COLLECTIVE INTELLIGENCE FOR MORE INCLUSIVE COMMUNITIES

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Abstract
Urban development strategies are more and more centred on citizens' needs and requirements. In this regard, collective intelligence can be understood as a fundamental element in enhancing the creation and development of more inclusive communities. This paper aims to present various ways in which collective intelligence can contribute to develop smart urban areas, formed by strong inclusive communities, giving as example different cities that have implemented this concept. The methodology used to carry out this research is both bibliographic – opting here to study the work of specialists in the field, authors from Romania and abroad, and empirical – formed by a case study on various smart cities around the world that use the concept mentioned. This type of intelligence is starting to be a very important issue in smart cities' evolution, improving the relationship between government and citizens. Even though technology is a significant element, citizens and public institutions' capability and will to collaborate for finding and implementing the best solutions for communities' problems should also be considered.

1. Introduction

The World Bank reported that over 50% of the world's population lives today in cities and, by 2045, this percentage will manifest a growth, with a total number of 6 billion people living in urban areas. Moreover, by 2050, the planet Earth will have urban residents representing 68% of the world's population [34].

With this in mind, we need to understand that rigorous policy coordination and investment choices are two important elements in the process of creating or developing cities that have a safe, inclusive, resilient and sustainable nature. In this context, governments from local and national level play an important role in shaping the future of the cities' development and creating opportunities for their residents [34].

Urbanization has become a keyword for today's development changes, therefore an efficient urban growth management is necessary for having a sustainable development, being linked with its economic, environmental and social dimensions [38].

It should be mentioned that urban development is the integration into cities, towns or small neighbourhoods of various planning activities carried out by different categories of individuals, such as: project managers, architects, civil and design engineers, evaluators and environmental planners. Urban development is thus a system of residential enlargement that creates cities, taking place in unpopulated areas or areas that need to be renovated [3].

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Specialists consider that there are some key approaches in addressing urban challenges, namely [1]:

- *Stakeholder partnerships* – for information exchanging, building capacities, increasing the level of resources and revenues, cities form partnerships with the private sector, organizations or even other cities;

- *Formulation of city development strategies* – based on SWOT analyses and long-term visions, cities formulate development strategies;

- *Inter-local cooperation* – in this context, rural and urban areas connections are becoming more valued than the rise of city-regions or multi-modal metropolitan areas;

- *Cities as ecosystems* – nowadays cities are being viewed as living ecosystems in which there is a need to have an equilibrium state between issues of economic, social and environmental nature;

- *City leaders as economic managers* – first, city leaders used to have only a political orientation, but now they adopt entrepreneurial and economic management methods.

At the European level, important progress is made through the Urban Development Network, which is formed by more than 500 cities or urban areas, these being accountable for putting into practice various integrated actions and solutions centred on strategies of sustainable urban development [7]. In the period of time between 2014 and 2020, these actions are being funded by the European Regional Development Fund (ERDF) [26].

We can see that many cities around the globe have started developing or implementing smart cities projects [40] and most of these projects are oriented on developing the technological aspect of the cities. "The focus on the technology [makes] cities 'smart', rather than the people, neglects the importance of citizen participation in urban policy-making, and de-prioritizes what local residents really want and need" [19]. However, "we are not saying that technology should not be a part of the smart city, but rather that 'smart' cities should not be defined by technology alone. Instead, the 'smart' city concept should address innovation from a more holistic perspective, promoting smart, participatory approaches to challenging urban problems that use technology, among other things, as an enabler of change, rather than as the change itself" [9].

By this, we can understand that cities need to be a nest for more inclusive communities, thus smart cities initiatives have to be indeed focused on people, but not only – they also have to be co-created by every actor of the community [10].

