International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies

http://TuEngr.com

PAPER ID: 10A14P

POLICY SOLUTIONS FOR INTEGRATION OF THE TECHNOLOGICAL INFRASTRUCTURE OF MOBILE TELECOM OPERATORS' SITES

Reza Talebi [a], Abbas Khamseh [b*], Mohammad Hasan Cheraghali [c]

[a] *Department of Technology Management, Roudehen Branch, Islamic Azad University, Rooden, IRAN.*
[b] *Department of Industrial Management, Karaj Branch, Islamic Azad University, Karaj, IRAN.*
[c] *Technology Management Department, South Tehran Branch, Islamic Azad University, Tehran, IRAN.*

ARTICLEINFO

Article history:
Received 24 May 2019
Received in revised form 01 June 2019
Accepted 14 August 2019
Available online 23 August 2019

Keywords:
Infrastructure;
Integration model;
Technological model;
Urban Landscape;
Green energy;
Policymaking; Save energy.

ABSTRACT

Population growth, technology advancement, the reduction of global resources and other issues have led to policy-making at the macro level in order to save resources and develop global requirements for this purpose. In this regard, and in light of the expansion of technology that requires extensive infrastructure use, the common use of existing infrastructure is one of the ways to reduce resource consumption. Telecommunication infrastructure is one of the most important infrastructures that promote the development of the pre-revolutionary world and is the bedrock for the comprehensive development of related technologies. Therefore, in order to maintain resources, it is necessary to integrate the infrastructure for the development of these technologies while creating telecommunication infrastructure. Considering the importance of these two categories, we try to examine the impact of integration on issues such as energy, the beauty of the environment and the reduction of costs, and for this purpose, using a questionnaire completed by the telecommunication industry and testing the relevant assumptions It integrates and works on it and provides solutions for telecommunications infrastructure policy.

1. INTRODUCTION

The movement and direction of the world are towards integration, so even in the simple issues and technologies that we have been using for many years, this is evident. The fine and coarse pencils, glasses and glass inks have become automata, writers, and psychologists, and in this way, the integration between ink and writing tools has come about, the long lines of productions that work anywhere in the human being, Have become mechanized lines that only one person guides in the

*Corresponding author (Abbas Khamseh) E-mail: Abbas.Khamseh@kiau.ac.ir

control room. Since technology is in the path of integration, it faces a variety of disruptions, so the owners and policymakers are struggling to reconcile different aspects. It goes without saying that technology is facing a lot of ups and downs in this way, analyzing systems that are technically social in nature (Antle et al., 2017, Abbasi et al., 2019) and can be adapted and complex systems (Holland, 2006) or systems Vital and viable and is not simple with theories such as the theory of complexity (McMillan, 2008), and their requirements and characteristics are unique to each other.

On the eve of Industry 4.0 along with the reduction of the resources of the planet, the look of the past has given technology a more attractive color and smell, and has pushed policymakers and industry owners to integrate more than the past and even between different disciplines and technologies (Columbia center on sustainable investment, 2017), (Finka et al., 2017) has led to the presence of various specialists at the same time to solve problems related to a technology, taking into account reducing carbon production and preserving environmental issues. . In discussions such as robotics, he saw the integration and integration of topics such as artificial intelligence, mechanics, electronics, and telecommunications, field we are dealing with environmental sciences, psychology, epistemology, and communication, all of which are used to create an integrated framework called "Robotic Science." One of the most important technologies that nowadays is the communication infrastructure for different technologies. And in the future it will be an important platform for them to be telecom infrastructure (Word's economic forum, 2017). All humans, in their use of telecommunications, the Internet and Intranet require tools and devices Telecommunication and this is the Internet presence of the objects IoT (Olive, 2017) and the need to manage objects for the sake of security and energy issues have come to fruition more than ever. Telecommunication infrastructures have been associated with human life from the past. At the time the telegraph was launched, they installed the wires in order to preserve them in the railroads, and used the security integrity of the railway lines and telegraphs simultaneously, after a little over the wires, Phone signals were built, and after the expansion of the telephone, special infrastructure was built (Nonnenmacher, 2001). In some cases, the infrastructure created for the use of cable television was also used and after the mobile phone came to the fore, the need to establish telecommunication sites were created and used to connect the towers of some lines. Expanding the need for communications in different industries requires more and more complex infrastructure, which will be saved in the cost of resources and speed of expansion if this infrastructure is combined with the technological infrastructure of other industries. The fifth-generation infrastructure required for mobile and Internet objects requires the creation of coverage across all parts of the globe and penetration into all layers (Electronic publishing, 2015), which, without taking advantage of everything available, has the difficulty of multiplying it he does.

