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ORIGINAL RESEARCH PAPER

Investigating the mutual effects of mobile phone use and civic culture: A systems approach

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Abstract

The extensive use of mobile phones has created the potential for promoting the culture and lifestyle of society. This study was conducted in Tehran; it examines the relationship between mobile phone use and civic culture. Considering the effect of multiple factors and complex relationships between variables, the study employs a systems approach to investigate the mutual relationship between mobile phone use and civic culture. Analysis utilized causal loop diagrams to depict relationships among variables, where 10 key factors were identified using the decision making trial and evaluation technique. These factors have exerted the greatest impact on civic culture; therefore, focusing on these factors during the urban policy-making process leads to the most effective policy that uses the least resources and budget. The ideal level of urban norms in the family was recognized as the most important influential and key factor followed by that at the community level of community acceptance in using the e-services of the city exerted the greatest impact on the issues. The outcomes could be used as a basis for policymaking in developing countries that intend to use mobile phones as a tool for promoting civic culture.

Keywords

Mobile Phone Use, Civic Culture, Cultural Planning, Systems Approach, Causal Loop Diagram, Decision Making Trial and Evaluation

Nowadays, mobile phones have become an integral part of daily life (McGuigan, 2005), and the number of users is constantly growing. Figure 1 illustrates the rapid growth of mobile phone users in the world (International Telecommunication Union (ITU), 2022). Figure 1 clearly depicts a remarkable growth in mobile phone registration in comparison to the population growth, throughout the world.

Mobile phones hold the potential to boost the civic culture. Thus, the increasing use of mobile phones creates promising outlooks for countries that intend to promote civic culture. Moreover, the place of residence is one of the factors that influence the upbringing of children. Thus, with the increased use of cell phones, children have become more familiar with the living conditions of others (Hendriati & Okvitawanli, 2022). In many developing countries, new communication technologies act as a bridge between the emerging middle and professional classes of society on the one hand and between global economy and global knowledge society on the other hand (Skoric & Park, 2014). Examples of smart cities may promote consumer-driven citizenship and individual accountability or emphasize communal duties for the common good

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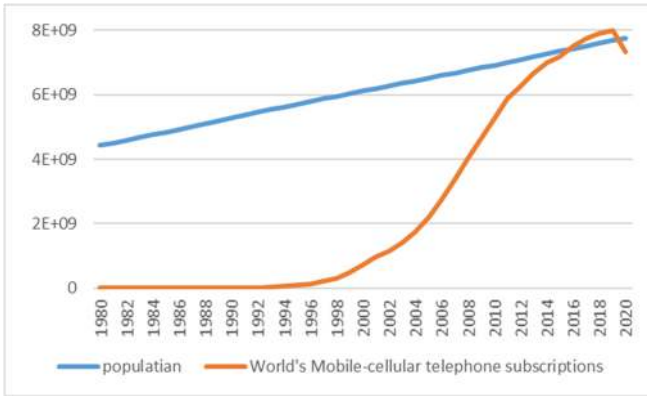Email: s.h.hosseini@samamsystem.com

Figure 1. *Mobile-cellular telephone subscription world-wide* (International Telecommunication Union (ITU), 2022)

of society (de Waal & Marloes Dignum, 2017). Moreover, applying information technology and electronic gadgets for urban architecture can be beneficial. Electronic space, including mobile phones will also influence the design and expansion of libraries, pedestrian stairs, and urban architecture (Jianan Xu & Li, 2019). A study conducted in India demonstrated that if authorities supplied new and novel digital services for citizens, then their lives would be transformed from the behavioral, technological, and social standpoints (Chatterjee & Kar, 2017). Scholars propose that citizens living in the envisioned smart cities of India will offer a high quality of life and will present more opportunities for creativity and innovation. Kayani, Ahmad, and Saeed (2013) conducted a study in Pakistan and concluded that information and communication technology (ICT) use has strengthened parent–child connections and provided Pakistani women with increased social voice and autonomy. Moreover, human rights and democracy have become more widely known due to access to the Internet and mobile technology. Alternatively, ICT has contributed to the fall of Pakistani conventional moral norms by spreading obscenity and negativity and rendering life more expensive and stressful. A study in Africa examined the impact of mobile phones on individuals with incomes below the poverty threshold (Scott et al., 2004). This study belongs to the fields of country management, peace, security, culture, and increasing the level of welfare of society. Using mobile phones and their applications can increase entrepreneurship, which increases income and reduces poverty (Scott et al., 2004).

Similar to other countries, the penetration

coefficient of mobile phones in Iran and, thus, access to services has increased (Fig. 2). Statistics demonstrate that penetration coefficient of mobile phones has reached 107% by the end of 2021 (International Telecommunication Union (ITU), 2022).

The effects of such an increase on the values, beliefs, norms, culture, and behavior of society are unknown and may be favorable or consequential. Moreover, imposing changes in the overall culture of society requires changes in the values, norms, and behaviors of individuals. Personal value is defined as a typically permanent or at least a long-lasting belief that a specific style of behavior is preferable to an opposite style of behavior (Rokeach, 1973). Conversely, a social norm is a binding rule that regulates relations and social practices across time (Davis et
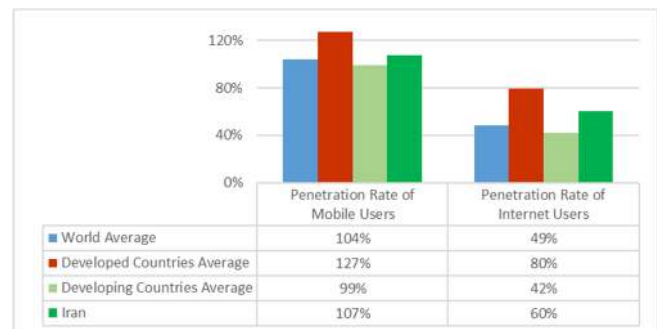

Figure 2. *Comparison of penetration rates of mobile phones worldwide* (International Telecommunication Union (ITU), 2022)

al., 1959). The majority of the community is committed to social norms, such that if an individual does not cope with these norms, then society will not accept the individual. Therefore, belief and value shape norms (Hakakzadeh, Razavi Alavi, & Attari, 2013). Moreover, the behavior of a person originates from one's beliefs and values. To change one's behavior, one should modify personal beliefs and values (Manteghi & Dinparvar, 2012). However, doing so is impossible without considering norms. Hence, for the purpose of cultural reform, we need to provide a condition in which values, beliefs, and norms are changed simultaneously (Khazaei, Sharifzadeh, Akbarnia, & Ghanbarzadeh, 2013).

