

INTELLECTUAL PROPERTY ISSUES IN MANAGING A SMART CITYTomasz SZEWC^{1*}, Szymon RUBISZ²

¹ Faculty of Organization and Management, Silesian University of Technology; tomasz.szewc@polsl.pl,
ORCID: 0000-0001-6326-4626

² Faculty of Organization and Management, Silesian University of Technology; szymon.rubisz@polsl.pl,
ORCID: 0000-0002-0999-5855

* Correspondence author

Purpose: The aim of the paper is to examine the specific issues concerning intellectual property protection in the development and functioning of smart city. The authors describe Polish law of intellectual property protection and interpret it in terms of actions carried out when the smart city is created, implemented, and then managed.

Design/methodology/approach: This work uses the formal and dogmatic method typical of legal sciences. It contains the content of legal norms and their interpretation, and is based on the analysis of the literature as well.

Findings: There are many areas where the law of intellectual property protection is directly related to acts taken when a city is transformed into smart city, covering the scope of copyright and industrial property. They are mentioned and analysed and their implications for city management are discussed.

Practical implications: We have shown what smart city managers should know from the scope of intellectual property regulations. This lets them to avoid infringement of someone else's intellectual property on the one hand and to be aware of how to protect the effort put into development work.

Social implications: The article enriches the theory both of legal sciences and management sciences. From the managerial point of view, it broadens the competences of local government managers. From a legal point of view, the work analyzes provisions on the protection of intellectual property in the context of reforming the city towards a smart city as well as of its functioning.

Originality/value: It is one of the few, if not the first, study in Polish literature dedicated to the issues of intellectual property protection in smart city.

Keywords: smart city, intellectual property, copyright, industrial property.

Category of the paper: research paper.

1. Introduction

The smart city concept is certainly an innovative approach to city management. Its creation is preceded by enormous intellectual work consisting in planning, designing, predicting and adjusting all elements of the already living city. It requires the cooperation of many actors including, above all, city authorities, business sector and citizens. The result of such collaboration is the creation of intellectual capital, including urban architecture, organizational resources, community qualities, intellectual property, etc. (Dameri, Ricciardi, D'Auria, 2014).

Smart cities generate huge amounts of data thanks to the extensive and constantly expanding network of devices connected to the system (cell phones, cameras, drones, service machines, personal computers, cloud computing) and sensors (motion, twilight, infrared, RFID). They support various types of services, such as monitoring, control and optimization of energy flow, intelligent transport systems improving urban traffic, parking systems, vehicles communicating with each other and with the city system, remote health monitoring programs, environmental monitoring sensors, information systems for cities' users, and more. This entire structure is controlled by dedicated software that coordinates the operation of the system through computer networks, including the Internet. Artificial intelligence and blockchain may also be involved in more advanced projects.

These issues raise questions about intellectual property, which seems to be a key component of a smart city. On the one hand, the very concept, design and related powers of the city, on the other hand, the implementation and use of already existing solutions, inventions and software. Therefore, when managing a city implementing the smart city concept, due to the particularly innovative nature of the ideas created and implemented, the multitude of entities participating in it, it is important to be aware of the legal conditions in relation to the possible scope of protection and the possible measures that may need to be taken to obtain this protection for the benefit of the city, as well as with regard to the rights of third parties. Hence the purpose of this study is to examine the specific issues concerning intellectual property protection in the development and functioning of smart city with the aim of pointing out some possible problematic issues.

2. The idea of smart city in modern world

There is probably no universally accepted definition of a smart city (Szymańska, Korolko, 2015; Baraniewicz-Kotasińska, 2017). A common interpretative approach is to focus pragmatically on the hardware and software aspects of technical infrastructure and its security: information systems, big data, Internet of things, sensors and beacons (Butt, Afzaal, 2019; Joy,

McGoldrick, Gerla, 2016; Al-Dhubhani, Mehmood, Katib, Algarni, 2018). This technological aspect is obviously an interesting field for engineers, IT and automation specialists, software developers. But ICT is not the only determinant of making city smart because there is also a soft side of the issue – a social side including economy, management, governance, natural resources, human capital, quality of life etc. Such a distinction can be seen in some works (Picon, 2019; Rudewicz, 2019; Tota, 2017).