The introduction of this section was to review the natural path of technology to integration, and also to consider the speed of infrastructure expansion (Columbia center on, sustainable investments, 2017) and, most importantly, the task of protecting resources and the environment Seeing life as one of our most important tasks and ultimately achieving a result that includes all of these. We also need to review the telecommunication infrastructure from the past and conclude that, given the need for and development of technologies, if we do not use different integration to provide this infrastructure, many resources will be consumed and ultimately the result. Which must be taken, is not taken.

In this article, we want to find out: What are the policy strategies for integrating telecommunication infrastructure and how can this integration help maintain resources?

So, we have tried to outline the integration of the various technologies, as well as the integration of telecommunications industries, and the prospects and future needs of the infrastructure. Also, with the prediction of the future, challenges and obstacles are examined and the solutions required. Nowadays, in our country, for the creation of infrastructures, there are significant and significant costs for each cellular operator, including the creation of telecommunications or fiber optic communication facilities with many barriers, such as complex bureaucracies in each one. There are cities that are slow to grow and cost a lot. Considering the necessity of expanding telecommunication infrastructure as well as the need for economic saving in the country, it is first necessary to identify costs, policymakers, actors, and stakeholders, and then presenting a country-specific strategy can have a significant impact on this. And it will add to the growth of infrastructure. Since this point has been ignored by the policymakers of the country and other stakeholders have solved their problems in a cross-sectional way, the view of the integrated utilization of infrastructure and the preservation of the interests and resources of the country has been less widely considered. Therefore, in this article, as an innovative work, aspects that have been neglected in the country so far are presented. First, the impact of integration on resource conservation is examined. Secondly, solutions and barriers to integration are presented. Thirdly, the necessary policies are needed to make this important.

2. LITERATURE REVIEW

Its integration and application in the various industries will be explained in the four sections below, and then examined according to the subject of the text - the integration of the telecommunication infrastructure.

2.1 INTEGRATING AND USING IT IN INDUSTRIES

Integration means putting together different components for the integrated user interface (Integration Dictionary). When we talk about integration in a system, it means that different components work together to operate in a function that is generally different from that of each component (Gilkey, 1959).

One of the examples of integration in the industry is the integration of the automotive industry because, at a time when all the technologies used in the vehicle were mechanically linked, they are now linked to the electronics industry. The arrival of navigators, electronic controllers, remote commands for turning on and off the car, or even opening and closing the door, and many other coarse cases indicate the integration of the technology in the industry. As an example, integration can be seen from the utilization of mechanical engineering in agriculture, including the results of this integration, namely drip irrigation system. In this type of irrigation, using mechanical sensors to improve the growth of plants and the Basso (Antle et al., 2017). This way of integration in the industry Chicken and fish farming, and the integration of electronic and mechanical sensors to adjust light, temperature, and feed, which has improved the industry. Therefore, it is necessary to change in different industries, to integrate and to take advantage of the achievements of other industries. New inventions like home dialysis devices are based on the integration of medical science, the recognition

*Corresponding author (Abbas Khamseh) E-mail: Abbas.Khamseh@kiau.ac.ir Volume 10 No.14 ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8 Paper ID:10A14P http://TUENGR.COM/V10A/10A14P.pdf DOI: 10.14456/ITJEMAST.2019.194

of the needs of patients, the recognition of home facilities, the integration of electronic science and mechanics, and ultimately the production of a device for the ultimate consumer use and enjoyment. Achievements like Scooter and Segway also integrate to understand human ergonomics, social science to understand transportation needs, improve energy consumption, improve traffic and integrate electronics and mechanics, manage science for commercialization, and eventually deliver the final product. Be Commercialization examples in different industries and technologies are such that they can be recognized by looking at the corners.