As previously mentioned, the use of mobile phones in many countries is increasing, including Iran; thus, utilizing the potential of mobile services for cultural modification is possible. For

example, one of the benefits of the expansion of mobile services is the reduction in the number of local trips and a consequent decrease in travel time (Ahmadi, Hashemi, & Rouhani, 2010). However, the expansion of mobile communication services was clearly the only cause of the reported reduction in the number of trips despite the involvement of many other factors. For example, In 2020, during last year's busy holiday shopping season, one-third of all online shopping was done by smartphone. Black Friday ($ 9 billion Internet revenue in 2021) accounted for 40% of mobile sales. On Cyber Monday ($10.7 billion in online revenue in 2021), 54% of visitors came from mobile devices, while around 33% purchased on their mobile device, up over 40% over the past few years (Smith, 2022). Creating various campaigns on social networks (e.g., drip campaigns and podcasts) is another example of the use of mobile phone services for cultural modification. Cheng (2018) concluded that Facebook activities could be classified into private and public social media and information retrieval. For this reason, the study examined the information of 155 undergraduates. Hence, mobile phones are a suitable means for implementing policies related to urban management. To appropriate utilize the potential of mobile platforms, we identified key variables that influence civic culture. Given the multiple variables engaged in cultural modification, this study employed the systems approach to model the relationships among these variables.

Researchers have repeatedly used the systems approach to investigate the sociological effects of new technologies. For example, Jalali (2011) examined the factors and indicators that should be considered in an electronic city. A few of these indicators include electronic infrastructures (e.g., number of fixed-line and mobile phones and broadband); the will of the government and urban management (well-thought strategic plans and determination of authorities); rules and regulations (digital signature legislation, credit cards, computer crimes and law); funding and financial resources (budgets allocated for upgrading the IT infrastructure of the city); and human resources (availability of specialist human resources). Kia et al. (2008) considered not only obstacles to the realization of e-cities but also the effects of the development of e-cities and mobile phone services on the civic culture of cities. Meanwhile, Kafashpoor (2008) examined external factors that influence the development of e-government. Based on empirical observations, the author concluded that the level of community acceptance of e-services is an essential factor to be considered to achieve e-government. Hardware and software infrastructure is another significant factor that influences the successful implementation of electronics. The current study suggests strategies, such as informing citizens through radio, television, and billboards, and holding public training courses on electronic services, to enhance technological literacy in ICT (e.g., training courses for the use of computers and smart phones) and better utilize e-city services (Kafashpoor, 2008).

This study conducts a systems analysis of the effect of the penetration coefficient of mobile phone on civic culture in Tehran and identifies the key factors influencing this issue. Moreover, strategies are proposed based on these factors, which are the most influential ones in the entire system. Thus, considering them in formulating strategies can lead to the increased efficiency of minimal resources and budget use.

The remainder of the paper is structured as follows, the next section discusses the systems approach and methodology. The third section presents the impacts of mobile phone use on civic culture using causal loops. The fourth section introduces the key factors of the mutual impact of mobile phone use and civic culture as leverage points and offers several policy recommendations.

Methods

Various factors of subsystems, such as cultural, social, political, infrastructural, and technological and other factors influence the issue. Alternatively, relationships among such factors are mainly non-linear. Moreover, a delay exists in the relationship between variables, which adds to the complexity of the problem. Therefore, we used the systems approach and the qualitative modelling of the problem using causal loop diagrams (CLDs). This method is one of the most appropriate methods for examining and understanding relationships that cause complexity. In the next step, the study used the decision making trial and evaluation (DEMATEL) technique to calculate the share and weight of the effect of

different variables on the problem through the opinion of experts due to the qualitative nature of the variables and limitations in gathering time-series historical data. In this manner, we can identify the variables with the most key impacts to obtain the most benefit with the least changes (leverage points). These variables can then be used to formulate effective policies. Previous studies, such as Moghaddam et al. (2011), have used the systems approach in combination with the DEMATEL. In addition, this approach is effectively used in social science research (Kiani, Hosseini, & Abdi, 2018; SaleckPay, Hosseini, & Shakouri, 2013).

Causal Loop Diagrams

The CLD demonstrates the cause and effect relationships among variables (Sterman, 2000) with the main objective of identifying causal assumptions through modelling to comprehensively express the interconnected structure of a system (Coyle, 1997). CLDs can be used to achieve a better understanding of phenomena (Azad, Khorshidi, Hosseini, & Mirzamohammadi, 2010; Kiani, Gholamian, Hamzehei, & Hosseini, 2009). In CLDs, connections between variables are plotted using arrows, whose direction indicates that of the causal relationship. The impact of variables may be positive or negative, which is indicated by signs on the arrow. Assuming that all other variables are constant, if a change in one variable influences another variable in the same direction, then the relationship between variables is positive. However, under the same assumption, if a change in one variable influences another variable in the opposite direction, then the relationship between them is negative (Kim, 1990). Loops exhibit positive and negative polarity similar to connectors. A positive or reinforcement loop at any period repeats a previous periodical behavior; if the beginning variable of the loop in the first period increases, then the subsequent process also increases (R) unless an element external to the loop changes such a behavior. A negative or balance loop behaves contrary to the previous periodical behavior (B; Forrester, 1997). Figure 3 depicts the function of two balance and reinforcement loops. The impact of birth on the population denotes a reinforcement loop, whereas the impact on mortality population represents a balance loop.

Decision-Making Trial and Evaluation Technique

Gabus and Fontela (1972) developed the DEMATEL technique, which is a decision-making method based on pairwise comparisons with the benefit of expert judgment in extracting a system and in systematically structuring it. Moreover, it presents a hierarchical structure of the elements of the system and offers mutual interaction by applying the principles of graph theo-
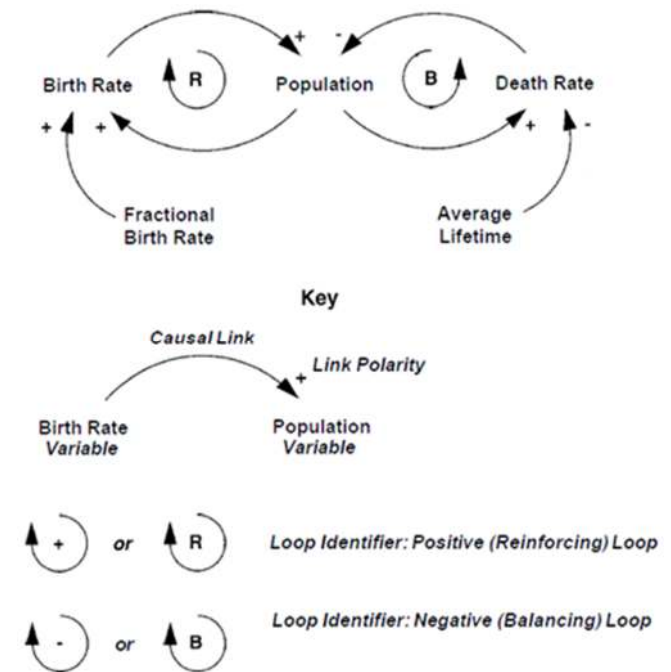

