A Survey on Citizens' Perceptions of Social Risks in Smart Cities

Research Paper

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Abstract. The digital transformation of urban environments into smart cities promises enhanced quality of life, efficiency, and sustainability through artificial intelligence (AI) and information technologies. However, this transformation often overlooks potential social risks, such as privacy violations, increased surveillance, cybersecurity threats, and social divides, which can undermine human security and societal well-being. This study identifies 15 key social risks associated with smart cities and examines citizens' perceptions of these risks through a quantitative survey of 310 participants in Germany and Italy. Results indicate that both the probability and severity of occurrence of social risks are rated relatively high by participants. Despite recognising significant social risks, participants generally maintain a positive attitude towards smart cities, highlighting a duality that differs depending on demographic factors like age and nationality. The findings underscore the necessity for a participatory and ethical smart city development that actively involves citizens to mitigate risks and ensure equitable benefits.
Keywords: smart cities, social risks, citizens' perception, AI ethics, social impact.

1 Introduction

The advancing digital transformation of urban environments into smart cities has gained significant attention in the contemporary academic discourse due to its promise to enhance quality of life as well as urban efficiency and sustainability (Sharifi et al. 2021). Central to this digital transformation is the deployment of information technologies, often based on artificial intelligence (AI), that powers the seamless integration and operation of various smart city functions. AI-driven sensors and cameras are used to increase urban safety and security through, e.g., timely detection of obstacles on railway tracks (European Commission 2023*a*) or by providing real-time surveillance footage to city representatives (Myagmar-Ochir & Kim 2023, Ansari et al. 2023).

However, the surge in enthusiasm for AI-driven solutions to foster the emergence of smart cities has often overshadowed the significance of recognising and addressing potential social risks associated with them. Social risks refer to those risks that can have negative consequences to human security harming individuals or society as a whole (Kampová 2010) by e.g., invading their privacy. It is important to consider and to be

aware of these potential risks to enable a safe and liveable city in which citizens are at the centre and their rights are not violated, facilitating an ethical and effective development of smart cities. Compared to technological and organisational risks, social risks remain understudied in the existing literature on smart cities (Nguyen et al. 2022, Shayan et al. 2020) although they present a critical factor of concern due to their profound implications for human security and societal structures. Social risks may foster uncertainties among citizens, hampering their willingness to live in smart cities and interact with smart services and technologies. They might make citizens feel uncomfortable and unsafe in their own cities. Research has argued that citizens' perspective on smart cities has often been ignored by local and national authorities, and that citizens have been mostly excluded from any initiatives and decisions by neglecting bottom-up approaches and participation (Engelbert et al. 2019, Marrone & Hammerle 2018). Not considering citizens' perceptions might, first, hinder responsible authorities to ensure a socially and ethically well-designed smart city that focuses on its citizens' interests and well-being by preserving citizens' fundamental rights. Second, the lack in transparency in the implementation might also negatively influence citizens' attitude towards and acceptance of smart cities ultimately leading to citizens' reactance. Third, by involving broader and diverse groups of the population, municipal authorities and responsible institutions could be supported to recognise more undesired consequences beforehand by considering diverse perspectives. This way, stakeholders could together proactively find solutions to mitigate risks for all involved actors.

Due to the relevance of understanding citizens' perceptions of smart cities and their risks when implementing smart cities, further research is warranted and required in this area. Reviewing related research substantiates the importance of smart cities and smart technologies. Especially in the technical and organisational field there have increasingly been publications related to new smart technologies and solutions (e.g., Lippert et al. (2023), Qian et al. (2019), Hollands (2015)) and how they could be implemented to enhance living in cities (e.g., Muschkiet et al. (2022), Eckhoff & Wagner (2018), Nambiar et al. (2018)). However, publications regarding social risks and citizens' perception of them has remained comparatively little. In this paper we, therefore, answer the following research questions:

RQ1: Which are the principal social risks of smart cities?

RQ2: How do citizens perceive these social risks?