2.2 INTEGRATION OF INFRASTRUCTURE AND RESOURCES

Many examples are available to save energy and optimize the utilization of resources and infrastructure. The use of electrical infrastructure to transfer data using PLC, BPL, and ... are examples used to establish Internet communications or electronic controls, where the infrastructure is available, but There was no possibility of creating a transmission line for data or a lot of costs.

Another example of this integration was the establishment of the infrastructure of the electric power industry, in that the power cables were produced in such a way that optical fiber would be installed to be used later for data use, thereby integrating the Creating and maintaining the power and data infrastructure simultaneously

After the establishment of telecommunication sites for the transfer of information between private or public companies

Point to Point Local Network, or Wi-Fi connectivity from telecommunication towers that were established as mobile infrastructure, thus creating a ground for the presence of leased companies by operators such as TOWER COMPANIES that provides service on towers to all those who require a variety of communications from operator to the final consumer.

The fixed-line infrastructure was used at certain times for the transfer of images and IPTV services, and some operator companies sold telephone packages, TVs and the Internet simultaneously, which meant the integration of telephone, TV and Internet infrastructure (Hart, 1998). Cable operators now offer these services simultaneously.

The examples cited include the integration of infrastructure and the use of common resources for various affairs.

2.3 THE FUTURE NEEDS OF THE TELECOMMUNICATION INDUSTRY

In order to imagine what future infrastructures are needed in the telecommunications industry, we need to have an accurate picture of the current situation. Currently, two megabytes of space is required for moving information, which requires proper bandwidth to move that image between mobile or wireless communications networks at the right speed. Consider how many mobile devices and computers are available on a daily basis, how many audios, images, videos, and more. This is the volume of information to the infrastructure for moving and storing information, and considers the layout information and the various maps that all people use them. All this, some of which we list, is only part of the information about the objects. When all objects such as televisions, coolers, heaters, air conditioners, refrigerators, water meters, electricity, gas, fixed telephones, and even single-lamp homes and streets, and whatever you can in an identity form Define network life for it, enter into a network and exchange information. The amount of removable information is unthinkable and

requires very high storage and bandwidths for relocation (Oliver, 2017).

The issues mentioned were merely data transfer and storage, now imagine that we would analyze and use this information; naturally, the infrastructure that they want to analyze images, videos, energies, and so on. Speed and power should be high enough to meet the need for policymakers and managers. Providing the creation of this infrastructure with the presence of the Internet of objects in the 5G context requires extensive use of resources and technology. It is worth noting that the electrical energy used for these displacements is very high and that there are a lot of coolants for these devices, all of which will pave the way for more energy-efficient energy sources, including green energies are. Maybe these energies are not worth the money for small uses, but for such cases, which lead to a huge amount of benefits, can be investigated.

2.4 INFRASTRUCTURE INTEGRATION FOR TELECOMMUNICATION INDUSTRIES

Since the approach of this text is towards the integration of telecommunication infrastructure, we examine this issue in a specific way. In light of the future approach of telecommunication industries and in order to protect its interests and accelerate the creation of infrastructure, it is necessary to help with everything that can help the telecommunication industry and to integrate with other industries.

Of the examples that can be said there is a power base, at least integration can be achieved through power grids and utilize them for data communications, apart from the power-line communication (PLC) and broadband over power line (BPL) topics mentioned by AT&T to expand penetration. Data in urban populated areas utilize a laboratory-level project to transmit data through the power grid and data transmission in the magnetic field around the power cables and can provide data transfer (http://about.att.com/story/project_airgig_trials_georgia.html).