Figure 3. *Causal links between variables* (Sterman, 2000)

ry, such that a numerical rating will determine the impact of these relationships. Votes and concessions given by experts will form a matrix that each of them allocates to one connoisseur. In these matrixes, x_{ij} denotes the idea of each expert and takes a value of zero (the main diagonal is zero). To summarize the ideas of all experts, Formula (1) is used to calculate for the mean.

$$Z = \frac{x^1 + x^2 + x^3 + \dots + x^p}{p}$$

(1)

where P denotes the number of experts. x^1, x^2, and x^p are a comparison matrix paired with Certified 1 and 2 with expert p. The following formula is then used to normalize the matrix.

$$H_{ij} = \frac{z_{ij}}{r} \qquad (2)$$

where *r* is obtained from the following equation:

$$r = max_{1 \leq i \leq n}\left(\sum_{j=1}^{n} z_{ij}\right) \qquad (3)$$

After calculating the abovementioned matrix, Formula (4) is used to achieve the matrix of fuzzy relations:

$$T = \left(H^1 + H^2 + \cdots + H^k\right) = H \times (I - H)^{-1}, \qquad (4)$$

I is the identity matrix. The next step is to obtaining all rows and columns of matrix *T*. Whole rows and columns are according to the following formula to obtain:

$$(D)_{n \times 1} = \left[\sum_{j=1}^{n} T_{ij}\right]_{n \times 1} \qquad (5)$$

$$(R)_{1 \times n} = \left[\sum_{i=1}^{n} T_{ij}\right]_{1 \times n} \qquad (6)$$

D and R are matrix n × 1 and 1 × n, respectively.

Next, the importance of $(Di + Ri)$ and the relationship between criteria $(Di - Ri)$ are determined. If $Di - Ri > 0$ is true; then the relevant criterion is efficient; if $Di - Ri < 0$ is true, then the relevant criterion is bonding.

Figure 4 presents a flowchart of the research. First, factors influencing the dynamics of mutual influence of the penetration rates of smart phones on civic culture was determined by analyzing the literature, current system status (internal documents and reports provided by the case study [Tehran municipality]), and the opinions of experts through semi-structured interviews. The most influential factors were then identified by rating the impact of variables on one another based on the opinions of experts using the DEMATEL technique. The last step puts forward an improvement based on causal links and determines the key factors.

Dynamics influencing the promotion of citizens using mobile platforms (causal loops)

Causal loops represent a dynamic behavior associated with civic culture using mobile phones. The study identified the following dynamic loops by reviewing the literature, analyzing the

performance statistics in this field, and obtaining the opinions of experts.
- Dynamic effect of beliefs and adapted norms of citizens on civic behaviors of families and
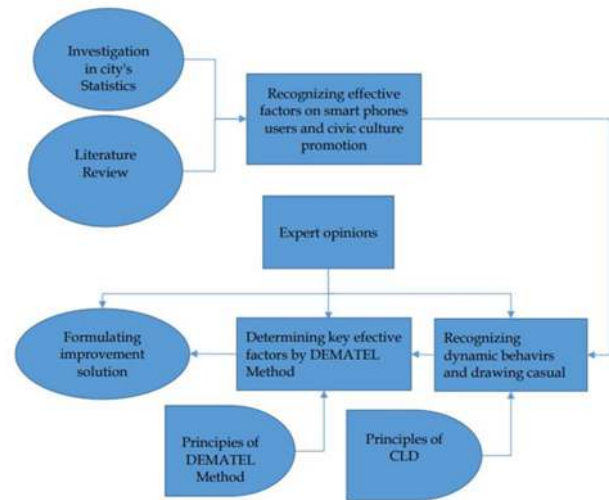

Figure 4. *Study Process*

communities;
- Effect of promotional activities on civic culture;
- Effect of education on civic culture;
- Effect of ICT infrastructure development on civic culture;
- Effect of profitability of companies providing municipal services (via mobile phones) on the effectiveness of the electronic services of the city; and
- Effect of reducing the running costs of municipal services and municipal fines on the behaviors of citizens.

Dynamic effect of beliefs and adapted norms of citizens on civic behaviors of families and communities

Norm is a decisive factor in the conduct of individuals, whereas beliefs are the basis of norms and value issues. This belief influences the norms of both groups (Manteghi & Dinparvar, 2012).

The high level of urban norms in a family promotes the behavior of family members. However, norms accept input from behavior (Shahmohammadzadeh, Shokri, Zamanizad, & Omidvar, 2014). In other words, the behaviors of the community change norms over time with delay. When ideal urban norms at the communi-
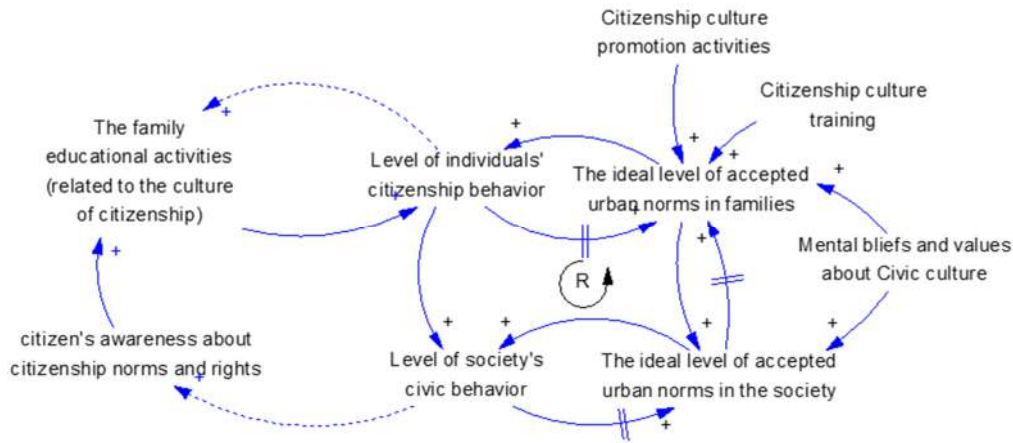
Figure 5. *Dynamic effect of beliefs and adapted norms of the citizens on civic behaviors of families and communities*

ty level increase, then the level of civil society becomes more compatible with urban norms (Zamani, Shahriari, & Abedini, 2012). This loop did not consider the changing dynamics of belief and value, whereas its variable is in the form of exogenous in the model. As previously mentioned, the consensus of families composes a community. Therefore, increasing the levels of urban ideals in family norms will lead to an increase in the levels of the urban ideal in the society norms (Naderi & Haghshenas, 2010).

The same is true for the impact of social norms on family norms. In other words, social norms influence family norms over time (Khazaei et al., 2013). Figure 5 illustrates the impact of beliefs, values, norms, and behaviors of families and communities on urban ideals.

