

Article

The Contribution of Socio-Cultural Aspects of Smartphone Applications to Smart City Creation. Poland–Turkey Comparison

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Abstract: The main objective of this article is to analyze the use of modern information technologies, referring to the example of smartphones, paying particular attention to selected cultural aspects of the phenomena that appear to play an important role in creating the concept of a smart city. The authors asked a research question: whether there is a difference in the perception of smart cities between Poland and Turkey in terms of a set of individual criteria and cultural differences in the context of globalization processes. The authors decided to compare the use of smartphones in an international environment. In their analysis, they examined Poland and Turkey, the countries which are characterized by markedly distinct culture and customs, but simultaneously present a similar level of IT development. The research was conducted in two stages at the turn of 2019 and 2020, and it involved more than 600 selected young people aged 18–25. It is important to mention that the study consulted the group of the most active internet users who are taking advantage of the benefits of internet-aided globalization. In order to carry out the survey questionnaire, the authors applied a CAWI (Computer Associated Web Interview) method. The original study aimed at identifying the character traits of smartphone users that appear to be most important from the point of view of implementing the concept of a smart city. As a result of this research, 15 such characteristics were identified, and the impact of smartphones on the strengthening or weakening of such qualities was tested in the course of conducting the survey questionnaire. The survey was translated into native languages and initially tested as part of the pilot studies. The results were compared, and the authors have identified and commented on differences between them. They also assessed the degree to which the hypothesis formulated in the research has been verified. The main limitation of the conducted study was the selection of a random group since the research sample consisted only of members of the academic community. The part of the study which is presented in this article fills the research gap related to the impact of smartphones on selected aspects of user behavior (punctuality, individualism, the quantity and quality of contacts) as well as social behavior (homogenization of cultures, the impact on economic and technological progress, strengthening of social bonds, civic responsibility (both in the social and economic sense), personal development initiatives, increase in social activity, sense of security, technological progress, and achieving prosperity). The examined features are particularly important in shaping the idea of smart cities. The results obtained in the study are conducive to expanding the research in this area.



Citation: Chmielarz, W.; Zborowski, M.; Fandrejewska, A.; Atasever, M. The Contribution of Socio-Cultural Aspects of Smartphone Applications to Smart City Creation. Poland–Turkey Comparison. *Energies* **2021**, *14*, 2821. <https://doi.org/10.3390/en14102821>

Academic Editors: Dorota Jelonek and Andrzej Sobczak

Received: 5 April 2021
Accepted: 29 April 2021
Published: 14 May 2021

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Keywords: smart city; smartphones; international comparisons; socio-cultural aspects of smartphones application

1. Introduction

The main objective of this article is to identify the potential contribution of socio-cultural aspects of smartphone use in supporting the idea of creating a smart city. The study, which created the basis for the analyses, discussions, and conclusions included in

this article, was carried out after the outbreak of the coronavirus pandemic (COVID-19) at the turn of March and April 2020. It was conducted simultaneously in Poland and Turkey, the two countries which are markedly distant in terms of their geographical location and culture. The selection was dictated by a similar level of development of internet services and relative ease of obtaining the necessary data from two cooperating universities: the University of Warsaw (Poland) and the University of Uşak (Turkey). So far, the entire study consisted of two stages. In the first stage, the authors concentrated on the technological and organizational aspects of the use of smartphones and mobile applications. In the second one, they analyzed and discussed the social and cultural aspects of the development of the individual and the society as well as the role of these factors in shaping the latest trends, including the current approach to the concept of creating smart cities. This article presents the findings from the second stage of the research.

For many years, the concept of developing modern, citizen-friendly cities—smart cities—has not been uniformly defined [1–4]. However, there are two types of definitions that appear to be prevalent, and they usually concern two areas: modern technologies and management [3]. In the first case, the emphasis is placed on IT supporting social and economic initiatives. The second approach focuses on the importance of human, social, cultural, and educational capital, which exists and develops in harmony with the principles of sustainability. However, it is important to note that contemporary sources pay more and more attention to the social and cultural aspects of creating a smart city. In this context, an urban area is considered smart if it invests in human and social capital and transport infrastructure in order to actively promote sustainable economic development and high quality of life, including wise management of natural resources through civic participation [4]. Earlier concepts paid more attention to the issue of using transport and telecommunications infrastructure, ICT, digital media, and creative industries [5]. However, the focus of attention soon shifted towards [6] human needs forming the basis for all the concepts shaping the artificial environment of human life, and technical infrastructure used by a man to develop his personality (i.e., responsibility, punctuality, etc.), and support professionalism in his actions or provide entertainment.

Among all the factors mentioned above, the greatest importance is currently attached to the city residents, their needs, their personalities, and generally increasing their role in shaping urban space, which they could co-create and live in greater harmony with the natural environment. One of the most important devices which currently allows citizens to implement these ideas are smartphones, which have been continually improved in recent years [7]. Their role appears to be significant in shaping the attitudes and personality of the inhabitants, and the latter seem to be prerequisites for the implementation of the idea of smart cities, now and in the future. Thus, the assessment of the importance of smartphones in shaping the desirable characteristics that would be conducive to building a smart city is a research gap, which this paper hopes to fill, at least to a certain degree.

Since 2013, smartphones have gained a dominant position among all devices enabling internet access, both in the private sphere as well as in business contacts [8]. Their characteristics, such as a lower price compared to the PC, their small size, various functionalities, and relative ease of use contributed to their popularity with the users. It is estimated that in 2020 there were 14.02 billion mobile devices used globally and this number is expected to increase to 17.72 billion in 2024 [9]. This, in turn, translates into 3.5 billion users in 2020 and represents an estimate of 3.8 billion users in 2021 [10]. The forecast for 2021 presents an 11% increase in the sales of smartphones in relation to 2020. In Poland, 93% of young people aged 18–34 own a smartphone, and in Turkey, the number is estimated at 83% [11]. Even though the sales of these devices dropped significantly in 2020 (about 20% worldwide), this will not stop the effects of the use of these devices and the software running on them. The main reason for this decline is the COVID-19 pandemic and the related lockdown. On the other hand, it is the lockdown, teleworking, and social distancing that heighten the need for electronic communication and, as a consequence, create a greater demand for these devices in the future.

A smartphone is defined as a portable (mobile), multifunctional multimedia device, which is a technical and functional combination of many tools which have been used so far, such as a mobile phone, fully portable computer, electronic camera and video camera, voice recorder, GPS navigation, notebook, computer game console (smartphones intended for games), and a health sensor controller, etc. The term mobile application represents a variety of software designed for use on smartphones and other mobile devices: independent, stand-alone and specialized, operating without access to internet website, mobile websites, streaming (on-demand access to internet resources), and computer games [12]. Internet access is provided by a smartphone using a browser (via websites) or mobile applications. Since the majority of users do not distinguish and cannot recall whether they performed operations via a website or using an application, it was assumed for the purpose of this study that the term “mobile e-commerce” would apply to both of these cases.

In order to obtain the goal set out in the study, the following structure was adopted in the paper. The article includes an introduction, followed by the second section which presents an overview of the literature. The third part of the paper describes the methodology and the research sample examined in the study. The analysis of the results, comparison and discussion are presented in the next section. The last part contains conclusions resulting from the conducted research as well as the indication of limitations of the current analysis and directions for further studies.