We first conducted a scoping literature review of 88 papers related to smart city risks. In addition, we carried out a quantitative survey among 310 participants to reveal their perception of social risks of smart cities and their attitudes towards smart cities in general. The review revealed 15 principal social risks, prominently including issues of privacy violation, increased surveillance, cybersecurity threats, and social divide. The conducted survey, which involved participants mostly living in Germany and Italy, presented empirical insights into citizens' perceived severity and likelihood of occurrence of the 15 identified social risks. The risk perceived as the most probable was profiling, whereas the risk with the severest impact was perceived to be cybersecurity threats and information systems' vulnerability. The survey also uncovered an interesting juxtaposition. Despite acknowledging substantial social risks, citizens maintain a predominantly positive attitude towards the concept of smart cities. This research contributes both to

give an overview of social risks arising from the implementation of smart cities and to provide insights into how citizens perceive them to inform more ethical and participatory smart city development strategies.

2 Background

2.1 Smart Cities

A smart city is an urban area that utilises Information and Communication Technology (ICT) to digitise and enhance various sectors and services, thereby improving efficiency and the quality of life for its residents (Caragliu et al. 2013). Although the term "smart city" has been in use since the 1990s, it lacks a single, unified definition. However, it generally encompasses areas such as smart mobility, administration, education, buildings, and energy (Singh et al. 2022). The European Commission defines a smart city as a place where traditional networks and services are optimised through digital solutions for the benefit of inhabitants and businesses (European Commission 2023b). Key technologies driving smart cities include sensors, the Internet of Things (IoT), AI, and 5G, which enable extensive data collection and analysis to support city management and innovation (Ullah et al. 2021, Rao & Prasad 2018).

An example of a smart city implementation is Rio de Janeiro's Centro de Operações Prefeitura, a command centre that integrates data from various city services to improve safety, emergency response, and information dissemination for the public (Kitchin 2014). Such an operations centre can entail risks such as increased surveillance and privacy violation of citizens or serve as a single point of failure (SPOF) for data and information infrastructures. As citizens are one of the main stakeholders of smart cities (Marrone & Hammerle 2018) and would be directly impacted by the consequences of implementation, it is important to analyse such projects from different perspectives, including the social and ethical ones. Another example is the "SmartSantanderRA" project, which consists of an augmented reality app providing real-time information about infrastructures and public places in the city of Santander in Spain allowing users live access to cameras around the city (Kitchin 2014). The two examples highlight that technologies can be applied in different ways and for various scopes within a smart city leading to diverse types and severity of risks for each application. Since the smart city is based on an interplay between different technologies, it is difficult to consider each single application for itself, which is why the term "smart city" is used as an umbrella term for all possible applications throughout this study.

2.2 Related Research

Although the general interest in smart cities has risen in the last decades, most of the current publications focus on the "underlying conceptual and technical aspects related to the planning and development of smart cities" (Sharifi et al. 2021, p. 17). We identified two related research streams to our study: (1) prior research that focuses on the identification and mitigation of smart city risks, and (2) research that examines stakeholders' perceptions of smart cities.

First, compared to the large body of research on defining and conceptualizing smart cities, less research has been done to examine potential risks of smart cities, especially social risks (Shayan et al. 2020, Ullah et al. 2021, Galdon-Clavell 2013). Recent reviews reveal that prior research mostly examined organisational risks (e.g., Di Bella et al. (2015)) and technological risks (e.g., D'Amico et al. (2020)), while only fewer studies have considered social risks (Shayan et al. 2020, Sharif & Pokharel 2022). Nevertheless, these risk categories are often intertwined and influence each other, which makes it difficult to clearly assign each risk to only one specific category, but rather to two or even more (Techatassanasoontorn & Suo 2010). This applies especially to risks of social nature, which are interdependent with technological and organisational risks (Techatassanasoontorn & Suo 2010). We consider all risks that may be classified as social risks as such in this paper, which doesn't necessarily confine them exclusively to this risk category. An example could be cybersecurity threats, which are of technological nature but also strongly impact society and individuals causing troubles on both a societal and a technical level. In this way, we aim to give an overview of the different social risks bringing together the fragmented discussions in relation to this type of risks.

