



CRITICAL ANALYSIS OF APPROACHES TO SMART ECONOMY

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Abstract. The article comprises the critical analysis of the theoretical aspects of the concept of smart economy. This article includes analysis of the structural components of smart city, the presentation of variety of definitions of smart economy, used in scientific articles and strategic documents, the identification of development factors and conditions, necessary for smart economy. The theoretical discussion of the main features of the smart economy, under the aspects of the increase of the long-term urban and national competitiveness seeks to answer the question – is the smart economy in the city is achievable in practice or is only the theoretical myth. This article is the first of the articles' complex, appointed to the research of the concept of smart economy and it's conditions measurement in Lithuania. This research is funded by the European Social Fund under the Global Grant measure.

Keywords: smart economy, smart city, national and urban competitiveness.

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1. Introduction

The scientific literature highlights that although cities occupy about 1 percent of continental land, but they concentrate more than half the world's population and generate more than half of the global economy: about 67 percent of global and about 85 percent of the European Union's gross domestic product. Globally, there are about 700 cities, each with population exceeding 500,000, whereas the top 25 cities of the world today account for half of the world's wealth. The fact that cities began to make an increasing effect on the economy of individual regions, countries or even on global economy has encouraged researchers to look for the causes of such a phenomenon and develop strategies for further increase in individual cities' effect. Ever since the early 1990's, scientists began to describe cities in various terms, allowing to distinguish the city's competitive advantage: learning, digital, ubiquitous, cyber, mobile, Hi-Tech, innovation, knowledge, innovative, agile, intelligent, science, intellectual, livingLab, creative, human, social, ecological, green, zero-carbon, zero-waste, zero-energy, nature friendly etc. Recently, the concepts of a smart city and simultaneously of a smart economy are particularly often included in the most recent scientific literature and various EU and individual national strategic documents.

It is projected that over 40 global cities will come as Smart Cities by the year 2020. By various measurement, such cities as Vienna (Austria), To-

ronto (Canada), Paris (France), New York (USA), London (Great Britain), Tokyo (Japan), Berlin (Germany), Copenhagen (Denmark), Hong Kong (China), Barcelona (Spain), Songdo IBD (South Korea), Masdar City (Abu Dhabi) and others are attributed to global smart cities, characterized by the growing and making an increasing impact on the regional, national or global economy: sustainable and inclusive growth, renewable energy, smart buildings, smart transportation and healthcare, broadband connectivity, balance between green and covered spaces, innovation, sustainability, smart city operations, smart commercial places, etc. Although the first Lithuanian city that began to use the smart approach, as a means of publicity and promotion, is Druskininkai, however, among Lithuanian researchers and practitioners the smart city concept, and simultaneously the concept of a smart economy, has so far received little attention. Although in many cases the smart city concept is used at the urban vision or strategic objectives level and / or as the city image building and marketing tool, but so far, the smart city and smart economy concepts are quite complicated and overlapping with other definitions, used for describing the city and economy.

So far the link between the smart city and smart economy is not revealed yet. It remains unclear whether the city is smart due to a smart economy, or a smart economy determines a smart city. Given the fact that the city is a complex economic, social, infrastructural, technological, political, cultural, natural - ecological system consisting

of interconnections between a number of internal and external components of a system and performing various profile functions, the analysis of the smart city concept is extremely complicated and complex. In order to fully understand the specificity of a smart city, it is important to examine in detail individual components of the smart city. One of the main components of the smart city, on which, at more or less extent, other structural components of the smart city are dependant, involves smart economy. Thus, the absence of a clear smart city concept among both scholars, politicians and businessmen does not allow to sufficiently precisely understand the specificity of a smart city and direct strategically targeted actions for strengthening the competitive position of a city in competition with other cities for human capital, tourists, investment, innovation, very important projects and other resources, as well as the improvement of living, working, learning and business conditions within the city. Therefore, smart economy in the context of the smart city concept requires additional economic discussions and justifies the relevance, timeliness and novelty of analysis on this topic in Lithuania.

The aim of the article - to conduct theoretical analysis of the smart economy concept within the smart city context and provide critical aspects of the smart economy concept, essential for the formulation and implementation of strategic measures aimed at enhancing the smart urban economic growth.

