude towards technology are more likely to find it easy to use, while those with less favorable attitude are more inclined to perceive it as less user-friendly. Lastly, individuals with a strong intension to use the technology are more likely to find it easy to use, while those with lower behavioral are more inclined to perceive it as less friendly.

Attitude

Variables	Attitude (%)		
	Low	**Medium**	**High**
Designation Pearson's chi² value = 13.7331 P-value = 0.000			
Junior Police Official	7.23%	24.84%	67.92%
Senior Police Official	19.05%	40.48%	40.48%
Interest in IT Pearson's chi² value = 29.2942 P-value = 0.000			
High	6.23%	23.61%	70.16%
Low	21.82%	43.64%	34.55%
Perceived Usefulness Pearson's chi² value = 416.1913 P-value = 0.000			
Low	92.00%	8.00%	0.00%
Medium	5.77%	74.04%	20.19%
High	0.87%	7.36%	91.77%
Perceived Ease of Use Pearson's chi² value = 353.6638 P-value = 0.000			
Low	72.22%	22.22%	5.56%
Medium	3.96%	69.31%	26.73%
High	0.45%	8.07%	91.48%
Behavioral Intension			

Pearson's chi² value = 375.2557 P-value = 0.000			
Low	77.14%	22.86%	0.00%
Medium	3.96%	68.32%	27.72%
High	0.00%	8.48%	91.52%

Table (8) Two Way Cross Tabulation with Attitude

For the variable of attitude, since the p-value for all categories is less than 0.05 i.e., designation (p = 0.000), interest in IT (p = 0.000), perceived usefulness (p = 0.000), perceived ease of use (p = 0.000), and behavioral intension (p = 0.000), they are all significantly associated with attitude. The findings indicate that junior police officials exhibit high level of attitude; whereas, senior police officials display an equal distribution between medium and high levels of attitude. Moreover, individuals demonstrating a high level of interest in information technology (IT) also exhibit a notably high attitude as compared to those with low level of interest. Moving forward, individual's perception of the usefulness of technology play a crucial role in shaping their overall attitude towards it. It can be seen that perceived usefulness increases so does a positive attitude towards technology, while lower perceived usefulness is associated with a less favorable attitude. Besides, within the group reporting low perceived ease of use a significant 72.22% exhibit a low attitude towards technology. Contrastingly, among those with high perceived ease of use, the majority, specifically 91.48% express a high attitude towards technology. It means that individuals who find technology easy to use are more likely to hold a positive attitude towards it. Finally, officials with a strong intension to engage in certain behaviors related to technology are more likely to hold a positive attitude towards it, while those with lower behavioral intension are more prone to exhibit a less favorable attitude.

Behavioral Intension

Variables	Behavioral Intension (%)		
	Low	**Medium**	**High**
Designation Pearson's chi² value = 23.7394 P-value = 0.000			
Junior Police Official	7.23%	27.04%	65.72%
Senior Police Official	28.57%	35.71%	35.71%
Interest in IT Pearson's chi² value = 29.1409 P-value = 0.000			
High	6.56%	26.56%	66.89%
Low	27.27%	36.36%	36.36%
Perceived Usefulness Pearson's chi² value = 416.1913 P-value = 0.000			
Low	92.00%	8.00%	0.00%
Medium	5.77%	74.04%	20.19%
High	0.87%	7.36%	91.77%
Perceived Ease of Use Pearson's chi² value = 337.4741 P-value = 0.000			
Low	72.22%	22.22%	5.56%
Medium	6.93%	72.28%	20.79%
High	0.90%	8.97%	90.13%
Attitude			

Pearson's chi² value = 375.2557 P-value = 0.000			
Low	87.10%	12.90%	0.00%
Medium	8.33%	71.88%	19.79%
High	0.00%	12.02%	87.98%

Table (9) Two Way Cross Tabulation with Behavioral Intension

The p-value for all categories is less than 0.05 i.e., designation (p = 0.000), interest in IT (p = 0.000), perceived usefulness (p = 0.000), perceived ease of use (p = 0.000), and attitude (p = 0.000), they are all positively associated with behavioral intension. There is a meaningful relationship between the position held within the police force and inclination towards adopting technology, as junior officials exhibit high level of behavioral intension and senior officials show combined percentage for both medium and high levels of intension. Individuals displaying a high level of interest shows high intension as compared to the those with low level of interest. There is a significant link between one's level of interest in IT and their preference to engage in behaviors that support its use. Respondents who perceive technology as having low usefulness demonstrate a corresponding high percentage of low behavioral intension. Conversely, those who perceive technology as highly useful exhibits even higher percentage. This suggests that as the perceived usefulness of technology increases, so does the behavioral intension to engage with it positively. Along with this, based on statistical analysis, the ease with which individuals perceive they can use technology influences their behavioral intension, and this relationship is considered a positive meaningful. In the context of attitude, individuals with low attitude exhibit a substantial 87.10% of low behavioral intension. Conversely, those with a high attitude towards technology demonstrate a notably higher percentage of 87.98% of higher behavioral intension.

Technologies with Variables

In this, association between different technological system(s) and variables were estimated.

Perceived Usefulness

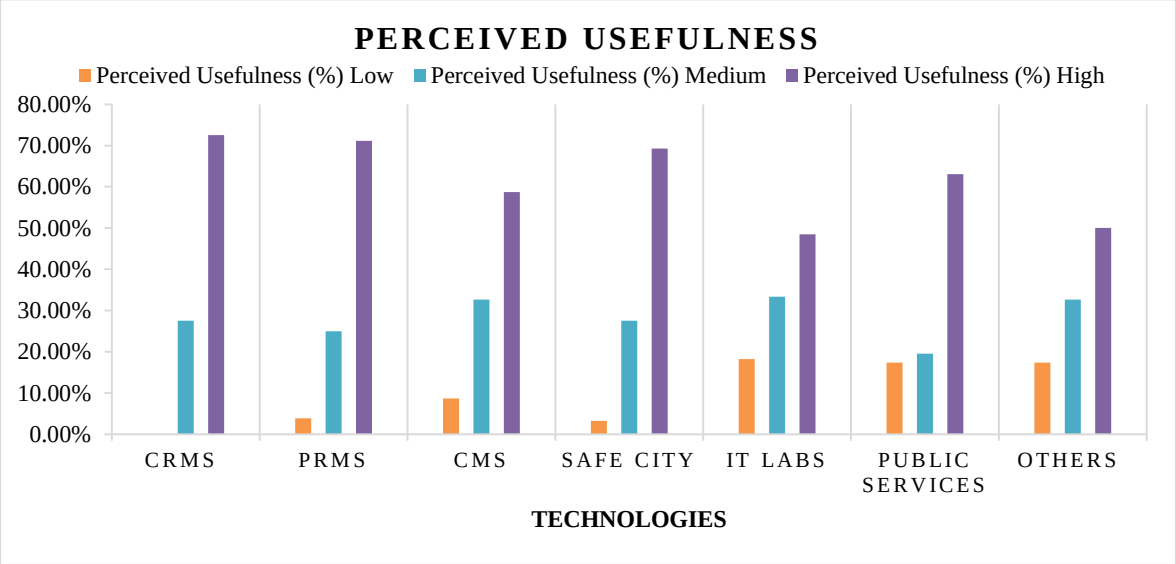


Figure (3) Technologies with Perceived Usefulness

*CRMS: Criminal Record Management System.

*PRMS: Police Record Management System.

*CMS: Complaint Management System.

*IT Labs: Information Technology Labs.

It can be observed a trend that as we move from right to left (others – CRMS), there is an increase in percentage of respondents with high perceived usefulness. CRMS recorded the highest percentage of high perceived usefulness. Whereas, officials working in safe city have the highest trend of medium perceived usefulness as compared to the others.

Perceived Ease of Use

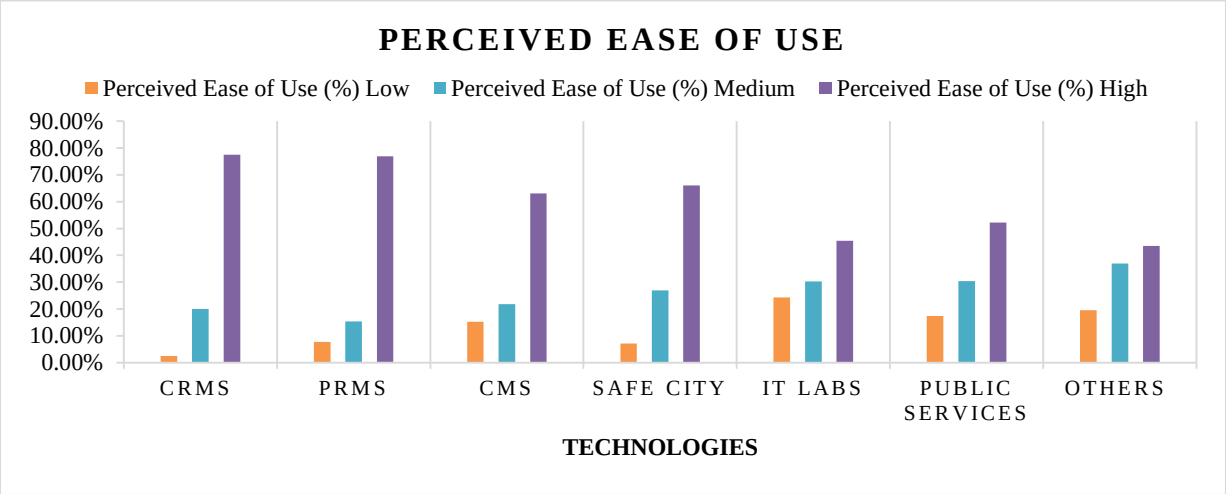


Figure (4) Technologies with Perceived Ease of Use

Respondents using technological system(s) in IT labs have highest percentage of low perceived ease of use among others; whereas, the trend increases in medium perceived ease of use. Officials using CRMS have high perceived ease of use.