The necessary infrastructure for telecommunication is the use of all existing infrastructure. To expand, water, electricity, telephone, television, railways, gas and so on can be used.

The minimum integration is to share the infrastructure of mobile and fixed operators for other operators, which helps reduce costs, save energy and resources.

As indicated, research indicators include:

- energy consumption
- Operator fees
- City View
- Use of green energy

Which will measure the impact of telecommunications infrastructure integrity?

3. RESEARCH METHOD

Considering the mentioned issues, the foundations of the design of the questionnaire and its indicators were obtained, which should examine the impact of telecommunications infrastructure integration on energy consumption, operators' costs, urban landscape and the use of green energies. The validity of the questionnaire was confirmed by reviewing the experts of this industry and evaluated for its reliability through Cronbach's alpha, which resulted in close to 1 and indicates the credibility of the questionnaire. Regarding the sensitivity of the subject, the statistical community includes those who have an IT background and are competent in policy and enforcement matters.

*Corresponding author (Abbas Khamseh) E-mail: Abbas.Khamseh@kiau.ac.ir Volume 10 No.14 ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8 Paper ID:10A14P http://TUENGR.COM/V10A/10A14P.pdf DOI: 10.14456/ITJEMAST.2019.194

This community reaches about 70 people who completed the questionnaire according to the morpheme questionnaire by 55 people.

After distributing the questionnaire and obtaining the answers of the experts with the above specifications, their response was examined by the t-student test and the correctness or inaccuracy of the research hypotheses was tested.

Research hypotheses include:

- The integration of telecommunication infrastructure reduces energy consumption.
- The integration of telecommunications infrastructure will reduce operating costs (construction costs, maintenance costs, rental costs, electricity costs, etc.).
- The integration of telecommunication infrastructure will improve the urban landscape.
- The integration of telecommunications infrastructure encourages the use of green energy.

4. RESULTS

By asking questions about each of the hypotheses, they were tested. In the following, the results of these studies are presented in tables related to each section.

4.1 THE REDUCTION OF ENERGY INDICATOR VARIABLES

To determine the impact of integration on energy consumption, questions related to this issue were raised and made available to experts, with the result as follows.

Table 1: Mean and standard deviation of the reduction of energy indicator variables

Variables	Average	SD	Min	Max.
Reduction of electricity costs of the operator	3.05	0.80	1	4
Reduction of cooling system cost	3.84	0.46	2	5
Reduction of the amount of power consumed by the DC generator	3.56	0.66	2	5

As shown in Table 1, the average of the Energy Reduction Indicators varies from 3.05 for the operator to reduce the cost of the electric power to 3.84 for the cost reduction of the Cooling system. Since the questions are answered on the basis of the 5-option Likert spectrum (5 = very much to 1 = very low), the number 3 in the middle of the 5-option Likert range, given that the mean variables of the indicator The reduction in energy from the middle of the 5-option Likert range has increased, so integrating telecommunication infrastructure will reduce energy.

4.2 INDICATORS OF OPERATOR COST REDUCTION INDEX

To assess the impact of telecommunications infrastructure integration, the costs of the operator were evaluated and questioned by the experts. Due to the sensitivity of the operators in this project, we tried to consider different aspects:

Table 2: Mean and standard deviation of the reduction of operator costs indicator variables

Variables	Average	SD	Min	Max.
Reduction of depreciation cost of operators	3.33	1.38	1	5
Reduction of costs of deployment for the operator compared to normal towers	3.45	0.79	2	5
It reduces the number of contractors	3.42	0.66	2	5
Reduction of the cost of technical support for operators	3.39	0.88	1	5
Reduction of the cost of physical storage for the operator	3.60	0.78	2	5
The cost of operators' monitoring is reduced.	3.49	0.77	1	5

From Table 2, the average operator cost reduction indicators varies from the lowest of 3.33, which is attributed to the reduction of the cost of depreciation, which is related to the reduction of physical maintenance costs for the operator. Since the questions are answered on the basis of the 5-option Likert spectrum (5 = very much to 1 = very low), the number 3 in the middle of the five-option Likert range, given that the mean variables of the indicator Reducing operator costs have risen to an average of 5-point Likert spectrum, so the telecommunication infrastructure integration technology reduces operator cost index variables.