Research methods: systematic, logical and comparative analysis of concepts published in the scientific literature.

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2. Smart economy in smart city

According to A. Abdoullaev (2013), the smart city concept is the new socio-technological paradigm and advanced economic model for sustainable growth in the 21st century, the century of cities. In the scientific (Chourabi *et al.* 2012, Lombardi 2011, Van Soom 2009, Shapiro 2008, Giffinger *et al.* 2007) and applied literature and in the strategies of individual cities, the smart economy is closely related to the smart city and identified as an important structural component of a smart city. The authors introduce various composite structures of the smart city. P. Lombardi *et al.* (2011), INSEAD (2011) distinguish five blocks of a city smart: smart governance, smart human capital,

smart environment, smart living and smart economy. Y. Yi-Yuan (2010) distinguishes smart services instead of a smart living. Other authors (Cohen 2012, Giffinger *et al.* 2007, Vienna University of Technology, and Centre of Regional Science 2007) further distinguish one more component - smart mobility. All of these components are based on the traditional regional and neo-classical urban and economic growth theories, which focus on the urban regional competitiveness (within the smart economy component), transport and ICT development (within the smart mobility component), the sustainable use, protection and preservation of natural resources (within the smart environment component), human and social capital development (within the smart people component), promoting the quality of life (within the smart living environment component) and the citizens' participation in urban governance and public services development (within the smart government component). H. Chourabi *et al.* (2012), S. Alawadhi *et al.* (2012) identify eight components: governance and organizations, technology, government, policy, people and communities, economy, the developed infrastructure and natural environment. S. Dirks, M. Keeling (2009) noted that a smart city consists of the urban (public) services, residents, business, transport, communication, water and energy supply systems. P. Nijkamp, K. Kourtik (2011) argued that in the Joint Programming Initiative 'Urban Europe' smart city was approached as the whole of a connected (smart logistics and sustainable mobility), entrepreneurial (economically viable), suitable for living (ecological sustainability) and pioneering (social participation and social capital) city. A. Abdoullaev (2013) highlights that the trinity city, or 3.0 City as the "Smart Sustainable City consist of Eco city/ town/ community, Digital city/ town/ community and Social city/ town/ community, with smart economy inside.

Although different authors introduce different constituent structures of a smart city, but they all identify the smart economy component as a separate unit. In addition, all of them maintain that each component affects others and is affected by other components. Although most commonly in the scientific literature, all the identified components are treated as equivalent, H. Chourabi *et al.* (2012) points out that separate smart city components, in different periods and under certain conditions, have a different impact on both the rest of the components and the smart city initiative itself. The authors classified the smart city components into: external, i. e. which is stronger and faster affected by the smart city initiatives, and internal, i. e. which are less and slower exposed to the smart

city initiatives. It is the economic component, that the latter authors attributed to external factors (as well as the government, people and community, natural environment, infrastructure), which can be frequently used in the smart city-building, and is likely to be more exposed to the smart city success than the internal factors.

In spite of different researchers' approaches to the concept of a smart city, the smart economy remains one of the key drivers of the smart city and one of the smart city indicators, because the city, characterized by high economic competitiveness, is assigned to smart cities. Thus, the importance of the smart economy for the smart urban growth justifies the priority of the concept analysis over other structural components of the smart city.

3. Diversity of the smart economy definitions

Studies have revealed the absence of the unanimous and generally accepted definition of the smart economy. In the scientific literature and in various strategic documents, the smart economy, depending on the authors' approach to the smart city concept and its constituent components and the context of problematic issues, defined and described the smart economy in different ways. In general, smart economy involves what is smartly created or achieved by enterprises, while generating new ideas and gaining more with less cost. Although this definition is short, it does not reveal the specificity of the smart economy. Therefore the authors continued to introduce more elaborate definitions of the smart economy, revealing its specificity (see Table 1).

Summarizing the definitions provided in Table 1, it can be argued that each of them contain both differences and similarities. Some researchers, in defining the smart economy, majorly focus on its characteristics (e.g. flexible and able to compete globally), others focus on the principles of the smart economy operation (e. g. employment of information and communication technologies (ICT), innovation, networks), others distinguished the results of a smart economy (e. g. high added value, new models of cooperation, new jobs), while others - the economy's response to changing external conditions (e.g. ability to overcome economic challenges, ability to transform). Despite of different elements of this description, all of them are acceptable if they allow revealing specificity of the smart economy.