In order for a city to be a successful inclusive one, some objectives must be achieved [15]:

- *The importance of leadership and vision* – this aspect should not be neglected and it refers to the fact that leadership should focus on making urban areas and services more inclusive, accessible, user and environmentally-friendly;

- *Know the facts* – quantitative and qualitative data is needed in cities and also the creation of smart city strategies for solving social problems;

- *Be adapted and adaptable* – smart city planning and initiatives should be adjusted to the individuals' specific needs and requirements and also be adaptable;

- *Increase citizen participation* – for ensuring inclusivity, this aspect is fundamental and it can be understood through the active participation of all stakeholders in a community;

- *Tackle digital exclusion* – when creating a smart city strategy, governments should make sure that every person is involved in the process of changing into a digital city; in this case, introducing a public ICT education and assistance would be helpful, with the help of libraries, community centres and NGOs and other trusted public institutions;

- *Prioritize people* – inclusive and smart are not the same thing in a city, therefore actors involved in the community should make efforts to create new smart city apps which can ensure inclusive development and to adapt the old ones to change.

2. Collective intelligence as a factor for more inclusive communities

In today's cities, a new culture is evolving, a culture in which citizens and communities are starting to collaborate with institutions and organizations that before were using systems of polarization, but now are focused on inclusion. This integration approach gives individuals a sense of belonging and connectedness, thus people with different visions and perspectives feel empowered to contribute to a greater purpose [28], one that makes their city become smarter, more inclusive and sustainable.

In this regard, collective intelligence is seen as "a new ROI (Return on Investment) for inclusion" [28]. In his book *Big mind – How collective intelligence can change our world*, Geoff Mulgan states that "collective intelligence is as old as civilization" [17]. Other authors state the same, giving as examples different groups of individuals (such as: families, business teams, armies) that have always showed fluctuating degrees of collective intelligence. They also say that this concept can be visible even in groups of animals (for example, flocks of birds can gather information from individual group members in order to find food and nesting places) [5].

Collective intelligence can be understood as the ability of various groups to make good decisions, by joining human and machine skills [17]. Moreover, the social, technological and cognitive requirements for having a case of collective intelligence are the following [2]:

- *cognitive predisposition* → allows humans to form shared intentions;

- *presence of cultural artefacts* → allows time and space co-ordination;

- *interaction with digital tools* → incorporates practices of social nature;

- *existence of governance systems* → supports the free transformation of knowledge.

Successful smart cities solutions need to use a citizen-centric approach which takes into consideration their needs and requirements. Thus, collective intelligence can be considered as a key factor for successful smart cities [8] as it contributes to enhancing the creation and development of more inclusive communities.

3. Study case: cities that have implemented the collective intelligence concept

There are many initiatives for using digital platforms in order to mobilise large groups of individuals and use their knowledge for finding solutions to challenges in all areas of society [18].

In this regard, NESTA has created, in 2018, a Centre for Collective Intelligence Design, which aims to discover how intelligence, of both human and machine nature, can be joined in order to benefit collective knowledge and help generate and develop innovative solutions that are efficient for meeting today's social challenges [18].

The centre is based both on the existing work of the global innovation foundation NESTA and on different researcher centres and specialists' visions, such as: The MIT Center for Collective Intelligence [32], The MIT Quest for Intelligence [33], The Alan Turing Institute [31], The Collective Intelligence Unit at Copenhagen Business School [4] and many others. The centre also collaborates with university researchers, government policymakers, start-ups, service leaders and large firms [18].

In her book *The Death and Life of Great American Cities*, the great urban theorist Jane Jacobs stated that "cities have the capability of providing something for everybody, only because, and only when, they are created by everybody" [12]. With this quote in mind, we will further present some successful examples of cities in which the concept of collective intelligence has started to be implemented.

As a first example of collective intelligence achieved through crowdsourced contributions, we can mention the project ***Zooniverse***, with headquarters in Oxford, UK and Chicago, USA, it being the world's largest and most popular platform for research powered by people, volunteers all around the world that assist professional researchers, this research resulting in new discoveries made accessible in various publications [43] and datasets that are useful to the research community [41]. Until today, it gathered 1,724,040 registered volunteers and more than 1000 classifications per day, arriving at a total of 398,671,597 classifications so far. It all started in July 2007, with *Galaxy Zoo* which is now the world's best-known online citizen science project, Zooniverse being its hosting project.