Second, although citizens are one of the main stakeholder groups besides governments, businesses, and research and tech organisations, researchers highlight that less focus has been set on citizens' perception and perspective of smart cities (Galdon-Clavell 2013, Shelton & Lodato 2019). Whereas most existing studies related to citizens in smart cities focus more on their role in smart cities (e.g., Tomor (2020), Lim et al. (2019)) or on their expectations and wishes discussing the opportunities and benefits of such innovations (e.g., Fischer & Döring (2024), Del-Real et al. (2021), Thomas et al. (2016)) only few studies initiated research on concrete risk perception and awareness of citizens. For instance, Vidiasova & Cronemberger (2020) conclude that the risks felt to be the greatest obstacle to smart city development are those of social nature. Other studies reveal a high level of concern among citizens (Mutambik 2023) and present reasons for citizens' discontent (van Twist et al. 2023). Some evaluate the perception of quality of life in a smart city and analyse the main elements of citizens' satisfaction with their home city (Macke et al. 2018); investigate the risk perception of employees in the administrative field (Wielicka-Gańczarczyk & Jonek-Kowalska 2023) or focus on the perception of AI in the smart city context (Lehtiö et al. 2023). While we acknowledge the contributions of these studies, they do not give a general overview of social risks arising from the implementation of smart cities but rather present social risk perceptions' in a fragmented way focusing either on solely specific risks, concrete fields or geographical areas. This is why we set out to bridge the two streams and examine citizens' perceptions of social risks of smart cities comparing two main European countries, i.e., Germany and Italy. These two countries do not strongly differ in terms of smart city projects development and in their legislation, being both part of the European Union (EU), but within European countries they are culturally different.

3 Methodology

We conducted a scoping literature review and a quantitative survey to better understand citizens' risk perceptions. The first objective of this study is to give an overview of the

most prominent and discussed social risks of smart cities, whereas the second objective is the subsequent collection and analysis of citizens' perceptions of the identified risks.

3.1 Scoping Literature Review

To determine a set of potential social risks that citizens may perceive, we first conducted a scoping literature review, searching the following databases: ScienceDirect, IEEEXplore, ProQuest and EBSCOhost. We applied the search string: *"smart city" AND "social risks" AND ("perception" OR "awareness" OR "citizen")* and identified 147 papers. After having eliminated duplicates and studies not written in English, first the titles and abstracts were screened and then the remaining 124 studies were fully read to check for relevance. The filter criteria were devised post hoc based on increasing familiarity with the literature as described by Arksey & O'Malley (2005). We excluded papers that exclusively focused on other kind of risks and those addressing other issues, such as the implementation of smart cities itself, the environmental impact or possible solutions. Further forward and backward searches for the remaining 42 studies resulted in a set of 88 analysed papers. The collected literature was then thematically organised, as proposed by Arksey & O'Malley (2005), resulting in the following categories: "definition", "awareness and perception", "risks", "examples smart cities", and "research relevance". We coded each article to identify risks and grouped them into sub-categories. For example, for the category "risks" the most important sub-category is "social risks", which itself also entails other sub-categories describing concrete risks such as "surveillance", "cybersecurity and cyberattacks" or "privacy and data protection". For the category "awareness and perception" the most important sub-category is "exclusion of citizens". While the five main categories were chosen beforehand based on the research goal, the sub-categories were inductively defined during the coding allowing a data-driven analysis (Braun & Clarke 2006). We used the tool MAXQDA for the coding process and followed the coding instructions for qualitative research (Saldaña 2013). As a result of the analysis, 22 different social risks were identified and grouped into 15 superordinated risk categories.

3.2 Survey

Survey Design. First, participants were asked to give a definition of smart cities from their point of view to reflect their level of knowledge and to indicate whether they had ever heard of the term before. We then provided a general definition to guarantee a uniform understanding of the smart city concept throughout the survey, which described the smart city as "a place where technology is used to improve the quality of life for its residents by integrating various digital technologies such as sensors, data analytics, and communication systems to enhance efficiency, sustainability, safety, mobility, and overall well-being within urban areas". The second part was intended to dig deeper into participants' understanding and awareness of smart cities by asking whether they tend to perceive smart cities more as a risk or as an opportunity for the future; and whether they are willing to engage in smart city projects and to live in such a city. Third, we requested participants to perform an evaluation of the 15 different social risks resulted from the

literature review. Participants were required to indicate the probability of occurrence of each single risk and assess its impact on themselves based on a five-point Likert-scale.

Data Collection and Sample Demographics. To reach as many people as possible, the study was offered in English, German, and Italian, and was shared primarily across Italy and Germany throughout different channels by adopting the snowball sampling method. This method allowed to include participants of all ages, genders, nationalities, and social status as the aim was to reach many and diverse citizens that represent the general population. In total 490 respondents participated in the survey during a period of six weeks. Out of the 490 initial participants, we discarded 179 because they did not finish the questionnaire, and one participant for speeding the questionnaire, following the guidelines by Döring (2023). These filter criteria resulted in a total of 310 valid questionnaires for data analysis. Out of the 310 participants 173 were male, 132 female, and 5 preferred not to specify their gender. The average age of the respondents was 36 years, with the youngest participant being 16 and the oldest 82 years old and a standard deviation of 16.15 years. The majority of the participants stated to have a university degree or higher (77%) and to work or study in a technical, scientific or economic field (58%). A similar response quantity of German (159) and Italian (127) participants allows a comparison between these two nationalities.

