Review

The Interaction between Internet, Sustainable Development, and Emergence of Society 5.0

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Abstract: (1) Background: The importance of this article is to analyze the technological developments in the field of the Internet and Internet technologies and to determine their significance for the sustainable development which will result in the emergence of the Society 5.0; (2) The authors used automated content analysis for the analysis of 552 articles published in 306 scientific journals indexed by SCII and/or SCI - EXPANDED (Web of Science (WOS) platform) between the years 1996 and 4/2020. The goal of the research was to present the relationship between the internet and sustainable development. (3) Results: The results of the analysis show that the top four most important themes in the selected journals were "development", "information", "data", and "business and services". (4) Conclusions: Our research approach emphasizes the importance of the culmination of scientific innovation with the conceptual, technological and contextual frameworks of the internet and internet technology usage and its impact on sustainable development and emergence of the Society 5.0

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Keywords: internet; Society 5.0; sustainable development; automated content analysis

1. Introduction

The emergence of the Internet can be considered one of the greatest innovations of the last thirty years. Since the beginning of the 1990s, the Internet has exerted significant influence and brought about changes in the economic and socio-political spheres. In this context, business process redesign, computerization and digitization in the 1990s were all actualized. Additionally, the emergence of the internet-enabled the electronic exchange of documents, the pooling of databases, new communication channels between public administration and citizens (e-government), between organizations, and between organizations and customers (e-commerce) [1,2].

In 2004, they announced on Facebook that they would "give people the power to share and make the world more open and connected" [3]. The rapid development and spread of web 2.0 and social media had begun, enabling the interaction between current and potential users (consumers) and revealing the form and nature of their thinking [4]. Porter identified two factors that determine internet profitability: an industrial structure and a sustainable competitive advantage [5]. These are universal factors that relate to any form of technology or type of business. However, their effectiveness depends on the type of business and industry.

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The introduction of the Internet and the parallel development of the Internet, or digital economy, enabled the transition from the third industrial revolution (1960–2011) to the next, dubbed as the fourth industrial revolution (also referred to as Industry 4.0) in 2011. Rapid technological developments, cheaper computer equipment and the increasing availability of broadband (such as 5G, fiber optic cable) are factors that have changed lifestyles and work styles. Information and communication technologies enable continuous interactivity, connectivity, transparency and leaps in productivity. All of these factors have an essential role in sustainable development. Technology and economic growth are inextricably connected in the transition from new to innovation economies [6].

Today, the digital media is used innovatively by content creators for creative expression in such spheres as digital art, science, technology, and business. Digital media enables users several important abilities. The abilities ranges from expression to education, whilst communication and social interaction are also bolstered. Thus, paving the way for the digital economy's popularity. Since 2008, aspects of life such as the economic and social activities have been integrated into the digital economy, made possible by technology by the internet and other platforms such as the mobile and sensory system [7]. In recent years, a more significant role in the technology field of ICT has been observed in the mobility of data transmission, cloud computing, the development of business intelligence systems and the web 2.0, which also includes social media [8]. The web 2.0 and its successors, the semantic web 3.0 and the 4.0 web, have evolved due to the maturity of their predecessors and the fact that more than four billion people in the world have access to the Internet [9]. Internet evolution is leading to further innovation in the global markets, which are manifesting themselves in many ways, from changing consumer behavior and thus to new sustainable development within business models (sharing economy, circular economy); reorganizing the financial industry with the introduction of fintech (digital payments, digital remittances, crowdlending and crowd investing); the decline of the traditional media and the emergence of the digital media (video games, video-on-demand, e-publishing, and digital music) [10,11]. In the government, new sectors developed, such as e-government as a public service and e-democracy as the citizen online participation and decision-making system, which are in the fourth industrial revolution, transforming smart governance in the framework of the smart city [12].

The fourth industrial revolution brings the next evolution step in the development of internet technologies. It is based on the "cyber-physical systems, the Internet of Things (IoT), the Internet of Services (IoS), 5G and the Industrial Internet" [13–15]. The fourth industrial revolution is changing the meaning of the ideology of a network, segueing from a focus on connections to a source of innovation [16]. The development of networks has also increased the importance of data. In recent years, the value of data has increased dramatically for businesses [17,18].

The importance of this article is to analyze the technological developments in the field of the Internet and Internet technologies and to determine their significance for the sustainable development which will result in the emergence of the Society 5.0. It goes back to the name of a Japanese government program in which they wish to establish a better, super-smart and more prosperous human-centered society, with the support of the economy known in Europe and America as Industry 4.0. [19].

The Internet can be understood as a conglomerate of ideas, technical and social inventions, political contexts, socio-cultural circumstances, and economic developments, the results of which are visible in the context of sustainable development. The question is how to familiarize oneself with the current knowledge about the relationship between the Internet and sustainable development. Since there are a large number of articles, an alternative approach was chosen that was capable of efficiently and successfully categorizing vast amounts of data, that enabled the reader to obtain appropriate explanations of the research phenomenon understandably. For the topic under discussion, an automated content analysis method was used to identify the key topics and the concepts of interest to the researchers [20–22].