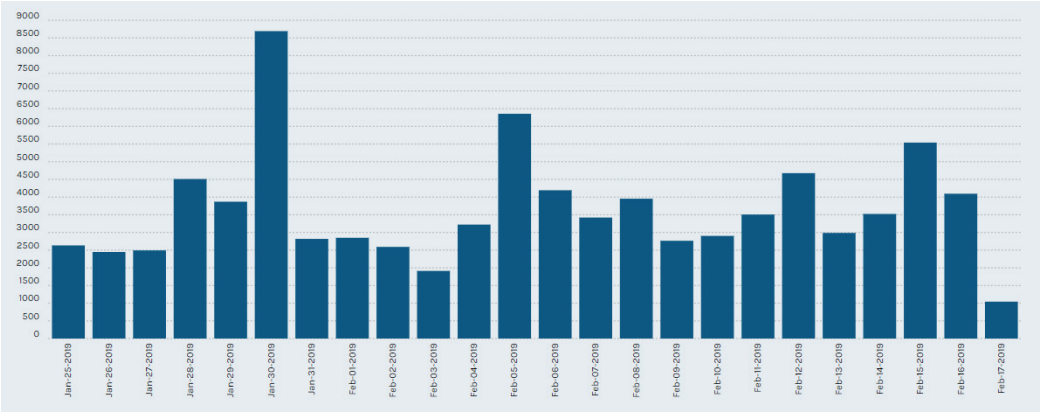

Figure 1. Classification stats (January 25, 2019 – February 17, 2019)
Source: [42]

As we can see in the figure above, the project has gathered much data from volunteers, making, for instance, 2632 classifications on January 25, 2019, fluctuating over the months until February 17, 2019, when it gathered 1042 classifications, the most classifications being gathered on January 30, 2019, precisely 8691.

Another successful example is given by the city of Lisbon, Portugal, through the online platform ***Patient Innovation***, a place where caregivers and patients worldwide can connect and thus share know-how, search for already existing solutions from individuals with similar challenges and implicitly create solutions developed by themselves or through collaborations, ideas that can meet problems related to the health sector. The platform was founded in 2014, it gathered over 800 solutions coming from more than 50 countries [25].

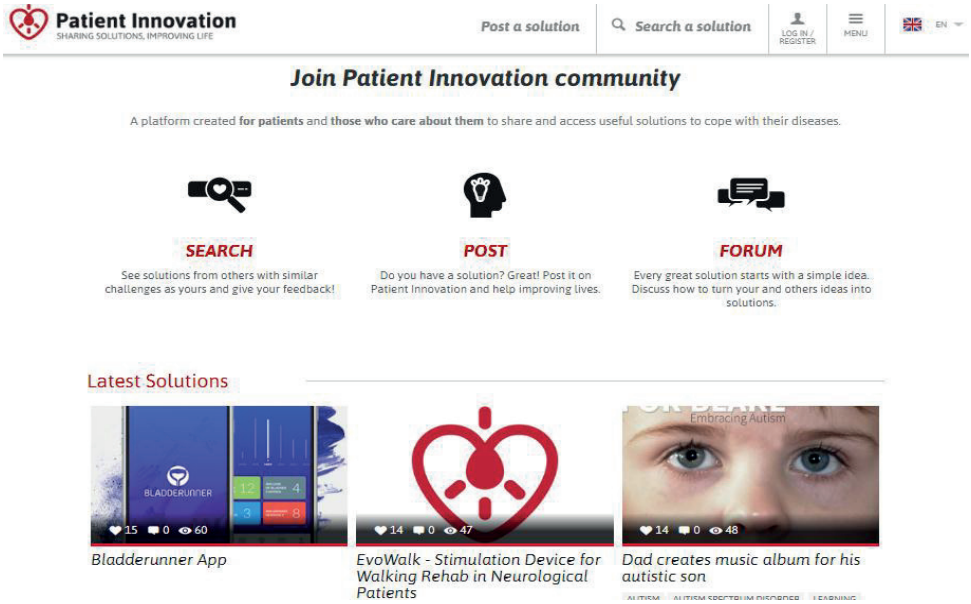

Figure 2. Patient Innovation platform
Source: [24]

About this project, Sir Richard Roberts, chief scientist at New England Biolabs, Nobel laureate in physiology or medicine in 1993 and Patient Innovation advisory board member, said it is „an outstanding social media use that should help many disadvantaged people", a project that won, among other important prizes, the title „Non-Profit Start-up of The Year 2016" in London, at an event promoted by the HealthCare Society in London, where over 1000 start-ups were taken into account and 50 were on the finalists' list [23].