Attitude

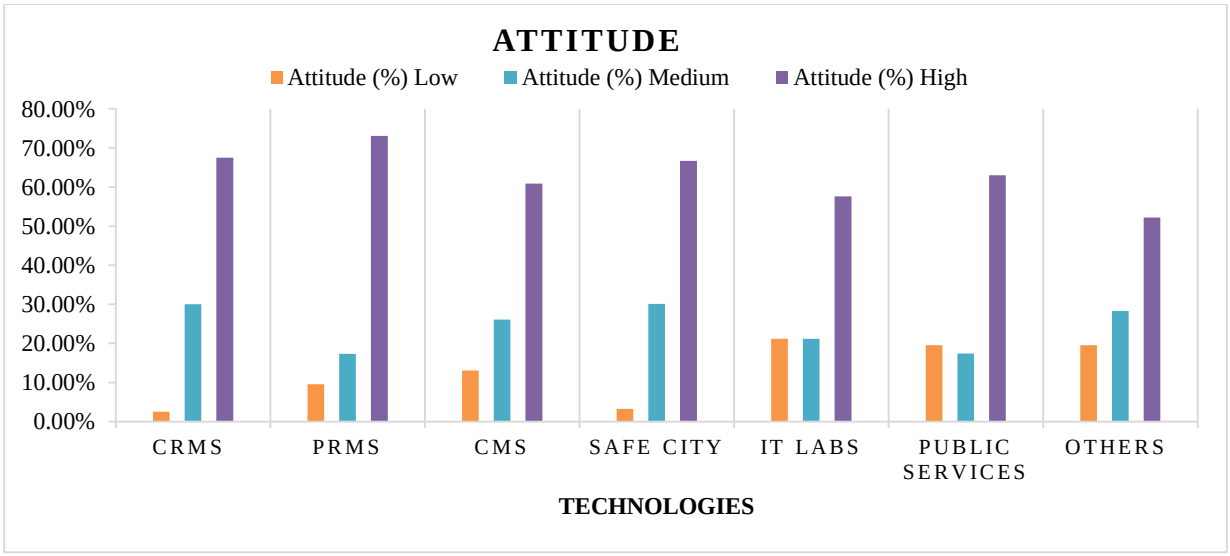


Figure (5) Technologies with Attitude

Officials using PRMS have high attitude, and those using CRMS have low attitude.

Behavioral Intension

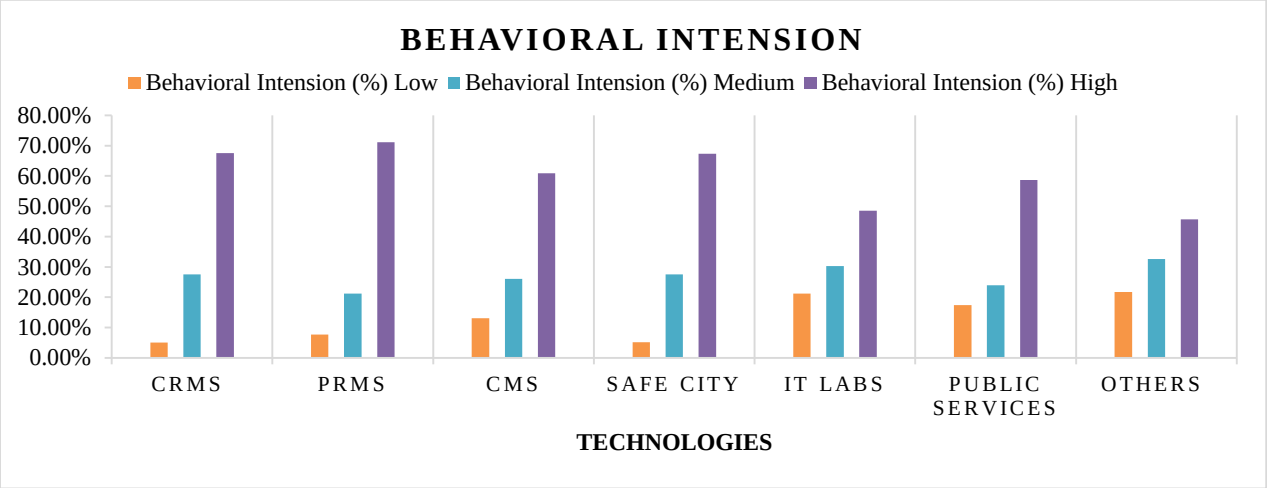


Figure (6) Technologies with Behavioral Intension

Respondents using PRMS have high behavioral intension; whereas, those using CRMS have low behavioral intension.

5.2.2 Cross Tabulation in Three Ways

Perceived Usefulness

Perceived Usefulness with Gender & Designation

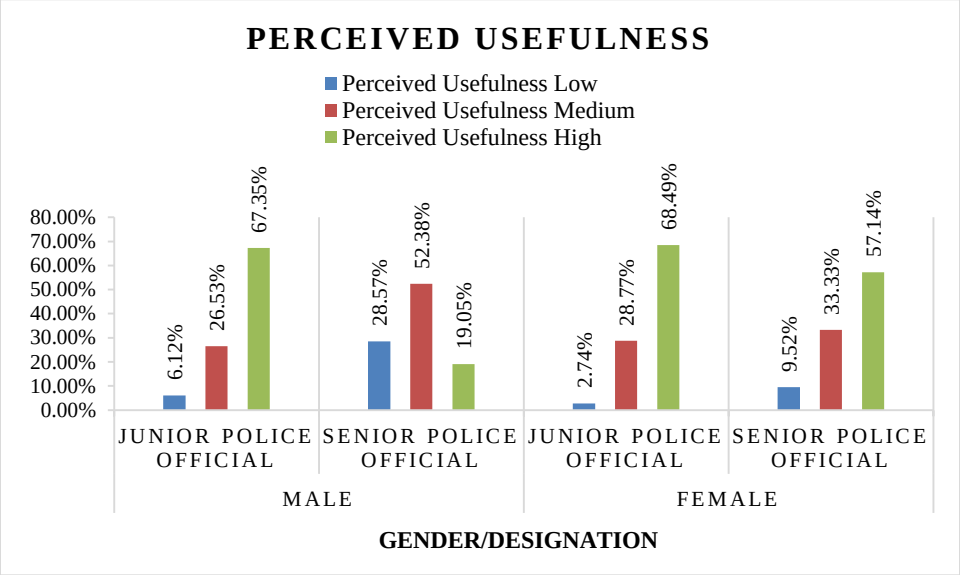


Figure (7) Perceived Usefulness with Gender & Designation

Perceived usefulness of junior male police officials towards the technology is high as compared to the senior male police officials. Similarly, the perceived usefulness of female junior police officials is high as compared to the female senior police officials. This could be due to various factors such as familiarity with newer technologies, adaptability, or perhaps a ranking difference. By comparing both sides, junior police officials (both male and female) have high level of perceived usefulness. This suggested a broader trend within the police force where junior recruits, who may be more accustomed to utilizing technology in their daily lives, are more inclined to see its benefits in their professional roles.

Perceived Usefulness with Gender & Education

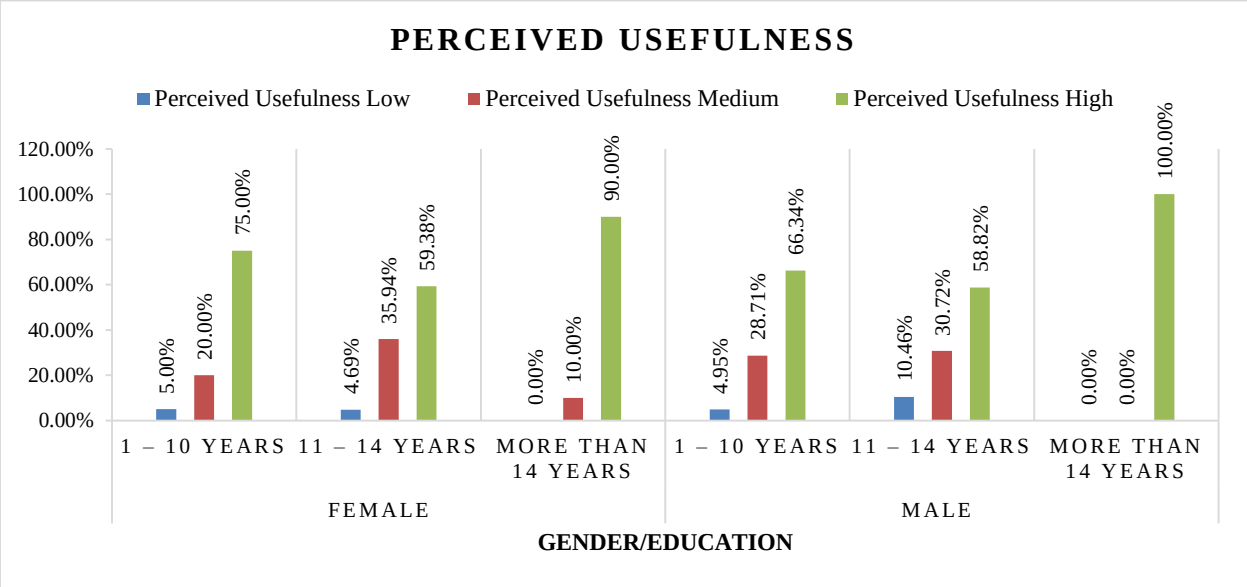


Figure (8) Perceived Usefulness with Gender & Education

Perceived usefulness of female officials with 1 – 10 years of education is higher as compared to the male officials. This could imply that female officials with lower levels may still recognize the benefits and utility of technology in their professional roles. Moreover, comparing the second category of years of education, female officials lead and tend to attribute more value to technology in their work compared to their male counterparts. Similarly, in more than 14 years of education, perceived usefulness of male officials is higher as compared to the female officials. Overall, officials with education more than 14 years show higher level of perceived usefulness. This overarching trend suggests that a higher level of education may generally correlate with a greater appreciation for the benefits and importance of technology in policing roles, regardless of gender.