Our approach emphasizes the importance of the culmination of scientific innovation and its impact on sustainable development; therefore, we are primarily concerned with the conceptual, technological and contextual foundations that drive the emergence of the Internet. This development, which has led to a global network, demonstrates the rich heritage of a range of inventions owing to

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the ingenuity of different individuals throughout history, with credit due to several organizations and the actualization of diverse strategic goals. In this paper, some critical cases that set the tone for the flourishing of the Internet are considered, utilizing an analysis of different sources, including those that posit that this growth would have been inevitable. It should be noted, that technology is not regarded as a set of neutral tools but are merely available in a social system since technological integration with the social environment usually "leaves room for different social interests and values to participate in it" [23].

The article consists of the following sections: introduction, which is followed by research method, which includes data collection, literature selection, data analysis and results of our analysis. The article concludes with a discussion of results and conclusion, which include paper limitations and propose researches in future development trends.

2. Research method

2.1. Data source and data collection

This research presents an insight into the studies about the relations between the Internet and sustainable development. In the research were analyzed articles published from 1996 to April 2020. The review focuses solely on the analyses of empirical and theoretical studies that were published as peer-reviewed papers.

The peer-reviewed scientific papers were retrieved through the research platform Web of Science (Science Citation Index Expanded (SCI-EXPANDED), Social Sciences Citation Index (SSCI) and Arts & Humanities Citation Index (A&HCI). The Boolean keyword combination was used to search for the relevant paper's titles and abstracts: [Internet] AND ('sustainability' OR 'sustainable development').

A search of the Web of Science resulted in 571 peer-reviewed articles published in academic journals. Review of the abstracts as well as the full texts was undertaken, unearthing 19 irrelevant articles, i.e., those that the main text was incongruent with the inquiry into the internet's importance in sustainable development were subtracted from the sample and analysis, which resulted in a final sample of 552 articles published across 306 journals

The first article on the topic was published in 1996. Since 2008, the number of published articles has increased, and a noticeable upward trend has been observed over the last three years. Most of the papers were published in journals that are directed to the general focus of sustainability (e.g., Sustainability, Sustainable development). A significant number of papers were published in such journals as, Journal of Cleaner Production, International Journal of Sustainable Development & World Ecology, Journal of Environmental Protection and Ecology, Environmental Engineering and Management Journal. The papers were primarily focused on environmental modelling, management, and planning. The third most important group were the journals focused on the Internet, computers, telecommunications and technology (IEEE Access, Sensors, Journal of Medical Internet research, Telecommunications policy, IEEE Communications Magazine, International Journal of Production Research, Computers and Electronics in Agriculture, Computers in Industry, Electronic Library, Electronics). Other papers were focused on the economy, tourism and development (e.g., Amfiteatru Economic, Tourism Management), urbanism, building and land use (Journal of Urban Technology, ISPRS International Journal of Geo Information), medicine (e.g., BMC Health Services Research) and education (e.g., International Journal of Sustainability in Higher Education).

In parallel with the increasing use of the Internet and internet technologies in society, the number of research articles dealing with the relationship between the Internet, internet technologies and sustainable development has also increased, as shown in Figure 1.

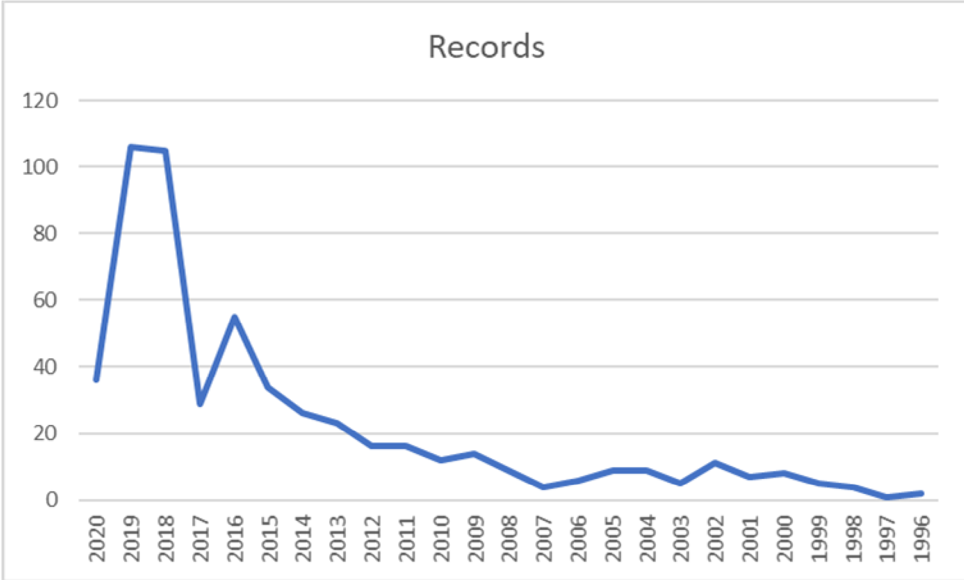

Figure 1. Publishing trends, authors work.