2. Literature Review and References

The first stage of the Poland–Turkey comparative study concerned the aspects related to technology and usability of smartphones, while the second focuses on the selected social aspects. The social dimension of technology applications can be assessed at the macro level, that is the one related to the society (organization of society, religion, art and literature, language of communication, customs and traditions, political system) or at the micro level—the one pertaining to individual users (the influence of the IT solutions on personality, skills or competence, knowledge and perception, approach to innovation, etc.) [13]. Self-reported dependence on mobile phones in young adults is indicated by a European cross-cultural empirical survey. As users of information technologies, we find ourselves in a specific social environment defined by accepted cultural norms and behaviors. These cultural conditionings shape our way of thinking and our actions, they influence our decisions and determine the level of knowledge, including technological knowledge. It is important to note that information technology consists in the use and exchange of knowledge and its practical applications in private and economic life. Since culture-conditioned behavior generally relates to “tacit” knowledge, the use of the latest technology sometimes leads to internal conflicts (resistance to change or innovation) or differences between particular countries or regions. It would seem that after three decades of the development of the worldwide web, internet technologies have significantly reduced cultural differences, both in terms of individual and social behavior. The impact of the use of smartphones in Poland and Turkey and the specified differences between the countries do not fully confirm the thesis concerning the convergence of attitudes and behaviors. The analysis presented in this article considers also the aspects related to the use of mobile devices shaping the social competence of the residents of future smart cities.

The most frequently mentioned functional qualities associated with the smart city areas include [14]:

- smart people—intellectual, cultural, and personal development of citizens who use the technical infrastructure for self-development, creating platforms for the exchange of know-how, smart entertainment, etc.,
- smart living—broadly understood enhancing citizens’ life with ICT solutions with regard to their social activities, health care, the functioning of offices or cultural, and educational institutions,

- smart mobility—transport or telecommunication as well as information—smartphones and their use, network computers, BIG Data transfers, device monitoring and management (Internet of Things—IoT),
- smart economy—based on innovative technological solutions and supported by knowledge from academic centers,
- smart governance—development and implementation of remote city co-management procedures, creation and access to city information systems, creation of digital mechanisms increasing the participation of citizens in decisions concerning city development,
- smart environment—optimization and rationalization of natural resources to make life easier and more comfortable for the citizens [15].

So far, smart cities are seen more as a concept. However, more and more of the elements specified above are already functioning or are being implemented. The reasons behind it are social and economic factors. Despite the passage of time, views on this subject are not unequivocal. For example, Hollands [5] reckons that building the infrastructure supported by the latest technologies allows supporting the acceleration of the development of the cities as well as its community. However, the author also claims that in order to create a smart city, it is necessary to include the knowledge and potential of its citizenry in this process, since the smart city is intelligent with the intelligence of its smart citizens. This approach emphasizes the importance of widely perceived education because this way it can constantly improve the competencies and intelligence of cities. According to the author, social initiatives are an additional factor accelerating the creation of a smart city. They should provide the most valuable information about possible further directions for city development to make it truly friendly to its residents [5].

The implementation of new concepts of a smart city allows reducing costs associated with its operation, increasing safety, and improving the quality of life for the citizenry. The essence of this approach is to focus on the residents' creative involvement in the implementation of the idea of a smart city with the application of the latest technologies. According to Albino, the aspect of living conditions should not constitute a separate category, because all activities in the course of implementing the concept of the smart city are aimed at improving living standards for the residents [16,17]. In this context, a smart city is construed as a space that combines the digital and social dimensions. At the same time, the author claims that not every digital city is smart, but every smart city must have characteristics described as digital [16].

Some sources [17,18], present a smart city as a joint initiative of local authorities, entrepreneurs, and residents living in a particular area. In this approach, the most important element is the creation of the best space to live and operate in a given territorial area. The condition for achieving this goal is the proper use of the latest technologies and the involvement of citizens, whose key role is to indicate places where changes should be made and new innovative solutions implemented. "This deep use of ICT" as R. P. Dameri claims, "enhances the role of the smart city in collecting and delivering data, information and knowledge affecting the daily life and improving its quality thanks to e-services, a deeper involvement of citizens in the city governance and their proactive role thanks to e-democracy and e-participation" [18]. Citizens' involvement and active participation in local governance are marked manifestations of their sense of responsibility, examined in this article, as well as the willingness to play an active role in the design and implementation of smart cities.

To sum up, the lack of one, uniform definition of Smart City is caused by the multidimensional nature of the concept which includes two areas: hard factors, i.e., strictly technological and logical characteristics, and soft factors—the human factor, along with the associated knowledge and competences. The structures of the new trend additionally include the latest technologies, without which the existence of the new concept is impossible. As the authors have already mentioned, mobility, which is mostly manifested in owning and using smartphones or applications running on them, appears to be one of the factors which have a decisive influence on social development. "This deep use of ICT"

as R. P. Dameri claims, “enhances the role of the smart city in collecting and delivering data, information and knowledge affecting the daily life and improving its quality thanks to e-services, a deeper involvement of citizens in the city governance and their proactive role thanks to e-democracy and e-participation.” Citizens’ involvement and active participation in local governance are marked manifestations of their sense of responsibility, examined in this article, as well as the willingness to play an active role in the design and implementation of smart cities [19].

Considering the circumstances, the problem of the use of smartphones and related research has become more and more important on a national and global scale. Nevertheless, it should be noted that until 2012, the importance or potential of smartphones was not recognized or appreciated. The rapid, incremental growth in their popularity and the continual improvement of their quality contributed to the fact that they are treated as an innovative medium with a high potential for effective use. Hence, in addition to articles of strictly statistical significance, there appear many academic works on smartphones and their applications. Review articles appear to confirm this tendency. The articles discussed selected problems that arose together with the gaining popularity of new devices at that time. The smartphones combined the characteristics of a mobile phone and a computer, offering free internet access to their users. The studies which examine smartphones by their use and perception from the point of view of individuals, i.e., considering the human point of view analyze the economic, educational, cultural, technical, and demographic aspects as well as security of smartphone use [20–22].

Economic problems, for example, the choice of a smartphone running the operating system (iOS, Android) dependent on such general economic indicators [21] as GDP per capita, gross savings, inflation, ICT development index, unemployment, and human development index. The authors believe that adopting global indicators allowed for international comparisons, while socio-psychological indicators should be applied at the microeconomic level.

Educational problems were often related to general problems, such as dependence of academic performance on smartphone use (in Korea and Australia) [22] or specific problems, such as antenatal education for women [23] in Korea, compared to international data. The research problems also had a broader context regarding the relationship between the frequent use of smartphones and dysfunctional behavior and negative effects in everyday life (e.g., increased procrastination) [24].

Cultural problems were frequently manifested in the international environment, and in individual countries or regions there occurred differences that were determined by the user’s gender. One of the studies analyzed the problem of the relationship between owning and using a smartphone and the identities of users in three cultures, which differ considerably in terms of their geographic, historical, and cultural characteristics. The countries examined in the research included Oman, the Islamic monarchy and Ukraine, a post-Soviet East European country, and the USA. The study also focused on the impact of the smartphone on the sense of identity and use from the point of view of its usability [25]. Its functionalities may include the tasks related to planning a trip, since numerous applications help the users make decisions concerning the destination, hotel, type of transport, based on the information about the location and the available options regarding the journey or accommodation [26].

The literature on the subject also deals with various technical problems, which initially were seen as important in terms of the innovativeness of the smartphone. However, the significance of these problems was gradually decreasing after a few years. Currently, they relate to specific problems, such as, for example, the interdependence between the use of mobile internet via a smartphone and the pattern of voice calls among individual clients [27] or comparisons of smartphone use in China and Germany depending on the cross-section of the smartphone screen [28].