Perceived Ease of Use

Perceived Ease of Use with Gender & Designation

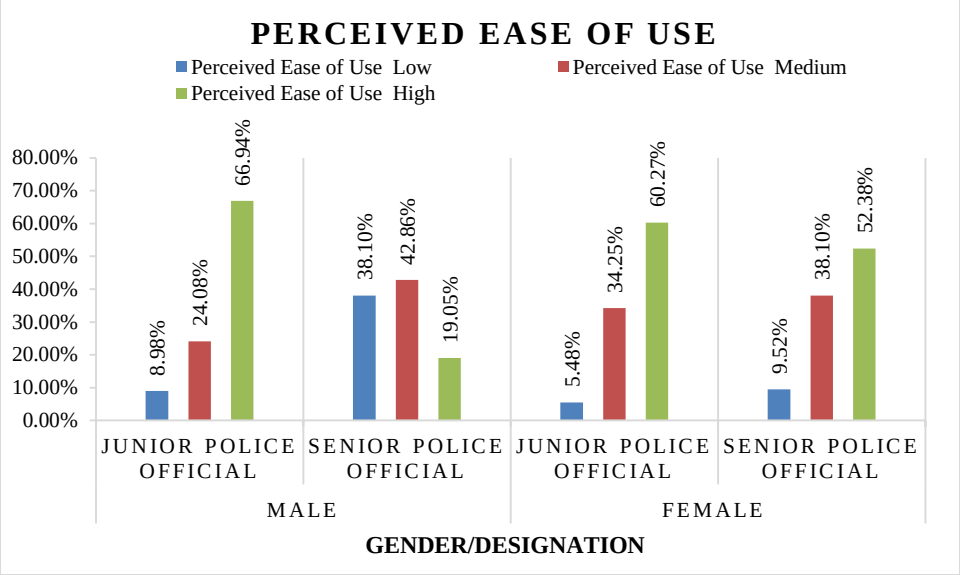


Figure (9) Perceived Ease of Use with Gender & Designation

The results revealed that perceived ease of use of junior male police officials is high as compared to the senior male police officials. Junior police officials perceived their tasks as significantly easier and reported higher sense of task affluence compared to their senior counterparts On the opposite side, junior female police officials have high perceived ease of use as comparison to the senior male police officials. So, junior police officials on both sides have high perceived ease of use and report a greater sense of straightforwardness in their roles. Also, regardless of gender, officials may find aspects of their duties more approachable or manageable than those with more experience.

Perceived Ease of Use with Age & Designation

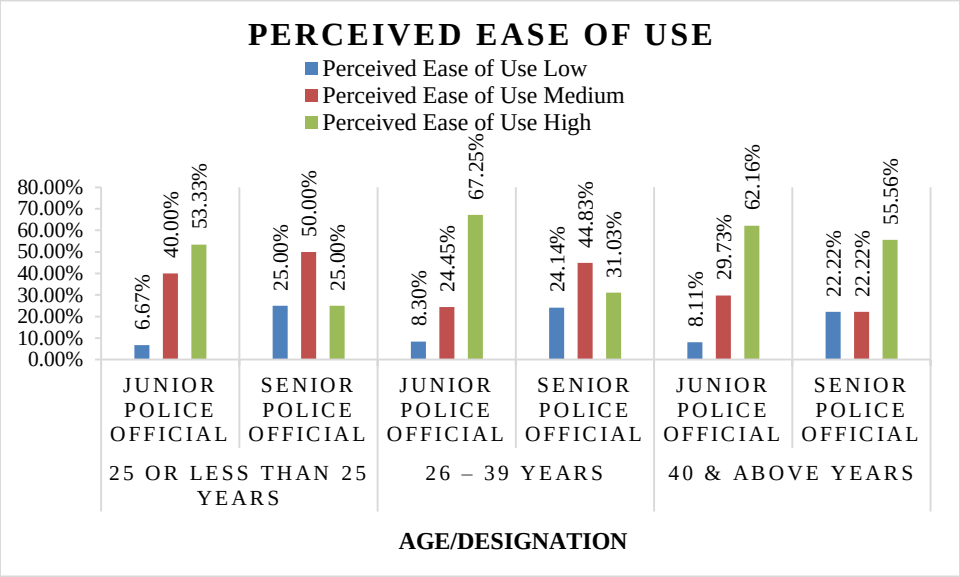


Figure (10) Perceived Ease of Use with Age & Designation

Perceived ease of use of junior police officials of middle age group is high as compare to the other two age groups as they perceive their tasks as easier while using the technological systems. Whereas, perceived ease of use of senior police officials is highest in age group 40 and above years. Overall, junior police officials of all age groups have high perceived ease of use as compared to the senior police officials. Besides, they also find aspects of their roles more approachable or manageable towards the technology use.

Perceived Ease of Use with Tenure/ Experience in Service & Designation

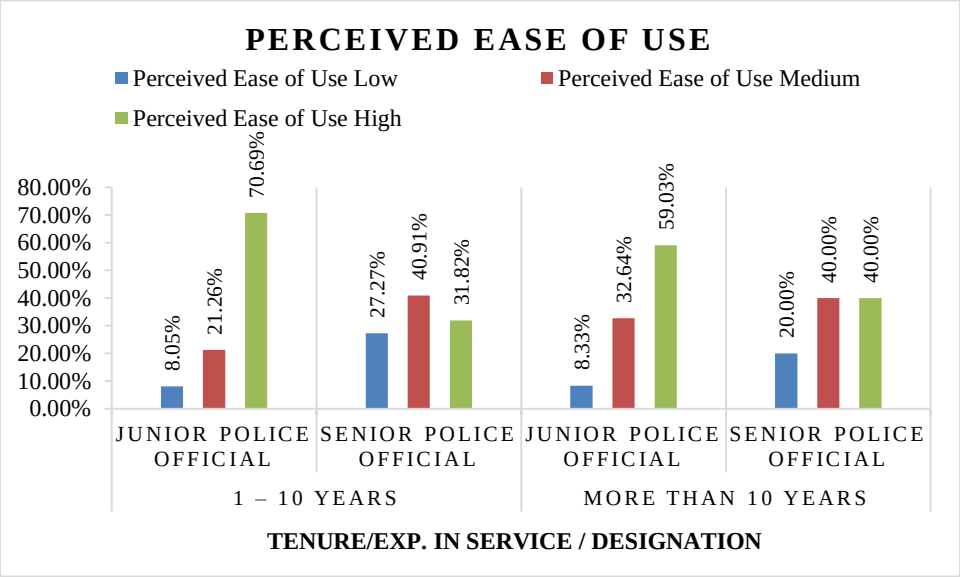


Figure (11) Perceived Ease of Use with Tenure/Exp. In Service & Designation

The analysis indicated that junior police officials with 1 – 10 years of experience tend to perceive their tasks as easier when compared to their counterparts with more experience. Conversely, senior police officials with over 10 years of experience demonstrate a higher perception of task ease compared to their counterparts with less experience. Despite these differences, it's noteworthy that when considering both sides, junior police officials consistently report a high perceived ease of use. This suggested a notable contrast in perception between junior and senior officials based on their level of experience, with junior official finding aspects of their duties more approachable and amicable.