A number of researchers focus on the employment of information and telecommunication technologies use in various urban functional systems and overall economic sectors, and namely the

employment of ICT, as a means to ensure economic development and the competitiveness, is distinguished as the smart economy characteristics and allows to separate it from the digital economy. According to Yi -Yuan (2010), implementation of IT systems in enterprises and the impetus for innovation creation in the industry is mandatory for the smart economy. Bilbao, The Committee of Digital and Knowledge Based Cities of UCLG (2012) linked the smart economy with 'smart' industries, especially in the field of ICT, as well as with other industries, with extensive use of ICT in manufacturing processes. In the INSEAD (2011) prepared report the smart economy is attributed to the creation of new businesses, ensuring access to a broadband connection at home and in businesses, assistance for rural residents by providing them with opportunities to develop their business outside urban areas, the employment of electronic tools in overall business processes, e.g. e-banking, e-commerce, e-auctions. However, in the last few years, it has been noted that scientists do not so strongly emphasize the importance of ICT for the development of the smart economy, and the increasing attention is attached to the 'soft' factors - smart, including not only technological, but also managerial solutions or ideas, knowledge and innovation. P. Preston, S. Sparviero (2010), citing the smart economy strategic document prepared by the Irish government in 2008, emphasized the importance of innovation or ideas, knowledge, skills and creativity of human capital for the economy and distinguished the following characteristic feature of the smart economy: the ability to efficiently transfer ideas to valuable processes, products and services. Moreover, the increasing role in defining the smart economy is played by one of the composite components of sustainable development - environmental sustainability, which is the basis for the "green" economy. L. Batagan (2011), while analysing the sustainable development models within the smart urban development, argued that in order to ensure a smart and sustainable urban growth, an efficient use of resources is important, which can be achieved through knowledge and innovation. P. Preston, S. Sparviero (2010) emphasized the importance of the 'green enterprises' for the smart economy. A. R. Davies, S. J. Mullin (2011), maintaining that the smart economy is a green economy, recognizes that the climate change is directly related to the protection of energy sources, and the smart economy encourages the reduction of carbon dioxide emissions in the industry and proposes to invest in a 'clean economy'.

Table 1. Definitions of the Smart Economy (source: compiled by author)

Author	Definition/Description
T. Bakici <i>et al.</i> (2013)	Smart economy involves the establishment of innovation clusters and mutual cooperation between enterprises, research institutions and the citizens in order to develop, implement, and promote innovation through these networks.
S. Zygiaris (2013)	Smart economy is an ability to employ the existing resources for the development and implementation of innovative solutions.
A. V. Anttiroiko <i>et al.</i> (2013)	Smart economy is a networking economy, developing new cooperation models in production, distribution and consumption.
Lithuania's Progress Strategy „LITHUANIA 2030“ (2012)	Smart economy is the economy that is flexible and able to compete globally [openness], generating high added value, based on knowledge, innovations entrepreneurship [creativity] and social responsibility and “green” growth [responsibility].
National Progress Program for the period 2014 - 2020 (2012)	Smart economy includes a favourable environment for economic growth and a high value added-oriented integral economy.
S. Alawadhi <i>et al.</i> (2012)	The economy of a smart city distinguishes by the ability to overcome economic challenges, create new jobs, establish new businesses and increase regional attractiveness and competitiveness.
S. Auci, L. Mundula (2012)	Urban efficiency is identified with the city's intelligence, as an effectively operating city attracts and maintains a skilled work force, new businesses, students, tourists and residents.
A. Ariffin (2012)	Smart economy is competitive in the spheres of innovation, entrepreneurship, intellectual property, efficiency and the labour market flexibility and integrates in global markets.
A. R. Davies, S. J. Mullin (2011)	Smart economy is a green economy; it encourages reduction of the amount of carbon dioxide in industry and suggests investing in the ‘clean economy’.
R. Giffinger (2011)	Smart economy is related to economic competitiveness and involves innovation, entrepreneurship, economic image, efficiency and the labour market flexibility, integration in local and international markets as well as the ability to transform.
S. Dirks, M. Keeling (2009)	Smart business (economy) includes the employment of information technologies and telecommunications in the companies' activities, new smart business processes and a smart technology sector. Smart business is characterized by business growth, job creation, improvement of the staff's qualification and efficiency gains.
A. Caragliu <i>et al.</i> (2009)	Smart economy is a sustainable and growing economy.
H. Schaffers <i>et al.</i> (2011) The Irish Government (2008)	Smart economy combines the enterprise economy and innovation or the ‘Ideas’ economy. Smart economy is characterized through the use of human capital - knowledge, skills and creativity, transforming ideas into valuable processes, products and services. Smart economy also focuses on the creation of the ‘green economy’ by developing “green companies” (promoting the employment of renewable energy sources, increasing the energy efficiency, based on its needs and reduction of costs).
R. G. Hollands (2008)	Smart economy involves the economy, which is characterized by businesses-leaders, creating a favourable business environment in the city in order to attract new and retain the existing businesses. An important role in the long-term urban growth is played by high technology and creative industries and a “soft” infrastructure (knowledge networks, voluntary organizations, free of crime environment, after dark entertainment economy).
L. Torres <i>et al.</i> (2005)	Smart economy involves the knowledge economy, where innovation and technologies are considered as the most important driving force.

