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Smart City – Does Smartness Render a City More Attractive as a Location of Study and Work?

Abstract

One of the main opportunities of smart cities is to enable new types of stakeholders, such as newcomers to communities or students, especially foreign students, to become more empowered in their communities. But at the same time, the challenge is how to motivate them to become active citizens, so that they would invest their time in participating in the development of the smart city and its services. In this context, we have researched how important the smart city functionalities are for the students and does the smart city image make a city more attractive when choosing a place to study or work. The research includes a survey with new/international students from three different Universities of Applied Sciences about relevant smart city themes, including smart mobility, smart services, smart governance and smart utilities. We have analyzed the collected material both quantitatively and qualitatively in order to find the main topics that are relevant for students in order to detect weak signals for urban planning. The key findings of the survey and workshop indicate that while all the respondents are actively using multiple smart city technologies and think they can positively boost a city's attractiveness, smart city image is still rarely a decisive factor when students are choosing a place to study or work. The students had also several new ideas how smart city technologies could improve the quality of their lives. The aim is to make research data available for urban planning, in general, and education and work communities, in particular.

Keywords: Smart city and region, active citizenship, inclusiveness, community newcomers

1 Introduction

Although infrastructure is important in urban environments, a city is nothing without citizens. In Smart Cities, citizens must be involved in creating urban strategies (Villanen et al. 2022, 95) and infrastructure related solutions. It has been hypothesised that active citizenship – citizens engaging in public discourse and neighbourhood associations (Johansson & Hvinden 2007, 18) – most likely materialises in local communities where smartness improves quality of life and promotes population cohesion via digitalised innovation systems (Vuorela & Jalas 2022, 32–33).

Smartness can be a way to attract new talent and innovative companies to a region. For example, Marchesani et al. (2023) found a relationship between the implementation of smart city digital technologies, talent flow and innovative companies. In this paper, we focus on university students to study how, and through which technologies, smartness can enhance the integration of newcomers into a community. Specifically, we studied how Smart City / Smart Region affect the focus group at present, what kind of Smart City functions are important for them and how important the smart city image is when choosing a place of study or work after studies. While universities can form crucial collaborators in pioneering smart city solutions, the emphasis of this study is on urban/regional development.

1.1 Smart City functions

The Smart City concept involves the integration of technology and data-driven solutions to enhance urban operations and services (Albino et al. 2015). While smartness can contribute to a city's attractiveness, it is not the sole determining factor; Smart City is multi-dimensional concept (ibid.). Many cities define themselves as smart; however, the term lacks a universal definition (ibid.). Many cities also demonstrate differences in approaches to smart city development (Hu & Cheng 2021). Generally, smart city initiatives improve urban efficiency, which can indirectly affect the cost of living (Mora et al. 2017, Estevez et al. 2021, Chan & Smith 2023). A literature review covering recent scientific studies on actions implemented in smart cities was conducted by Jacques et al. (2024).

1.2 Smart City image

According to Borruso and Balletto (2022), a Smart City is an idyllic concept of the 21st century; it should be a city that responds to citizens' needs, without focusing on technological devices; it should provide solutions through technological infrastructure and relevant devices, such as smartphones and apps (ibid.).

The impact of the smart city image and functionalities to the attractiveness of urban regions has been studied only recently, e.g. Romão et al. (2018), Marchesani et al. (2023) and the Smart City Institute's surveys (Liège University 2020) focusing on understanding factors which enhance economic, social and touristic dynamisation of urban regions.

2 Methods

The paper focuses on exploring whether Smartness renders a city/region more attractive to newcomers to a community as a place of study and work. This is undertaken through qualitative and quantitative research approaches, involving data collection via a workshop and a survey with new and/or international students in higher education in Finland. The aim is to gain understanding of students' perceptions of smart cities and the effect of smartness on the choice of study place through following research questions:

1. How does Smart City/Smart Region affect the lives of UAS students at present?
2. What Smart City functions could improve the city as place of study?
3. Does Smart City image with relevant functions make the city more attractive when choosing a place of study/place of work?

To determine the students' views, a web-based survey was conducted in spring 2024 among students in three Finnish Universities of Applied Sciences (UAS). The survey questions:

1. Did the image of the city/region affect your choice of place of study?
2. Do you find the city/region of your place of study technologically advanced?
3. What smart city technologies do you use regularly or what such technologies in other respects affect your life? (For list of smart city technologies, see chapter 3 Results)
4. What smart city technologies do you think improve the city/region as a place of study regarding inclusiveness and interconnectedness?
5. Does smart city image and relevant services make the city more attractive when choosing a place of study/place of work: why?
6. Do you think smart city technologies might have negative impacts (consider your situation as newcomer to a city / region)?
7. What is your country of origin/gender/age?