Perceived Ease of Use with Gender & Education

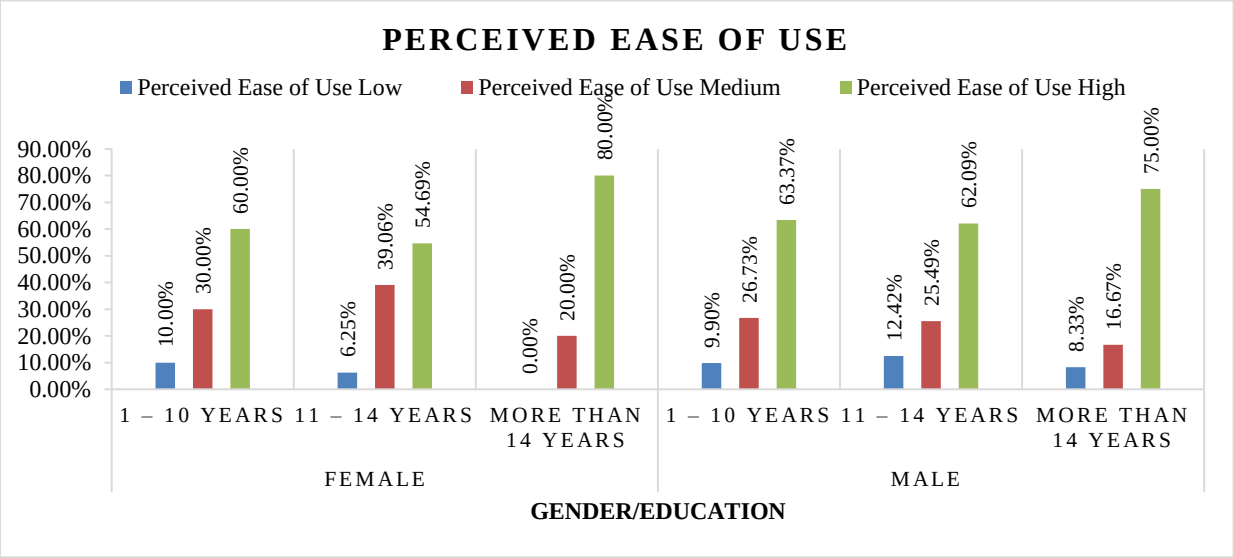


Figure (12) Perceived Ease of Use with Gender & Education

Perceived ease of use of male officials is higher in the first category of years of education as compared to the female officials. Also, in 11 – 14 years of education, male officials have higher level of perceived ease of use; whereas, in the last category female officials show higher perceived ease of use as compared to the male officials. Overall, it is noteworthy that officers with more than 14 years of education generally exhibit a heightened level of perceived ease of use across genders. This indicates a potential correlation between higher educational attainment and greater comfort level with technological systems or processes among law enforcement officials, regardless of gender.

Attitude

Attitude with Gender & Designation

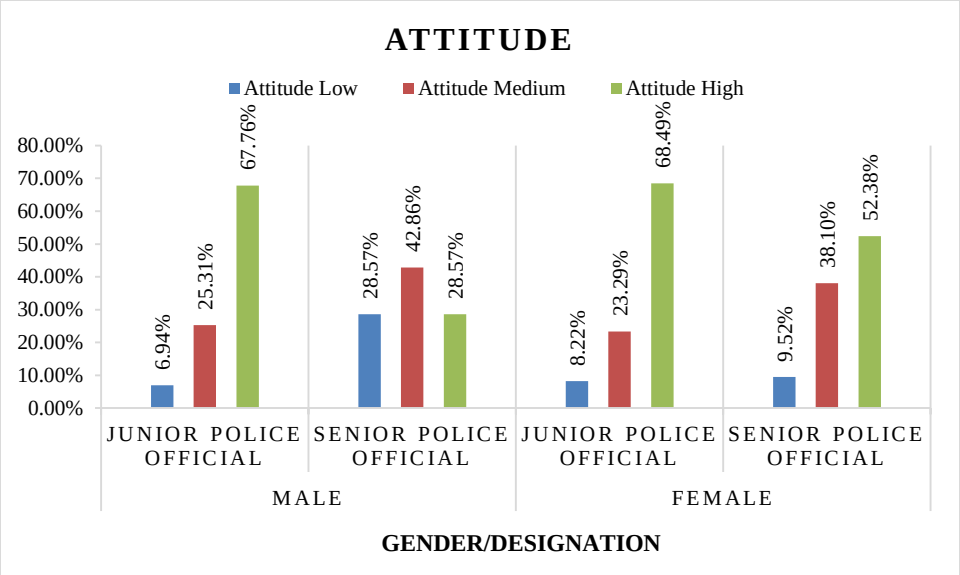


Figure (13) Attitude with Gender & Designation

The results revealed that the attitude towards technology among junior female police officials is higher as compare to the junior male police officials. On the other side, senior female police officials have high attitude when compared to their male counterparts at the senior level. However, the overall trend showed that on both sides junior police officials display a favorable and strong positive attitude towards technology. Additionally, there is a consistent pattern of higher acceptance among female police officials, regardless of their career stage.

Attitude with Tenure/Experience & Designation

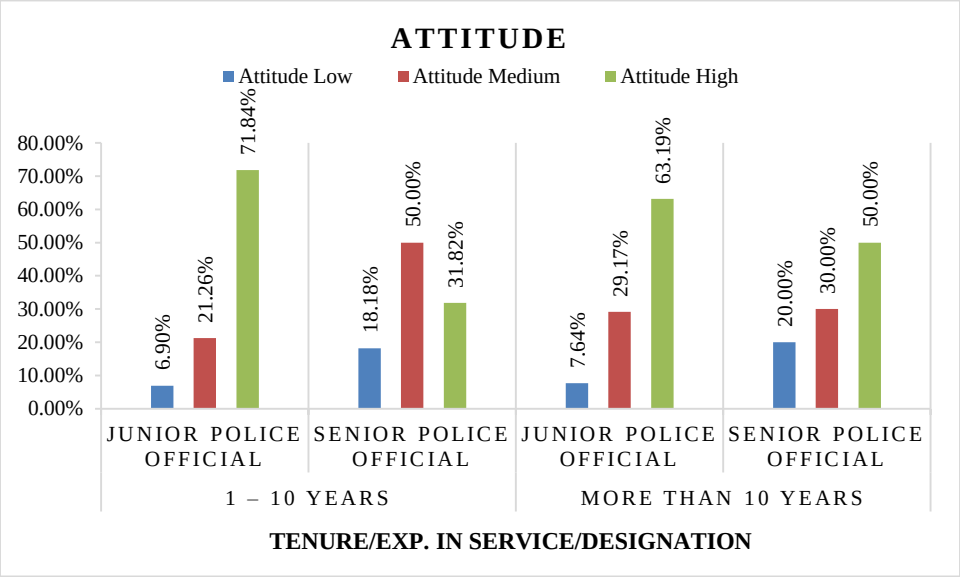


Figure (14) Attitude with Tenure/Exp. In Service & Designation

The results showed the junior police officials having 1 – 10 years of experience exhibit a strong positive attitude towards utilization of technological system(s); whereas, senior police officials having experience more than 10 years seem to have less enthusiastic attitude. Overall, junior officials who likely have been exposed to technological advancements throughout their training and early career, demonstrate a greater receptivity towards incorporating technology into their work routines. Besides, it is noteworthy that the overall trend of positive attitude among junior police officials regardless of their specific years of experience within the 1 – 10-year range.

Attitude with Gender & Education

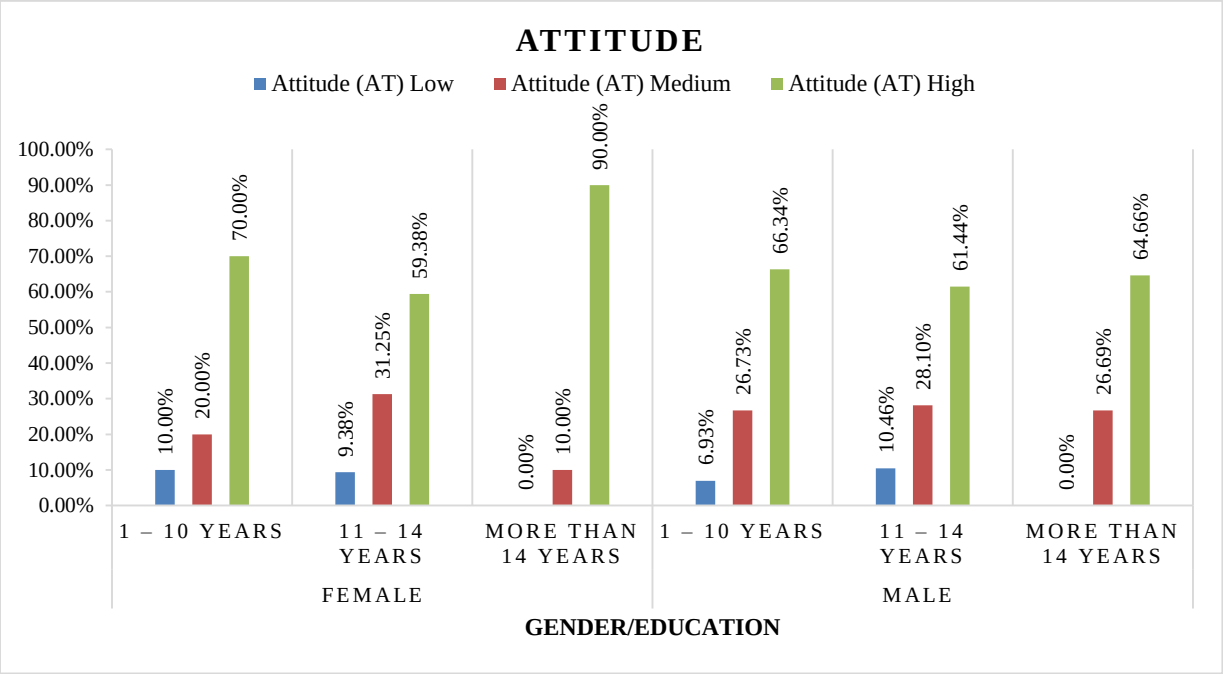


Figure (15) Attitude with Gender & Education

The female officials with 1 – 10 years of education displayed a notable higher attitude towards technology usage as compared to the male counterparts. In the second category of years of education, male officials exhibited a high attitude and tended to have a particularly favorable disposition towards technology adoption; however, in the last category of more than 14 years of education, female officials showed high attitude towards acceptance of technology. This indicates that among highly educated individuals, female officials are more inclined towards accepting and integrating technology into their professional sphere.