Data Analysis. To start our analysis, we first analysed citizens' general attitude towards and awareness of smart city projects on the basis of descriptive statistics by evaluating their mean values and standard deviations. Then, we engaged in detailed analysis that focused on the calculation of (M)ANOVAs, and Pearsons' correlation coefficients to highlight significant correlations between the perception of each presented social risk and demographic factors, including the willingness to engage and to live in smart cities, the awareness and general attitude towards them, and the faith in humans and in technology.

4 Results

4.1 Social Risks of Smart Cities

The 15 potential social risks related to the implementation of smart cities that we identified in literature are illustrated in Table 1. In addition to these risks, the two last rows of Table 1 present risks that the survey participants felt to be missing.

Threats to Urban & Personal Big Data. Smart city technologies rely on vast amounts of data collected from sensors, GPS devices, and cameras, characterised as Big Data due to its volume, velocity, and variety (Chauhan et al. 2016). This extensive data collection poses significant privacy and security risks, including unauthorised profiling, data breaches, and misuse of personal information, raising concerns about data protection and citizens' control over their information (Fabrègue & Bogoni 2023, Kitchin 2014). Additionally, the vulnerability of smart city infrastructures to cyberattacks, such as DDoS and data interception (Kumari & Jain 2023, Bastos et al. 2018), highlights

the critical need for robust cybersecurity measures to protect both personal data and essential services (Demertzi et al. 2023, Khan & Khan 2023). Such cyberattacks can cause large-scale damage and chaos, as when the transport system of the Polish city of Olsztyn was paralysed, including traffic lights and public transport ticket machines (Poitevin 2024).

Table 1. Overview of the identified social risks

Categories of social risks	Social risks
Threats to Urban & Personal Big Data	- Privacy violation & invasion - Profiling - Misuse or third party selling of collected data - Disclosure of personal data - Cybersecurity threats
Asymmetric Power Distribution & Surveillance	- Unequal information distribution - Surveillance - Loss of freedom & of freedom of speech
Stakeholders' Interests & Technological Lock-in	- Prioritisation of certain stakeholders' interests - Technological lock-ins & dependence - Standardised & uniformed solutions
Social Divide & Societal Implications	- Social divide & gentrification - Loss of human connection - Growth of unemployment - Ethical implications
Environmental Impact	- Electronic waste & rebound effects - Higher energy & resources consumption - Higher costs & blackout threats
Health, Cognitive & Cultural Implications	- Loss of creativity & competences (e.g., orientation) - Overload, confusion & less movement due to digitisation - Loss of identity, culture, tradition & homologation of society

Asymmetric Power Distribution & Surveillance. Informational security is paramount in smart cities to prevent both cyberattacks and the misuse of vast amounts of personal data by governments and corporations. Security vulnerabilities might expose sensitive data as in the case of a Chinese smart city where biometric data of hundreds of persons was easily accessible on a web browser without a requested password (Whittaker 2019), allowing a potential misuse. The misuse of data is evidenced by incidents like PRISM, where national intelligence agencies of different states accessed and analysed huge amounts of data they got from diverse servers without authorisation (Bernal 2016, Gellman & Poitras 2013). These data misuses lead to significant social risks such as pervasive surveillance, loss of individual freedoms and rights; and power imbalances, highlighted by scholars like Zuboff (2020) and Cohen (2017), with real-world examples from China's extensive surveillance systems (Jia 2023) and their impact on democratic processes (Akbari 2022). Additionally, widespread monitoring contributes to psychological distress and self-censorship among citizens, undermining personal autonomy, self-expression, and societal engagement (Penney 2021, Novaes 2021).

Stakeholders' Interests & Technological Lock-in. Smart city initiatives are largely controlled by public entities and private tech corporations, which restrict citizen involvement and potentially erode fundamental rights (Christofi 2023, Hamilton 2016). This collaboration is primarily driven by financial incentives, often sidelining ethical, legal, and social concerns, as exemplified by the Sidewalk Toronto project where data governance was monopolised by a private company despite public opposition (Goodman & Powles 2019, Yeung 2017). Additionally, reliance on major tech firms leads to the standardisation of diverse cities with uniform solutions, ignoring unique local characteristics and creating dependencies that undermine citizen-centred urban development (McNeill 2015, Kitchin 2014).