2.2. Classical Content Analysis

The research in this article is based on content analysis, which has been used for more than three centuries, but only in the middle of the 20th century, has it received a methodologically developed form, while the term itself, content analysis in English, has been used since 1941 [24]. The procedure is based on Krippendorff that went through several stages of development: the quantitative analysis of newspapers, content analysis, propaganda analysis, general content analysis and computer analysis text [25], whereby the second edition also refers to the development of qualitative approaches [24,26], which are used in the article research. Krippendorff believed that various forms of qualitative content analysis probably emerged in response to the quantitative analysis of newspapers or too partial results of content analytical research in the middle of the last century [24]. Other authors assume that this form of content analysis was developed primarily for the qualitative studies of the considerable amounts of data obtained through the use of scientific interviews and used in various disciplines such as sociology, psychology and linguistics [27–29]. Content analysis is a research technique that aims to produce a systematic empirical record of symbolic communication as one of the most critical aspects of social life [30]. According to Halmi [30]., the application of content analysis moves between quantitative semantics on the one hand and the subject register on the other, whereby the subject register implies the discovery of only the essential content of some symbolic communication. According to Barelson's classical definition, content analysis is "a research technique for the objective, systematic and quantitative description of the manifest content of communication". The quantitative aspect of content analysis is more emphasized in this definition because of the need to prove and confirm the method as "scientific/positive/solid", but in this case, the qualitative elements of the research remain with "textual and/or visual content". Therefore, the qualitative aspects of the analysis are also relevant content, especially when the number of units analyzed is too small to apply statistical methods. There are three approaches to the analysis of symbolic (qualitative) material outlined by Barelson: a) from the content—the researcher is primarily interested in the content-related characteristics of the message; b) from the creator of the material—the researcher is only interested in the content of the message if this enables him to learn more about the characteristics of the person who created the message; c) from the audience—through the content of the message, the researcher tries to find out the characteristics of the audience to whom the message is addressed [30].

Classical content analysis is based on the review and manual entry of bibliographical references in order to provide content-relevant insights into texts. The content analysis itself is performed manually, which means that studies are limited to manually examining various written sources (e.g., academic articles) to identify thematic and consents. The research is thus limited to the text size,

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which results in several associated limitations (e.g., insufficient sampling, biased estimates), time-consuming searches for a large number of articles, and thus the reduced efficiency and effectiveness [31]. Another limitation associated with manual text analysis is that researchers prioritize resources according to their interest and thus overlook other relevant findings [31,32]. All these reasons have led to the consideration that researchers need to apply new methods that can help to address these existing problems and make content or text analysis more effective, objective and robust. Therefore, an alternative approach to classical text analysis is automated content analysis (ACA) which based on a different computer programs and it is increasingly used in scientific literature [29].

2.3. Automated Content Analysis

An Automated Content Analysis references a series of algorithms using probabilistic models. These models are segmented into different sections, namely, "topic models" or "concept-mapping models" [33]. The aim is to decipher obscure thematic compositions in the literature. The term "thematic composition" describes the main themes of a literature collection, the frequency with which they occur, and how the correlate. The purpose of these algorithms is to identify themes and classify the literature utilizing the themes as a guide for the classifications [31].

3. Analyses and Research Results

3.1. Data Analysis

ACA was undertaken with the Leximancer software (5.0). As an advanced natural language processing software, Leximancer has no preconception to extract the data, the final analysis is gleaned from the data. Utilizing Bayesian theory, Leximancer quantified the text through an emerging, unsupervised iterative process to determine the frequency of concepts and their relationships [32]. Therefore, the " fragmented pieces of evidence " in the document "can be used to predict what actually happens in the system" [34]. Leximancer identified the main concepts in text reliably in a process that is easily duplicated (i.e., frequency and patterns of co-occurrence) based on the interdependent of words in the text. Leximancer transcends the limitations of qualitative analysis. Firstly, it overcomes some of the inherent biases and potential errors of researchers, especially in the manual coding of categories and defining the rules of classification [35]. With Leximancer, we can automatically infer concepts and themes from the data and provide clear, concise and accurate interpretations [36]. The concept derived from Leximancer consists of words which are interrelated defined in the software as “words” that appear in two blocks of sentence text (including their synonyms). The prominence here in defining a theme is based not only on frequency of occurrence of certain words, but also on the number of connections that word has with other identified concepts [37]. Leximancer generates a heat map to visually display the final results. Themes are coded by color, and brightness is used to denote the significance of the theme [38]. The mapping implies strong semantic relationships based on the visual proximity in Leximancer [39; -32].

The research was carried out in four stages, beginning with the selection of relevant documents, followed by the generation of concept seeds utilizing the tab “concept seed”. The next step was the creation of a thesaurus for useful terms and the fourth and final step was the generation of results. Each step can be tailored to the needs and requirements of research to ensure that only relevant information is analyzed. With the use of a comprehensive analysis, all terms that were not substantial in the study were omitted. Leximancer also provides a list of common words that should be excluded (e.g., a, an, ich, me, you, via). The remaining words were carefully removed manually from being further analyzed (e.g., “paper”, “article”, “study”, “research”, “methodology”). The software automatically produces results in the form of a topic guide and a concept map [40].

The research findings are discussed in the next subchapter.

3.2. Research Results

Leximancer 5.0 generated a total of 64 concepts and 12 topics from the titles, abstracts and keywords of 552 articles published in 306 journals between 1996 and 4/2020. The authors used the

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slider % visible concepts to 100% and changed the number of concepts visible on the map from 50% (automatically) to 100%. The topic size was moved from 33% (automatic) to 39%. A topic is defined as a group or cluster of concepts that have commonalities or connections. This can be seen in their immediate proximity to the concept map. The topic's name is gleaned from the most prominent concept that appears in the group of interconnected concepts. The calculation of the number of hits informed the topics that are formed, and taken from the text and fit each concept based on the programs machine learning abilities [41]. Table 1 presents the themes, as well as the hits and related concepts.