Behavioral Intension

Behavioral intension with Gender & Designation

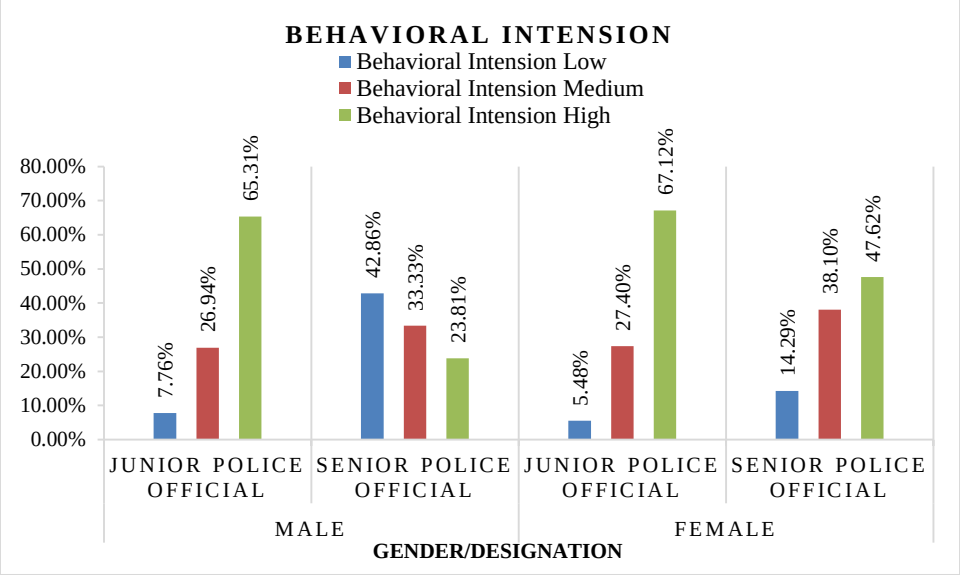


Figure (16) Behavioral Intension with Gender & Designation

The results indicated that junior female police officials have high behavioral intension and showed a stronger inclination or readiness to adopt technological system(s) as compared to their male counterparts. On other side, senior female police officials exhibited high behavioral intension when compared to the senior male police officials. Generally, across genders, junior police officials, both male and female, showed a higher behavioral intension towards technological systems.

Behavioral Intension with Gender & Education

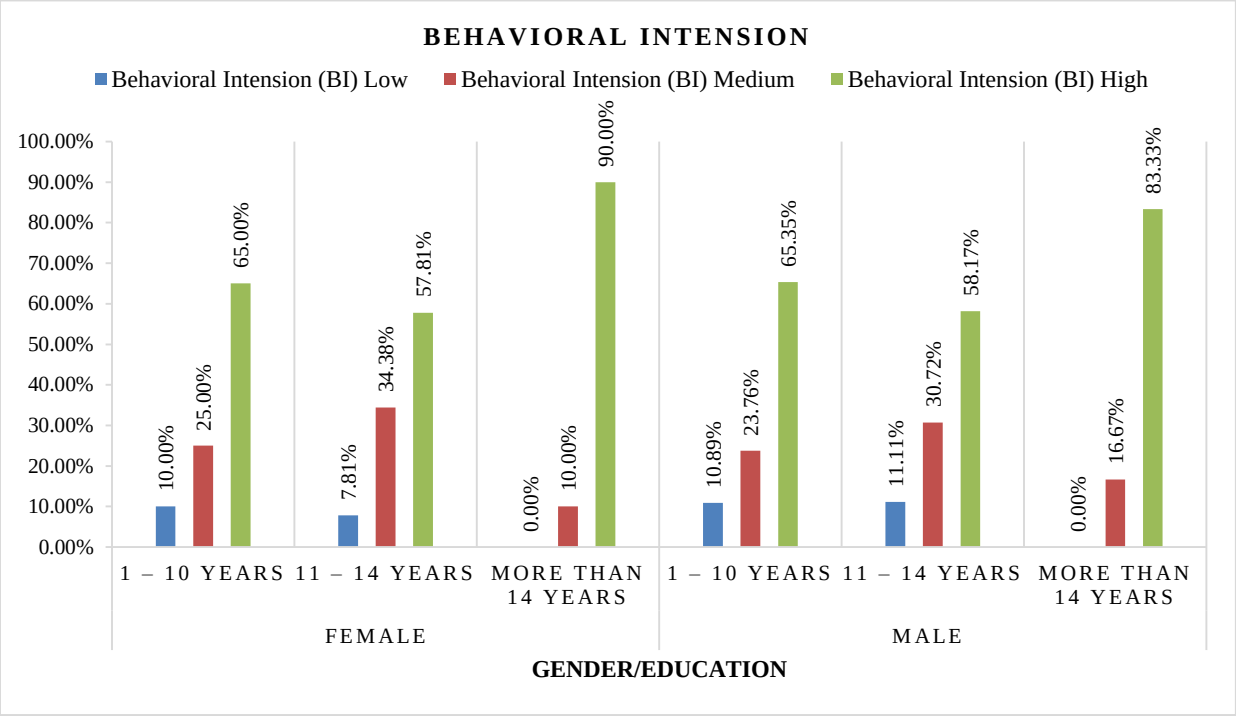


Figure (17) Behavioral Intension with Gender & Education

It can be observed that male officials with 1 – 10 years of education showed higher behavioral intension to utilize the technology. This suggests that among male officials with relatively lower levels of education, there is a keen interest or willingness to adopt technological systems. Similarly, male officials with 11 – 14 years of education have higher behavioral intension which implies that there is notable inclination towards technological adoption; whereas, in the final category, female officials displayed higher intension to use technology. Ultimately, when considering both genders and all education levels, officials with more than 14 years of education consistently exhibited a higher intension to use technological systems. This overarching trend suggests that as educational attainment increases beyond a certain point, individuals tend to become more receptive to technology due to various reasons such as familiarity with digital tools in higher education or a greater appreciation for its potential benefits in professional settings.

Acceptance of Technology

Acceptance of Technology with Gender & Education

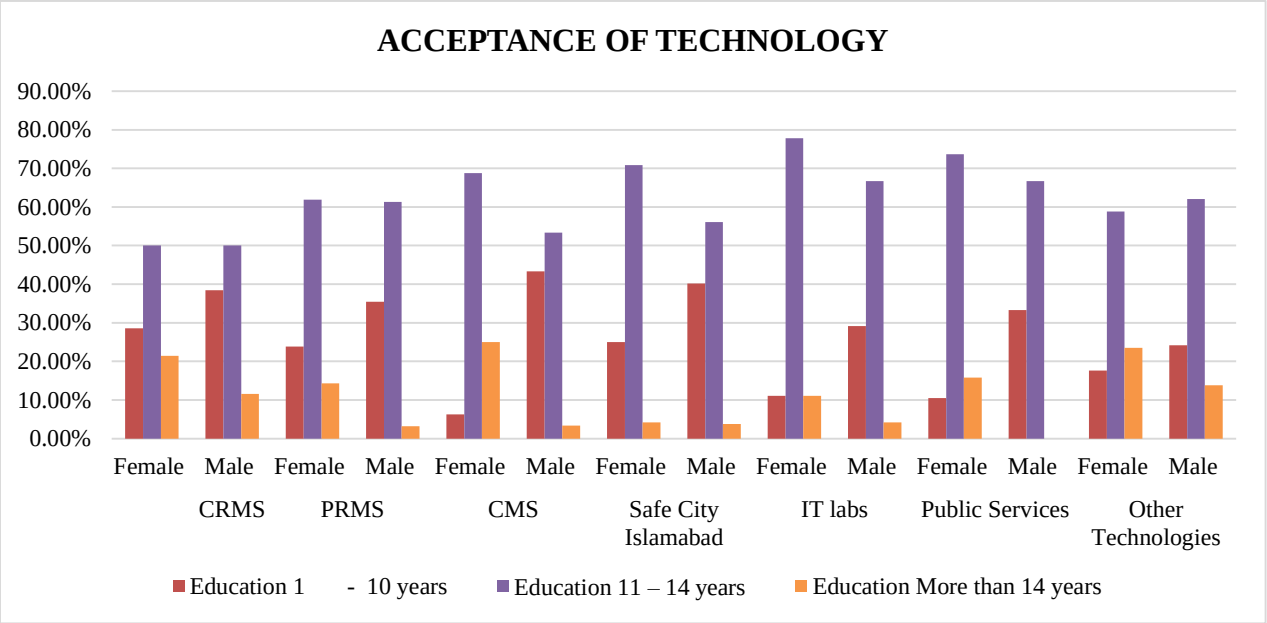


Figure (18) Acceptance of Technology with Gender & Education

In the initial stage of education spanning 1 – 10 years, female officials exhibit greater acceptance of technology when utilizing CRMS; whereas, male officials tend to favor CMS. Transitioning to the 11 – 14 years of education bracket, female officials demonstrate increased acceptance of technological systems within IT labs, while male officials display higher acceptance levels across both IT labs and public services. In the final category, female officials show a preference for technology acceptance in CMS and other technologies. In a nutshell, officials with 11 – 14 years of education showed higher acceptance of technology towards IT labs.