The research frequently examines demographic factors, mainly related to age groups and gender, paying attention to problems related to excessive smartphone use, especially in

the younger part of the population, and differences in smartphone use between women and men [29,30]. Many of these studies concern Arab countries, where the differences in the use of smartphones by men and women are relatively the largest. The latter research also has an international aspect as it presents a comparative analysis of two countries, namely, Jordan and the United Arab Emirates. The impact of owning and using smartphones on the social communication of the elderly [29] was also investigated. Some studies highlight specific problems, such as the use of smartphones while driving, broken down by gender [30].

The issues associated with the security of smartphone use, very important when operating on the internet, have been considered as part of the relevant research initiatives. However, the actual content dealt more with the issue from the point of view of interest in it, not necessarily undertaking specific actions to ensure the safety of online operations. The issue of security has been examined multiple times, considering various perspectives. The studies in this context concerned the security of personal data when performing operations with a smartphone, user awareness, and their level of education in this regard [31].

As can be seen from the enumeration presented above, the literature on the subject considers various aspects associated with using smartphones; they also include international comparative analyses. Although the publications cover a vast area of topics, the studies carried out so far have not dealt with the complexity and the combination of various problems, e.g., technical, security, economic, practical, and socio-cultural aspects of the use of smartphones. Especially in the situation of their suitability to support the development of smart cities. To some extent, this article fills this research gap.

3. Research Method

3.1. Description of the Method

The following research methodology was adopted to consider the cultural aspects of the possession and use of smartphones and mobile applications running on them:

- using relevant literature sources to identify user characteristics relevant to the development of smart cities and their subsequent verification,
- constructing a pilot version of the questionnaire to verify the correctness and comprehensibility of the questions,
- on the basis of the evaluation—developing and improving the prototype of the survey, the building of the final version of the questionnaire, and its translation into national languages,
- random selection of groups of respondents and inviting them to complete a survey questionnaire using a CAWI (Computer Associated Web Interview) method,
- analysis and discussion of the findings using comparative analysis and measuring distance metrics,
- drawing conclusions and making recommendations concerning the degree of fulfilling the characteristics of smartphone users for the implementation of the smart city idea across the examined countries.

The first stage was applied for analysis of technical aspects and directions of smartphone use and created the basis for considering the socio-cultural implications of having and using smartphones, and it enabled the analysis of technical and organizational aspects of the issue.

The second part of the survey focused on socio-cultural aspects. Based on the literature review (Section 2), twenty-five characteristic features of smartphone users have been identified to exert a positive impact on the creation of smart cities. A pilot group including selected twenty respondents assessed the characteristics in terms of their relevance for the abovesaid analysis. After the verification, the final version of the survey questionnaire consisted of 15 questions concerning the impact of a smartphone on the users' behavior and perception of the world around them [32,33].

The study examined the relationship between owning and using a smartphone on one hand and on the other the number of aspects that are listed below:

- punctuality and meeting the deadlines related to professional duties and obligations,

- supporting individualism or collective work,
- the influence on the number of direct contacts (face-to-face interaction) with other people,
- the intensity of the impact of owning and using the smartphone on direct contacts (face-to-face interactions) with other people, whether it has a positive or negative effect on the quality of direct contacts with other people,
- strengthening (divergence) or reducing (convergence) the differences between cultures,
- determining the degree of influence of using smartphones on economic progress,
- identifying the degree of influence on technological progress,
- recognizing the impact on strengthening social ties,
- strengthening the sense of responsibility and shared responsibility among citizens,
- strengthening the sense of responsibility and shared responsibility among citizens in the areas of education, the situation on the labor market, responsible consumption, environmental protection, and investment,
- undertaking independent actions focused on competition and achieving individual success or creating bonds and building a sense of community in a particular group of people,
- identification of the user's sense of safety and security of functioning in the economic and social environment,
- recognizing whether owning and using a smartphone is primarily connected with leisure activities, digital entertainment, activities to the benefit of the general public, more frequent contacts with others, or not supporting any activity,
- determining whether the use of a smartphone strengthens the desire to use other innovative devices,
- making the users reflect on their well-being and its level, at present or in the future.

In order to determine the level of the distinguished user qualities, which are conducive to the creation and development of smart cities in the analyzed countries, and to identify the differences between them, the authors have applied the following procedure:

- firstly, the authors calculated the percentage share of the fulfilment of a particular feature in each of the countries, considering its positive or negative impact on the studied phenomenon,
- secondly, the authors compared the percentages of users' responses from both countries and established the differences in percentage points,
- thirdly, two measures of distance were calculated—the city distance (the sum of the absolute values of the differences between the results obtained in both countries) and the Euclidean distance (the root of the sum of squared deviations of the results obtained in both countries). However, with this measure, the effect of large individual differences between dimensions (outliers) is suppressed because it is not squared,
- fourthly, the standard deviation is a measure of volatility, which demonstrates the spread of the value of some measure (e.g., the difference between the results obtained for two separate countries) around its mean. In this case, the overall distance is calculated as a combination of the average differences between the results of the characteristics collected with the questionnaires and their clustering around the average difference in the group of indicators. Additionally, the authors put forward H0 thesis: there is no difference between Poland and Turkey in terms of the sizes of individual criteria, groups of analyzed criteria and the evaluation of the entire study, against the H1 thesis: about the existence of differences, with the assumed probability of 0.05.
- finally, the authors compared the level of compliance with the requirements of the distinguished features by the users of smartphones and mobile applications from the point of view of supporting the idea of creating smart cities.

3.2. Research Sample Analysis

At the turn of 2019 and 2020, the authors conducted research on the use of smartphones in the context of cultural differences. The research group was chosen from randomly selected student groups of the Faculty of Management of the University of Warsaw (Poland)

and the University of Uşak (Uşak, Turkey). The random selection of student groups and the freedom to give answers caused some differences in the number of responses. Nevertheless, the research sample showed high similarity, due to the following factors:

- respondents came from the same academic community,
- they represented similar age and similar activity on the internet (see: Table 1).

Table 1. Selected sample attributes; source: own work.

Sample Attributes	Poland	Turkey	Average
Gender:			
women	67%	45%	58%
men	33%	55%	42%
Age 18–25	97%	87%	92%
Average age	21	23	22
Place of origin:			
Cities Above 500,000	25%	36%	31%
Cities 100,000–500,000	8%	43%	26%
Cities 10,000–99,000	29%	17%	23%
Small towns 1000–9000	4%	1%	3%
Very small towns	3%	1%	2%
Villages	31%	2%	17%
Education:			
Secondary	96%	2%	49%
Undergraduate	3%	79%	41%
Higher	1%	19%	10%
Professional status			
Employee	1%	11%	6%
Student	40%	76%	58%
Working student	59%	13%	36%
Activity on the internet	99%	97%	98%

In total, the study examined the opinions of 614 people from the group of 897 students (68% feedback) who were invited to fill in a survey. 385 Polish students and 229 Turkish students provided full answers to the questions contained in the questionnaire. Among all the respondents, the sample included over 58% women and over 41% of men. In Poland, two-thirds of the respondents were women, in Turkey, women constituted 45% of the sample. Thus, the difference in the number of representatives was 21 percentage points. The differences were mainly due to the gender ratio of students in management studies in both countries. The research sample obtained at universities was dominated by people aged 18–25. The average age in the entire population is 22 years, in Poland it is on average 21, and in Turkey 23. The geographic structure of the respondents' origin was different and adapted to local customs. Most of the respondents, 29%, came from cities with more than 500,000 inhabitants (in Poland—25%, in Turkey—36%, a difference of 11%). In Poland, in the present study, most people came from villages (31%), in Turkey from cities with 100,000–500,000 inhabitants (44%). The latter category also included the largest differences between Poland and Turkey amounting to 36%. The second significant difference occurs among respondents from rural areas. In Turkey it is only 2% of the surveyed population, so the difference is estimated at 29%. Among the surveyed population, the largest group (61%) included people with secondary and undergraduate education (31%). This depends on the particular year of studies of the students examined in the research: in Poland—undergraduate studies, in Turkey—graduate and postgraduate studies. To some extent, the above-mentioned factors also influenced the professional status of the respondents. It is particularly evident in the case of Turkey, where 11% of the respondents declared being employed (post-graduate studies), and 76% are students—mainly higher education. It is interesting that in Turkey there are relatively few working students among the population (13%). In Poland, almost 59% of students declared themselves working, and almost 41%,

not working. It seems that in Poland, in the case of studies at social faculties, it is easier to combine studies with work.