For facilitating the process of collaborative decision-making, we can mention ***Loomio***, an open source software, created in 2011 in Aotearoa, New Zealand, having the purpose of demolishing the obstacles that arise in the decision-making participation process at every level: in neighbourhoods, community organisations, businesses, social movements, local and national governance [13]. This social enterprise is part of the ***Enspiral Network***, a collective system of people and groups, working together across the world in order to achieve their purposes. It too is based in New Zealand, but in the city of Auckland, being founded in 2010 [6].

In October 2015, in Canada was created the open platform ***TrudeauMeter***, which allows citizens to track if their national politicians deliver what they promised or not, based on evidence, such as: news articles, official government documents and so on. Being user-friendly, simple, collaborative and impartial, it empowers the idea of what living in a democratic society means, transparency being an important issue in this context [36].

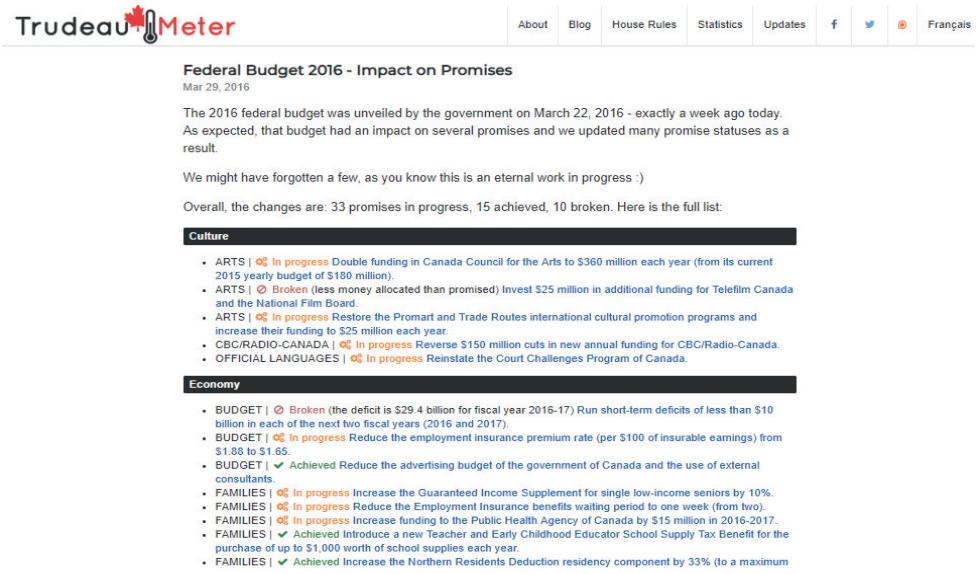

Figure 3. TurdeauMeter news example
Source: [37]

As we can see in the figure 3, a news example provided by the platform is regarding the federal budget for 2016, it offering its users the exact number of politicians' promises in progress (33), achieved ones (15) and the ones that were not accomplished (10), these promises regarding issues of culture, economy, environment, government, indigenous peoples and security.

In Santander, Spain, there is a project called ***SmartSantander***, created in 2009, which involves using a number of 20,000 sensors that can measure noise, temperature, traffic flow, pollution etc. Its purpose is to transform the city into a smart one by making use of new technologies in order to improve the public services' delivery and enhance citizens' participation [39].