The concept of smart city gives new tools for city management as an aggregate of objects, communication routes, population and relationships between them; Thanks to various types of innovative solutions, city authorities can make better decisions. Abosaq (2019) indicates that it is a combination of many different, integrated with each other small projects, which are joint initiatives of the public and private sectors. Barrionuevo, Berrone and Ricart (2012) say that the idea of a smart city is largely based on the integration of advanced information technologies in order to find intelligent solutions and obtain a better quality of life. Cretu (2012) also draws attention to the use of intelligent sensors, tools and data sets that are to support the improvement of quality of life. Thanks to this, communities living in such cities are to have a happy and healthy life guaranteed (Guan, 2012). There are also attempts to define the concept of smart cities through a multi-dimensional approach. According to Cohen (2011) it shall be based primarily on such areas as smart people, smart economy, smart environment, smart governance, smart living and smart mobility.

Thus, it can be concluded that the technologies in combination with large-scale data, machine learning incorporated into the city structure make it more efficient and interactive. They also leave their mark on the community by involving it in the city management process, raising awareness and improving people's standard of living. As follows from the classic definition of local self-government, it is the right and ability of local communities, within the limits set by law, to regulate and manage a substantial share of public affairs under their own responsibility and in the interests of the inhabitants (ECLSG, 1985). As a result, residents benefit from living in a well-managed city, which expresses their interest, i.e., the benefit they receive from the functioning of local government administration (Szewc, 2005). At the same time, the financial situation of the city is related to the number of inhabitants and their income, as a significant part of local income is made up of shares in income tax. As a result, the city is interested in attracting residents and the development of entrepreneurship, thanks to which they have more financial resources. Undoubtedly, one of the arguments when making decisions by individual people about moving to one or another town is the quality of life in it, i.e., the implementation of modern solutions.

So, the initiator of a smart city may be the city itself, especially when its authorities consciously agree with Kitchin's (2015) statement that it is a "path to socio-economic progress and better quality of life" and, perhaps, when they are aware of different political benefits. Apart from local government authorities, there is of course the business sector – global ICT companies and smaller suppliers, providing technological solutions and services. They rather

perceive the smart city from the angle of its business goals – the ability to easily reach customers with the most accurately addressed offer, sales opportunities, public contracts. Regardless of the perspective taken, however, technology and related innovations are of key importance in this matter. They are smart city enablers (Paquet, 2001). This, in turn, is related to the implementation of solutions that are some forms of intellectual property, the beneficiaries of which are cities and its users. Thus, these solutions create a space for interaction between authorities, businesses, citizens and other entities, and within its framework it comes to interesting issues related to intellectual property rights.

3. Scope of intellectual property and its role in smart city

Overview of the principles of legal protection should begin with a general observation, which shows that the discussed aspects of smart city are not material in nature, they are different concepts or ideas, which are then expressed in various types of documents and on the basis of these documents can then be implemented, produced or realized. Moreover, they are various types of goods that function in the digital world, are creative, inventive, novel and innovative. Even if there are physical goods in use, the idea behind them has an intangible, additional value, sometimes even greater than the good itself. As a result of the legal protection of the smart city elements, one should look for in the regulations establishing the protection of ideas, solutions, works and inventions. The rules of intellectual property law are such laws.

Intellectual property (IP) is most commonly associated with patents, trademarks and copyrights, that is, everything original and creative what a human can come up with (Kostański, Jyż, 2020). World Intellectual Property Organization (2019) defined IP as “creations of the mind: inventions, literary and artistic works, and symbols, names, images and designs used in commerce”. Generally speaking, these are all kinds of exclusive rights granted respectively to inventors and businesses as well as to authors, producers and publishers for protecting their inventions, business ideas or other intellectual resources. These rights are protected by the field of law, which covers two basic areas (from the point of view of this study): industrial property and copyright (which in continental law is called the authors' rights). Industrial property relates to inventive designs, trademarks and geographical indications. The above-mentioned inventive projects are inventions, utility models, industrial designs, topographies of integrated circuits and rationalization projects. Generally speaking, they rely on a technical solution to a specific problem. Another words industrial property includes the creator's right (“ownership”) to a certain intangible concept that can generally be used in industrial production, or even more broadly, in economic activity. Copyright law, on the other hand, regulates the protection of works, objects of related rights and an image of the person. However, the most important difference between the two legal regimes is the fact that copyright objects are automatically

protected, and the protection of industrial property must be preceded by a formal procedure. Finally, it is necessary to mention that the issue of intellectual property also includes the protection of databases.