The Impact of Promotional Activities on Civic Culture

Promotional activities are conducted in two forms, namely, spontaneous and governmental. The first is composed on the basis of the current state of civic culture. For example, a spontaneous campaign named Drop was created to promote water-saving due to the limited water resources of the city (Gholipour & Shahriari, 2013). The increased difference between the current behavior of an ideal society and urban norms makes the more spontaneous groups of people to start voluntarily working on the issue. In this case, the support of reference groups (secular and religious) increases the credit and effectiveness of these groups. Such spontaneous activities increase the citizens' awareness of norms and rights and will promote the ideal behavior at the community level (Khajenouri &

Kaveh, 2013).

The second form of promotional activities is governmental programs. Given that the municipal administration is in charge of implementing these activities the current circumstances and the gap between the community and the ideal determine the amount of budget and municipal support (Ahmadi et al., 2010). Therefore, whatever the difference between the current behavior of an ideal society and urban norms is more; urban management allocates more budget to the promotion of civic culture. Budgets allocate to civic culture leads to the implementation of strategies, where one of the considerable and efficient promotional platforms is mobile phones. The budget leads to the implementation of promotional activities using two methods, namely, the mobile platform and other fields, such as radio, television, and billboards. In turn, the awareness of citizens regarding norms, culture ideal level, and promotion at the social level is increased. Thus, the difference between the behaviors of a perfect society and promotional programs in urban management will benefit from decreased control. Figure 6 illustrates this dynamic behavior.

Effect of Education on Civic Culture

As previously mentioned, education is one of the factors that promote civic behavior. As urban management is responsible for civic culture education, it makes decisions on allocating additional funds for education with consideration of differences in social behaviors compared with ideal levels and city norms (Tabatabaei, 2014). This budget leads to an increase in training. Moreover, civic culture training can be conduct-
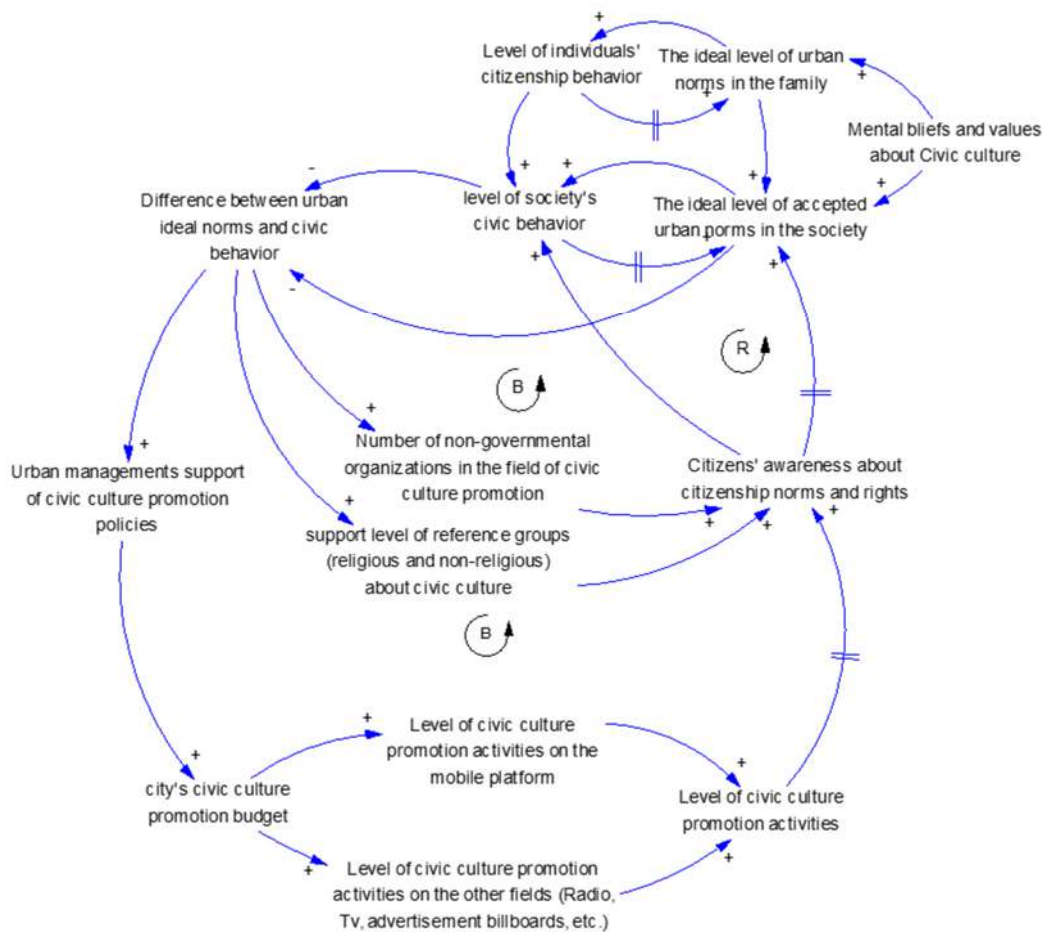
Figure 6. *Effect of promotional activities on civic culture*

ed in two ways, namely, formal and public education (Manteghi & Dinparvar, 2012). The inclusion of citizenship and cultural education is possible in courses for schools and universities under formal education. Alternatively, organizing events, such as festivals will ensure cultural training in the community for public education (Abassi & Homayoon, 2013). Given that the use of e-services is an acceptable and effective element in address problems in urban areas, such as traffic and air pollution, one of the areas of education is the awareness of e-services available on mobile platforms. This awareness could to the increased use of these services, such that its penetration in society will increase (Navabakhsh, Hashemnezhad, & Zadshempoor, 2010). Moreover, the greater use of e-services among the public increases the acceptance level of using such servicers and the ideal level of society. This issue influences social behavior and decreases the difference between the ideal and urban norms, which reduces the implementation

of educational policies in urban management. Figure 7 depicts the dynamic behavior of civic culture education.