4.3 IMPROVING THE URBAN LANDSCAPE INDEX

Since one of the most important effects is the spread of technology on urban landscapes, so there are relatively large questions about the various aspects of this issue.

Table 3: Mean and standard deviation of Improving the urban landscape index variables

Variables	Average	SD	Min	Max
Similar Telecommunication Towers cause environmental beauty.	3.44	0.74	2	5
The impact on the ease of urban planning	3.36	0.78	1	5
The impact on the urban beautification	3.38	0.76	1	5
There is the possibility to create a way to camouflage towers in urban areas	3.33	0.86	1	4
Integrated Towers beautification can be used to create an urban icon	3.33	0.67	2	4
Integration of the masts under tower improves the urban landscape	3.56	0.57	2	4
Integration of the masts creates the possibility for beautification	3.53	0.57	2	4
Providing the possibility of saving urban spaces dedicated to operators and the proper use of them	3.64	0.52	2	4

According to Table 3, the average of the Urban Landscape Optimization Index varies from 3.33 to "Possibility of creating a method for camouflaging the towers in urban space" and "Beautifying the combined towers (as one of the telecommunication infrastructures) can be used to create a The urban symbol is "up to 3.64 to allow the city to be saved in space dedicated to the operators and the proper use of them. It can be seen that the average of the urban landscape optimization index variables is greater than the average Likert spectrum of 3. This means that utilizing the integration of telecommunications infrastructure in optimizing urban landscapes is effective.

4.4 INDICATORS OF THE USE OF GREEN ENERGY

Since the use of green energy, which can be called solar energy as one of the most important ones, continues to be costly, there needs to be sufficient incentive to use them. Considering that the use of these energies occurs during joint integration, it is therefore economically feasible to invest in this issue through more detailed questions.

Table 4: Mean and standard deviation of the Moving towards green energy index variables

Variables	Average	SD	Min	Max.
The possibility of the increasing distance of installation of telecommunication equipment from the residential by integrating Telecommunication Towers	3.45	0.86	1	5
Considering the altitude, the possibility of using wind energy will be provided.	3.71	0.50	2	4
The cost of using solar energy will be affordable.	3.40	0.83	2	5

According to Table 4, the average variable of the incentive index for using green energy is 3.40

*Corresponding author (Abbas Khamseh) E-mail: Abbas.Khamseh@kiau.ac.ir Volume 10 No.14 ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8 Paper ID:10A14P http://TUENGR.COM/V10A/10A14P.pdf DOI: 10.14456/ITJEMAST.2019.194

for cost of using solar energy, up to 3.71 for wind energy. Because of the questions, on the five-point Likert scale (5 = very much to 1 = very low), in fact, three sets the five-point Likert range. The average incentive variables to utilize green energies were higher than the midpoint of Likert's five-point spectrum. This suggests that the integration of telecommunication infrastructures has led to an increase in the indices of the incentive to use green energy.

4.5 BRIDGES OF INDICATORS

The extracted indicators are all influenced by the integration of telecommunications infrastructure and summarized in Table 5.

Table 5: Mean and standard deviation indicators

Variables	Average	SD	Min	Max.
Reduction of energy consumption	3.75	0.60	2.00	4.83
Reduction of operators cost	3.61	0.67	1.57	5.00
The use of green energy	3.42	0.66	1.87	4.44
Improving the urban landscape	3.64	0.73	1.83	4.83

According to Table 5, the average energy consumption index was higher (3.75) and the average index of green energy use was the least (3.42).

As the five-choice questionnaire's questionnaire was "5 = very much to 1 = very low", in fact, the third Likert range is the fifth option. If the property is successful at least 50 percent, then we test the statistical hypothesis below:

$H_0=\mu\leq 3$

$H_1=\mu>3$

In this way, the Table 6 is used to measure each of the statistical hypotheses.