Even though the research was conducted in a similar environment, there occurred a significant variation in the samples examined in both countries. It was particularly evident in the case of professional status; there was a large difference between the number of students working in Poland and Turkey (around 46%). On the other hand, the differentiation of the two samples increases the chances of generalization.

The average distance with the results calculated by the average absolute difference (city distance) of the values in Poland and Turkey amounts to 87% (Euclidean distance 54%, standard deviation 23%). The smallest variation occurs in terms of the age of the respondents (20% city distance, 11% Euclidean distance, 3% standard deviation), due to the fact that the study was conducted in student groups. By contrast, a random selection among student groups resulted in a significant diversification of other indicators, such as gender, place of origin, education, and professional status. This was most evident with respect to education, where the questionnaires in the case of Poland were sent mainly to undergraduate students, and in the case of Turkey to students of graduate and post-graduate studies. This also had an impact on the responses concerning professional status, and in Poland, it seems, a greater number of students combine studies with being employed. The other two indicators, gender and place of origin, can be explained by the cultural differences as well as the location of both universities.

The main research was preceded by a pilot study conducted among students at the University of Warsaw. This option offered a greater guarantee of the repetitiveness of the survey; the students determined whether the questions included in the questionnaire were unambiguous (understandable) and important from their point of view. The pilot group (30 people) was selected among students participating in the Erasmus program, and thus having broad horizons and experience in terms of international cooperation.

The Cronbach's alpha index was greater than 0.7 (Poland 0.78, Turkey 0.72), which makes it possible to judge the significance and reliability of the collected data (high internal consistency of data).

To conclude, the study was conducted on a research sample in a similar academic environment, but the structure of this sample, as shown earlier, presented different characteristics. The greatest differentiation, the critical value of the Fisher-Snedecor reverse test, was exceeded in the case of respondents' education and place of origin.

4. Results

Both in Poland and Turkey, respondents mainly indicate that they own smartphones—on average 98%, similarly to their internet-enabled activity. Thus, it was a good basis for specifying cultural differences in the use and use of smartphones and applications.

The second part of the survey concerned socio-cultural issues. It consisted of a series of questions concerning the impact of smartphones and their functionality as one of the leading information technologies on the characteristics, behavior, and motivations of their users and the possibility of shaping their actions and rationale behind them. As Gironda and Korgaonkar [32] claim, “research abounds on consumer behavior with technology and social media, together with related practical implications” [33]. Political, economic, technical, and cultural changes, on the one hand, lead to increased levels of interdependence between countries and nations, and on the other, to the extension and deepening of different forms of social relations around the globe [34].

Culture and cultural conditions belong to a group of significant factors shaping the behavior of smartphone users, determining the way they use modern ICT solutions to obtain information or contact the outside world. Culture influences many aspects of the functioning of individuals and social groups and determines the socio-economic changes taking place in society. It shapes behaviors and actions, and it affects the perception of the surrounding world. It also determines the needs and decisions regarding everyday behavior related to the use of smartphone functions and the possibilities offered by mobile

applications, e.g., purchasing goods and services, using electronic banking, contacts with other people, using innovative ICT solutions in everyday life for professional purposes, socializing, or entertainment. According to Geert Hofstede, culture is a collective “programming of the mind” of members of a given society, which sets patterns and models of action and thinking, which are separate and distinct for any social group [35,36].

Culture is a factor related to the system of values adopted in a particular community. It also constitutes a set of patterns impacting ways of thinking, feeling, and reacting. It is acquired and passed on from generation to generation, establishing the rules and principles guiding communication, cooperation as well as establishing and maintaining interpersonal relationships. For the first time, the authors attempted to enrich the analysis with social and cultural aspects, such as attitude to time, propensity to take risks related to the use of modern solutions, such as e-banking or e-commerce, interpersonal relations, quality, and intensity of contacts with others, individualism or collectivism (sense of community or shared responsibility), attitude to indulgence, and relaxation or planning for the future, etc. Another aspect that should be indicated at this point is that culture is learned. Onkvisit and Shaw [35] also stress that the ability to learn culture also enables individuals to absorb new cultural trends. Moreover, culture is also important from the point of view of the perceived customer value, such as the one related to owning and using smartphones, their quality, particular features as well as functionalities. This aspect of the present study might be useful due to the fact that the perceived customer value can be seen as a tool allowing accurate interpretation of consumer behavior as well as understanding (and resonating with) the deeper values cherished by members of the society [35–37]. The considerations contained in this article related to cultural differences and social aspects of internationalization and globalization processes refer to both Polish literature [38–42] and foreign sources [35,36,43,44].

The social and cultural factors of smartphone users influencing the creation and development of smart cities have become the basis for the creation of a questionnaire, whose findings are presented below.

The first question in the section concerning the social and cultural aspects of using smartphones was related to punctuality as well as keeping the deadlines and appointments. According to Hofstede’s analyses, Polish people have a very high preference for avoiding uncertainty. This means that they display an emotional need for rules, where precision and punctuality are the norms. According to Hofstede’s considerations, in Turkey, the need for laws and rules, including punctuality and keeping appointments is also a general tendency, and the difference between the countries is rather small [35,36].

The discrepancy between the findings of surveys concerning respondents in Poland and Turkey is visible at first glance, and it amounts to approximately 20%. With a slight difference in the case of the category of “I have no opinion” in Poland as 88% of respondents expressed a positive opinion on this subject, and 67% shared the same positive view in Turkey. The group which expressed a negative opinion amounted to approximately 24% of Turkish students and only 5% of Polish students. This gives about 80% of an average positive opinion on the impact of using a smartphone on punctuality, compared to a 12% share who expressed the opposite view. Since, for both countries, punctuality seems to be an important aspect of social behavior and value system, it emerges that a smartphone may be a technological solution supporting it. A smartphone may be seen as a device that impacts people’s behavior in terms of time management and meeting deadlines. Even though some of the aspects related to the importance of punctuality may result from upbringing or the influence of a social group in which a particular person lives, still, as the responses indicate, mobile devices are seen as helpful to respondents in terms of managing their time more effectively (Table 2).

Table 2. The impact of using smartphones on punctuality and keeping appointments; source: own work.

Opinion	Poland	Turkey	Average
No	5%	24%	12%
I have no opinion	7%	8%	8%
Yes	88%	67%	80%
Total	100.00%	100.00%	100.00%

As regards the fulfilment of this feature to support the smart city idea, the obtained result gives Polish respondents a 21% advantage over their Turkish counterparts. This means that they attach more importance to the possibility of using smartphones and applications installed on them in order to increase punctuality and improve the aspects related to meeting deadlines.