Table 1. Themes and concepts in the journals in the years from 5/1996 to 4/2020.

No	Theme	Hits	Concepts
1	Development	1201	development, sustainable, technologies, public, sustainability, environment, fintech
2	Information	889	information, Internet, technology, access, communication, global, change
3	Data	856	data, system, model, network, developed, application
4	Services	633	services, digital, support, potential, resources, big
5	Management	601	management, systems, key, challenges, quality, planning
6	Social	543	social, economic, impact, growth, business, market
7	Energy	527	energy, smart, urban, cities, factors
8	Countries	521	countries, Internet, online, digital, policy
9	Environmental	463	environmental, future, important, role
10	Knowledge	354	knowledge, service, health, users
11	Mobile	235	mobile, education, networks
12	Performance	90	performance

Source: Authors' work.

Figure 2 depicts the detailed concept map. Concepts are connected to the themes based on their relationship to each other, these are graphically shown as circles. Leximancer use the heat map concept to denote themes, therefore hot colors (red, orange) show the significant themes, while cool colors (blue, green) depict those that are less critical [40]. The four themes with the most significant number of hits are "development", "information", "data" and "services".

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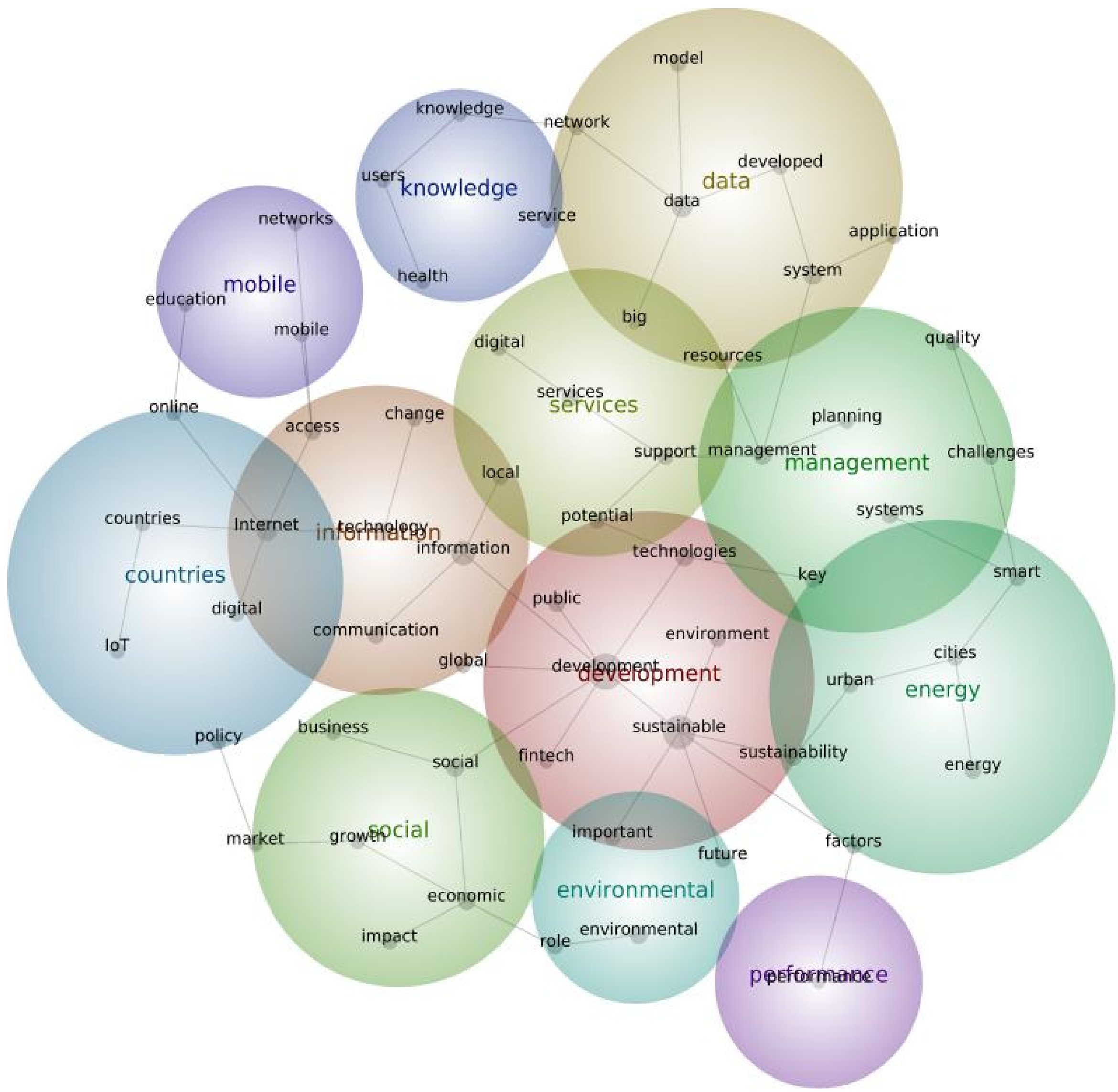

Figure 2. Concept map of the chosen papers published between 1996 and 4/2004 (source: authors' work).