Table 6: Result of t-test to assess the impact of the installation of integrated towers in different indices

Index	t	Degree of freedom	Confidence level.
Reduction of energy consumption	9.163	54	0.001
Reduction of operators cost	6.687	54	0.001
Green energy	4.798	54	0.001
Urban landscape	6.505	54	0.001

According to the results observed in Table 6, the test of all assumptions is in the accepted region (H_1 is accepted). Therefore, integration of telecommunications towers will have a positive impact on all aspects of the assessment. Another thing that attracted attention in these comparisons is success of the integration of telecommunications towers in various aspects, and that the success of view of various criteria is not different. By using the Friedman test, we have obtained Table 7 result.

Table 7: Results of analysis of variance Friedman.

No.	The design criteria	The average rank of aspects	
1	Reduction of energy consumption	2.85	
2	Reduction of operators cost	2.40	
3	Green energy	2.22	
4	Urban landscape	2.54	
Friedman test		p>0.05	Chi- Square=6.996

5. DISCUSSION

The complexity of utilizing common infrastructure among the various stakeholders is so much that it is sometimes thought to be unrealistic. Because the interests of each one are different and sometimes contradictory, in some cases the competitive environment causes the infrastructure to remain monopolistic because it sees it as a competitive advantage with others, while Subscribing to others prevents monopolies, even in some cases involving stakeholder interests, the opposition to uncertain reasons and the need to maintain ownership, prevent the integration of infrastructure. In the meantime, the silence of state laws and policies leads to inconsistencies, and while the government can, with proper policy, enforce the creation of shared infrastructure and require its proper orientation. Apart from the absence of government policies, non-state structures the government's agility and getting out of the 100% control of services due to the unavailability of permanent infrastructure, fear their owners from sharing and damaging their infrastructure due to sharing the barrier to building infrastructure integrity. In this sense, the government must, after proper policy-making on infrastructure sharing, plan, and policy to oversee the work, so that the challenge for the beneficiaries and stakeholders is overcome. It is clear that the existence of these cases and thinking of this The causes of public harm are considered to be the duties of governments, and failure by governments to think about them leads to a lack of proper stakeholder participation, which naturally results in general damage, lack of economic growth and resource-wasting On a massive scale.

6. CONCLUSION

To solve the challenges, some of which are mentioned in the previous section, they have to be categorized and discussed separately for each issue. The biggest issue is related to legislation and policy, if the owner of the law seriously looks at the integrity of the infrastructure. To a large extent, this will be overcome. In addition, the legislator and the policymaker are required to elaborate the rules in a precise manner and assess the interactions in all aspects so that the next issue, that is, solving the problems of the stakeholders and taking into account their profit without the integrity of their limitation, will be resolved. A very important stage of cultural discussion is that the stakeholders should be culturally and intellectually justified and not be encouraged to move towards integration. Ultimately, in case of non-justification, the law should be used without leaving any controversy for anyone, otherwise Future Infrastructure Research will not be possible and if each individual beneficiary is to take action individually, his expenses and the loss of their resources at a macro level will be such that they will be eliminated from the competition, so the primary priority would be to formulate joint policy of integration, which should be developed by policymakers. In the results of statistical issues that were examined by energy indicators, operator costs, urban landscape, and green energy use, we found that all of these indicators are recovered using shared infrastructure. This implies the need for integrated policy because the adoption of proper policies and controls in the area of infrastructure and their integration saves energy and encourages the growth of the use of green and carbon-free energy. In other words, it is necessary to adopt single decisions for ministries such as the Ministry of Energy, the Ministry of Communications and Information Technology, the Ministry of

*Corresponding author (Abbas Khamseh) E-mail: Abbas.Khamseh@kiau.ac.ir Volume 10 No.14 ISSN 2228-9860 eISSN 1906-9642 CODEN: ITJEA8 Paper ID:10A14P http://TUENGR.COM/V10A/10A14P.pdf DOI: 10.14456/ITJEMAST.2019.194