N. Tikhomirova *et al.* (2011) distinguished the goals of the smart economy which themselves reveal characteristic features of the smart economy:

- To restore and maintain a sustainable economic growth after the global crisis (i.e. sustainable growth);
- To ensure high productivity (i.e. high productivity);
- To promote the innovative business environment (i.e. implementing innovation);

- To develop and adopt new ideas and knowledge for the economic and social progress (i.e. knowledge economy);

- To develop a knowledge-intensive sectors and industries (i.e. knowledge economy);
- To create the ‘green economy’ and develop the green information and communication technologies (i.e. the green economy);
- To ensure social cohesion (i.e. sustainable development);

- To develop the innovative ecosystem (i.e. implementing innovation);

- To install smart energy systems in all economic sectors (i.e. a saving, using efficiently).

A. Ariffin (2012) emphasized that the smart economy should not only focus on ensuring the local urban well-being, but also economically trigger and involve the peripheral regions of the country in the smart economic growth process, focusing on the 'green' technologies and ICT.

From the above definitions it is possible to generally distinguish common characteristics of the smart economy, which, as a set, allow revealing its specificity:

- Innovation and knowledge economy: implementation of innovation, increasing productivity and reducing costs, in all sectors of the economy;

- Learning economy: the learning is the most important process in all spheres of economy.

- Digital economy: widespread employment of information and telecommunication technologies in the economy;

- Competitive economy: the ability to compete globally and be open. Employing knowledge and innovation, a competitive battle is going on, based on higher profits, productivity, quality, resources cost efficiency and cost (especially overhead cost) and waste reduction.

- Green Economy: implementation of the sustainable development principles, focus on creating a free of pollution 'clean' economy and the efficient consumption of energy resources;

- Network economy: development of the competencies networking between universities, business and government.

- Socially responsible economy: enterprises and organizations are characterized by economic, ethical, legal and philanthropic responsibility.

In spite of various characteristics attributed to the smart economy, the smart economy can be comparable to the competitive economy on a global scale, however, it is emphasized that the knowledge economy concept is broader than the concept of a competitive economy and it involves the competition mode – the knowledge and innovation-based economy, the focus on sustainable development and the green economy, etc.

4. Factors and conditions for the smart economy development

The smart economy approach is multicriterial, which leads to a complexity of the definition itself. Aiming to provide a clear and elaborate definition, it turns out that 'everything determines everything'. It remains unclear whether the economy is

smart because, for example, it is competitive and is characterized by high performance, or whether it is competitive and is characterized by high productivity due to the fact that it is smart. In order to conduct a more detailed analysis of the smart economy approach, it is appropriate to conduct the analysis of factors that determine the development of a smart economy. However, due to the complexity of interconnection between the smart economy factors and the confusion in determining the 'input – outcome' causal relationship, the smart economy should be best approached as a continuous and self-reinforcing process (not the result), the result of which is converted into input, which then leads to the result. Thus, at any given period of time, the city or region has such a combination of the smart economy factors, which is inherited from the previous period and which, at the given period of time, is affected by both the internal and external urban factors. These factors interaction creates a new combination of the smart economy factors, which is further used for the smart economy development, and at the same time, for promoting urban competitiveness. It is important to emphasize that the smart economy development process may develop in the opposite direction: in case the city fails to make smart decisions, adapt to changing conditions and employ the existing or newly developed factors of the smart economy. So, the smart economy can be seen as the ability to be competitive, adapt to the changing environment and employ the available resources for the development and implementation of innovative solutions. This means that the smart economy is a living system, whose development is determined by a variety and abundance of factors.