Social Divide & Societal Implications. The digitisation of urban areas can exacerbate societal polarisation, increase unemployment, and reduce human connections (Hollands 2008, Graham 2002). Factors such as digital illiteracy, unequal access to technology, and biased AI systems deepen economic and social divides, while automation threatens job security, particularly in rapidly digitising cities like Singapore (Wendehorst & Duller 2021, Edelman Trust Institute 2024*c*). These challenges raise significant ethical concerns, including discrimination and loss of autonomy, highlighting the need for participatory and transparent decision-making in smart city initiatives (Fabrègue & Bogoni 2023, Lee et al. 2020).

4.2 Citizens' Awareness & General Attitude towards Smart Cities

Participants' given definitions of smart city, at least partially, corresponded with our proposed meaning of it assuring a relatively homogenous understanding of this term. More than half of the participants (54%) is unaware of ongoing smart city projects in their own city, indicating a rather low knowledge rate in relation to potentially existing projects. However, the general attitude towards smart cities, as shown in Table 2, seems to be relatively positive.

Table 2. General attitude towards smart cities (on a 5-point Likert scale)

Statement	Mean value	SD
There are many beneficial applications of smart cities	3.93	1.08
I am impressed by what smart cities can do	3.66	1.13
Smart cities can have positive impacts on people's well-being	3.85	1.10
Smart cities are exciting	3.67	1.22
Smart cities can provide new economic opportunities for a country	3.86	1.15
Much of society will benefit from a future full of smart cities	3.45	1.20

Most respondents tend to agree with all statements seeing the strongest agreement on beneficial applications of smart cities and the lowest on a general benefit to society. This positive attitude is also emphasised by respondents' willingness to engage (60%) and cooperate (53%) in smart city projects. It is also reflected by almost 62% of the respondents perceiving smart cities more as an opportunity and only 14% considering

them more as a risk. The optimistic perception correlates with the willingness to engage and cooperate in smart city projects ($r_{xy} = 0.63$) and with the willingness to live in such a city ($r_{xy} = 0.77$). The latter factor negatively correlates with the age seeing younger participants more willing to live in such a city ($r_{xy} = -0.35$).

The age seems to play a role also when considering the general perception of smart cities, revealing older participants having a slight tendency to perceive these cities more as a risk ($r_{xy} = -0.29$) and to stronger disagree to the statements in Table 2 ($r_{xy} = -0.40$). Besides the age, other influencing factors regarding the perception are the faith in humans ($r_{xy} = 0.56$) and in technology ($r_{xy} = 0.38$) indicating that the higher the faith the better the general attitude towards smart cities.

4.3 Citizens' Perception of Smart City Risks

In contrast to a generally positive perception of smart cities, citizens rather critically assessed the single social risks as can be observed in Figure 1. Most risks are rated relatively high both in relation to their probability and to their impact and are positioned in the critical area of a risk matrix (Markowski & Mannan 2008).
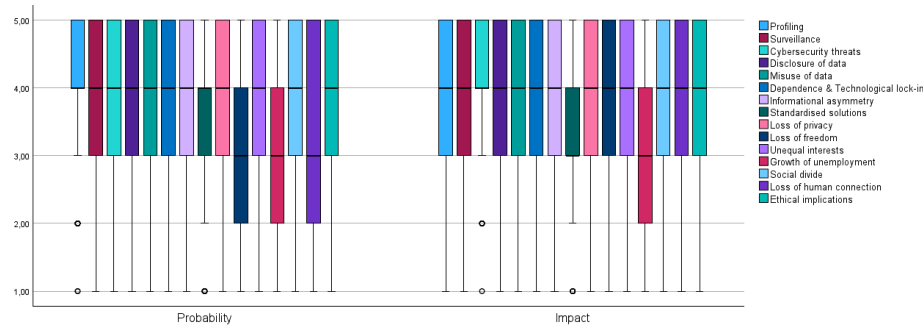