The questions 1–3 and 5–6 assumed yes/no answers, with possibility to provide open feedback in case of affirmative answers, whereas question 4 involved only open feedback.

Simultaneously, an eight-hour workshop was organized, involving 70 students and two facilitators on the same theme. Workshop data was collected by means of LFA – Logical Framework approach. The question used as a starting point for the workshop was as follows: How can a city attract students/newcomers to study and work through smartness? LFA is a brain-storming method (Pandey 2008; Hella 2017), where a logical framework is co-created for a vision on needed development (Vuorela & Aalto 2023).

While the workshop yielded qualitative data, the questionnaire-based survey yielded both qualitative and quantitative data. The survey questions related to respondents' views, explaining also why a particular alternative was chosen. Of qualitative research traditions, phenomenography was deemed particularly suitable for analyzing respondents' different views. Phenomenography refers to the individual ways people have for experiencing, conceptualizing, perceiving, and understanding phenomena around them (Marton 1981, 1988). The common element in this research orientation is that the objects of interest are conceptions (Svensson 1994). In this study, the objects of interest are the students' conceptions of smart cities as place of study. In accordance with the quantitative data presentation techniques in descriptive statistics (Cohen et al. 2018), the qualitative data is analyzed employing content analysis technique by theming data (Newby 2010).

3 Results

3.1. LFA workshop results

The positive smartness-related themes identified in the workshop with 70 Finnish and international students consisted of ideas portraying students not only as consumers of smartness, but also as promoters of active citizenship for engaging newcomers to cities or regions:

- Smartness as a means to improving social sustainability among the youth: breaking silos between groups of people; promoting equality among domestic and international youth regarding job opportunities and leisure activities
- Digital communication platforms for welcoming newcomers to smart regions
- Involving newcomers and youth in developing smart services
- Creating opportunities for sparsely populated areas with smartness: distant work, affordable housing and smart commuting and logistics (e. g. drone-based deliveries)
- Smartness has brand value, which helps to create vibrant communities in remote areas

3.2 Survey results

3.2.1 Survey data

The questionnaire was answered by 36 students from three universities in Finland: LAB, Laurea and Oulu UAS during April–May 2024. Assuming that the answers were representative of all high school students in Finland, the margin of error within the 95% confidence level is 16.7% for the quantitative analysis. The gender distribution of respondents was 13 (36.1%) male, 21 (58.3%) female and 2 others, compared to the average of 56% female students in Finnish universities during 2020–2023 and 55% in OECD countries. Of all the respondents, 29 (80.5%) were Finnish nationals and 7 (19.5%) foreign compared to the average of 10–12% foreign students in Finnish higher education institutes in 2020–2023 (Opetushallitus 2024). Despite the fact that the number of respondents was low and foreign students were overrepresented, we believe that the quantitative and qualitative analysis can still provide relevant indications.

3.2.2 Quantitative results

While the majority of respondents, 75%, replied that the image of the city/region of study did not affect their choice of place of study, 61% responded that smart city image and related services can make a city more attractive when choosing a location. A minority of respondents, 28%, considered that smartness might have also negative impacts. The questions and results about the impact of the smart city image are presented in Figure 1.