The scientific literature identifies various factors of the smart economic development which, due to the confusion in determining the 'input – outcome' causal relationship, can often be described as conditions or symptoms of the smart economic development. P. Preston, S. Sparviero (2010) argued that the European Commission meeting held in Lisbon in 2000, setting the goal for Europe to become the most dynamic knowledge-based global economy, ensuring sustainable development and creating more and better jobs, has determined a high priority given to research and technologies development, innovation and knowledge in pursuit of European competitiveness. These are the factors that are commonly referred to as the smart economy development factors. R. Giffinger (2011), Vienna University of Technology, Centre of Regional Science (2007) the smart economic development factors attributed to innovation, entrepreneurship, economic image, flexibility of labour market and integration of the

local and international markets as well as the ability to transform. B. Cohen (2012) approaches the smart economy through entrepreneurship and innovation, productivity and the local and global interconnectedness. A. Murray *et al.* (2011) emphasized that the city, in order to become a smart city, must be economically viable, i. e. be competitive within the global knowledge economy. The authors explain that this competitiveness is achieved and maintained when the culture of innovation, learning, cooperation and partnership is developed, thus attracting and retaining competent employees and entrepreneurs. H. Chourabi *et al.* (2012) stated that the development of a smart economy is determined by the companies' employment of information technologies, implementation of the new smart business processes and a smart technology sector. The smart economy growth is ensured by the spread of information technologies and the ability to react to changing conditions. This requires a business-friendly environment in which the smart urban economy is characterized by establishment of new enterprises, creation of new jobs, improvement of the workforce skills and increase in the enterprises productivity. P. Lombardi (2011) pointed out that the smart economy, smart economy as an integral part of the smart city, is associated with the aspiration to be entrepreneurial, as this ensures competitive economic viability. The advantage is achieved only with the employment of innovation and creative potential. The authors emphasize that innovation is no longer understood as a linear process involving the invention, commercialization and market entry stages. Innovations are treated as a cyclical and interactive process. T. Bakić *et al.* (2013) pointed out that the smart economy involves the development of innovation clusters, communication and cooperation between enterprises, academic institutions and population. A. R. Davies, S. J. Mullin (2011), while analyzing interfaces of the smart and green economies, argued that in order the economy to be smart, it had to be 'green', encourage the reduction of industrial carbon dioxide emissions, also they suggest investing in a 'clean economy'.

Researchers and practitioners distinguish various conditions essential for the smart economy to emerge and grow. S. Zygiaris (2013) emphasized the interconnection between the city's urban resources, infrastructure, public services and stakeholders and innovative eco-systems, as well as the need to work together and complement each other for developing new business models, as an essential precondition for the smart economic growth. The Lithuania's Progress Strategy "LITHUANIA 2030", drafted by the Lithuanian Progress Council

in 2012 and approved by the Seimas of the Republic of Lithuania, includes the statement that 'a smart economy must create opportunities to unlock to the maximum the most important resource of Lithuania: creative, innovative, responsible and enterprising people'. The strategy states that the smart economy will be achieved when:

- The most favourable business environment is set up, including institutional environment, efficient infrastructure and provision of essential services;

- Responsible business prevails, and economic development is based on sustainable use of resources;

- Economy becomes integral.

The National Progress Programme for the period 2014-2020 (2012) includes the statement in order to develop a smart economy, business productivity should be increased in compliance with the principles of sustainable development, i. e. 'in order to prevent hazardous effects of economic growth on the environment and human health' as well as to ensure rational use of natural resources.

A. Abdoullaev (2013) highlights, that in Europe 2020, the strategy for smart, sustainable and inclusive growth is:

- Smart growth: developing an economy based on knowledge and innovation (innovation; education; digital society).