Another question concerned the impact of smartphone use on the individual or collective work style. According to Hofstede studies, Poland is an individualist society. The respondents demonstrate a high preference for a social framework where people are expected to focus and look after themselves and their immediate families. Previous analyses conducted by Hofstede suggest that Turkey is a collectivistic society. This means that individuals in Turkey belong to closely-knit groups, such as families or organizations, who take care of each other in exchange for mutual support and loyalty [35,36]. All in all, as Table 3 indicates, the respondents in both countries believe that having a smartphone is more conducive to individualism. In Turkey, 48% of respondents share this view, 6% more than in Poland. But at the same time, opinions are divided—38% of respondents in Turkey express the opposite opinion (29% in Poland). At the same time, 28% of students in Poland have no opinion on this subject (13% in Turkey, discrepancy amounting to 15%). Thus, it appears that Turkish respondents tend to indicate that the impact of owning and using a smartphone is more prominent, especially that individualism is not in line with the general tendencies observed in society.

Table 3. The influence of using smartphones on the individual or collective work style; source: own work.

Opinion	Poland	Turkey	Average
I have no opinion	28%	13%	23%
It supports individualism	42%	48%	45%
It supports collective work	29%	38%	33%
Total	100%	100%	100%

Analyzing the issue of supporting individual work by smartphone users, Turkish respondents have a slight advantage (6%) over Polish respondents. The difference in this regard amounts to 10%. At the same time, they show much greater flexibility in terms of using the possibilities offered by mobile devices. This tendency is extremely important from the point of view of the diversity of approaches to work styles facilitating the development of the smart city concept.

The third question concerned the problem of whether the use of a smartphone affects the number of direct contacts (face-to-face interaction) with other people. A scale of 1 (no) to 100 (yes) was adopted, with 50 representing a neutral attitude to this problem. In Poland, as Hofstede claims, the culture is seen as highly individualistic, communication is also affected by this tendency. According to Hofstede's considerations, in Turkey, communication tends to be more indirect, the harmony of the group should be seen as a priority, and it has to be maintained. Time is needed to establish a relationship based on trust, and feedback in the case of exchanges in Turkey is usually indirect [35,36].

On this scale, Polish respondents assessed the impact which mobile phones have on our interactions at almost 40%, which is almost neutral, while the Turkish respondents

assessed it at the level of 61 points, which is possible. The issue of the extent to which having a smartphone affects direct contacts is associated with this question. The response was rated on the same scale. The received answers were similar to the previous question. The respondents in Poland assessed this issue assigning slightly negative scores (38), and the respondents in Turkey assessed it positively (70). Here, slightly negative responses represent the view that the possession and use of a smartphone disturb interpersonal contacts to a certain degree, and moderately positive that it supports them. It emerges that Turkish respondents see the device as another opportunity to create bonds and a sense of belonging to a particular group, while Polish survey participants think that using a smartphone has a negative influence on the way we communicate and establish relationships, perhaps perceiving communication via a mobile phone as a specific limitation in relation to traditional face-to-face interactions.

The findings suggest that Turkish respondents are more inclined to implement the smart city idea because they treat mobile devices and related software as one more communication channel facilitating direct contacts, while Polish respondents attach more importance to direct contacts, which is perhaps less convenient but more suited to the nature of interpersonal contacts.

The study also enabled the assessment of the question of whether having a smartphone impacts the process of deepening cultural differences (divergence) or rather strengthens the tendency of making cultures more similar (convergence). At present, it emerges that globalization tendencies appear to be offset by the sustainability of national culture and the re-emergence of the tendencies aimed at cultivating diversity, evidenced, among others, by the present increased focus on cultural heritage, history, national culture and identity. These tendencies are significant for a number of reasons. Namely, they may facilitate collaboration within and between nations, they help to resolve conflicts or tensions and deepen the mutual understanding among the members of particular communities, societies, and regions [25,37,44]. It is important to point to one more important aspect of culture, that is its sustainability. Because culture is shared and passed down from generation to generation, it is relatively stable and permanent. However, having said that, we should also indicate that culture is cumulative. Culture is based on hundreds or even thousands of years of accumulated circumstances and experiences shared by particular communities and societies. As Onkvisit and Shaw [35] claim: "Each generation adds something of its own to the culture before passing the heritage on to the next generation. Therefore, culture tends to become broader-based over time, because new ideas are incorporated and become a part of the culture. Of course, during the process, some old ideas are also discarded." As the authors claim, culture is dynamic and constantly changing: "it adapts to new situations and new sources of knowledge". The authors also emphasize that consumption patterns, lifestyles, and the priority of needs are dictated by culture. Culture is the agent which prescribes the manner in which people look for opportunities to meet their needs. As the authors [35] state: "The dynamic aspect of culture can make some products obsolete and can usher in new buying habits." In both countries, about 70% of respondents responded to this dilemma positively, i.e., according to them, the use of a smartphone causes the increased similarity of cultures. Only 13% of the share, on average, believe that it causes the strengthening of cultural differences, and on average, nearly 18% have no opinion on this subject (Table 4). However, it is important to indicate that the discrepancies did not reach more than 7% of opinions.

There is no significant difference in the opinion of the respondents of both countries in terms of increasing cultural similarities; almost 70% of the respondents support the opinion related to making societies similar through the phenomenon of information mobility, which is in line with the smart city idea.

Table 4. The impact of using a smartphone on deepening of the cultural differences or increasing similarities of cultures; source: own work.

Opinion	Poland	Turkey
I have no opinion	19.48%	14.41%
No, it strengthens cultural differences	10.65%	17.47%
Yes, it makes cultures more similar	69.87%	68.12%
Total	100.00%	100.00%

The next question concerned the impact of owning and using a smartphone on economic progress. The authors used the same slide scale from 1 (no influence) to 100 (strong influence) to obtain the findings. This time, the responses in both countries moved towards positive views. In Turkey, this score was established at 53—slightly above the neutral impact. In Poland, it amounted to 71—in the range of the values for medium-high impact on economic progress. The results in terms of assessing the impact of owning and using smartphones on the acceleration of technological progress were similar. In Turkey, the score was 68 (medium impact), in Poland, it was 81 (high impact). This was also related to the opinion on increasing the propensity to use other innovative devices, which resulted from the fact of owning and using a smartphone. The assessment on the same scale produced a result of 73 in Poland (between medium and high degree) and for respondents from Turkey 56 (more than average impact on the use of other modern devices).

Polish respondents, on the other hand, see a greater impact of the use of mobile devices on technological progress than their Turkish counterparts, although on a scale of 1–100 their responses also exceed the neutral point. Supporting economic development by technology is one of the most important postulates of a smart city, so to a greater or lesser extent, it is supported by users from both countries.

From a social point of view, the authors analyzed which activities can result from or increase as a consequence of owning and using a smartphone. The following activities were distinguished: leisure activities, digital entertainment (computer games, movies, music, etc.), activities for the general public, frequent contacts with other people, and the lack of support for such activities. In the case of Turkish citizens, it is very difficult to unanimously state whether they like engaging in leisure time activities. Hofstede states that Turkish people are almost equally prone to behaviors showing constraint and those displaying the willingness to indulge in activities just for pleasure or to relax [35,36]. Polish people tend to move towards restraint in their actions to a greater degree than the Turkish participants of the study. It emerges that the differences between countries are quite significant. However, a detailed analysis of the types of leisure activities is very interesting. Even though the general characteristics of cultures point to significant differences, the examination of the tendency to engage in leisure activities or relaxation produces very similar results in both countries. The discrepancy in the case of other analyzed aspects is more prominent and worth considering. The detailed results (Table 5) show that the basic area of smartphone use is digital entertainment (38% of responses on average) and pleasure (32% on average). According to the respondents' opinions, smartphones are used for activities to the benefit of the general public to the smallest extent (9% on average), 3% claim that they do not support any activity. The biggest differences occurred in terms of digital entertainment—almost a 14% advantage of respondents from Turkey and frequent contacts with others (13%). The latest result confirms the earlier opinion of Turkish students about the low rate of smartphone use for communication with others.