Intellectual property is a relevant issue in the context of smart cities. In essence, their smartness is based on collecting, analysing and using data to improve city life and achieve goals mentioned before – for the benefit of both the city administration and city residents. So, first of all, it comes with an idea, concept and design of transforming the existing city into an intelligent one. This process requires the selection of implemented solutions, both technical and organizational, often the development of a long-term plan or action strategy, as well as the establishment of legal acts that are the basis for activities. All this leads to the need to consider the principles of legal protection of these ideas. In other words, we may wonder whether the thought and documentation created in this process could be subject to copyright protection? The problem of copying or imitating solutions, strategies and legal acts of one city by other cities may arise, which raises the question of possible ways of legal protection. For example, is the concept (strategy) of implementing a smart city subject to protection (e.g., Smart City Strategy – Vienna 2022)? Or devices used in a smart city (e.g., sensors, cameras), software (e.g., digital customer service system of the city hall), databases of collected information (e.g., water meter readings) and finally legal acts formalizing the adopted strategies.

Further issues arise when the smart city is already functioning. Let's remind that such a city works thanks to a variety of types of technologies, devices, sensors, counters and, of course, software. These, in turn, are very often covered by exclusive rights in the field of, respectively, industrial property law and copyright. After all, cities are mostly not independent and self-sufficient in such projects. They actually have to cooperate with private sector and frequently these are not just bilateral agreements, but more comprehensive and complicated contracts involving many different stakeholders and suppliers. Some kind of a conflict of interest concerning intellectual property can be seen here. On the one hand, these will be the economic interests of private entities wanting to protect their intellectual property and constantly earn money from it. On the other hand, there is the public interest in improving infrastructure, the quality of life etc., for which it is necessary to use innovative, elastic hardware and software technologies but sometimes even cultural goods, such as music. Finally, there are also citizens these facilities are meant to serve very often free of charge. An important issue, therefore, is the appropriate creation of agreements regarding the use of intellectual property and its licensing.

4. Copyright and related rights issues in smart city

There is no doubt that the smart city concept is an innovation in city management (Kidyba, Malinowski, 2017). The implementation of innovations, in turn, implies the need to generate intellectual property value. This applies primarily to the preparation of documentation or analyses, both preliminary and in the form of a detailed project. Considering that changes aimed at transforming a city into a smart city often require deep reforms in city management, they must begin with a certain idea, a general concept about the direction and scope of changes, drawn up in writing in the form of documentation, because smart city solutions are too complex to be content with merely verbal expression. Sometimes a need may arise to establish legal acts constituting a formal legal basis for the activities undertaken. On the other hand, the implementation may involve the production and installation of devices, software, data collection and their use. Due to the fact that the production of these values is often expensive (requires high qualifications) and time-consuming, cities may be interested in protecting them against their appropriation by other local government units.

Considering the initial stages of the smart city implementation process, taking the form of ideas, and then analyses, reports or even legal acts, it is possible to consider their protection under copyright law. This is due to the fact that a work is the primary object of protection, and the listed intellectual property values can be considered as works (Barta, Markiewicz, 2011). Polish Act on Copyright and Related Rights of 1994 (ACRR) defines work as every manifestation of a person's creative activity of an individual character, established in any form, regardless of value, purpose and manner of expression. A work defined in this way can be expressed in words, mathematical symbols, graphic signs; the works may be works of fine art, photographs or audio-visual works. However, the concept of a work and its protection is not absolute – they are subject to certain limitations and exceptions.

First, it concerns discoveries, ideas, procedures, methods and principles of operation, mathematical concepts. This means that the work is an expression of certain content that can occur in many ways, however, this expression must meet certain conditions as to its nature. At this point, the most important observation is that in the case of works, protection concerns the form itself, i.e., the way of expressing certain content or concepts (which should be understood primarily as the selection of words, photos), while it does not cover the ideas themselves. This leads to the conclusion that the concept of implementing a specific solution in the field of smart city is not protected and that subsequent towns may imitate the precursor of an idea, e.g., the concept of establishing city bike rentals. On the other hand, the moment an idea is clarified, written as a report, analysis, project, roadmap, strategy, etc., it begins to be expressed in a certain way and becomes a work. This is due to the fact that the author or authors of such a document adapt the idea to the specific conditions of a given locality and – most importantly from the point of view of the definition of the work – express it in a way

characteristic of them i.e., they present a certain individual style (Judgement, 2012). Thus, when compiled, it begins to fulfil the legal requirements of protection: such a document is creative (new to human achievements), has an individual character (expresses the style, character and personality of the creator) and is fixed, i.e., available to people other than the creator (Barta, Markiewicz, 2011; Późniak-Niedzielska, 2017).