Effect of ICT Infrastructure Development on Civic Culture

ICT infrastructure can influence the development and sustainability of communities (Ko, Routray, & Ahmad, 2019). As previously noted, the use of e-services will relieve several major problems in cities. It, for example, provides the required services for civilians and reduces the need to build and develop physical infrastructure. Therefore, developing ICT is one of the urban management tools for promoting civic culture and for providing additional e-services. Moreover, a significant difference between society behavior and norms can promote improvement in ICT and its infrastructure in urban management to reduce this difference (Manteghi & Dinparvar, 2012). Therefore, the budget allocat-
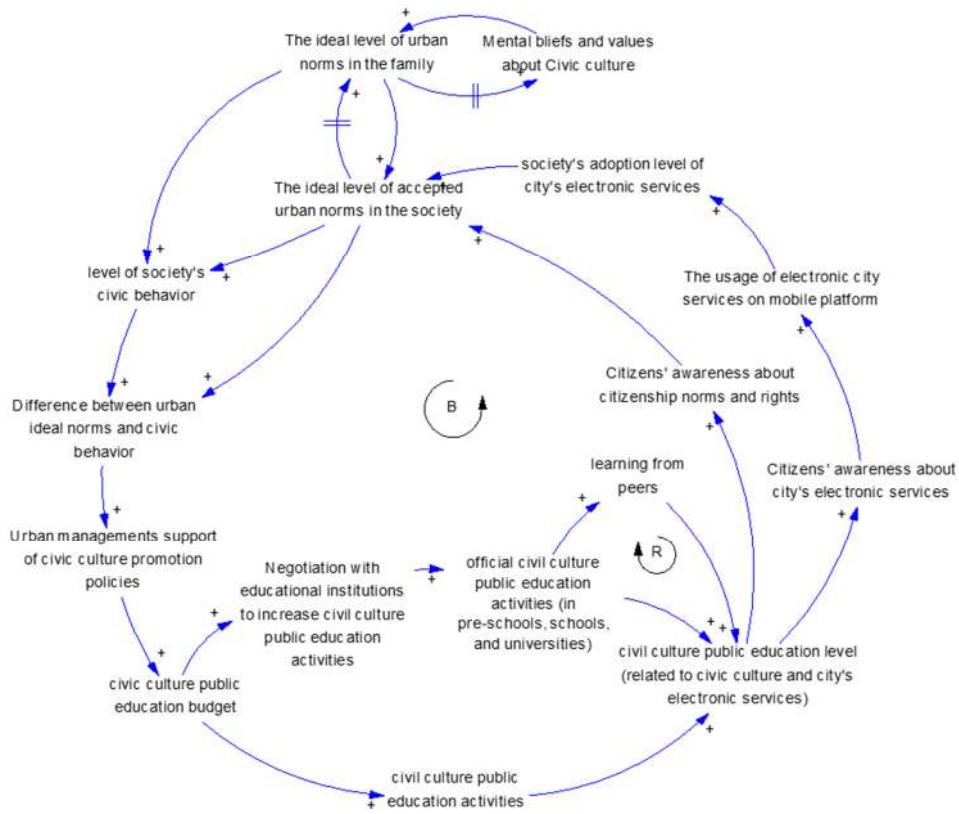
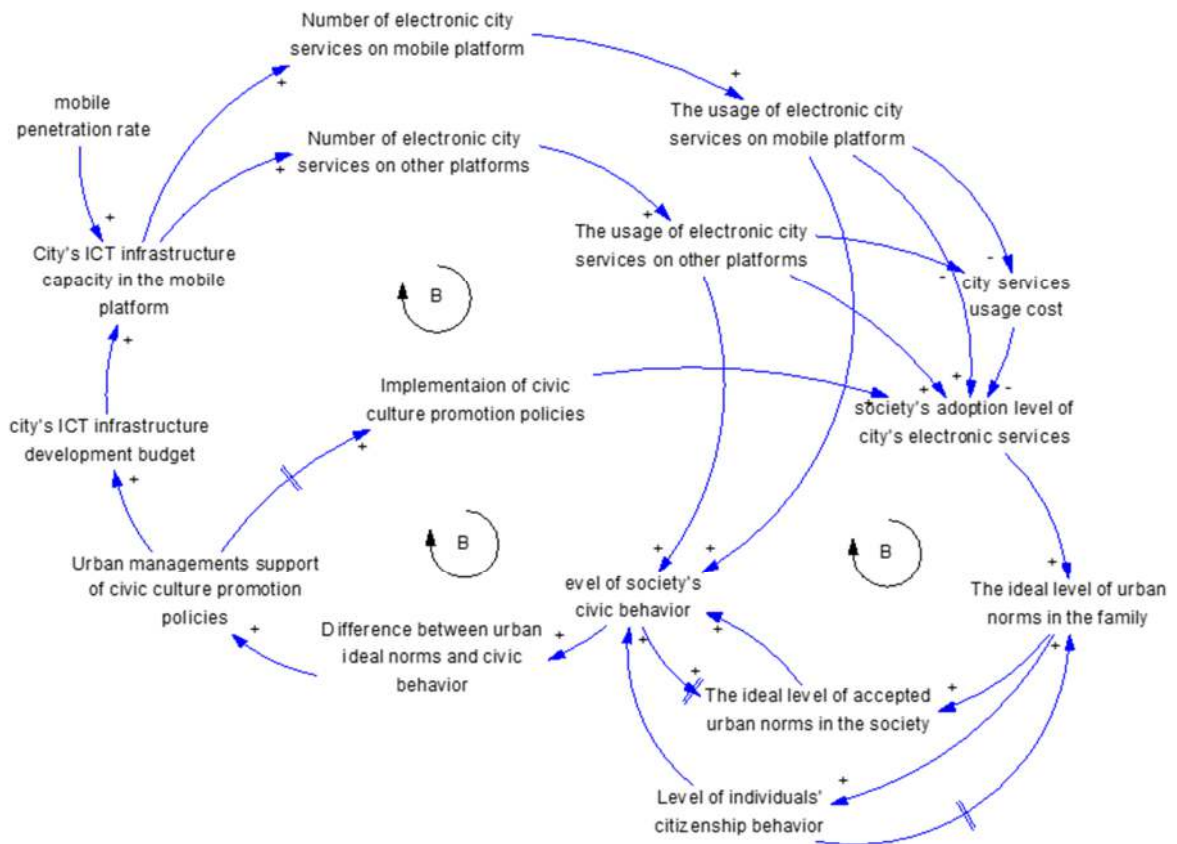**Figure 7.** *Effect of education on civic culture*

Figure 8. *Effect of ICT infrastructure development on civic culture*

ed to the development of rural infrastructure for ICT and its capacity will be increased, which leads to additional public e-services on mobile and other platforms, such as the Internet and telephone. Conversely, more citizens will use the added e-services of the city. This scenario leads to an increase in the acceptable level of urban society in the use of e-services. As a result, many urban problems will be solved, and the ideal level of community and public norms will be promoted. Consequently, social behaviors are closely associated with city norms and reduce their difference.

Another loop is incentive policies for the public use of e-services. Urban management can encourage the level of acceptance of using e-services by implementing an encouragement urban policy for using such services. For example, discounts on annual duties by electronic payments make increase payments (Khazaei et al., 2013). Figure 8 displays the behavioral dynamics due to the development of ICT infrastructure and urban communication and policies that encourage the use of e-services.

Effect of Profitability of Companies to Provide Municipal Services (via Mobile Phones) on the Effectiveness of E-Services

One of the significant effective factors of development of municipal e-services in mobile platforms is the manufacturers of mobile apps. The more profitable business of such companies in manufacturing mobile apps promotes further activities and leads to the development of municipal e-services in the context of mobile phones. By increasing the difference between the ideal level and city norms in social behavior, urban management opts to allocate funds for the development of e-services to further promote civic culture. Therefore, an increase in the budget provision of municipal services in the context of mobile software development will increase the profitability and number of firms in an area. The presence of more companies enhances the quality of apps and the acceptance level of the community of using these services. Finally, the ideal level of the community behaviors will get close to urban norms and will reduce its difference (Babran & Sadat Akhavan Tabatabaei, 2011). Figure 9 presents the formation of this behavior.