On the other hand, the use of mobile devices for pro-social activities appears to be largely similar in the two examined countries. Respondents in both cases focus more on digital entertainment, recreational activities, or contacts with others than activities that would be beneficial for local communities. Also, there occurs a threefold difference in minus in Poland and more than a fivefold difference in Turkey. This is contrary to the smart-city idea and points to social immaturity and focusing on satisfying one's own needs.

Table 5. The impact of owning and using a smartphone on supporting pro-social activities; source: own work.

Activity	Poland	Turkey	Average
Digital entertainment	31%	45%	38%
Leisure activities or relax	33%	30%	32%
Frequent contacts with others	24%	11%	18%
Action to the benefit of the general public	11%	8%	9%
It does not support any activity	1%	6%	3%
Total	100%	100%	100%

Subsequently, the authors assessed whether owning and using smartphones can contribute to strengthening social bonds. Many people tend to satisfy their needs related to communication, entertainment, leisure, or supporting social initiatives using smartphones. Parsons and MacLaran [38] refer to consumption patterns, shared by people which are “socially meaningful in the sense that they exist in opposition to comparable alternatives”. Moreover, lifestyles are seen as “symbolic boundaries that create what is distinctive about a particular consumption pattern by placing this pattern in relation to other significant alternatives”. Interestingly, the Poles—a large share of participants of the study, being more individualist than the Turkish representatives—see the device as a factor creating and strengthening relationships among people. Fewer Turkish citizens believe that relationships are made stronger through using a smartphone, and more of them express the view that the relations are less intense and weaker. While a similar number of respondents (11% on average) in both countries gave answers that indicated they had no opinion on the subject, the remaining answers differed markedly. This opinion was confirmed by 69% of respondents in Poland, and 55% in Turkey (14% fewer respondents than in Poland). The opposite opinion was expressed by a 19% share of the sample in Poland, and 35% in Turkey, accounting for a 16% difference (Table 6).

Table 6. The impact of using a smartphone on strengthening social bonds; source: own work.

Opinion	Poland	Turkey
No	19%	35%
I have no opinion	12%	10%
Yes	69%	55%
Total	100%	100%

Interestingly, even though there appears a marked reluctance to use mobile devices to support social activities, opinions related to strengthening social ties are very positive in Poland; they amount to almost 70% of the respondents’ opinions, and in Turkey, they exceed 50%. This indication is essential from the point of view of the subject examined in this article as the creation of smart cities is indeed focusing on strengthening social ties with the use of ICT technologies.

According to the opinion of the respondents, having and using smartphones may contribute to strengthening the sense of responsibility and shared responsibility among citizens. Such an opinion was expressed by 69% of respondents in Poland and 55% in Turkey, which is the same value as in the case of previous estimates. The scope of this shared responsibility defined by the survey participants in both countries is almost identical; it is most visible in the case of education (21% on average) and the labor market, and the least visible (19%) with regard to environmental protection and investment. The following were directly related to the response to this question. The respondents were asked to decide whether owning and using a smartphone prompts them to engage in independent activities focused on competition and individual success, or rather it motivates them to create ties and build a sense of community in a particular group of people. Following the distribution of the previous responses, the authors expected that the respondents would choose the

second option, and this prediction was confirmed. Nevertheless, the differences between the answers were not very significant. In Poland, they were at the level of 2% (the first alternative 49%, the second 51%). Among the respondents in Turkey, the situation was largely similar—the first alternative was chosen by 47%, the second by 53%—the general outcome was, therefore, similar, the difference amounted to 3%.

The claim that the use of smartphones and applications running on them strengthens the sense of responsibility and co-responsibility among citizens of both countries leads directly to the creation of a civil society, which is one of the most important postulates of the creation of smart cities.

An interesting discrepancy between the results of the survey appeared in terms of the sense of security related to the possession and use of a smartphone. The following scale was adopted (1:to a small extent; 100:very much). According to this scale, in Poland, this security was rated at 70 (to a large extent), and 60 (medium) in Turkey. Where does such a difference come from? Are there any previously noted differences with regard to using this particular communication tool?

The postulate of security of mobile devices seems to be the most important in creating ICT-based smart cities. In both countries it is received positively, with a slight advantage of the importance of security in Poland, nevertheless, since this is one of the most important factors, the question arises whether it should not be higher than 60–70%.

The last question in this part of the survey concerned the impact of owning and using smartphones on considering the prospects related to increasing the welfare of society. A total of 52% of Turkish respondents think about it at present, in Poland, the share of survey participants supporting such a view was estimated at 25%. The difference is thus close to 27%. In Poland, the opposite was true, 39% will think about it in the near future, in Turkey it was 18% (a difference of 21%). On average, nearly 23% of respondents do not consider owning and using a smartphone either now or in the future in terms of its impact on their own well-being.

In Turkey, the respondents chose the closer (current) perspective of the impact of having and using mobile devices on the welfare of society. In Poland, the respondents opted for the prospect of achieving this in the near future. In both countries, however, around 20% of survey participants did not see the connection between the use of mobile devices and the increase in welfare. It follows that, due to the rapid technological progress, we became accustomed to frequent changes in this area. It also strengthens our belief that in a few years there may be a device that will surpass current smartphones and offer even greater opportunities to achieve a higher standard of living. The shortest perspective seems to be the most advantageous for the creation of smart cities, but the pace of changes may lead to the replacement of smartphones with other devices which would be even better adapted to support the implementation of smart cities.

Considering the fact that the sample consisted of representatives of the group which is most active on the internet, it seems that in the era of total globalization, the differences between countries, even culturally distinct ones, should be smaller. As can be seen from the findings presented above, the differences in both countries between owning and using smartphones were surprisingly large, especially in the part of the survey questionnaire, which concerned sociological and cultural determinants.

5. Discussion of the Findings

The most important differences and similarities, presented in the form of percentage differences between the present results for the research sample in Poland and the results obtained from the sample in Turkey, lead to the following conclusions:

- on average, 98% of respondents in both countries have smartphones, which is on average 8–10% more than the national average, in Poland a 10% share also have a business smartphone (which is the result of the structure of the sample),
- 88% of respondents were positive about the impact of smartphone use on punctuality and meeting deadlines in Poland, and 67% in Turkey,

- it is believed that having smartphones is more conducive to individual, not collective work,
- the role of the smartphone in maintaining direct contacts in Poland was assessed as negative, and in Turkey, it was evaluated as moderately positive,
- according to the respondents, the use of a smartphone affects the similarity of cultures (70% of responses),
- it also influences economic progress (in Poland, almost 20% more people supported this claim),
- a smartphone is used in both countries for playing games and personal enjoyment rather than activities for the general public,
- having and using a smartphone may contribute to a sense of responsibility and shared responsibility among citizens, although the differences here also reach 14%,
- smartphones can also contribute to strengthening social bonds in Poland, which is confirmed by 69% of respondents, in Turkey the share is 14% smaller,
- there occurred a large difference in terms of the sense of security in using the internet in Poland, this security was rated at 70, in Turkey at 60, on a scale of 1–100,
- when considering the impact of having and using a smartphone and the moment of considering increasing the welfare of society, the responses also differed between the two countries—52% and 25% of Turkish and Polish respondents think about it now, respectively, but 39% will think about it in the near future.