Figure 2 shows that the circles of certain thematic overlapping with the circles of other thematic, thus forming cross-sections that contain individual concepts, which thus fall into both overlapping thematic. For example, the theme "development »overlaps with the theme's "services", "management", "energy", "environmental", "social" and "information". The theme "information" overlaps with the themes "countries", "services", "development" and "social". The theme "services" overlaps with the theme's "development" and "management". The theme "data" overlaps with the theme's "knowledge", "services" and "management". The theme "knowledge" overlaps only with the theme "data". The theme "management" overlaps with the theme's "development", "energy", "services" and "data". The theme "energy" overlaps with the theme's "development" and "management". The theme "environmental" overlaps with the themes "social" and "performance". The theme "performance" overlaps only with the theme "environmental". The theme "countries" overlaps only with the theme "information". It can also be seen in Figure 2 that the concept "important" lies between the intersection of the themes "environmental" and "development". The concept "sustainability" lies between the intersection of the theme's "development" and "energy". The concept "potential" lies between the intersection of the theme's "development" and "services". The concept "local" lies between the intersection of the theme's "services" and "information". The

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concept "internet" lies between the intersection of the themes "information" and "countries" and the concept "big" lies between the intersection of the themes "data" and "services".

4. Discussion

For this automated content, the analysis used 552 articles published in 306 scientific journals indexed by SCII and/or SCI (WOS platform) between the years 5/1996 and 4/2020. The goal of the research was to present the relations between the Internet and sustainable development.

4.1. Research Topic through the Period

According to the consideration, the history, and the time variation of the article thematic, the authors edited them following the development of the Internet and internet technology and their meaning for the sustainable development and emergence of the Society 5.0 in two periods, according to their content characteristic.

4.1.1. Research Topic between 1996 to 2011

Based on the analysis of the content of the articles published between 1996 and 2011, it can be concluded that in the nineties of the 20th century, came the convergence of the telephone, data and broadcasting networks and services. The results were visible in the synergy between computer science, computers and media, and were implemented at the end of the 20th century [42-44]. Nevertheless, it was only in the early 1990s that the personal computer got its own network identity, which is known as an IP address, connection equipment for local area networks (LAN) and connection to remote computers [45]. The concept of hypertext was disclosed in the early 1990s by Tim Berners-Lee, who invented today's indispensable worldwide web and defined it as "a practical project designed to bring global information into existence using available technology" [46]. From the technical point of view, the web can be defined as a collection of uniquely labelled digital personal files written in hypertext mark-up language (HTML) on servers that are connected to a network of computers connected to TCP/IP, and accessible from any computer independently of the system platform [47].

In the second half of the 1980s and early 1990s, the increase in the availability of computers and information equipment contributed to a faster transition to the computerization and digitization in the private and the public sectors. The new generations of programming languages (e.g., C +, SQL), relational databases and LANs have enabled the integration of previously separate tasks, the interdependence of organizations with information as well as the increased transparency of business and decision making [48]. Unlike the period of automation, where technology was used primarily for tasks, in the period of computerization and digitization, the trend from individual computer jobs changed to job integration and multi-purpose jobs, with access to programs from local and central units [49].

The concept of information infrastructure comprised approximately three layers in the mid-1990s and up to the end of the century: the underlying layer of networks (ISDN, GSM, broadcasting, IP, MPLS, Bluetooth, satellite) [50,51], the intermediate layer (security, electronic signature, directories, billing) [52–54] and the service layer (telephony, radio and tv, www, SMS, WAP protocol, video conferencing) [55-57]. In the context of business process redesign, computerization and digitization in the 1990s, and based on the information infrastructure, it was possible to do what interested the user and what would benefit them. These were mainly the services and applications developed during this period: e-commerce [58,59], new ways of internet entertainment (e.g., movies on the Internet) [60] and virtual entertainment (e.g., online games) [91], distance learning [62,63], telemedicine [64,65], e-government (exchange documents with public service) [66], geographic information systems for spatial decision making for e-government sustainable development projects (regional and territorial spatial data) [67-69], environmental early-warning systems [70,71] and GIS for healthcare organizations for the purpose of the collection of epidemiological data and for informing about healthcare delivery [72].

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All of this (information infrastructure, services, applications, content) is the cornerstone of the functioning of the information society, but it requires the interdisciplinary knowledge of other fields (economics, law, sociology, psychology) [73-75].

During the research period, the intellectual property became the universal basis for most new and existing services. The asynchronous transfer mode (ATM) technology, which initially played its role in the backbone networks, also became established in accessing the networks linked to ADSL and even in the UMTS concept [76,77]. The introduction of third-generation mobile communications heralded the introduction of internet protocol version 6. In connection with the dominance of the protocol, IP came to the forefront in the MPLS label based on multi-protocol switching, which was intended to incorporate the advantages of IP and ATM technologies and was implemented in spinal networks in combination with optical technologies [78]. Mobile telecommunications had outgrown the voice transmission system, and 3G was mainly focused on multimedia and e-business [79,80].

The technologies of GPRS, EDGE and WAP, however, point the way to universal mobility [81]. The technology was, therefore, no longer a limiting factor since it allowed the implementation of virtually all services [82-84]. A bigger problem was to develop relevant new services that were simple to use and at the same time interesting enough for users. The development of the internet-based communication and knowledge management systems enabled the rise of the digital platforms which enabled data collection [85], information sharing [86,87], decision making (e.g., real estate knowledge, device-based decision support system, agriculture knowledge-based decision support) [88,89], capacity building [87], open access [90], transparency [91], collaboration and information services [92-94]. The internet platforms, mobile applications and participation tools enabled the emergence of the electronic banking [95,96], touristic online services [97,98], telemedicine [64, 65], online education [63] and ICT-based learning systems (e.g., for environmental studies) [99, 100], open-source [101], e-government (e.g., digital signature) and e-democracy services (e.g., citizen participation) [102]. It is important for e-business emergence, that internet platforms gain the trust of customers which enables privacy and security.