Figure 1. Risk perception of each single risk

Overall, the risk perceived as the most probable is profiling, whereas the one with the greatest impact is felt to be cybersecurity threats and information systems vulnerability. The risk that is perceived to occur most unlikely is the loss of freedom and of freedom of speech and the one with the lowest impact is the growth of unemployment. Most risks do not strongly differ between their evaluated probability and impact, except for the loss of freedom and of freedom of speech, where the impact is rated significantly higher than the probability. Older participants rated the probability of risks higher, especially of growth of unemployment ($r_{xy} = 0.35$) and of prioritisation of certain stakeholders' interests ($r_{xy} = 0.30$). Participants who rated the probability of occurrence of single risks higher are also less willing to live in a smart city. Especially the risks related to loss of freedom ($r_{xy} = -0.48$), loss of human connection ($r_{xy} = -0.40$), and growth of unemployment ($r_{xy} = -0.39$) showed a strong correlation. Growth of unemployment is felt to be more probable by respondents not employed in the technical, scientific or architectural field ($r_{xy} = -0.30$) and by those without a university degree or higher ($r_{xy} = -0.21$). Participants with self-assessed lower faith in technology rated the risk of

unequal information distribution higher ($r_{xy} = -0.27$), as did those with a self-assessed lower faith in humans for the risk of privacy violation and invasion ($r_{xy} = -0.27$). A gender distinction could be recognised for the risks of social divide ($r_{xy} = 0.19$), ethical implications ($r_{xy} = 0.17$), and growth of unemployment ($r_{xy} = 0.16$): women rated them as slightly more probable. No correlations could be found between participants who heard of smart cities before and risks' probability and impact.

4.4 Comparison between Germany & Italy

The survey revealed some differences in risk perception between German and Italian participants. Figure 2a shows that not only age but also nationality influence the risk probability perception. Italian participants of all age groups seem to feel a higher risk occurrence probability compared to German ones. The same tendency applies to the risk impact perception, except for the age group 36-45 years where it is the other way around, as presented in Figure 2b.
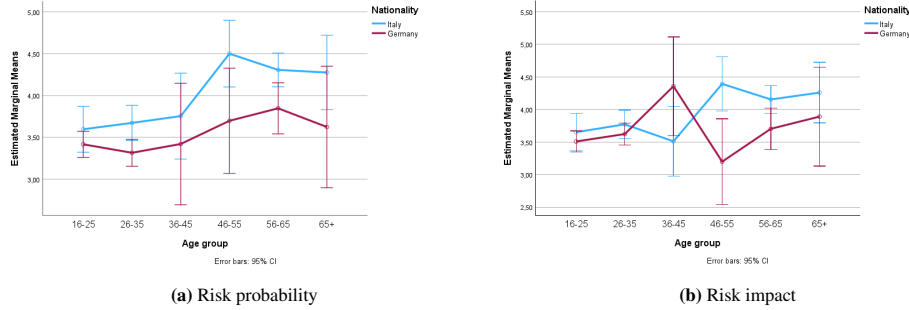

(a) Risk probability   **(b)** Risk impact

Figure 2. Profile plot among different age groups & nationalities

This perception discrepancy is also supported by a more positive general attitude towards smart cities among German compared to Italian participants. The study results suggest that German participants consider smart cities to have more beneficial applications and a positive impact on society, economics, and on people's well-being ($r_{xy} = 0.25$). They stated to be more willing to cooperate in the implementation of smart city projects ($r_{xy} = 0.26$) and to live there ($r_{xy} = 0.16$). The risk probability which correlates with the nationality the most, seeing Italians rating it as higher, is growth of unemployment ($r_{xy} = -0.47$) followed by the disclosure of personal data ($r_{xy} = -0.31$) and privacy violation & invasion ($r_{xy} = -0.30$). For the evaluated risk impact it is standardised & uniformed solutions ($r_{xy} = -0.31$) followed by the growth of unemployment ($r_{xy} = -0.25$) and prioritisation of interests of certain stakeholders ($r_{xy} = -0.23$).

5 Discussion

5.1 Duality in Smart City Perceptions

Results of the survey suggest a duality between citizens' perceptions: they perceive smart cities positively while at the same time they are concerned about potential social

risks. One reason for their high risk perception could be a lack of trust in government regulators. Related studies suggest that 59% of both countries' populations agree on the fact that government regulators lack adequate understanding of emerging technologies to regulate them effectively (Edelman Trust Institute 2024*a,b*). Another juxtaposition can be recognised between citizens' relatively low awareness of smart city projects compared to their willingness to cooperate and engage in these projects. Although citizens lack awareness, which might be attributable to prior exclusion from projects' implementation, they are motivated to be included in the decision-making process and to contribute to a socially and ethically well-designed smart city from which they can benefit. By letting citizens be an active part of the decision-making process they can gain more insights into current projects and related decisions. Citizens might also enrich the discussion about potential risks by adding their perspectives and interests, enabling a citizen-centred smart city implementation.