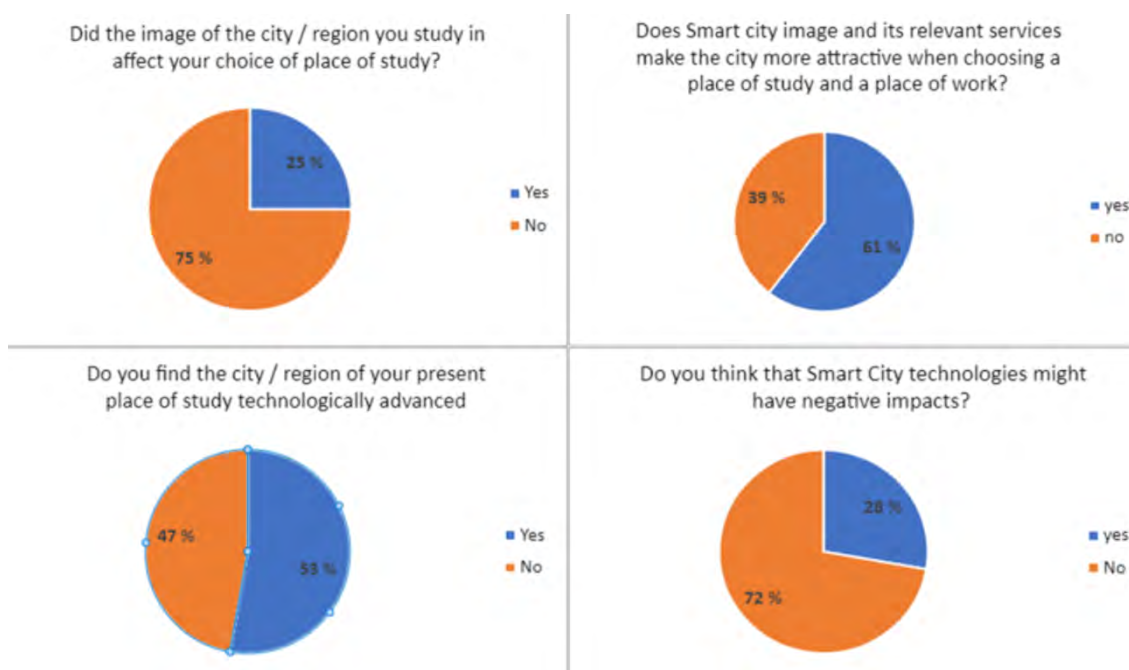


Figure 1. Results on the impact of smart city image (survey questions 1–2, 5–6).

Following the discussion e.g. by Albino et al. (2015) about the classification of Smart City functionalities, the survey included questions on how much the students use specific smart technologies:

- Smart Mobility: city-bikes, e-scooters, digital services for public transport
- Smart Services: digital ticketing, health care, library services, parking
- Smart Governance: participation in city planning and budgeting
- Smart Living: smart home systems connected to city infrastructure
- Smart Environment: neighborhood security, lost objects tracking, on-demand lighting.

The results are summarised in Figure 2.