Under internet services, we most often imagine browsing the Internet, which, in addition to the web itself, also includes voice telephony, video conferencing, audio and video streaming, video on demand, WebTV and similar services. In the 21st century, the Internet became a medium that has brought together services that had so far been provided based on specific networks [103].

Internet technology has become universal, so it has succeeded. On the other hand, this universality in providing some services also causes problems. The compromise is between adding new functionalities, introduced by internet technology (information on request, interactivity, easy generation and publishing content) and the quality of service and price. Internet services that became an alternative to existing similar services (provided by specialized networks) typically provided some new additional functionalities that were lower in quality than the "original" services and had a lower price. Increased bandwidth and the introduction of control mechanisms for quality of service in IP networks ensured higher quality, but also a higher price, which was still lower than the "original" solution [104]. Information infrastructure was understood as a concept that seeks to interact with the different telecommunications networks, processing device data, databases and terminals to the appropriate user quality and the safe use of telecommunication services for a reasonable price. This means that there was no single solution, instead there were several, and each meant an inevitable compromise between functionality, quality and price [105].

The most significant trends in modern telecommunications were: i) mobility, especially 3G and 4G, which have caused countries to have to re-examine the industry policy. There were more and more services that were accessible on a mobile basis (voice and data) [104] and ii) broadband, which was, at the beginning of the 21st century, the only service at that time that enabled high-speed Internet (video services from radio and cable TV were only slowly migrating to other media) [105,106]. Fast Internet and the emergence of the internet platforms as a media-oriented service enabled the virtualization of network environments and the adoption of new movie distribution internet services [107]. It has to be mentioned that public investments in rural broadband services have an important impact on the regions and the countries' economic development [108, 109].

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The advent of the Internet in the early 1990s influenced the rise of the so-called new economy (1990–2008) or the knowledge-based economy [110,111]. A vital feature of the digital economy era was the influence of the Internet on the growth of dot.com online businesses. Expectations about the influence of the Internet on the growth of new business models were therefore high at the end of the 20th and beginning of the 21st century [73].

In the era of the new economy, there was a boom in global competition. However, the first world economic crisis in 2002 led to the decline of the dot.com companies. Changes in macroeconomic trends contributed to the uncertainty in the business environment. The financial crises between 2008 and 2009 ended the period of the new economy. The studies about the investments in information technology (IT) in the new economy show that that almost half of all projects initiated in the field of IT failed. Investments did not have such influence on the high economic growth in the U.S., with low unemployment and low inflation in that time [66].

The organizations were therefore faced with the question of how to ensure a sustainable e-business model [112], and according to the research, large firms adopted ICT faster than SMEs. [113-115]. Many established companies in different industries were faced with the enormous changes in product design and business processes (e.g., virtual teams) that have led to the provision of digital services and products, such as car sharing, which is exclusively based on digital platforms and mobile applications [106].

The organizations were introduced to a comprehensive infrastructure based on a more flexible organizational structure for the implementation of marketing and technological innovation as required [73]. The new social and economic paradigm has brought an organizational change in management strategies, structures and styles. The increasing productivity (labor) during this period (after 1980) no longer provided a sufficiently high added value. Therefore, it was necessary to find a new business resource to create it. The predominance of this was that the knowledge and flexibility of organizational structures. With the introduction of knowledge, the role of the winning factor in the market began to assume quality. The importance of the quality of products or services provided and the process of work itself has gradually shifted from the industrial sector to public administration and public organizations. The product-oriented business was thus retreating to the customer-oriented business based on customer information behavior [117]. Humanity recognized that the ability to develop or acquire the fundamentals of modern information and communication technologies plays a vital role in economic, environmental and social development (e.g., foreign direct investments, citizens' wellbeing, digital literacy) [75,82,118].

In 2011, came the launching of the fourth industrial revolution (4IR). The ubiquitous computing was considered as a "promising technological path of innovation", and the Internet of Things (IoT) was born, which enabled new business models, technological platforms, the emergence of the smart city and its services [120].

4.1.2. Research Topic between 2012 to April 2020

According to the analysis of the content of the articles published between January 2012 and April 2020, it can be concluded that the fourth industrial revolution is based on the Internet of the Future, that consists of the four pillars: Internet of Users (IoU), Internet of Content (IoC), Internet of Services (IoS) and Internet of Things (IoT) (see Figure 3).