Of course, there are more exceptions provided. Some categories of creativity are not considered as works and are explicitly excluded from protection. It is a fairly extensive catalogue from which, in relation to a smart city, exemptions from the protection of legal acts and their official projects, official documents, materials, signs and symbols as well as published patent or protection descriptions may apply (ACRR, Art. 4). These circumstances lead to the conclusion that the adoption of a specific regulation by one city does not exclude the adoption of an identical or even similar regulation by another city.

An important aspect of smart city are computer programs, which, for example, operate databases, collect information from sensors and process them, support the work of various devices, or to contact residents with the city hall. This raises the question about their protection. In the light of the law, computer programs are considered as works and are protected like literary works (ACRR, Art. 74 1.), which means that if a city is the owner of the rights to software (because, for example, it commissioned it), other cities cannot use this program without its consent. This consent can be granted, of course, for a fee or free of charge. It is also likely that the city will use the vendor's software or another available on the market. It is obvious that it will then do so on the basis of a general license. However, the problem may arise of the possibility of adapting the functionality of the program to the specific needs of the city, modifying these functionalities later, interoperability with other systems (closed resources), sharing data and their structure. This, of course, is associated with significant costs. However, one can also indicate a different option, namely the choice of software under the open-source license. Adaptation of such software to the city's needs is usually legally possible, as is its further development, the possibility of securing or ensuring cooperation with other systems, etc. At the same it is necessary to know that the open code of the basic version of the program is available to everyone and in this aspect, there are some issues regarding system safety and threat of attacks. Another issue that there are different types of licenses providing for different use and if a project would go beyond their framework, perhaps the extension of the license would not be possible at all.

The creation of related rights can be associated with the creation and functioning of smart city. These are various intangible goods, protected just like songs. Phonograms and videograms seem the most important from the point of view of the subject of consideration. A phonogram is the first fixation of the sound layer of the acoustic phenomenon or sequence of moving images, with or without sound, regardless of whether it is an audio-visual work (ACRR, Art. 94 1.). A characteristic feature of smart city is that their monitoring is very extensive, in the form of a camera system. Recordings from such cameras are videograms (ACRR,

Art. 94 2.) because they record the course of certain events (phonograms will occur rather sporadically, although such a possibility cannot be ruled out). Such phonograms and videos are also subject to legal protection for their producers.

Databases may be another subject of protection in smart city. The database is a set of data or any other materials and elements collected according to a specific systematics or method, individually available in any way, including electronic means, requiring a relevant to the quality or quantity, investment expenditure to prepare, verify or present content (DBA, Art. 2 1.). So, it is a set of data that can be different types (e.g., information about the air temperature, subsequent monitoring recordings, car traffic information, the level of filling in public transport, etc.), which are arranged according to a specific systematics. In addition, it is necessary to incur expenditure on gathering this data. These outlays can be both quantitative (e.g., spending time to search for information or financing the appropriately capacious disk spaces) and qualitative (which means the features of the base or qualifications of the creators). It should be mentioned here that a database may also be a work and be subject to copyright, however, this only applies to databases that are creative in terms of the selection or compilation of materials (DBA, Art. 1). Typically, however, the database is organized according to commonly accepted criteria, such as alphabetical or chronological, which are self-explanatory and not creative. Then the rights to such a database are vested in the producer.

In this case, the city can be a producer (if it commissioned the creation of such a base) or a user if it uses a database made by someone else, e.g., available on the market. In the first case, only the city will be entitled to download data from the database and secondary use in whole or in a significant part. When it comes to the use of the database by other cities, two situations should be distinguished here. Firstly, it will be used with the consent of the city that created the database, which requires the conclusion of a rental or lending agreement) or making the database available on a computer network, or without consent, if it takes place within an institution called fair use or permissible use as provided by Polish law. As the name suggests, it includes situations in which the use of the database is allowed and the possible lack of consent of the database manufacturer is irrelevant here. These are different cases from which the application of the law of citation may be considered for the implementation of a smart city. The right to quote covers the use of the database (even in a significant part) for illustration, teaching and research purposes, provided that the source is indicated and the database is used non-commercially (DBA, Art. 8 1.). Thus, it is possible to imagine a situation that when developing analyses, a city will use a database of another city that has already implemented a specific smart city strategy for research or illustration purposes.