Health, the Ministry of Housing, Roads and Urban Development, the Ministry of Agricultural Jihad and other ministries playing roles in infrastructure development. In the course of this article, it was observed that the orientation and movement of the world and technologies towards integration, and the main of these policies and actions are due to the conservation of resources and the use of common resources. The studies conducted in Iran, a small part of which are presented in this article, also indicate that it was necessary to maintain resources with proper functioning and policy and to prioritize and prioritize it. Therefore, the formation of a task force on energy policy, which consists of all decision-making and policymakers in Iran, is one of the requirements that we will eventually end up, and certainly it is not the sole responsibility of the Ministry of Energy or other organizations and policymakers. But the creation of this culture and the need to address this need in the impermeable power of the state is something that begins with these kinds of studies and provides a way for the custodians to constantly review the future, the current situation, and how exit this position and address one of the most important policies concerns.

7. MATERIAL AND DATA AVAILABILITY

Information regarding this study can be requested to the corresponding author.

8. REFERENCES

Abbasi, F., Motavasseli, M., Zali, M. R., Faghih, N., & Meigounpoory, M. R. (2019). How Does The Technological Innovation Come From? A Multilevel Framework. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*,10(4), 527-550.

Antle, J. M., Basso, B., Conant, R. T., Godfray, H. C. J., Jones, J. W., Herrero, M., Tittonell, P. (2017). Towards a new generation of agricultural system data, models and knowledge products: Design and improvement. *Agricultural systems*, 155, 255-268.

ATT. (2019). http://about.att.com/story/project_airgig_trials_georgia.html

Chong Tjen-San, Chris Leung. (2017). One Belt One Road Infrastructure Sector.

Columbia center on sustainable investment. (2017). Module 8 of the Broadband Strategies Toolkit, (draft document).

Electronic publishing, European Commission, 5G Vision, 2015

Finka, M., Ondrejička, V., Jamečný, Ľ., & Husár, M. (2017). Public Participation Procedure in Integrated Transport and Green Infrastructure Planning. *In IOP Conference Series: Materials Science and Engineering* (Vol. 245, No. 5, p. 052054). IOP Publishing.

Gilkey, H. T. (1959). New air heating methods. In New methods of heating buildings: a research correlation conference conducted by the Building Research Institute, Division of Engineering and Industrial Research, as one of the programs of the BRI fall conferences (pp. 47-56).

Hart, T. (1998), Legal Theory, Vol. 4, pp. 283-300, 1998, reprinted in hart's postscript: essays on the postscript to 'the concept of law', Jules Coleman, ed, Oxford University Press.

Holland, J. H. (2006). Studying complex adaptive systems. Journal of systems science and complexity, 19(1), 1-8.

McMillan, E. (2008). Complexity, management and the dynamics of change: Challenges for practice.

Routledge.

Nonnenmacher, T. “History of the U.S. Telegraph Industry”. EH.Net Encyclopedia, edited by Robert Whaples. August 14, 2001

World Economic Forum. (2017). Digital Transformation Initiative Telecommunications Industry. (White Paper).

Yang, Eunsang. (2017). A Foundry of Human Activities and Infrastructures.

Reza Talebi is a PhD Candidate completing his PHD degree in Technology Management at Department of Management at Faculty of Technology Management, Roudehen Branch at Islamic Azad University, Tehran, Iran. He received his MA in same major from South Tehran Branch at Islamic Azad university, Tehran, Iran, and his BA in Telecommunication at Elmosanat University, Tehran, Iran. His research focuses on Integration Technology in Telecomm, especially Mobile Infrastructures.

Dr. Abbas Khamseh is an Assistant Professor at Department of Management, at faculty of Industrial Management, Karaj Branch at Islamic Azad University, Karaj, Iran. He is interested in Technology and Management.

Dr. Mohammad Hassan Cheraghali is an Assistant Professor at Department of Management, Faculty of Industrial Management, South Tehran Branch, Islamic Azad University, Tehran, Iran. His researches are in areas of Technology Management, Decision Making, Data Science, and System Dynamics.