Summary

To sum up, junior police officials exhibit higher level of perceived usefulness (PU), perceived ease of use (PEU), attitude (AT), and behavioral intension (BI) towards technological systems. This demonstrate a greater interest as well as approachability towards incorporating digitalization and innovation into their work routines and professional sphere. Moving forward, officials with

education more than 14 years' display attentiveness and willing in adoption of advanced systems and have positive attitude towards acceptance of technology.

5.3 Goodness of Fit Measures

For goodness of fit, structural equation model (SEM) was implemented. Basically, SEM is used to explore and test complex links of relationships between various variables simultaneously. It involves investigating the relationships between latent variables themselves. It explores how these variables are interrelated, establishing the causal pathways or associations between them.

Fit measures	Values
RMSEA	0.304
P-close	0.000
CFI	0.95
TLI	0.85

Table (10) Goodness of Fit Measures

**CFI: Comparative fit index.*

**TLI: Trucker-Lewis index.*

The provided table (10) summarizes the model fit measures, demonstrating that the model's validity is supported by various adequacy indices, including RMSEA, p-value, comparative fit index (CFI), & Trucker-Lewis index (TLI). As per the criteria established by (Stephen G. West, 2012) and (Li-Tze HU, 1998) a Comparative Fit Index (CFI) closer to 1 or greater, particularly equal to or exceeding 0.95, signifies an excellent fit for the model. In this case, the CFI is 0.95, indicating an excellent fit. Additionally, the Trucker-Lewis Index (TLI) is 0.85, which signifies a very good fit. These fit indices collectively suggest that the proposed measurement model aligns well with collected data. Consequently, it can be inferred that the model's fit is sufficiently adequate to proceed with the examination of the structural model's path coefficients in this study.

Dependent variable	Fitted	R-squared	Mc	Mc2

Perceived Usefulness	0.3836	0.6876	0.8292	0.6876
Attitude	0.4184	0.6989	0.8360	0.6989
Behavioral Intension	0.4438	0.6590	0.8118	0.6590
Overall		0.7214		

Table (11) Equation Level Goodness of Fit Measures

Variables	**Direct Effect**	**Indirect Effect**	**Total Effect**
PU			
PEU	0.7660414	0	0.7660414
AT			
PU	0.5540149	0	0.5540149
PEU	0.3297675	0.4243984	0.7541659
BI			
PU	0	0.4631637	0.4631637
AT	0.836013	0	0.836013
PEU	0	0.6304925	0.6304925

Table (12) Direct, Indirect, & Total Effect

**PU: Perceived usefulness.*

**PEU: Perceived ease of use.*

**AT: Attitude.*

**BI: Behavioral intension.*

The above mentioned table presents a comprehensive overview of direct, indirect, and total effects of the variables within the model, which are reflected through the coefficients that define the

relationships. Specifically, when considering the direct effects of variables on each other, it is evident that perceived ease of use (PEU) exerts a substantial direct effect on perceived usefulness (PU), with a coefficient of 0.7660414. Additionally, both perceived usefulness (PU) and perceived ease of use (PEU) directly influence attitude, with coefficients of 0.5540149 and 0.3297675, respectively. Moreover, attitude directly influences behavioral intension, with a coefficient of 0.836013, while perceived usefulness (PU) and perceived ease of use (PEU) do not have a direct effect on behavioral intension.

Conversely, there is no indirect effect of perceived ease of use (PEU) on perceived usefulness (PU). This is absence of an indirect effect is due to the specified direct relationship between these variables, resulting in a coefficient of zero, indicating no indirect path. Similarly, when examining the relationship between perceived usefulness (PU) and attitude (AT), there is no indirect effect specified. However, there is an indirect effect specified between perceived ease of use (PEU) and attitude (AT), with a coefficient of 0.4243984.

Moving on to the relationship between perceived usefulness (PU) and behavioral intension (BI), there is an indirect effect, and the total effect of perceived usefulness and behavioral intension is statistically significant, with the coefficient of 0.4631637. In contrast, when considering the connection between attitude (AT) and behavioral intension (BI) there is no indirect effect; both variables have direct relationship as specified previously.

Lastly, in the context of perceived ease of use (PEU) predicting behavioral intension (BI), there is an indirect effect with a coefficient of 0.6304925. this comprehensive analysis sheds light on the intricate interplay between these variables within the model.

Path	Path coefficient	P-value	Relationship
PU → AT	0.55	0.000	Significant
PEU → AT	0.33	0.000	Significant
PEU → PU	0.77	0.000	Significant
AT → BI	0.84	0.000	Significant

Table (13) Path Analysis

**PU: Perceived usefulness.*

**PEU: Perceived ease of use.*

**AT: Attitude.*

**BI: Behavioral intension*

This study employed a structural equation modeling approach to develop a model that represents the relationship among the four factors in this study: perceived usefulness (PU), perceived ease of use (PEU), attitude (AT) and behavioral intension (BI) to use the technological systems. Table (13) shows the results of the path analysis by confirming the presence of a statistically significant relationship in the predicted direction of the proposed research model. Overall, 4 out of 4 paths were supported by the data. Consistent with prior research (Davis, 1989; Hu, Chau, Sheng & Tam,1999) perceived usefulness (PU) and perceived ease of use (PEU) has a significant effect on attitude (AT), with $p < 0.05$. While perceived ease of use (PEU) has a significant effect on perceived usefulness (PU). Moreover, attitude (AT) has a significant influence on behavioral intension (BI), with $p < 0.05$.

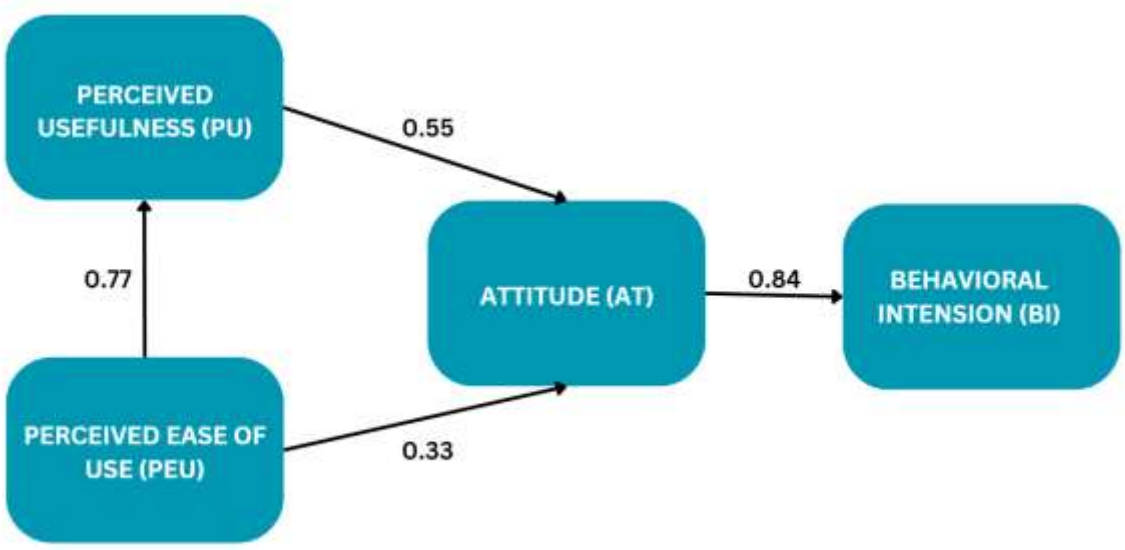


Figure (19) Path Coefficient Research Model

The structural model and path analysis was tested by examining the path coefficients and their significance. The path coefficients are present in figure (19). Consistent with the analysis, perceived usefulness demonstrated a significant influence on attitude (path = 0.55). Similarly, perceived ease of use demonstrated a significant influence on attitude (path = 0.33) and perceived usefulness (path = 0.77) (Ronnie H. Shroff, 2011). The link between attitude and behavioral intension was also significant (path = 0.84). This finding supports current research that demonstrated the strong relationship among PU, PEU, AT and BI and encourage each other.