When it comes to a database, it is worth mention the data themselves. They can have a very different character. In smart city it will be different information from neutral numerical statistics (traffic, use of infrastructure) to images and personal data, including sensitive (monitoring, tracking). Especially the collection of the latter raises specific concerns about basic rights, such as the right to privacy (Rubisz, 2020). In this paper, we won't actually raise the issue of personal

data, nevertheless it is worth mentioning that a special regulation on the level of the European Union is provided, i.e., the General Data Protection Regulation of 2016, as well as constitutions and national laws, which include these sensitive spheres of human life with due protection. From the point of view of intellectual property law, an interesting question is, for example, who owns the collected data? The answer to this question is of key importance in the context of the aforementioned actors who create and manage a smart city. They will want to know what was created, by whom, thanks to whose solution and who has the right to such information, especially if it is a product that can be protected by copyright. Municipal agreements with the private sector should regulate these issues by defining the status of collected data as public (which does not mean that all of them should be generally available), as well as setting the limits of their use, taking into account the public interest balanced with business goals.

5. Industrial property issues in Smart City

The implementation of the smart city concept often requires the design of various devices or, more broadly, the creation of technical methods of solving various problems, e.g., mobile health monitoring equipment (Winkowska, 2021). The technical thought contained therein will be protected as intellectual property, but on different terms depending on the category. And so, from the legal point of view, a technical solution may be an invention, utility model, topography of an integrated circuit, or finally a rationalization project.

According to the universal legal norms concerning industrial property, an invention is a technical solution that is new, has an inventive step and is suitable for industrial use (IPL, Art. 25-27). In other words, a given solution cannot be known anywhere else in the world before, it must be ground-breaking and surprising even for a skilled person, it cannot be a cliché or routine use of technical knowledge, and the invention must be possible to implement in industrial production, regardless of its type. It is worth knowing that there are different categories of inventions: products (substances or mixtures), devices (e.g., machines), methods (production methods) and applications (new uses of already known substances). If the invention meets the above criteria, the inventor may formally seek an exclusive right to use the invention, e.g., for commercial purposes. A patent, because this is what we are talking about, is a document confirming this exclusivity for a specified period of time (max. 20 years), provided that regular payments are made. However, in a situation where a given solution is not patentable, the inventor can use the procedure intended for utility model. It's also a new technical solution, however, it is required to refer to the shape, structure or composition of an object in a permanent, material form (IPL, Art. 94 1.). Instead of the requirement of an inventive step, a utility condition appears here, which means satisfying the needs so far not satisfied by any device, or satisfying them to a greater extent. Satisfying needs should be understood here

broadly, not only as covering the use, but also as arising at the production stage, e.g., making it cheaper or accelerating it. For this reason, utility models are called "small inventions" as less technically significant (Wojcieszko-Głuszko, 2020).

Taking into account the specificity of a smart city, it seems that it will most often use solutions that are devices. We can think of some examples, like a novel sensor (sensor capable of measuring soil moisture allowing to optimize the use of water in public squares and parks), inventive connectivity mechanisms (public transport, security alerts), new ways of processing information, etc. They may use modern information technologies like machine learning, artificial intelligence, blockchain, cloud computing, collecting and sharing data with highest bandwidth via LTE and 5G mobile networks (since 2021 LG Electronics is testing 6G network which allows 1TB/s data transfer). It may be added here that if the device uses a computer program to operate as intended, such a program can then be protected as part of the invention. The development of this type of products certainly requires enormous resources, extensive R&D departments and significant financial outlays.