Use of Smart City Technologies

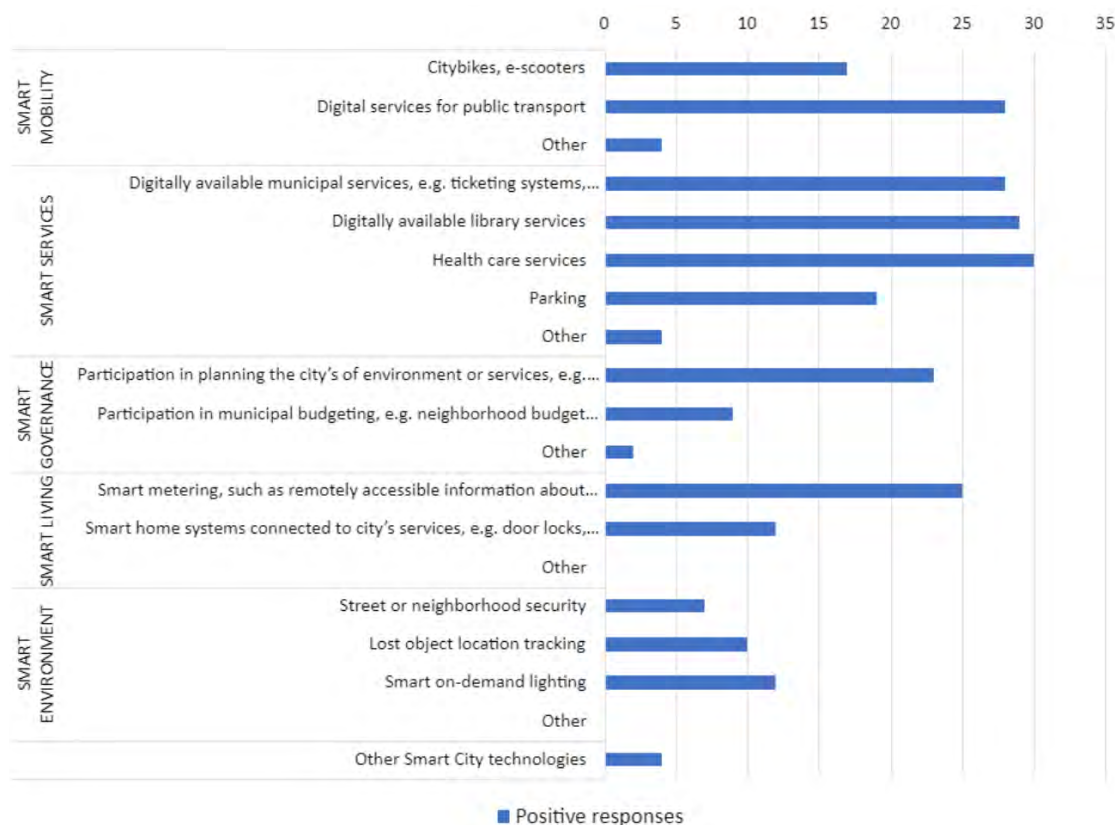


Figure 2. Use of different smart city technologies (survey question 3).

According to the survey, all respondents had used at least 3 of the smart city technology sub-categories listed in the survey; the average of the used technologies was 7.19.

3.2.3 Qualitative results

Several survey questions included open-ended characteristics. In questions 1–4, the respondents were asked to explain their choices. These answers yielded the results depicted in Table 1. The answers to questions 1–3, show that other reasons besides smartness also play a role when choosing a location. Regarding smartness, the respondents name quite a few features and technologies, from city ranking to different public / private smart services.

Table 1. Responses to open-ended questions about smartness as part of present or future city/region as place of study (Survey questions 1–4).

Question theme	Open-ended responses
Question 1: Reasons for choosing a place of study	Smartness, positive city image; practical reasons re: distance from home, range of opportunities
Question 2: Opinions about smartness of city of present study place	Capital city area; ranks highly in smartness worldwide as all cities in Finland; digital public & private services: libraries, city bikes; taxi services, e-scooters, food robots
Question 3: Other smart technologies affecting respondents' lives	Sustainable mobility, digital order & delivery services, tourism-related information & recommendations, platforms for booking meeting & studying locations & restaurants; mental health care apps for self-monitoring
Question 4: Types of smart tech services seen to improve city / region as place of study re: inclusiveness & interconnectedness	<p>Logistics-related: smart infrastructure & transport apps, city bikes, car sharing</p> <p>Networking-related: social platforms, services for making friends, self-order systems in restaurants</p> <p>Studies-related: online study infrastructure & services e.g. 24-hr self-service library, learning platforms, virtual classroom & tools</p>

In question 4, 24 (of 36) respondents specified what smart technologies improve the city/region as a place of study regarding improved inclusiveness and interconnectedness. The themes, identified from the answers to open questions included: study environment and study related technology, networking and community activities and logistic services. Answers regarding study environment included better online study possibilities, 24-hour self-service library, digital learning platforms, remote learning infrastructure, virtual classrooms, and collaboration tools.

The proposals for networking and community activity technologies included self-ordering systems in restaurants, services providing real estate services or remote workspaces, social platforms for discussing trendy topics, services for finding friends and an open calendar where people could add their own events or share information. Logistic services included proposals for car sharing, smart transport, and city-bikes. Transportation applications and smart infrastructure for accessibility were also mentioned.

As for reasons why smart city image makes a city more attractive as a place of study (question 5), five broad themes could be discerned (see Figure 3): it promises an easier life, more possibilities, as well as feelings of advancement and importance, especially for technology-oriented people. Some respondents did not find a smart city attractive due to reasons which can be grouped into three broad categories (see Figure 3). The most common view was that other issues take precedence over smartness when respondents choose a place of study. Regarding the possible negative effects of smart technologies (question 6), two main categories could be detected among the answers, namely, the demands of technology, which not all people are able to meet, and the risks technology brings with it (see Figure 3).