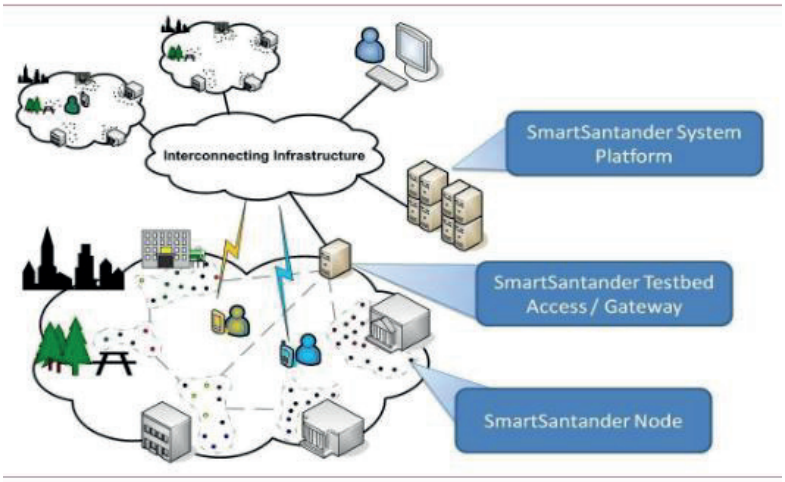

Figure 4. SmartSantander infrastructure
Source: [29]

As we can see from the figure above, we are talking about an experimental facility, through which the project addresses the main requirements of a real-world IoT platform, by identifying, planning and implementing various building blocks necessary in this context. The experimental facility has thus an architecture that depends on the existing components and also on the building blocks to be created. The platform's key functions are the following: a) to validate approaches to the IoT architectural model; b) to evaluate the main building blocks of the IoT architecture, interaction, management protocols, mechanisms, device technologies and main support services (discovery, identity management, security); c) to evaluate social acceptance of IoT technologies and services [29].

An app was also created, ***SmartSantanderRA*** [30], which turns users' smartphones into sensors, thus citizens becoming both testers and extensions of the project's capacities [29]. Moreover, we can say that the "seanseable city" is now focused on citizens, this meaning that it will use not only technological sensors, but also human sensors and living sensors of their environment [16].

When it comes to the case of Finland, we can mention the ***Open Citizen Science project***, which took place between August 2016 and January 2017, being created by the non-profit association Open Knowledge Finland (OKFI) [21], founded in 2012, which gathered more than 500 members from all areas of interest, including organizations, citizens and various companies. The project was commissioned by the Finnish Ministry of Education and Culture, through its initiative of open science and research [22] and it focused on researching two main topics: citizen science and open science, creating discussion opportunities regarding these topics and how, by being connected, they can be fostered and promoted in Finland, thus providing recommendations for national level policy action. The Open Citizen Science project had the target of involving citizens in scientific research, this implicitly meaning that they will gain knowledge and understanding of concepts that are important to them and that can help them get involved in the decision making process and in finding solutions to their problems or requirements [20].

Another successful example created by Open Knowledge Finland is ***ResponsiveOrg Finland***, a community that aims to act as the central hub for responsive thinkers and practitioners, creating an

open network through which individuals can explore and support various practices for capacity building and impact creation. The role of the non-profit association is thus to share information, organize meetings and provide different services, activities that can make change possible [27].

Therefore, even if we talk about projects that are aiming citizen collaboration and contribution to the health issue, the decision-making process, transparent politicians' actions, various environmental polluters or just their involvement in research activities, such successful examples demonstrate that all actors which are a part of an urban community must be included in the process of thinking, collecting ideas, generating solutions and making decisions. This means that all people must be included in the creation or development model of a smart city, collective intelligence being a significant element in this context.

4. Conclusions

As the managing partner of Bee Smart City, Bart Gorynski, said, "we need to leverage collective intelligence across the many different layers and subgroups of society, encouraging us all to become participative 'bees' in the 'hive' that is the modern city. Only through multi-stakeholder approaches, focused on the needs of the people, will we implement really effective 'smart' initiatives that change our cities for the better" [11]. Thus, we can understand that collective intelligence is starting to be a very important aspect in the development of smart cities, redefining and improving the government-citizens relationship.

By taking into consideration the successful examples of collective intelligence use from all over the world, urban areas can be formed by smarter communities, using new technologies that will help them create social innovations, sustain development and be more inclusive.

Social networks' tools are supporting citizens to have a creative and innovative way of thinking. By taking into consideration the technological approach, it can be understood that activities of collective intelligence contribute to shaping societies and cultural aspects, being useful for creating smarter, stronger communities [14]. Morevover, cases of collective intelligence use highlight the fact that sharing information, communication, collaboration, problem-solving approaches adopted by citizens and all actors of a community lead to a greater involvement of them.