It turns out that patenting smart city solutions has been quite common for over a dozen years (Statista, 2020). Asian companies are in the lead here: Japanese (Denso, Panasonic, Toyota), Korean (LG, Samsung) and – the most numerous – Chinese (Huawei; State Grid Corporation of China was the worldwide biggest owner of active smart city patent families, more than 7000). Such, sometimes global, companies compete with each other looking for various possibilities of obtaining a monopoly for a specific solution for a smart city, using various tricks (e.g., linguistic, legal) to convince others that their idea is not obvious, and therefore meets the criteria for obtaining an exclusive right. Moreover, they carefully research the market and protect their interests against unauthorized, unlicensed use of their patented solutions. They are also experienced in protecting these interests through the courts in various jurisdictions. The city, when designing and implementing intelligent solutions, building infrastructure, using devices and methods, must therefore be aware that these may be subject to patent or similar protection. In such a situation, it is therefore necessary to properly prepare for the need to conclude appropriate license agreements or to adopt a more complex model of cooperation with rightsholders.

However, the willingness to patent one's solutions is not only the domain of great players. Local actors in the private sector compete with each other in smart cities. They are well aware of the potential value of technologies that cities are equipped with, hardware and software solutions and the use of the Internet of Things, so they will certainly want to protect their interests and secure a profit in exchange for investments in innovation. Contractual provisions adopted under the smart city project should provide opportunities to protect innovative companies, although obtaining exclusive rights under industrial property law and the desire to license solutions to other cities may become part of their strategy.

The above overview shows that the technical solutions must meet relatively high requirements, for example in terms of novelty and for bringing a certain added value to the technique, whether in the form of an inventive step, non-obvious or usefulness. These conditions eliminate the possibility of protecting minor improvements. The legislator anticipated such a situation and created a category of rationalization projects including all other solutions that could be used, but not meeting the premises of a protected solution. Thus, rationalization projects do not benefit from the *erga omnes* protection, but can only be protected as a trade secret or a contractual secret (i.e., regulated in an agreement obliging to keep the confidentiality). The legal regulation of such projects only emphasizes the right of their authors to remuneration, however, on condition that rationalization regulations are established in a given entity.

As we mentioned before, one of the arguments when making decisions by individual people about moving to one city or another is the quality of life in it. A modern and intelligent city attracts even more. It can therefore be assumed that smart cities would be interested in having distinguishing features that would easily identify them, the content of which would indicate its modern character. In a word, they would be interested in having a logo with which they could promote and stand out (e.g., the city of Wrocław has the Smart City Wrocław logo, THE SMART CITY word mark of Beverly Hills). And this conclusion leads to the need to consider another subject of industrial property law, which are trademarks.

A trademark is a sign that enables to distinguish the goods or services of one enterprise from the goods of another enterprise and can be presented in the register of trademarks in a way that allows for the determination of an unambiguous and precise subject of the protection granted (IPL, Art. 120 1.). In the case of a smart city, one can therefore consider a service mark. When explaining the definition, it can be indicated that the design of such a mark must ensure distinctive and representational ability (Trzebiatowski, 2020). The first concerns the functioning of the mark in market trading. In this sense, such a mark is not only an emblem that a given entity uses when presenting its offer, but covers the entirety of information and ideas about a product distinguished by this sign among goods of the same type (Skubisz, 2001), intended to evoke certain associations among buyers, such as of course, *mutatis mutandis* can be applied to the services provided by the smart city administration. The second ability – representational, concerns the preparation of documentation in order to obtain a sign protection as a result of registration at the patent office. Such a sign should be independent and uniform. Independence is differently the separateness of the sign from the characteristics of the goods or service to which it refers, e.g., a sign of smart city cannot be a photo of a city landscape (IPL, Art. 129¹ 3.), but it can be stylized by the graphic contour of city buildings. In turn, uniformity is a conciseness or shortness of the sign – the sign cannot be too complex and difficult to take with one cognitive act. So, a trademark is a great marketing tool which can be used by a city to promote itself as smart and great for living. Therefore, more and more cities in the world, which can boast of their smartness, take action promoting their brand.

6. Conclusion

The above analysis of the basic issues related to intellectual property and the smart city concept proves that the implementation and operation of a smart city requires the production and use of intellectual property resources. It also shows that it is a broad topic with different treads. They can be also examined in detail in other works. It is clear that exclusive rights can affect many different aspects that are relevant to smart city technology. It also seems obvious, and one can agree with Shapiro (2020), that the future of smart cities will depend on intellectual property and its elements.