5.2 Discrepancies in Smart City Risks' Perceptions

Emerging from the risk perception analysis, a discrepancy in risk ratings could be primarily noticed in relation to citizens' age and their nationality. Older participants tended to rate risks' probabilities of occurrence and risks' impact on themselves higher than younger participants did. One reason could be that older participants may be more reluctant and skeptical towards digitisation of different fields in general. We also observed different ratings between Italian and German participants: Italians of all ages rated the probability of risk occurrence higher than Germans. Concretely, Italians felt the probability of disclosure of personal data and privacy violation and invasion as well as the risk of unemployment growth to be higher than Germans. This rating difference might stem from Italy's historical background and its current political and economic situation reflecting general worries regarding the labour market, which entails higher unemployment rates and unstable labour conditions compared to Germany (Statistisches Bundesamt 2024). In fact, according to a study on the subject, in Italy 92% of the population worry about job loss (Edelman Trust Institute 2024*b*) compared to the 81% in Germany (Edelman Trust Institute 2024*a*). Furthermore, Italians seemed to be more concerned than Germans about the impact smart cities could have on the city identities and specialities, being afraid that standardised and uniformed solutions could not consider the cities' uniqueness and lead to homologation of urban areas or inadequate innovations. These concerns could possibly emerge from a high attachment and appreciation of the variety, history and culture of their own cities.

5.3 Implications for Research & Practice

Whereas most literature has focused on technological risks (Shayan et al. 2020, Nguyen et al. 2022), we concentrate on giving an overview of social risks that are fragmentarily discussed in diverse studies, and we surveyed perceptions of 310 citizens related to these risks. Our findings illustrate that social risks are felt to be of high probability and impact by European citizens living in Germany and Italy. We contribute to research by highlighting concern among citizens as one of the main stakeholders of smart cities and

emphasising the importance of taking into account and mitigating social risks. Considering recent works that also dealt with social risks, (e.g., Vidiasova & Cronemberger (2020), Mutambik (2023)), we extend their work by making a comparison across two main European countries. We thereby show that citizens' perceptions may differ even across geographically close countries. It is, therefore, important to consider cultural and historical backgrounds as well as societal norms when implementing smart city technologies. Based on our results, we encourage local authorities and relevant institutions to include all stakeholders, especially citizens, in the decision-making process regarding smart cities to ensure diverse perspectives and guarantee that everyone benefits from their implementation.

5.4   Limitations & Future Research

The literature review is limited in scope and entails risks of bias due to lack of clearly defined evaluation methods and it may not include all relevant papers. Since technological, organisational, and social risks influence each other and are often defined in different ways throughout the literature, it cannot be guaranteed that all social risks were identified. To minimise the quantity of missing risks, participants of the survey were asked to add risks that they felt to be missing in the evaluation. The survey is not representative of the whole population because of the adopted snowball sampling method, and it is limited to three languages and the usage of digital devices. However, many participants of diverse ages and backgrounds could be reached, enabling a statistical analysis. The survey may also suffer from an interpretation bias based on the subjective understanding of the participants, especially when distinguishing between smart cities and technologies in general. The study only focuses on German and Italian citizens' perceptions of social risks of smart cities remaining confined to two major European countries. Future research could concentrate on citizens' perceptions of other countries and continents eventually comparing the results with each other. Based upon this study, future research could focus on qualitative methods, such as conducting interviews with citizens or other stakeholders, to consolidate the results in relation to smart city perceptions.

6   Conclusion

Although smart cities have received increasing attention from researchers in the last years, less attention has been paid to social risks of smart cities and to citizens' perceptions of them. Within this research, we have taken first steps towards closing this gap by identifying 15 potential social risks and by revealing citizens' perceptions of them in relation to their probability of occurrence and severity of impact. Our study shows that citizens have concerns in relation to smart city implementations as they rated the probability and impact of social risks of smart cities relatively high. They are, however, willing to engage and cooperate in smart city projects as they also recognise the benefits and opportunities smart cities can have for citizens. Including citizens in the decision-making process could help to mitigate risks and undesired consequences by considering all stakeholders' perspectives and concerns.

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