Effect of Reducing the Operating Costs of Municipal Services and Fines on Civic Behavior

The expansion of e-services not only promotes civic culture in the community but also reduces the operating costs of urban management. For example, reducing intercity trips causes leads to traffic reduction and decreases the need for public transportation, which significantly reduces operating expenses (Shoureshi, 2008). Consequently, with the increasing capacity and
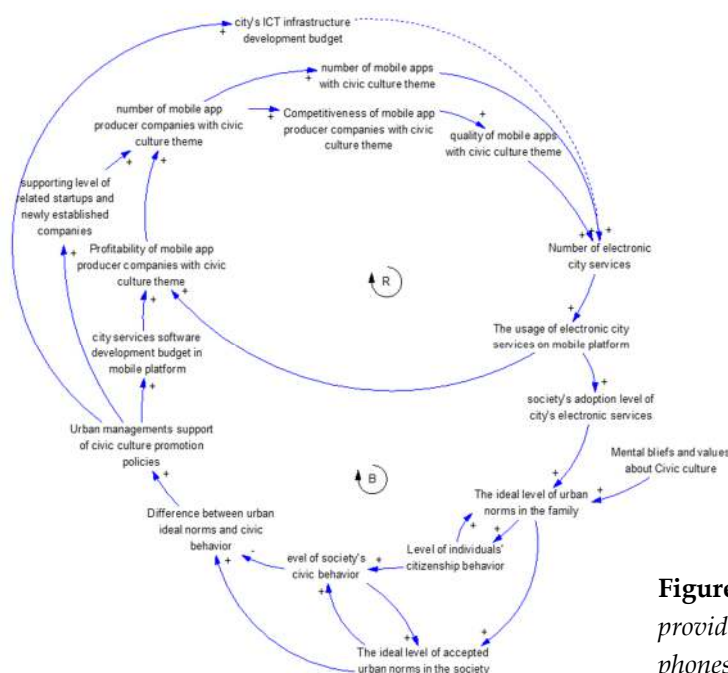

Figure 9. *Effect of profitability of companies providing municipal services (via mobile phones) on e-services*
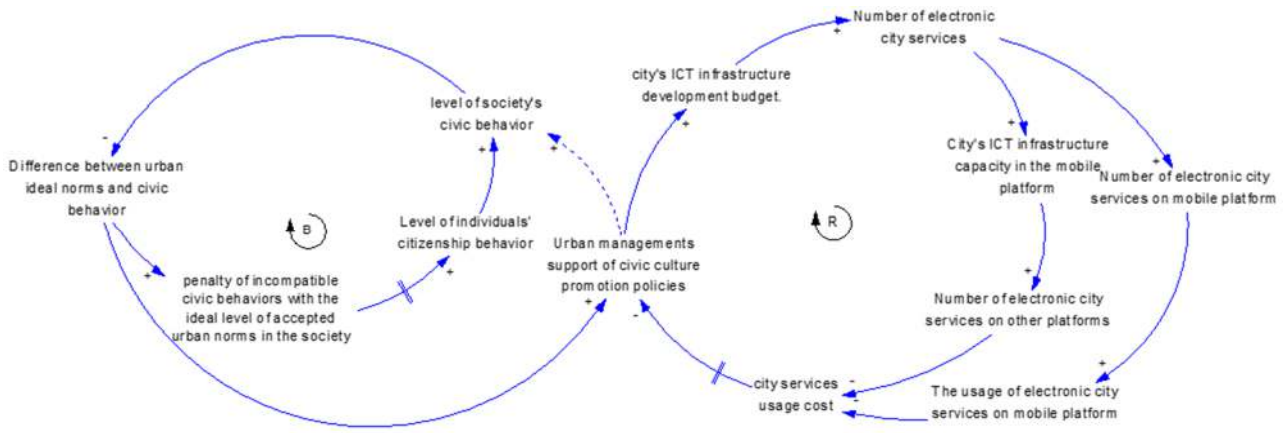
Figure 10. *Effect of reducing the operating costs of municipal services and the impact of fines on civic behavior*

amount of the use of public e-services, the operating costs of urban management decrease, which leaves room for the support of urban management development. Another dynamics is the impact of fines on changing civic habits and behaviors. When a behavior is contrary to urban norms, it reduces the difference between the ideal and urban norms by considering appropriate penalties (Mozafari & Karimi, 2015). Figure 10 exhibits a double-loop dynamic behavior, including "reduction of operating costs of municipal management" and "effect of fines on community behavior."

Identification of Key Factors Using the Proposed Conceptual Framework

As previously mentioned earlier, after finalizing the causal loops, the experts scored the degree of the impact of the relationship among variables and used the DEMATEL technique to identify key factors and the most effective variables. The results reveal that the variables with the most points are key variables (or leverage points) and are expected to exert the largest impact on the promotion of civic culture and the development of relevant policies for urban management. In other words, increasing or decreasing the key variables exerts the greatest impact on other variables and the entire system. Moreover, identifying these variables leads to the possibility of municipal management to gain the best effect with the lowest cost and activity. We acquired data for the coefficients in Table 1 using a questionnaire completed by urban management and ICT professionals as follows: four municipal specialists (two from the Tehran City Council and two

managers from various municipal ministries, namely, the Deputy Ministers of Social and Cultural Affairs and Public Relations), two university professors, and two family counsellors. These experts were selected based on their field of expertise, articles published, current employment, and positions occupied.

Table 1 provides 10 key factors and the degree of their impact. The consideration of norms in families and communities was identified as top key factor. Civic behavior will be more prevalent in society regardless of whether these norms are close to the culture. The use of the electronic urban services of cities will lead to changes in norms. The reliability of the use of e-services on mobile platforms is the second key factor followed by the level of community acceptance in using e-services. The volume of promotional activities in the field of civic culture was identified as the fourth key factor followed by family educational activities. The sixth factor is the support level of urban management for the implementation of promoting policies. The profitability of mobile apps with the content of urban life was identified as the seventh factor.

Discussion

This study aimed to identify the mutual effect of mobile phones and civic culture. Relevant public organizations can use these elements to establish urban planning and development policies that maximize the impact of mobile phones on civic culture. Much research has been conducted on the effects of ICT on urban life and culture. However, this platform is considered one of the best and most effective means of promoting civ-

Table 1. *Key factors influencing the mutual influence of the penetration coefficient of mobile phones and civic culture*

No	Key Factor	Ri+Di
1	Ideal level of urban norms in family	2.17
2	Ideal level of urban norms at the community level	1.4
3	Level of community acceptance in using the city e-services	0.92
4	Volume of promotional activities with cultural citizenship content	0.72
5	Family educational activities (related to the culture of citizenship)	0.69
6	Support level of the urban management from the implementation of promoting policies of civic culture	0.63
7	Profitability of manufacturers of mobile apps with the content of urban life	0.53
8	Education level of civic culture	0.42
9	Municipal information technology capacities in the field of mobile phone	0.36
10	Culture of citizenship in the context of other areas	0.30

ic culture due to the widespread use of mobile phones and public access to them. In the previous section, the 10 key factors were identified through pairwise comparisons of a network of causal loops. These factors were selected according to the literature review and the opinion of experts.