Designing a modern and well-managed city is not only time-consuming, but also requires high qualifications and high expenses. On the other hand, using the effects of someone else's work is relatively simple and usually comes down to copying it. As a result, it is worthwhile for local officials and politicians managing the city to be aware, on the one hand, of the possibility of protecting the expenditure incurred, and, on the other hand, of the risk related to unlawful infringement of someone else's intellectual property rights, in case of taking shortcuts and appropriating the results of someone else's work. Cities must adapt to this, but at the same time they should remember to focus on the goal. They must take care of properly constructed contracts, pay attention but also create clear licensing rules, and at the same time not be limited to one supplier and ensure interoperability.

Works, databases, phonograms and videograms created in the process of implementing smart city concept are subject of copyright or related rights protection. However, it is worth considering that the law protects only the way of expressing certain content or concepts while it does not cover the ideas themselves. So the concept of implementing a specific solution in the field of smart city is not protected and that subsequent towns may imitate the precursor of any idea. There are also exemptions from the protection of legal acts and their official projects, official documents, materials, signs and symbols as well as published patent documentation. This means that the adoption of a specific regulation by one city does not exclude the adoption of similar or even identical regulation by another city.

The city should also grant protection or buy rights to devices used to implement the idea of smart city. A trademark of a smart city can be also protected. Unfortunately, minor improvements can't be protected *erga omnes* as inventions or utility models. They can be only rationalization projects and have a status of a trade secret or a contractual secret (protection *inter partes*). It means that when revealed, they can be used by everybody.

References

1. Abosag, N.H. (2019). Impact of Privacy Issues on Smart City Services in a Model Smart City. *International Journal of Advanced Computer Science and Applications, Vol. 10, Iss. 1*, pp. 1-9.
2. Act on Copyright and Related Rights (ACRR) (1994). Journal of Laws of the Republic of Poland.
3. Al-Dhubhani, R., Mehmood, R., Katib, I., Algarni, A. (2018). Location Privacy in Smart Cities Era. In: R. Mehmood, B. Bhaduri, I. Katib, I. Chlamtac (Eds.), *Smart Societies, Infrastructure, Technologies and Applications* (pp. 123-138). *SCITA 2017, LNICST, Vol. 224*. Cham: Springer.
4. Baraniewicz-Kotasińska, S. (2017). Smart city. Ujęcie nowych technologii w koncepcji inteligentnego miasta. *Nowoczesne Systemy Zarządzania, Vol. 12, No. 3*, pp. 29-40, doi: 10.37055/nsz/129410.
5. Barrionuevo, J.M., Berrone, P., Ricart, J.E. (2012). Smart Cities, Sustainable Progress. *IESE Insight, Iss. 14*, pp. 50-57.
6. Barta, J., Cwiakalski, Z., Czajkowska-Dąbrowska, M., Markiewicz, R., Traple, E. (2011), *Prawo autorskie i prawa pokrewne. Komentarz*. Warszawa: Wolters Kluwer.
7. Butt, T.A., Afzaal, M. (2019). Security and Privacy in Smart Cities: Issues and Current Solutions. In: A. Al-Masri, K. Curran (Eds.), *Smart Technologies and Innovation for a Sustainable Future. Advances in Science, Technology & Innovation* (n. pag.). Cham: Springer.
8. Cohen, B. (2011). The Top 10 Smart Cities On The Planet. *Fast Company*. Retrieved from <https://www.fastcompany.com/90186037/the-top-10-smart-cities-on-the-planet>, 10.09.2022.
9. Dameri, R.P., Ricciardi, F., D'Auria, B. (2014). Knowledge and intellectual capital in smart city, European Conference on Knowledge Management. *Kidmore End, Vol. 1*, pp. 250-257. Retrieved from https://www.proquest.com/openview/bb3467d3f57bc1f84174_f313a7cd1469/1?pq-origsite=gscholar&cbl=1796412, 10.09.2022.
10. Database Protection Act (DBA) (2001). Journal of Laws of the Republic of Poland.
11. European Charter of Local Self-Government signed on 15 October 1985, Council of Europe (1985).
12. Guan, L. (2012). Smart Steps to a Battery City. *Government News, Vol. 32, No. 2*, pp. 24-27.
13. Industrial Property Law (IPL) (2000). Journal of Laws of the Republic of Poland.
14. Joy, J., McGoldrick, C., Gerla, M. (2016). Mobile Privacy-Preserving Crowdsourced Data Collection in the Smart City. In: *Scientific Challenges in Data and Event-driven Smart City Service and Applications* (SDESS 2016), Irvine. Retrieved from