However, even though technology is a significant element, citizens and public institutions' capability and will to collaborate for finding and implementing the best solutions for communities' problems should also be considered. The interaction between individuals should still exist, thus there must be found an equilibrium between using both traditional methods and digital technologies to perform various activities [35].

5. References

[1] ASIAN DEVELOPMENT BANK, Urban Development: Issues, Challenges, and ADB's Approach, https://www.adb.org/themes/urban-development/issues, accessed on 4.01.2019.

[2] BROADBENT, S., GALLOTTI, M., Collective Intelligence: How does it emerge?, https://media.nesta.org.uk/documents/collective_intelligence.pdf, accessed on 5.01.2019 (2015).

[3] BROOKS, A., What is urban development?, https://bizfluent.com/about-4728387-what-urban-development.html, accessed on 4.01.2019 (2017).

[4] COPENHAGEN BUSINESS SCHOOL, Collective intelligence: CBS spearheading the next "new black", https://www.cbs.dk/en/companies/news/collective-intelligence-cbs-spearheading-the-next-new-black, accessed on 6.01.2019 (2018).

[5] EGGERS, W. D., GUSZCZA, J., GREENE, M., Making cities smarter. How citizens' collective intelligence can guide better decision making, https://www2.deloitte.com/insights/us/en/deloitte-review/issue-20/people-for-smarter-cities-collective-intelligence-decision-making.html, accessed on 5.01.2019 (2017).

[6] ENSPIRAL, https://enspiral.com/, accessed on 6.01.2019.

[7] EUROPEAN COMMISSION, The Urban Development Network, https://ec.europa.eu/regional_policy/en/policy/themes/urban-development/network/, accessed on 4.01.2019.

[8] GELSIN, A., Collective Intelligence: Key Success Factor for the Smart City, https://hub.beesmart.city/strategy/collective-intelligence-key-success-factor-for-the-smart-city, accessed on 5.01.2019 (2017).

[9] GELSIN, A., – managing partner at Bee Smart City, cited by Maxwell, L., The importance of the "smartivist" – how smart citizens accelerate smart city development, https://hub.Beesmart.city/strategy/smartivist-accelerate-smart-city-development, accessed on 4.01.2019 (2018).

[10] GORYNSKI, B., – managing partner at Bee Smart City, cited by Maxwell, L., How to ensure that your smart city strategy is inclusive, https://hub.beesmart.city/strategy/how-to-ensure-that-your-smart-city-strategy-is-inclusive, accessed on 4.01.2019 (2018).

[11] GORYNSKI, B., – managing partner at Bee Smart City, cited by Maxwell, L., The importance of the "smartivist" – how smart citizens accelerate smart city development, https://hub.beesmart.city/strategy/smartivist-accelerate-smart-city-development, accessed on 4.01.2019 (2018).

[12] JACOBS, J., The Death and Life of Great American Cities, Vintage Books – A division of Random House, USA (1961).

[13] LOOMIO, https://www.loomio.org/about, accessed on 6.01.2019.

[14] MATEI, A., TÎRZIU, A. M., Collaborative learning as a tool for social innovation, International Conference on Education and New Learning Technologies (EDULEARN17), 9th edition, July 3-5, 2017, Proceedings of EDULEARN17 Conference, vol. 9, published by IATED Academy, Barcelona, Spain (2017).

[15] MAXWELL, L., How to ensure that your smart city strategy is inclusive, https://hub.beesmart.city/strategy/how-to-ensure-that-your-smart-city-strategy-is-inclusive, accessed on 4.01.2019 (2018).

[16] MAXWELL, L., The importance of the "smartivist" – how smart citizens accelerate smart city development, https://hub.beesmart.city/strategy/smartivist-accelerate-smart-city-development, accessed on 4.01.2019 (2018).

[17] MULGAN, G., Big mind – How collective intelligence can change our world, Princeton University Press, USA (2018).

[18] MULGAN, G., BAECK, P., Developing a new Centre For Collective Intelligence Design. Learning how to combine human and machine intelligence at scale, https://www.nesta.org.uk/blog/developing-new-centre-collective-intelligence-design-learning-how-combine-human-and-machine-intelligence-scale/, accessed on 6.01.2019 (2018).