Table 2 provides improvement strategies (based on expert opinions and related literature). The result suggests that family awareness, which could be leveraged by effective informal educational content, plays an important role (Kafashpoor, 2008; Naderi & Haghshenas, 2010; Abassi & Homayoon, 2013; Shahmohammadzadeh, Shokri, Zamanizad, & Omidvar, 2014). Another informal approach could be holding festivals and community events to promote community awareness in the field of public norms (Kafashpoor, 2008; Ahmadi et al., 2010). In this regard, advertising on media, billboards, and advertisement displayers of the city, is an effective tool for increasing society's awareness of e-services (Kafashpoor, 2008; Gholipour & Shahriari, 2013; Khajenouri & Kaveh, 2013). The study observes that emphasizing the pivotal role of financial incentive policies is not necessary (Ahmadi et al., 2010; Khazaei et al., 2013). Moreover, the results suggest that local governments use social media to render urban management policies clear and concise (Ahmadi et al., 2010; Jalali, 2011; Gholipour & Shahriari, 2013; Khajenouri & Kaveh, 2013). It should also support the production, publishing and advertising of related apps (Ahmadi et al., 2010; Chatterjee & Kar, 2017). Considering the content of civic

culture in formal education is also important (Manteghi & Dinparvar, 2012). Alternatively, creating a reliable ICT infrastructure to provide urban e-services is crucial (Jalali, 2011; Chatterjee & Kar, 2017; Ko, Routray, & Ahmad, 2019). Finally, an integrated approach that considers all possible and effective platforms for better e-service delivery is highly suggested (Jianan Xu & Li, 2019).

One of the limitations of this study is the lack of access to time-series historical data on the behavior of effective variables, which renders the modelling and analysis process difficult. Moreover, a managerial change in relevant institutions leads to an interruption in the process due to the long-term dynamics of cultural and behavioral changes; the same is true for the current study, in which a change in the management team of the municipality can influence the scoring results and suggested strategies. To avoid this tendency, we used a diverse group of experts. A wider range of experts can improve the results. We suggest that further studies develop a simulation model to elucidate the effects of various policies on outcomes. Although the database for the time-series data of the main variables are limited, a simulation model (developed using real data and expert opinion) will provide more insights for policymakers.

Conclusion

Urban management is mainly concerned with civic culture and behavior. As an unavoidable part of today's life, mobile phones are an appro-

Table 2. *Key factors for improvement of e-services*

Key factor	Rating F	Suggestion
Ideal level of urban norms in family	1	It is recommended that useful educational content be taught to families by urban management experts to increase family awareness in the right direction.
Family educational activities (related to the culture of citizenship)	5	
Ideal level of urban community norms	2	It is suggested that festivals and community events be held throughout the year by the urban management planning and cultural centers to promote community awareness in the field of public norms.
Acceptance level of community in using municipal e-services	3	The allocation of incentive policies (such as granting discounts on the payment of public duties) is necessary, and the specific budget for the services in the city (such as advertising on media, billboards, the city advertising displayers, etc.). These measures strengthen civil society awareness of e-services.
Volume of promotional activities with citizenship cultural content	4	Urban management policies should be clear and concise. It requires the establishment of a common understanding and view to promotional activities is in the collection of municipal management. It is suggested that the planning and allocation of funds expand the promotional activities of urban management, especially in social networks offered in virtual space to receive maximum promotion efficiency.
Support for urban management of policies that promote civic culture	6	
Profitability of manufacturers of mobile apps with the content of ur-	7	It is suggested that the specific budget allocates by the municipal administration to support the production, publishing and advertising apps suggested public e-services.
Level of citizenship culture education	8	It is suggested that cooperation with the Ministry of Science, Research and Technology should be noted to consider citizenship culture con-
Municipal information technology capacities in the field of mobile phones	9	It is suggested that urban management is better to develop information technology and communication infrastructure in the city with the budget allocation and appropriate cooperation with the relevant agencies and departments to provide urban e-services.
Promotion of civic culture in other areas	10	Besides mobile phone platforms, other platforms such as the expansion of Web kiosks in the city, the development of electronic services in corporates' websites, etc. should be considered. This strategy guarantees the effectiveness of promoting urban citizens through e-service delivery.

priate platform for promotional and educational activities related to civic culture. The study examined the key effective factors of the promotion of civic culture using mobile phone platforms and the interactive effects of using a mobile phones on the state of civic culture were. In this context, variables and dynamics are identified. The study rated their effects and used the DEMATEL technique to identify key factors. The findings could be used to align urban planning and development policies. As we conducted a general literature review to develop the main model, these findings can also be used to develop relevant strategies for improving urban management in other developing countries with minimal modifications based on the local policy priorities of cities.

References

Ahmadi, H., Hashemi, S., & Rouhani, A. (2010). A study of the relationship between modern communication means and sexual identity of the youth in Shiraz. *Woman and Society Journal of Research*, *1*(4), 33–60.

AminMozafari, F., & Karimi, F. (2015). Investigating the relationship between new media (mobile and internet) and social security (Case Study: 15-30 Years Citizens of Tabriz). *Journal of Research Police Science*, 17(1), 48–61. https://civilica.com/doc/1301105

Azad, H. R. L., Mirzamohammadi, H. A. K., Hosseini, S. H., & Mirzamohammadi, S. (2010). Fight or flight : using causal loop diagram to investigate brain drain in developing countries. *International Journal of Society Systems Science*, *2*(3), 285–296. https://doi.org/10.1504/ijsss.2010.033495

Babran, S., & Sadat Akhavan Tabatabaei, M. (2011). Investigation of the role and impact of mobile use on high school girl students. *Culture of Communication*, *1*(1), 95–118.