- https://www.researchgate.net/publication/305186333_Mobile_Privacy-Preserving_Crowdsourced_Data_Collection_in_the_Smart_City, 10.09.2022
15. Judgement of the Court of Appeal in Katowice of October 9, 2012, Case V ACa 175/12.
 16. Kidyba, M., Malinowski, Ł. (2017). *Smart City. Innowacyjne rozwiązania w administracji publicznej a zarządzanie inteligentnym miastem*. Chorzów: Wyższa Szkoła Bankowa w Poznaniu.
 17. Kitchin, R. (2015). Making Sense of Smart Cities: Addressing Present Shortcomings. *Cambridge Journal of Regions, Economy and Society, Vol. 8, Iss. 1*, pp. 131-136.
 18. Kostański, P., Jyż, G. (2020). In: J. Sieńczyło-Chlabcz (Ed.), *Prawo własności przemysłowej. Komentarz* (pp. 3-65). Warszawa: C.H. Beck.
 19. Paquet, G. (2001). *Smart Communities and the Geo-Governance of Social Learning*. Ottawa. Retrieved from: <http://gouvernance.ca/publications/01-02.pdf>, 10.09.2022.
 20. Picon, A. (2019). *EDPL, Vol. 5, Iss. 2*, pp. 154-155, doi: 10.21552/edpl/2019/2/4.
 21. Późniak-Niedzielska, M. (2017). Przedmiot prawa autorskiego. In: J. Barta (Ed.), *System prawa prywatnego, t. 13, Prawo autorskie* (pp. 7-85). Warszawa: C.H. Beck.
 22. Rubisz, S. (2020). Some Issues with the Right to Privacy in Smart Cities. *Scientific Papers of Silesian University of Technology. Organization and Management Series, Vol. 147*, pp. 237-246, doi: 10.29119/1641-3466.2020.147.18.
 23. Rudewicz, J. (2019). Przemysł i technologie wobec wdrożenia wizji miasta inteligentnego (smart city) [Industry and Technologies in the Context of Implementing Smart City Concept]. In: *Studies of the Industrial Geography Commission of the Polish Geographical Society, Vol. 33, Iss. 4*, pp. 195-212, doi: 10.24917/20801653.334.12.
 24. Shapiro, A. (2020). 'Embodiments of the invention': Patents and urban diagrammatics in the smart city. *Convergence: The International Journal of Research into New Media Technologies, Vol. 26, Iss. 4*, pp. 751-774, doi: 10.1177/135485652094180.
 25. Skubisz, R. (2001). Funkcje znaku towarowego, In: *Księga pamiątkowa z okazji 80-lecia rzecznictwa patentowego w Polsce*, pp. 222-242. Warszawa: Pirpat.
 26. *Smart City Strategy*. Retrieved from: <https://smartcity.wien.gv.at/en/approach/>, 10.09.2022.
 27. Statista (2020). *Largest smart city patent owners worldwide from 2011 to November 2020, by number of active patent families*. Retrieved from: <https://www.statista.com/statistics/1032965/worldwide-smart-city-patent-owners-trend/>, 10.09.2022.
 28. Szewc, T. (2005). *Dostosowanie prawa polskiego do zasad Europejskiej Karty Samorządu Terytorialnego*. Katowice-Bydgoszcz: Branta.
 29. Szymańska, D., Korolko, M., (2015). *Inteligentne miasta – idea, koncepcje i wdrożenia*. Toruń: Wydawnictwo Naukowe UMK.
 30. Tota, P. (2017). Smart City – Accessible City. Newest urban technologies as a framework of universal design. *Środowisko Mieszkaniowe, Vol. 19*, pp. 4-12.
 31. Trzebiatowski, M. (2020). In: J. Sieńczyło-Chlabcz (Ed.), *Prawo własności przemysłowej. Komentarz* (explanations to art. 120-129). Warszawa: C.H. Beck.

32. Winkowska, J. (2021). Analiza wdrożeń smart city w Polsce i na świecie. *Akademia Zarządzania, Vol. 5, Iss. 3*, pp. 207-224.
33. Wojcieszko-Głuszko, E. (2020). In: J. Sieńczyło-Chlabicz (Ed.), *Prawo własności przemysłowej. Komentarz* (explanations to art. 94-106). Warszawa: C.H. Beck.
34. World Intellectual Property Organization (2019). *World Intellectual Property Indicators 2019, Vol. 1*, Geneva: WIPO.