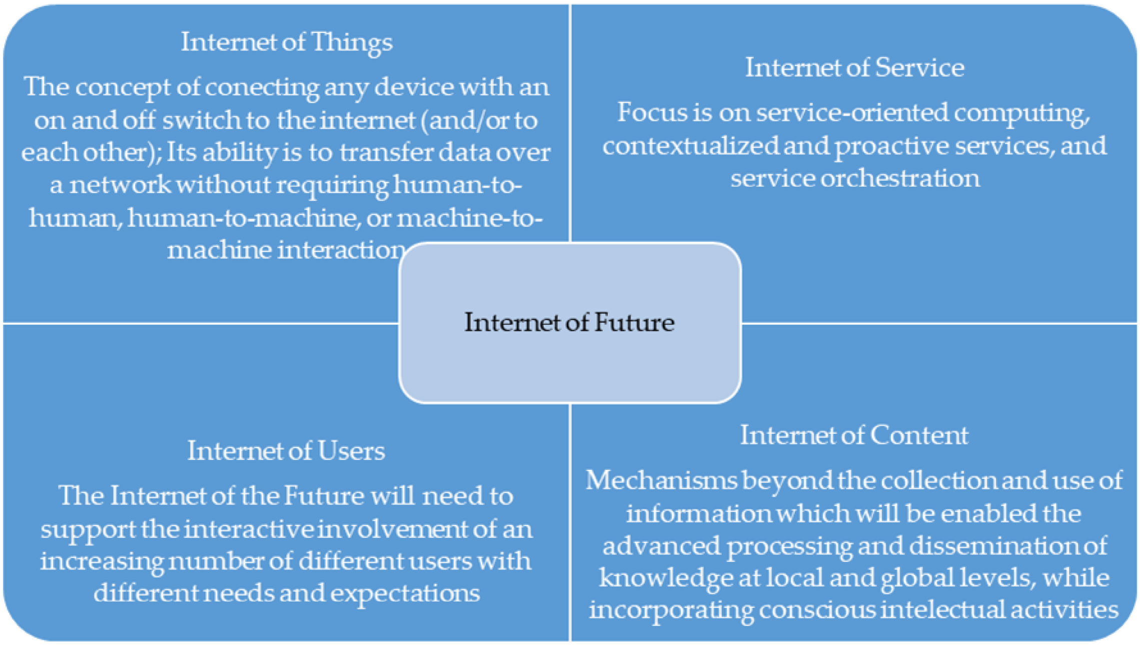

Figure 3. The constitution of the Internet of the Future (source: authors' work).

From the perspective of the Internet of Users, the Internet of the Future will need to support the interactive involvement of an increasing number of different users with different needs and expectations [121,122]. Within the Internet of Services, the focus is on service-oriented computing, contextualized and proactive services, and service orchestration. This will lead to the creation of virtual communities and the exchange of knowledge and experience among the users involved, with semantic technologies playing an important role in gathering vast amounts of information and knowledge [8,11]. This had led to the big data dilemma that we face today, as well as the novel cloud computing paradigm, which has proliferated in recent years. The growth of big data is projected to continue its rapid growth and will play a significant role in promoting the development of society [123]. Sources of big data include web, social media, mobile applications, different types of records and databases, geospatial data, surveys, scanned traditional documents, among others [8,124]. The gap between the cloud and the endpoints (e.g., IoT nodes) is bridged by fog computing. The task of fog computing is to enable the storage and management of data in network nodes located near its devices. Thus, data processing, storage, networking, decision-making and data management not only occur in the cloud, but these processes have already started their way to the cloud IoT (preferably near IoT devices). If cloud computing is a centralized unit, fog computing is a decentralized unit. Thus, fog computing enables devices to either serve as fog computing nodes themselves (e.g., tablet or smartphone acts as a fog node for home sensors) or use fog resources as clients of the fog nodes [124].

With the 4IR, creativity becomes the source of new value creation, and innovation and intuition (e.g., in smart manufacturing) [125] have become the lever for shaping the winning factors in the market. This develops an era of innovation economics, in which knowledge development, professional attitudes to work and the acquisition of ICT become a stable basis for creativity and innovative processes as a way to increase efficiency and effectiveness [6].

The technological development in 4IR is the result of the rapid penetration of smart technologies in the human professional and social environment. When we talk about the importance of digital literacy for human social and professional sustainable development from ten years ago, today it becomes a prerequisite for managing the complexity of solving everyday functional activities. The rapid implementation of smart technologies in the business or private environment, therefore, requires people to acquire new skills and competencies to invest in acquiring, sharing and creating knowledge, which requires access to devices connected to the Internet. Knowledge management 4.0 (KM 4.0) enables continuous processes of sharing, storing, analyzing and transforming rough data into value-added information [126]. It is important for the business and urban ecosystems of the smart

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cities that stakeholders adopt digital platform deployments that play an important role in acquiring and improving the complexity of data collection and analysis. Smart technologies can collect knowledge (even tacitly) from citizens (i.e., through the codification of habits, visualization, consulting, use of e-services) and transfer "peer" data to data processing and storage centers (cyberspace) (e.g., by providing enriched information on citizens using platforms such as e-health, e-government, e-learning, e-social links for the elderly, e-mobility and fintech which could also use video and audio to explain functionality, use and human control [127,128]. The importance of knowledge management 4.0 processes has increased with the emergence of social distancing because of the coronavirus in 2020. This will have a significant impact on further socio-economic developments and accelerate KM 4.0 processes in the individual's daily life and social inclusion.