6. Conclusions

As the above findings indicate, compared with the results of other studies, in terms of quantitative data, they are in line with national and international trends. In terms of qualitative data, the findings are previously specified differences resulting from the adopted methodology and the research sample adopted, similarly to previous works.

In the socio-cultural sphere, the differences are much greater than in the technical and application sphere, and there are more of them (40% of the total, 34% in the technical sphere). This applies to issues such as determining whether the use of a smartphone affects punctuality and compliance with work-related deadlines and whether it supports individualism or rather forges social bonds. Another issue analyzed in this paper is whether using a smartphone strengthens the sense of responsibility and shared responsibility among citizens in the field of education, the situation on the labor market, responsible consumption, environmental protection, and investment. The last aspect considered in the articles whether it motivates individuals to reflect on the desirable level of well-being at present or in the future.

The biggest differences could be observed in terms of the issue of supporting individualism at work with a smartphone. The greatest dispersion in terms of the average results occurred in the area of the smartphone's impact on the quality of direct communication between people.

The above comments are in line with the findings resulting from the calculated statistics, although it seems that in the social and cultural spheres these differences are more significant. The city distance, Euclidean distance, standard deviations, and the calculated statistics of the Fisher-Snedecor inverse test are given in Table 7. To prove the hypothesis (see Section 3.1.), the α significance level was calculated for the probability distribution of the Fisher-Snedecor inverse (right-hand) value. It can be applied in the Fisher-Snedecor test to compare the degree of variability of two data sets for two populations (including the study of the distribution of smartphone use assessment and the socio-cultural aspects of their possession and use in Poland and Turkey) and to compare it with the p -value determined on the basis of test statistics. If $p \leq \alpha$, then we reject H_0 and assume H_1 , if $p \geq \alpha$, then we reject H_1 and assume H_0 .

Table 7. Measures of the differentiation of the results obtained for Poland and Turkey; source: own work.

No.	Section, Group, Questions	City Distance	Euclidean Distance	Standard Deviation	Fisher-Snedecor Test	Total Indicator
1.	The use of a smartphone increases the tendency to punctuality and compliance with deadlines related to duties, Answer scale: Yes; No; I have no opinion	41.61%	8.25%	20.31%	2.420	3.12
2.	The use of a smartphone increases the support of individualism or collective work, Answer scale: Yes, it increases my individualism; Yes, it increases teamwork; I have no opinion	30.42%	3.51%	13.26%	5.440	5.91
3.	The use of a smartphone increases the impact on the number of direct contacts (face-to-face interaction) with other people, Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	20.83%	4.34%	14.73%	0.020	0.42
4.	The use of a smartphone increases the intensity of the impact/ having a smartphone has a positive or negative effect on the quality of direct contacts (face-to-face interaction with others), Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	29.77%	8.86%	21.05%	0.040	0.64
5.	The use of a smartphone increases the similarity of cultures or, on the contrary, strengthening cultural distinctiveness, Answer scale: Yes; No; I have no opinion	13.64%	0.75%	6.13%	1.120	1.33
6.	Determining the degree of impact on economic progress, Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	29.77%	8.86%	10.31%	0.010	0.50
7.	The use of a smartphone enhances the identification of the degree of influence on technological progress, Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	8.36%	0.70%	5.91%	0.003	0.15
8.	Recognition of the impact on strengthening social ties, Answer scale: Yes; No; I have no opinion	31.43%	4.37%	14.78%	1.840	2.35
9.	The use of a smartphone increases the feeling of responsibility and shared responsibility among citizens, Answer scale: Yes; No; I have no opinion	31.43%	4.37%	14.78%	1.840	2.35
10.	The use of a smartphone strengthens the sense of responsibility and shared responsibility among citizens in the areas of: education, the situation on the labor market, responsible consumption, environmental protection, and investment, Answer scale: Yes; No; I have no opinion; in relation to the areas: education, the situation on the labor market, responsible consumption, environmental protection, and investment	1.90%	0.29%	3.07%	4.050	4.10
11.	The use of a smartphone enhances the taking of independent actions focused on competition and achieving individual success or creating bonds and building a sense of community in a particular group of people, Answer scale: independent competition-oriented activities and achieving individual success; creating relations and building a sense of community in a given community	5.25%	0.14%	3.71%	0.040	0.13
12.	Identification of the user's sense of security in functioning in the economic and social environment, Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	7.76%	0.60%	5.48%	0.003	0.14

Table 7. Cont.

No.	Section, Group, Questions	City Distance	Euclidean Distance	Standard Deviation	Fisher-Snedecor Test	Total Indicator
13.	Recognizing whether owning and using a smartphone motivates respondents to engage in: leisure activity, digital entertainment, activities to the benefit of the general public, more frequent contacts with others or lack of support for any activity, Answer scale: own pleasure; digital entertainment; activities for the public good; frequent contacts with others; does not increase any	37.46%	3.88%	8.81%	1.030	1.53
14.	The use of a smartphone increases the propensity to use other innovative devices, Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	13.04%	1.70%	9.22%	0.009	0.25
15.	Making the user reflect on the achievement of the desired degree of well-being by the user at the present or in the future.	52.67%	11.68%	19.73%	2.910	3.75
16.	Social and cultural aspects of using smartphones (average), Answer scale: 0%; 20%; 40%; 60%; 80%; 100%	23.69%	4.15%	11.42%	1.390	1.78

The F test is a test in which the test statistic has a distribution. The basic F test is used to test the hypothesis of equal variance of the normal distributions of two populations. It is also called the test for homogeneity of two variances. This test is also called the Fisher test. $X = (X_1, \dots, X_m)$ and $Y = (Y_1, \dots, Y_n)$ are two independent samples of the distributions of $N(\mu_X, \sigma^2_X)$ and $N(\mu_Y, \sigma^2_Y)$, respectively [39].

However, if we consider all the factors in total, for 15 indicators (socio-cultural aspects), with 14 degrees of freedom, then with a probability of 95% we can conclude that the overall difference was not as significant as it seemed. From the analysis of the phenomenon in general, it can be stated that the hypothesis of significant differentiation was not confirmed the critical value of the test = 2.42 was exceeded only for 27% of the distinguished indicators:

- the use of a smartphone increases the support of individualism or collective work,
- making the user reflect on the achievement of the desired degree of well-being by the user at the present or in the future,
- the use of a smartphone strengthens the sense of responsibility and shared responsibility among citizens in the areas of: education, the situation on the labor market, responsible consumption, environmental protection, and investment,
- the use of a smartphone increases the tendency to punctuality and compliance with deadlines related to duties,

In the first two of the above-mentioned cases, that is: supporting individualism and a short-term perspective of the impact of information technologies on welfare, the majority of Turkish respondents expressed their support for these claims. In the other two cases related to the influence on punctuality and social responsibility, the responses of Polish survey participants turned out to be dominant. In the remaining cases, this differentiation was relatively small and the shares were rather evenly distributed: the advantage of the Turkish sample occurred in a total of five cases; in the next five, more Polish respondents were supporting the opinions, and in the remaining five cases the differences were very low.