➢ Suggestions to Improve Technological System(s)

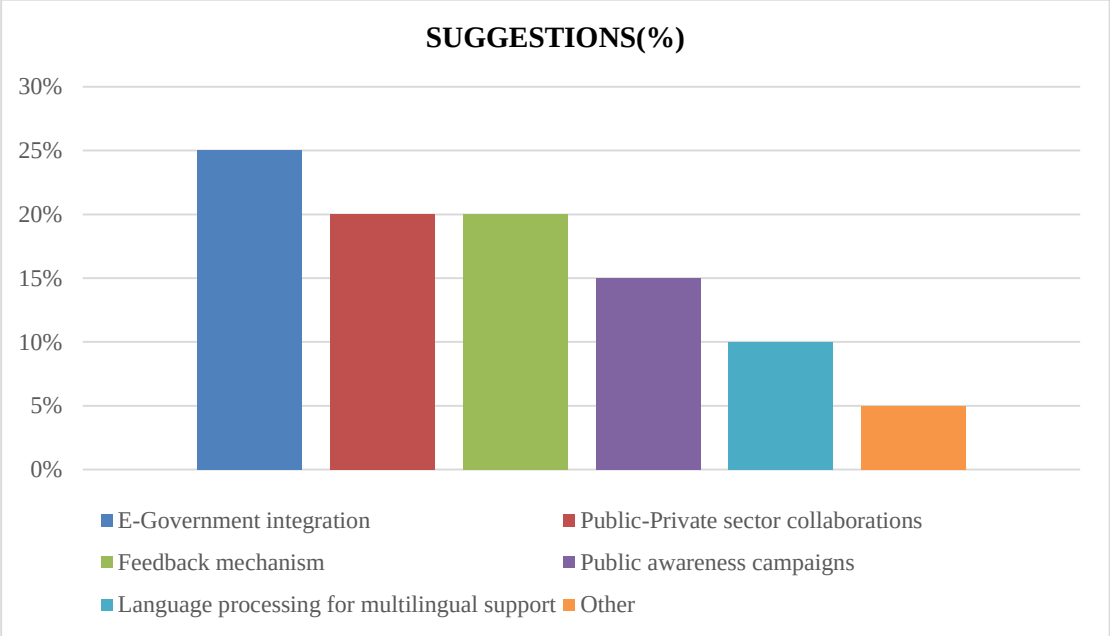


Figure (20) Suggestions to Improve Technological Systems

Majority of the officials suggested to collaborate with other government's departments to incorporate policing systems with e-government advantages. This would help in strengthening overall governance and public service delivery process. Moreover, there should be a collaboration with private sector organizations, tech companies, and educational institutions to leverage expertise, resources, and innovation in improving policing technology. Also, digitalization would encourage transparent and accessible feedback mechanism for the public to report any issues or concerns related to the use of technology in policing. Furthermore, some officials recommended to launch public awareness campaigns to educate the community about the use of technology in policing, emphasizing its role in ensuring public safety and reducing crime. Besides, it was also proposed that there should be multiple lingual processing technology to support communication among officials and citizens. Lastly, other suggestions included utilization of social media for community outreach, and continuous and comprehensive training officials by introducing international mediums.

CHAPTER 6: DISCUSSION

The study investigated the Police adaptation towards technology. Digitalization and automation is considered as one of the important elements in ensuring progress and prosperity. In this regards, Islamabad police has taken an initiative to strengthen its landscape. With the passage of time, it has been transforming from traditional methods to advanced and modern methods in order to maintain law and order, prevent and investigate crimes, and ensuring public safety. The results revealed that police are highly adaptive towards technology. It shows that the use of technology is considered as crucial tool for police organization and plays a vital role in implicitly supporting and enhancing both individual and group performance, as well as transforming various processes (Mohini Singh, 2011).

Moreover, the purpose of this study was to determine if the TAM can be applied to examine the relationship between different technological systems and police official's intension to use them with selected factors of perceived usefulness (PU), perceived ease of use (PEU), and attitude towards usage (AT). Consistent with prior research (Davis, 1989; Hu et al, 1999) perceived ease of use has a significant effect on attitude towards usage. An explanation might be that when officials perceive the technological system(s) as one of that is easy to use and nearly free of mental effort, they may have a favorable attitude towards the usefulness of the system. These findings support current research which suggests that user's positive feeling towards the ease of use of technology is associated with sustained use of technology. The results of the study also showed that perceived ease of use (PEU) had significant influence on perceived usefulness (PU). It means that the officials are willing to adopt the technological system(s), and this may suggest that officials tend to focus on the usefulness of the technology itself. Moreover, this study also finds a significant and conclusive relationship between perceived usefulness (PU), attitude (AT), and behavioral intension (BI) to use the technological system(s). The police official's attitude towards technology use is positively influenced by perceived usefulness and behavioral intension towards technology is positively influenced by attitude.

Besides, technological sophistication has been evaluated through various factors such as the variety of IT used, hardware and software characteristics, development tools, man-made interfaces, processing modes, and types of operations. However, few studies have explored the specific

relationship between technological sophistication and variables like perceived usefulness, perceived ease of use, attitude, and behavioral intension. This study shows that more sophisticated technologies are associated with greater perceived usefulness. The use of advanced technologies provides more readily available and faster information, saving time and energy for users. These systems support multiple tasks, leading to informed and better decision making, which ultimately enhances work efficiency and productivity. Additionally, advanced machinery and equipment improve the ease of use of technology. For instance, they facilitate a better understanding during investigations and assist in training processes, making the use of technology easier and effortless. The majority of respondents demonstrated a positive attitude towards using technology for various kind of work. They reported feeling stress-free and confident when using digital systems and expressed a desire to continue utilizing these systems in their future work.

Furthermore, majority of the officials were confident about various technologies that they will enhance and polish their skills and training process. These systems help them in getting information more quickly that assists them in in reducing their workload. Impressively, digitalization reduces officers stress and limited choices and plays a tremendous role in achieving organization's goal and changes its perception towards technological shift (Neomi Frisch Aviram, 2023) and support them in solving crimes within minutes (Watkins et. al., 1998). This increases productivity and effectiveness of both officer and organization.

Also, integration of technological system(s) improves the job performance and support the work by maximizing its productivity. It influences the key aspects of policing by changing the importance of communication and technical tools, making accountability a built-in part of reporting, and restructuring the daily routines of police work (Chan, 2001).

CHAPTER 7: CONCLUSION

To conclude this, the integration of various technologies within Islamabad Capital Police (ICP) has significantly influenced its operations. The implementation of systems such as complaint management system, police station record management system, criminal record management system, IT labs, safe city driving cars, drones and surveillance cameras, eagle squad, 15 PUKAAR, CCTV cameras, and public services across different police stations and facilitation centers, as well as within Safe City Islamabad initiative, has been instrumental. To gather insights, a questionnaire survey was conducted among 360 police officials in the capital. The study utilized the Technology Acceptance Model (TAM) as the theoretical framework to evaluate the official's acceptance and use of technology. Utilizing a structural Equation Model (SEM) for assessing goodness of fit measures, the research aimed to establish the interrelationships among key variables: perceived usefulness, perceived ease of use, attitude, and behavioral intension. The outcomes align closely with the study's objective. It was observed that police officials exhibit a positive attitude towards adopting new technologies. They perceive that integration of technology maximizes their organizational growth and progress, and improves job performance. Moreover, the utilization of these diverse technological tools has notably amplified their work efficiency, aiding in crime investigation and prevention. Various systems help them in enhancing their work routine and provide various benefits regarding their official work. Furthermore, there is an optimistic outlook among officials regarding the regarding the prospective use of these systems in their future endeavors.

There were some limitations in the study. Firstly, time constraint due to which the data could only be collected from the city of Islamabad, however, further studies should be conducted in other cities. Secondly, availability of the official was also uncertain due to law and order situation of the capital. Lastly, some of the officials were reluctant to fill the questionnaire.

Owing to the positive relationship between perceived usefulness, perceived ease of use, attitude, and behavioral intension, the study recommends paying more attention to these drivers and successful implementation of this recommendation will increase effectiveness of technology usage. This will boost the confidence among police officials towards new technologies. Moreover, this will increase the productivity of other law enforcement agencies and help in providing better

safety to the people of the country. The study will further assist policy makers in determining the best measures of increasing compliance with technology in policing and will guide other provinces (Khyber Pakhtunkhwa, Sindh, Gilgit-Baltistan) to adopt the modern and advanced technological systems in Police department.

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APPENDIX A

QUESTIONNAIRE

Which technology/technological system(s) you are using?

i. Criminal Record Management System (CRMS).
ii. Police Station Record Management System (PRMS).
iii. Complaint Management System (CMS).
iv. Safe City Islamabad.
v. IT Labs.
vi. Public Services.
vii. Others.

Section 1 – Perceived Usefulness

1. **This technology enables me to find relevant information quickly.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
2. **This technology allows me to interact digitally with citizens.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
3. **The technology is useful in getting information swiftly.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree

- Strongly Agree

4. **This technology saves my time.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
5. **Effective tracking of Police performance will be implemented using this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
6. **Using this technology improves my job performance**.
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
7. **This technology increases work efficiency and productivity.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
8. **This technology supports my work.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

Section 2 – Perceived Ease of Use

1. **I find this technology useful.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
2. **It is easy for me to learn how to use this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
3. **It is easy to become skilled in using this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
4. **I have been trained to use this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
5. **My interaction with this this system is understandable.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

6. **It will be easy for me to get information through the system.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
7. **The system helps me in my daily work.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

Section 3 – Attitude

1. **This technology is valuable contribution to the functioning of Islamabad Capital Police.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
2. **I feel no stress while using this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
3. **I am sure it will help to deal with crime and to be more engaged in investigation.**
    - Strongly Disagree
    - Disagree
    - Neutral

- Agree
- Strongly Agree

4. **I generally support the use of this technology for crime prevention.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
5. **I believe it is a good idea for me to use it for the future.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
6. **I am completely satisfied with the performance of this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
7. **I feel confident using this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
8. **I can perform various official functions using this system.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree

- Strongly Agree

9. I found it easy to share information with my colleagues using this technology.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

10. Using this technology does not cause any problems in my daily work.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

11. I did not face any challenge while using this technology.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

12. Using this technology has improved my skills and abilities.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

13. This technology helped me to collect information related to my work.

- Strongly Disagree
- Disagree
- Neutral
- Agree
- Strongly Agree

Section 4 – Behavioral Intension

1. **I plan to use this technology frequently.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
2. **I plan to use this technology throughout my career.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
3. **I plan to use this technology as often as possible.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
4. **I found the various functions in the technology to be well integrated.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
5. **If given the choice to use this technology or not, I would like to use it in near future.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

6. **This technology is working well.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
7. **I am satisfied with the cyber security of this technology.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
8. **I am satisfied with the ability of this technology to integrate with other technologies.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
9. **The response time of this technology is very good.**
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

Section 5 – Demographics

1. **Gender**
    - Female
    - Male
2. **Age**
    - 25 or less than 25 years

- 26 – 39 years
- 40 & above years

3. **Education**
    - 1 – 10 years
    - 11 – 14 years
    - More than 14 years
4. **Tenure/Experience in Service**
    - 1 – 10 years
    - More than 10 years
5. **Designation**
    - Junior Police Official
    - Senior Police Official
6. **Interest in IT**
    - High
    - Low

How to improve the technological systems (Any suggestions)?