[19] MÜLLER, T., – co-founder at Bee Smart City, cited by Maxwell, L., The importance of the "smartivist" – how smart citizens accelerate smart city development, https://hub.beesmart.city/strategy/smartivist-accelerate-smart-city-development, accessed on 4.01.2019 (2018).

[20] OPEN KNOWLEDGE FINLAND, Open Citizen Science, https://fi.okfn.org/projects/open-citizen-science/, accessed on 17.02.2019.

[21] OPEN KNOWLEDGE FINLAND, https://fi.okfn.org/about/, accessed on 17.02.2019.

[22] OPEN SCIENCE COORDINATION IN FINLAND, https://openscience.fi/, accessed on 17.02.2019.

[23] PATIENT INNOVATION, Celebrating 3 Years of Patient Innovation – Report 2014-2017, Portugal (2017).

[24] PATIENT INNOVATION, https://patient-innovation.com/, accessed on 6.01.2019.

[25] PATIENT INNOVATION, https://patient-innovation.com/about, accessed on 6.01.2019.

[26] REGULATION (EU) no. 1301/2013 of the European Parliament and of the Council of 17 December 2013 on the European Regional Development Fund and on specific provisions concerning the Investment for growth and jobs goal and repealing Regulation (EC) No 1080/2006, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R1301, accessed on 4.01.2019.

[27] RESPONSIVEORG FINLAND, http://responsiveorg.fi/, accessed on 17.02.2019.

[28] SHAMBAUGH, R., A New ROI for Inclusion: Collective Intelligence and the "Power of One", https://www.huffingtonpost.com/entry/a-new-roi-for-inclusion-collective-intelligence-and_us_ 5a28139ae4b0650db4d40c50, accessed on 5.01.2019 (2017).

[29] SMARTSANTANDER, http://www.smartsantander.eu/, accessed on 6.01.2019.

[30] SMARTSANTANDER, SmartSantanderRA: Santander Augmented Reality Application, http://www.smartsantander.eu/index.php/blog/item/174-smartsantanderra-santander-augmented-reality-application, accessed on 6.01.2019.

[31] THE ALAN TURING INSTITUTE, https://www.turing.ac.uk/, accessed on 6.01.2019.

[32] THE MIT CENTER FOR COLLECTIVE INTELLIGENCE, https://cci.mit.edu/, accessed on 6.01.2019.

[33] THE MIT QUEST FOR INTELLIGENCE, https://quest.mit.edu/, accessed on 6.01.2019.

[34] THE WORLD BANK, Urban Development, http://www.worldbank.org/en/topic/urban development/overview, accessed on 4.01.2019 (2018).

[35] TIRZIU, A. M., Social innovation – a beneficial vision on the public sector. Case study: social innovation in the public universities from Italy, Smart Cities Proceedings, 3rd edition, December 10, 2015, Pro Universitaria Publishing House, SNSPA, Bucharest, Romania (2016).

[36] TRUDEAUMETER, https://trudeaumetre.polimeter.org/about, accessed on 6.01.2019 (2015).

[37] TRUDEAUMETER, https://trudeaumetre.polimeter.org/news, accessed on 6.01.2019.

[38] UNITED NATIONS, World Urbanization Prospects: The 2018 Revision [Key facts], Department of Economic & Social Affairs, https://population.un.org/wup/Publications/Files/ WUP2018-KeyFacts.pdf, accessed on 4.01.2019 (2018).

[39] URAIA, http://www.uraia.org/en/library/inspiring-practices-catalogue/smart-santander/, accessed on 6.01.2019 (2017).

[40] WILLIAMS, T., In high-tech cities, no more potholes, but what about privacy?, The New York Times, https://www.nytimes.com/2019/01/01/us/kansas-city-smart-technology.html, accessed on 4.01.2019 (2019).

[41] ZOONIVERSE, https://www.zooniverse.org/about, accessed on 6.01.2019.

[42] ZOONIVERSE, https://www.zooniverse.org/projects/zookeeper/galaxy-zoo/stats, accessed on 15.01.2019.

[43] ZOONIVERSE publications, https://www.zooniverse.org/about/publications, accessed on 6.01.2019..