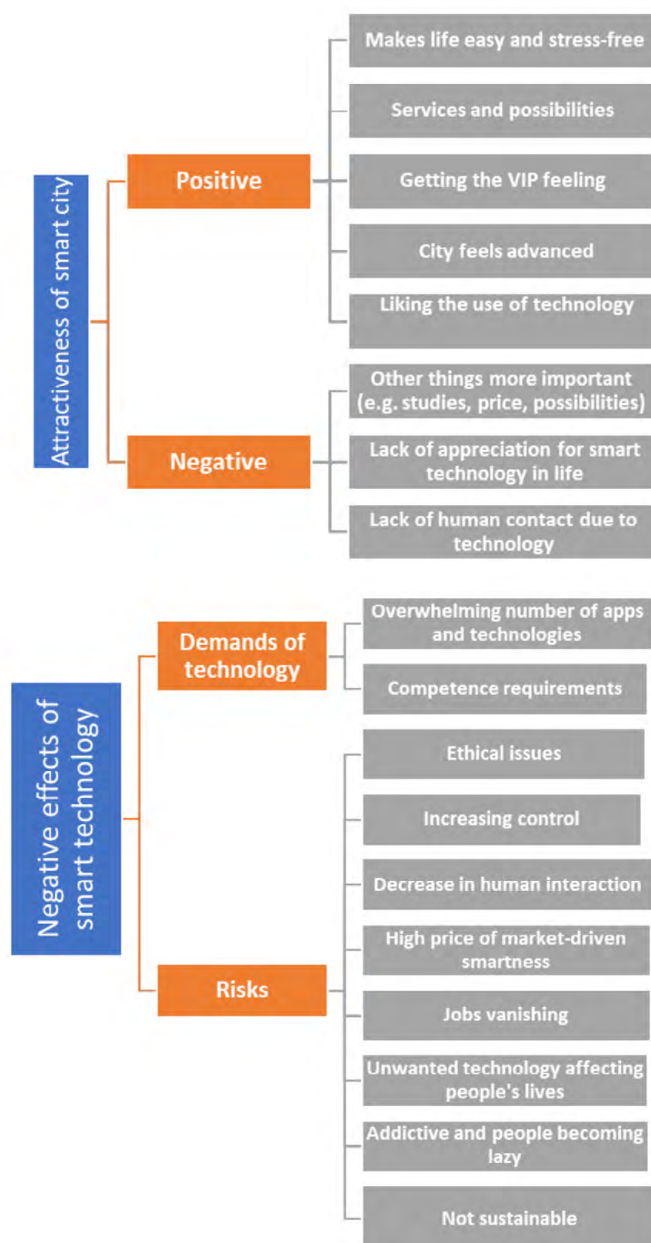


Figure 3. Open ended answers to survey questions 5 and 6: attractiveness of smart city and perceived negative impacts.

In particular, the category of risks included various issues such as increase of control and decrease in human interaction brought about by new technology.

4 Conclusions and discussion

In conclusion, this study examined the state-of-the-art use of smart city technologies by students of three universities and explored ideas for further developments. Research material was collected with a survey and a workshop to estimate their current use of smart city technologies and to assess the attractiveness of smart city image for students when choosing study or work locations. Although the number of responses to the survey was low (N = 36), we believe that together with the results from the LFA workshop, this study provides insights about current importance of smart city concepts and potential for future developments.

One of the key findings of the quantitative analysis of the survey is that, while almost two thirds of the respondents believe that the smart city image can have a positive impact on people's decisions when choosing a place for study or work, only 25% think that smart city image impacted their personal decision. This raises questions such as:

- Are the expectations for smart city technologies higher than their actual impact on people's lives?
- What could a city do to make the smart city image a more impactful characteristic, such that it would improve the city's attractiveness also in practice?

Another finding is that all the survey respondents are already using multiple smart city functionalities and have interesting ideas for further use of smart technologies that could help their lives (see also Villanen et al 2022; Vuorela & Jalas 2022, Johansson & Hvinden 2007). This could be an encouraging indication that cities and regions have ample opportunities for leveraging smart city technologies both for improving the attractiveness of the cities/regions' images and engaging citizens in participatory planning of its smart city functionalities.

While the majority of the respondents do not see threats with smart city technologies, as many as 28% of the students think that smart city technologies can also pose risks for citizens. This can be interpreted as a clear signal that cities need to understand and mitigate the risks related to investing in specific technologies and in the smart city image in general.

The findings tentatively suggest that smart city technologies have the potential to significantly improve the quality of life, study environment and promote inclusiveness and interconnectedness, as well as enhance logistic services. The results are thus in line with the findings by Jacques (2024) and Yigitcanlar et al. (2020), indicating that smart governance and innovation are the most popular smart city concepts alongside with internet-of-things and mobility as the most popular technologies.

As a further study, it would be interesting to apply the methodologies presented in this paper to analyze also a more detailed distribution of the results –according to regional and demographic distributions –comparing the cities where the students come from and their expectations. However, for a more detailed analy-

sis we think that the number of respondents should be essentially higher and/or focused on a specific city or geographic area. Overall, we hope that this research provides valuable insights for further research and discussion about urban planning for educational and work environments.

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