APPENDIX B

TABLES

Technological Systems	Percentage
Crime Record Management System	11%
Police Record Management System	14%
Complaint Management System	12%
Safe City Islamabad	43%
IT labs	9%
Public Services	12%
Others	12%

Table (14): Technology Usage by Respondents

CROSS TABULATIONS IN TWO WAYS

Technologies with Variables

Perceived Usefulness

Technologies	Perceived Usefulness (%)		
	Low	Medium	High
CRMS		27.50%	72.50%
PRMS	3.85%	25.00%	71.15%
CMS	8.70%	32.61%	58.70%
Safe City	3.21%	27.56%	69.23%
IT labs	18.18%	33.33%	48.48%
Public Services	17.39%	19.57%	63.04%

Others	17.39%	32.61%	50.00%

Table (15): Technologies with Perceived Usefulness

Perceived Ease of Use

Technologies	Perceived Ease of Use (%)		
	Low	Medium	High
CRMS	2.50%	20.00%	77.50%
PRMS	7.69%	15.38%	76.92%
CMS	15.22%	21.74%	63.04%
Safe City	7.05%	26.92%	66.03%
IT labs	24.24%	30.30%	45.45%
Public Services	17.39%	30.43%	52.17%
Others	19.57%	36.96%	43.48%

Table (16): Technologies with Perceived Ease of Use

Attitude

Technologies	Attitude (%)		
	Low	Medium	High
CRMS	2.50%	30.00%	67.50%
PRMS	9.52%	17.31%	73.08%
CMS	13.04%	26.09%	60.87%
Safe City	3.21%	30.13%	66.67%
IT labs	21.21%	21.21%	57.58%
Public Services	19.57%	17.39%	63.04%
Others	19.57%	28.26%	52.17%

Table (17): Technologies with Attitude

Behavioral Intention

Technologies	Behavioral Intension (%)		
	Low	Medium	High
CRMS	5.00%	27.50%	67.50%
PRMS	7.69%	21.15%	71.15%
CMS	13.04%	26.09%	60.87%
Safe City	5.13%	27.56%	67.31%
IT labs	21.21%	30.30%	48.48%
Public Services	17.39%	23.91%	58.70%
Others	21.74%	32.61%	45.65%

Table (18): Technologies with Behavioral Intension

CROSS TABULATIONS IN THREE WAYS

Perceived Usefulness

Gender	Designation	Perceived Usefulness		
		Low	Medium	High
Male	Junior Police Official	6.12%	26.53%	67.35%
	Senior Police Official	28.57%	52.38%	19.05%
Female	Junior Police Official	2.74%	28.77%	68.49%
	Senior Police Official	9.52%	33.33%	57.14%

Table (19): Perceived Usefulness with Gender & Designation

Gender	Education	Perceived Usefulness		
		Low	Medium	High
Female	1 – 10 years	5.00%	20.00%	75.00%
	11 – 14 years	4.69%	35.94%	59.38%
	More than 14 years	0.00%	10.00%	90.00%
Male	1 – 10 years	4.95%	28.71%	66.34%
	11 – 14 years	10.46%	30.72%	58.82%
	More than 14 years	0.00%	0.00%	100.00%

Table (20): Perceived Usefulness with Gender & Education

Perceived Ease of Use

Gender	**Designation**	**Perceived Ease of Use**		
		Low	Medium	High
Male	Junior Police Official	8.98%	24.08%	66.94%
	Senior Police Official	38.10%	42.86%	19.05%
Female	Junior Police Official	5.48%	34.25%	60.27%
	Senior Police Official	9.52%	38.10%	52.38%

Table (21): Perceived Ease of Use with Gender & Designation

Age	Designation	Perceived Ease of Use		
		Low	Medium	High
25 or less than 25 years	Junior Police Official	6.67%	40.00%	53.33%
	Senior Police Official	25.00%	50.00%	25.00%
26 – 39 years	Junior Police Official	8.30%	24.45%	67.25%
	Senior Police Official	24.14%	44.83%	31.03%
40 & above years	Junior Police Official	8.11%	29.73%	62.16%
	Senior Police Official	22.22%	22.22%	55.56%

Table (22): Perceived Ease of Use with Age & Designation

Tenure/Exp. In Service	Designation	Perceived Ease of Use		
		Low	Medium	High
1 – 10 years	Junior Police Official	8.05%	21.26%	70.69%
	Senior Police Official	27.27%	40.91%	31.82%
More than 10 years	Junior Police Official	8.33%	32.64%	59.03%
	Senior Police Official	20.00%	40.00%	40.00%

Table (23): Perceived Ease of Use with Tenure/Experience in Service & Designation

Gender	Education	Perceived Ease of Use		
		Low	Medium	High
Female	1 – 10 years	10.00%	30.00%	60.00%
	11 – 14 years	6.25%	39.06%	54.69%
	More than 14 years	0.00%	20.00%	80.00%
Male	1 – 10 years	9.90%	26.73%	63.37%
	11 – 14 years	12.42%	25.49%	62.09%

	More than 14 years	8.33%	16.67%	75.00%

Table (24): Perceived Ease of Use with Gender & Education

Attitude

Gender	**Designation**	**Attitude**		
		Low	Medium	High
Male	Junior Police Official	6.94%	25.31%	67.76%
	Senior Police Official	28.57%	42.86%	28.57%
Female	Junior Police Official	8.22%	23.29%	68.49%
	Senior Police Official	9.52%	38.10%	52.38%

Table (25): Attitude with Gender & Designation

Tenure/Exp. In Service	**Designation**	**Attitude**		
		Low	Medium	High
1 – 10 years	Junior Police Official	6.90%	21.26%	71.84%
	Senior Police Official	18.18%	50.00%	31.82%
More than 10 years	Junior Police Official	7.64%	29.17%	63.19%
	Senior Police Official	20.00%	30.00%	50.00%

Table (26): Attitude with Tenure/Experience & Designation

Gender	Education	Attitude (AT)		
		Low	Medium	High
Female	1 – 10 years	10.00%	20.00%	70.00%
	11 – 14 years	9.38%	31.25%	59.38%
	More than 14 years	0.00%	10.00%	90.00%
Male	1 – 10 years	6.93%	26.73%	66.34%
	11 – 14 years	10.46%	28.10%	61.44%
	More than 14 years	0.00%	26.69%	64.66%

Table (27): Attitude with Gender & Education

Behavioral Intension

Gender	Designation	Behavioral Intension		
		Low	Medium	High
Male	Junior Police Official	7.76%	26.94%	65.31%
	Senior Police Official	42.86%	33.33%	23.81%
Female	Junior Police Official	5.48%	27.40%	67.12%
	Senior Police Official	14.29%	38.10%	47.62%

Table (28): Behavioral Intension with Gender & Designation

Gender	Education	Behavioral Intension (BI)		
		Low	Medium	High
Female	1 – 10 years	10.00%	25.00%	65.00%
	11 – 14 years	7.81%	34.38%	57.81%
	More than 14 years	0.00%	10.00%	90.00%
Male	1 – 10 years	10.89%	23.76%	65.35%

	11 – 14 years	11.11%	30.72%	58.17%
	More than 14 years	0.00%	16.67%	83.33%

Table (29): Behavioral Intension with Gender & Education

Acceptance of Technology

Technology	**Gender**	**Education**		
		1 - 10 years	11 – 14 years	More than 14 years
CRMS	Female	28.57%	50.00%	21.43%
	Male	38.46%	50.00%	11.54%
PRMS	Female	23.81%	61.90%	14.29%
	Male	35.48%	61.29%	3.23%
CMS	Female	6.25%	68.75%	25.00%
	Male	43.33%	53.33%	3.33%
Safe City Islamabad	Female	25.00%	70.83%	4.17%
	Male	40.15%	56.06%	3.79%
IT labs	Female	11.11%	77.78%	11.11%
	Male	29.17%	66.67%	4.17%
Public Services	Female	10.53%	73.68%	15.79%
	Male	33.33%	66.67%	
Other Technologies	Female	17.65%	58.82%	23.53%
	Male	24.14%	62.07%	13.79%

Table (30): Acceptance of Technology with Gender & Education

How to improve technological systems (Suggestions)

Suggestions	Percentage (%)
E-Government integration	25%
Public-Private sector collaborations	20%
Feedback mechanism	20%
Public awareness campaigns	15%
Language processing for multilingual support	10%
Other	5%

Table (31): Suggestions on How to Improve Technological Systems