- Sustainable growth: promoting a more resource efficient, greener and more competitive economy (climate, energy and mobility; competitiveness).

- Inclusive growth: fostering a high-employment economy delivering social and territorial cohesion (employment and skills; fighting poverty).

Modern research has confirmed the utmost importance of technological environment and smart people for a smart urban development, and at the same time for a smart economic development as well. S. Alawadhi *et al.* (2012), interviewing officials of four cities in North America (USA - Philadelphia, Seattle, Canada - Quebec, Mexico - Mexico), responsible for the smart urban initiatives, established that implementation of new technologies creates a more reliable public image, increases transparency, because provides better opportunities for the public interest and participation in the decision-making processes. New technologies change organizational culture and are relevant for the formation of a smart city. S. Community portal, L. Mundula (2012), having analyzed 70 medium-sized cities in Europe, argue that only smart people and smart environmental characteristics positively affect the efficiency of a

city. R. Achaerandio *et al.* (2011) agrees that the smart city is directly dependent on the information and telecommunication progress and innovation. The Italian smart city index distinguishes the employment of smart services, infrastructure, innovation and sustainable development, as well as institutional, financial and organizational resources to promote innovation, as the smart city indicators and conditions for the smart city growth.

Thus, in spite of the complexity in distinguishing between the smart economy factors and conditions, caused by the 'input – outcome' causal relationship, summarizing, it could be noted that the smart economic development should be initiated and implemented at all levels: both at the city, enterprise and organization, and the individual and national level. The research (Charalambakis *et al.* 2011, Porter 1990) having proved that national and regional competitiveness is directly related to business development through the corporate competitiveness of enterprises and creating conditions for them to become and remain competitive, it can be concluded that the smart economic development (which is often identified as competitiveness) depends on the urban economic system actors' activity and environment in which the smart economy develops. This only confirms that the smart economy, as an individual component of the smart city, is unable to function without the functioning and impact of the other smart urban components.

5. Conclusions

In the scientific literature smart cities are considered as cities of tomorrow or future cities. Due to the fact that the smart economy is one of the smart urban structural components, the smart economy is attributed to the economy of tomorrow or future economy.

Smart economy is not merely a theoretical approach. Despite the fact that the smart economy involves many different but closely interrelated economic trends and its practical accessibility is more complicated and time-consuming, compared with the accessibility of individual economic trends, practical examples of individual cities have proved the real implementability and accessibility of this approach in economics. Thus, the smart economy concept is approached as a real concept, practically accessible in the country's economy.

The smart economy approach has not developed as a result of the scientists' theoretical discussion; it was determined by the realities of business and life. Recent market and living conditions require from individual enterprises and the economic system itself intelligence, the use and development of knowledge, continuous learning,

networking, innovation and innovativeness, agile, sustainability and social responsibility and digitality. All these qualitative characteristics are particularly reflected in the smart economy concept.

Smart economy is the economy, which is characterized by all of the following qualitative characteristics: innovative, productive, digital, integral, green, economical, socially responsible, networking and agile. The achievement of qualitative characteristics of a smart economy in the national economy allows the city to become more viable, open and accessible, grow faster and be favourable to the surrounding environment and future generations. So, the smart economy is considered as an essential prerequisite in today's perspective, aimed at ensuring the country's economic competitiveness not only in the current period, but also in the future on a global scale.

The main tools for empowering the smart urban economy involve learning, knowledge, experience, competence, creativity, research and technological development and innovation, networking and cooperation, entrepreneurship, the ability of enterprises and organizations to transform and adapt; the infrastructure of information and telecommunication technologies, urban strategic decisions focused on the clean economy and social responsibility, qualitatively developed urban infrastructure (transport, public, communal, culture, education). A purposeful and targeted development of these tools provides the city with excellent opportunities for the smart economy to emerge and develop.

The smart economy involves many areas and is unable to function efficiently without functioning of the other smart urban components; thus, in order to achieve the aim of the smart urban economic development, a mere preparation of strategic documents is not sufficient enough. Its development should be encouraged and implemented not only by governmental authorities, but also at the enterprise, organization and individual level. Only a complex functioning of the market operators is able to empower the emergence and development of the smart economy, first in individual cities, and then in the whole country.

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