Chatterjee, S., & Kar, A. K. (2017). Effects of successful adoption of information technology enabled services in proposed smart cities of India: From user experience perspective. *Journal of Science and Technology Policy Management*, *9*(2), 189–209. https://doi.org/10.1108/jstpm-03-2017-0008

Cheng, C. (2018). A two-dimensional framework for analyzing Facebook use and subjective well-being. *Psychological Research on Urban Society*, *1*(2), 67–73. https://doi.org/10.7454/proust.v1i2.16

Coyle, R. G. (1997). System dynamics modelling: A practical approach. *Journal of the Operational Research Society*, *48*(5), 544–544. https://doi.org/10.1057/palgrave.jors.2600682

Davis, G. F., Diekmann, K. A., & Tinsley, C. H. (1994). The Decline and Fall of the Conglomerate Firm in the 1980s: The Deinstitutionalization of an Organizational Form. *American Sociological Review*, *59*(4), 547–570. https://doi.org/10.2307/2095931

De Waal, M., & Dignum, M. (2017). The citizen in the smart city. How the smart city could transform citizenship. *It-Information Technology*, *59*(6), 263–273. https://doi.org/10.1515/itit-2017-0012

Forrester, J. W. (1997). Industrial dynamics. *Journal of the Operational Research Society*, *48*(10), 1037–1041. https://doi.org/10.1057/palgrave.jors.2600946

Gabus, A., & Fontela, E. (1972). World problems, an invitation to further thought within the framework of DEMATEL. Battelle Geneva Research Center, Geneva, Switzerland, 1-8.

Gholipour, M., & Shahriari, H. (2013). Political sociology of mobile phone: The effect of mobile phone usage on political life. *Political Science Research Journal*, *8*(2), 7–48.

Hakakzadeh, M., Razavi Alavi, S. M., & Attari, S. M. (2013). *Culture of the electricity consumption patterns reforms* (1st ed.). Kerman.

Hendriati, A., & Okvitawanli, A. (2022). Challenges of parenting in an urban setting. *Psychological Research on Urban Society*, *2* (1), 12. https://doi.org/10.7454/proust.v2i1.43

International Telecommunication Union (ITU). (2022). Mobile cellular subscriptions. https://data.worldbank.org/indicator/IT.CEL.SETS

Jalali, A. A. (2011). Requirements for the realization of electronic city. *Science Journal of Manzar*, *3*(17).

Kafashpoor, A. (2008). *Designing and explaining the key elements in developing the strategies for providing electronic services in the context of E-government*. The 1st International Conference on Electronic City, Tehran, Iran. https://www.en.symposia.ir/ICEC01

Kayani, A. K., Ahmad, D. K., & Saeed, D. A. (2020). Perceptions about cultural globalization in urban Pakistan. *South Asian Studies*, *28*(1).

Khajenouri, B., & Kaveh, M. (2013). A study on the relationship between media consumption and the sense of social security. *Strategic Research on Security and Social Order*, (2), 57–78.

Khazaei, T., Sharifzadeh, G., Akbarnia, M., & Ghanbarzadeh, N. (2013). Relationship between depression, self-esteem, and academic achievement of students in Birjand. *Modern Care Journal*, *10*(2),141148.

Kia, A. A., Selseleh, M., Naghibossadat, S. R., & Selseleh, A. (2008). The obstacles and solutions to establish E-Cities in Iran. *Cultural Strategy*, *4*.

Kiani, B., Gholamian, M. R., Hamzehei, A., & Hosseini, S. H. (2009). Using causal Loop Diagram to Achieve a Better Understanding of e-Business Models. *International Journal of Electronic Business Management*, *7*(3).

Kiani, H., Hosseini, S. H., & Abdi, F. (2018). A model to investigate the effect of work ethic culture on dynamics of rework in management of projects. *Interdisciplinary Description of Complex Systems*, *16*(1), 40–59. https://doi.org/10.7906/indecs.16.1.3

Kim, D.H. (1990). Toward learning Organizations: Integrating Total Quality Control and Systems Thinking. *Cambridge, Massachusetts, Pegasus Communications*.

Ko, G., Routray, J. K., & Ahmad, M. M. (2019). ICT infrastructure for rural community sustainability. *Community Development*, *50*(1), 51–72. https://doi.org/10.1080/15575330.2018.1557720

Manteghi, M., & Dinparvar, E. (2013). A survey of hidden identity in cellular phone and internet users. *Quarterly Journal of Information and Communication Technology in Educational Sciences*, *3*(2), 5–26.

McGuigan, J. (2005). Towards a sociology of the mobile phone. *Human Technology: An Interdisciplinary Journal on Humans in ICT Environments*. *1*(1), 45–57. https://doi.org/10.17011/ht/urn.2005125

Moghaddam, N. B., Sahafzadeh, M., Alavijeh, A. S., Yousefdehi, H., & Hosseini, S. H. (2011). Strategic environment analysis using DEMATEL method through systematic approach. *Management Science and Engineering*, *4*(4), 95–105.

Naderi, F., & Haghshenas, F. (2010). The relationship between impulsivity and loneliness, and mobile phone Usage in Collage Students. New Findings in Psychology, 111–121.

Navabakhsh, M., Hashem Nejad, F., & Shampoor, V. (2010). The effect of internet and mobile on identity change of 15-29 years old youth in Mazandaran Province. *Sociology of Youth Studies*, *1*, 145–170.

Pay, B. S., & Hosseini, S. H. (2013). Why do students use virtual social networks in Iran: a system approach. *Interdisciplinary Description of Complex Systems: INDECS*, *11*(1), 108–122. https://doi.org/10.7906/indecs.11.1.9

Rokeach, M. (1973). The nature of human values (1ˢᵗ edition). New York.

Scott, N., Batchelor, S., Ridley, J., & Jorgensen, B. (2004). The impact of mobile phones in Africa. Commission for Africa, *19*(4).

Shahmohammadzadeh, Y., Shokri, M., Zamanizad, N., & Omidvar, A. (2014). *The relationship between loneliness and mobile addiction.* The 1st National Conference on Sustainable Development in Educational Sciences and Psychology, Social and Cultural Studies, Tehran, Iran. https://civilica.com/doc/320854/

Shoureshi, A. (2008). Using Mobile Phone while Driving and its Role in Increasing Accidents and Reducing Safety. Journal of Traffic Management Studies, (9), 95–108.

Skoric, M. M., & Park, Y. J. (2014). Culture, technologies and democracy: A cross-national analysis of political development. *Telematics and Informatics, 31*(3), 364–375.

Smith, J. C. (2022). Mobile eCommerce Stats in 2022 and the Future Online Shopping Trends of mCommerce. OuterBox SEO & Website Design. https://www.outerboxdesign.com/web-design-articles/mobile-ecommerce-statistics

Sterman, J. (2000). Business Dynamics, System Thinking and Modeling for a Complex World. McGraw-Hill, Inc..

Tabatabaei Mozdabadi, S. (2014). Feasibility study and implementation using mobile phones in Tehran municipality. *Journal of Training and Development of Human Resources,* 1(2), 25–40.

Xu, J., & Li, B. (2019). Application of case-based methods and information technology in urban design-The renewal design of the urban region around Roma railway station. Proceedings of the 24th CAADRIA Conference, Wellington, New Zealand, pp. 625-634.

Zamani, E., Shahriari, Sh., & Abedini, Y. (2012). Relationship between quality and quantity of mobile phone usage and personality traits of students. *Culture and Communication Studies*, 13(19), 141–159.