The calculated synthetic indexes (sum of the established distances, standard deviation, and the Fisher-Snedecor inverse test) did not differ substantially from the test results. The highest value of this indicator occurs in the case of the use of a smartphone to support

individualism or collective work. As far as socio-cultural issues are concerned, the smallest differences appeared in regard to the identification of the sense of safety in moving in the environment and in identifying the impact of having and using a smartphone on technological progress.

The consequences for the creation and development of smart cities resulting from the analyzes of the socio-cultural consequences of the use of mobile devices in Poland and Turkey are as follows:

- the use of smartphones and mobile applications supports the creation of smart cities in various cultural areas (Poland and Turkey),
- it is the best universal communication medium, and it replaces a PC or a desktop computer for many people, without considering in-depth the issues of related inconvenience [14]. In particular, it increases its impact on the number of remote, multimedia contacts with other people,
- owning and using a smartphone supports such desirable characteristics of the user and the urban community as:
 - punctuality and meeting deadlines—an invaluable feature in business contacts in terms of implementation and use of IT systems and a desirable feature in personal contacts,
 - depending on the type of work performed, it increases the sense of individualism or allows for a quick expansion of collective work. However, in the comments to the survey, it was emphasized that focusing on and extending only collective work inhibits individualism and reduces the sense of responsibility (claims made by mainly Polish respondents). On the other hand, in the short term, it accelerates the performance of tasks (opinions supported by Turkish respondents),
 - in some cases, too long, too intensive, and unplanned use of a smartphone may have a negative impact on the subsequent number and quality of direct contacts in personal life, as opposed to business contacts. However, the respondents claimed that there was a certain return point, which, if exceeded, may result in deterioration or even breaking of business contacts only via a smartphone,
 - it facilitates, especially in crises (e.g., the COVID-19 pandemic), the creation of social bonds, which are further strengthened by traditional contacts. This goes beyond the traditional concept of a smart city, but it is fully in line with the modern approach to creating smart cities (see Section 2),
 - in crises, it also strengthens the sense of shared responsibility of residents and enables communication with them,
 - it is particularly noticeable in such areas of smart cities as education and health care,
 - contrary to the declarations of respondents from both countries regarding m-commerce and m-banking [14], using a smartphone increases the sense of security in functioning in the economic and social environment, which is also critical for creating a smart city,
 - it motivates respondents to spend their free time digitally and engage in digital entertainment, not only using a smartphone but also computers—this is one of the initial assumptions of creating a smart city,
 - the idea of building a smart city seems (especially in Turkey) to be the basis for creating a high standard of living in the near future,
- simultaneously it has been shown that the possession and use of smartphones can be considered an inhibitor of the development of the concept of smart cities:
 - it reduces the need for face-to-face contacts, which in extreme cases leads to social isolation and lower work efficiency,
 - it can limit social activity to the use of a smartphone, which goes against the principle of sustainability in the development of smart cities,
 - it reduces the need for environmental protection, responsible consumption, development of investments, etc., in areas that are real rather than virtual,

- in a digitally diverse society, where there occurs a digital generational gap, it may cause digital exclusion of some of the members of the society or a specific part of the population (due to the sample selection, this survey did not indicate such a problem; however, the respondents noted it in the comments),
- the diversity of views on the socio-cultural effects of the use of mobile devices on the personal characteristics of users and their social roles in smart cities decreases, which may be seen as evidence of the ongoing process of globalization,
- respondents are optimistic about the impact of having and using smartphones on economic and technological progress, which is the basis for the creation of smart cities and stimulates the use of other innovative devices.

The observation of the market of smartphone production, supply, and use shows that it will continue to develop rapidly, and it may take many directions. It is true that the dynamics of this growth is slowly decreasing [40], but it is due to primarily:

- a very high level of control of the current market through the sale of smartphones and the spread of applications supporting them,
- the increasing quality of smartphones and mobile applications, which extends the length of their use,
- in this situation, if the smartphone still works without any problems, and technological progress does not enforce changes, users do not replace their smartphones, but
- the fifth-generation mobile technologies could become such a significant change, which will probably make the replacement of smartphones necessary,
- introduction of the so-called smartphone screens developed or emitted, which will be a significant technical novelty for users and may induce them to purchase new devices,
- a progressive tendency to diversify the sales structure (multi-sector), which may result in offering new smartphones as part of other purchases.

The basic limitation of the study was the selection of the research sample. The selection of the 18–25 age group for the analysis (93% of the surveyed population) has certain implications related to limiting the possibility of generalizing the results. Nevertheless, in many studies [41] this particular group is regarded as the most active social group in terms of communicating with each other in general, and in particular on the internet. Their online activity may include the use of information services, shopping, financial operations, and the use of music or games. This group is also seen as the most innovative group, which is the fastest to adopt new products as well as make full use of them. In Poland, this part of the population constitutes less than 6% (in Turkey over 9%). Naturally, this is also the most appropriate sample to examine, because it uses the internet most often and most intensively. We should add at this point that both the number of internet users and social media users in Turkey are similar to the share in Central and Eastern Europe, including Poland, and amounts to approximately 30% [41]. In addition, it should be stressed that Polish society (average age 41) is, unlike Turkey (average age 33), an ageing society [43], so the share of internet users in this age group in Poland is decreasing year by year, and in Turkey, it tends to grow.

As mentioned earlier, the study was conducted with the participation of students—the most active and forward-thinking users of smartphones and mobile applications. It was a purposeful selection of the sample, as the authors wanted to avoid a situation where the results are no longer valid right after the study is completed. On the other hand, there is also a certain limitation: the authors found it difficult to generalize the obtained results, because owning, frequency of using smartphones, purchases and payments made with them, etc., move beyond the characteristics of other age and professional groups, as well as those obtained in national surveys in both countries. Statistical sources [44] indicate, however, that in the group of people aged 18–35, over 90% of people have their own smartphones, and in other age groups only from 15% to 74%. Student groups, especially students of social sciences, are remarkably susceptible to innovation and globalization trends, so on this basis, the authors may draw conclusions concerning future trends in the

development of activities related to mobile devices and the use of mobile applications. In addition, it is also a group susceptible to international comparisons, due to approximate requirements in relation to trends observed on the internet.

The findings presented in this paper constitute the third stage of research, the continuation of which in the future will include in-depth analyses of cultural differences related to the application of technological innovations in selected countries and their impact on the development of smart cities.

Taking all the above into consideration, the next stage of the research should include:

- extending the study sample to examine other groups of users,
- subsequent identifying a group of social and cultural factors, relevant to the enlarged study sample, which may affect the implementation of the smart city concept,
- increase the scope of regional comparisons to countries with different cultural characteristics and conditions.

However, several new questions arise: Are we able to predict all directions for the development of mobile devices? Will such devices still be referred to as smartphones? How will new developments affect the development of smart cities?

Author Contributions: Conceptualization, W.C., M.Z., A.F. and M.A.; methodology, W.C., M.Z., A.F. and M.A.; software, W.C., M.Z., A.F. and M.A.; validation, W.C., M.Z., A.F. and M.A.; formal analysis, W.C., M.Z., A.F. and M.A.; investigation, W.C., M.Z., A.F. and M.A.; resources, W.C., M.Z., A.F. and M.A.; data curation, W.C., M.Z., A.F. and M.A.; writing—original draft preparation, W.C., M.Z., A.F. and M.A.; writing—review and editing, W.C., M.Z., A.F. and M.A.; visualization, W.C., M.Z., A.F. and M.A.; supervision, W.C., M.Z., A.F. and M.A.; project administration, W.C., M.Z., A.F. and M.A.; funding acquisition, W.C., M.Z., A.F. and M.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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