The economic innovation system incorporates critical factors such as social capital and innovation, and reverse innovation versus globalization. Reverse innovation is the process of presenting a product first in underdeveloped markets or developing countries, and only then in industrialized countries [129]. In the context of an innovative economy, social innovations are knowledge-based. Their core mission is to enable the further sustainable development of both organizations and the social environment [130]. The technologically advanced business model of social innovation in the 4IR is based on connecting individuals, organizations (both for-profit and not-for-profit), networks or digital platforms to connect both tangible and intangible resources. Thus, we can talk about the creation of a sustainable natural socio-economic model based on social innovation, social entrepreneurship and innovative, disruptive entrepreneurship [131]. In doing so, it is necessary to ensure an adequate level of R&D funding, the international protection of intellectual property deregulation, facilitating the acquisition of capital through venture capital and contemporary derivatives as it is presented by the disruptive innovation crowdfunding and blockchain [132].

Mechanisms beyond the collection and use of information will be developed within the Internet of Content and Knowledge. They will enable the advanced processing and dissemination of knowledge at local and global levels while incorporating conscious intellectual activities. For example, advanced web applications and multimedia search engines will be developed to make knowledge available to both human users and devices or things [133,134].

The IoT can be described as a dynamic global network infrastructure that will add the ability to interact with real physical objects through the use of standard communication protocols and the ability to configure the Internet of the Future independently. It is and will continue to integrate them into the business, information and social processes that are part of everyday life. In this way, we get a so-called smart environment in which people can play an active role in the context of using certain things. Technological changes that have a significant impact on the social and political development of society, and the emergence of new forms of social engagement, lead us to the smart city paradigm and create opportunities for citizens to gain greater influence in decision making through modern technological solutions and socio-political issues [127]. This leads to the development of smart city governance, which could be based on social consensus based on a self-governing city management system [128,135]. The research thus proceeds from a systematic approach to the social environment, and thus we assume that the consequences of the use of modern technological solutions will have an impact in the future on changes in social relations and the complexity of the social system [136,137]. It is primarily about designing theoretical frameworks that are useful for designing and regulating new social relationships and for managing a complex social system and policy making (e.g., the democratic process of self-organization of the (cyber) community in interaction with government institutions) [138,139].

In connection with the Internet of Things, we come across a series of related concepts that may even be contained in the Internet of Things concept. Above all, it is necessary to distinguish between the Internet of Things, the Web of Things (WoT), the communication between devices (M2M) and wireless sensor networks (Wireless Sensor Network, WSN). Unlike the Internet of Things, which enables the accessibility and connectivity of devices and things, the Web of Things is about integrating embedded devices into the web using web protocols and services such as HTML, XML, RSS and others, that is, the accessibility of data from devices and things. Sensor networks play a

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unique role within connected embedded devices, which are typically wirelessly connected spatially distributed nodes that jointly observe or monitor a particular physical or chemical phenomenon [140].

Today, the IoT has an impact on mobility services, health care, smart homes, energetical systems, agronomy etc., as well as in the area of intelligent factories, where the development of the industrial Internet plays an important role [141]. In the context of the smart factory, it is essential to mention Cyber Manufacturing Systems that together with IoT, forms the framework the smart manufacturing, where the communication and information network provides the connection between all the connected systems [142]. Artificial intelligence is increasingly concerned with data analysis, planning and the management of smart, sustainable and human-centered product development processes [143]. The smart factory of the future will be based on the sustainable mutual interaction between machine and human [144]. This definition of a future smart factory is very close to the concept of Society 5.0 because its vision is to establish a human-centered society in which products and services will be designed to meet potential needs and reduce specific gaps such as regional, generational, gender, linguistic ones. The transformation processes will enable that people life will be comfortable and vigorous. In order to ensure such living conditions, some of the challenges of economic and social change will need to be addressed, which can be achieved by going beyond the use of advanced ICT, AI and robots versus the transformation of society [19]. According to the Japanese Artificial Intelligence Technology Strategy AI presents the key technology for emergence the Society 5.0. The strategy consists from five pillars and it has to be exposed the ethics and regulation of AI development and rule which includes answers to how, where, how long as to who can companies collecting, storing and sharing a customer data [145]. Japanese government propose the establishing the global rule about data sharing and they released the Social Principles of Human-Centric AI in 2019 [146].

In the next chapter are presented the results of the automated content analysis of the articles published between May 1996 and April 2020.

4.1.3. Automated Content Analysis Results for Articles from 5/1996 to 4/2020

The results of the analysis show that the top four most important themes in the selected journals are “development”, “information”, “data”, “business and services”.

The theme “development” is related to the concept’s “development”, “sustainable”, “technologies”, “public”, “sustainability”, “environment” and “fintech”. This can be explained by the fact that information and communication technologies are increasingly entering the field of so-called green IT technologies in order to achieve long-term sustainable development [147]. The technological footprint is seen as an important factor that harms the environment. Consequences are seen in that the United Nations Sustainable Development Goals are not being achieved. In order to preserve the natural environment, it is, therefore, necessary to accelerate the development of technologies that achieve a low technological footprint [148]. Another issue related to sustainable development is the introduction of new technologies in the digital business environment, introducing new sustainable business models through the internet and internet technologies such as sensors and Wifi robots. These technologies are important in the field of waste collection [149], business logistics, consumption, production [150], and the field of natural disaster warning systems [151]. New technologies have also led to the emergence of fintech, which is significantly changing the business of the financial industry, moving it from traditional banking and e-banking into the cyber-physical system (emergence of corporative sustainability) [152]. It is also important for citizens that, as part of the development of a sustainable society, local authorities can implement online tools to involve citizens more in political decision making. In this way, citizens can contribute to the development of their environment by making more environmentally conscious demands on the leadership of the municipality [136].

The theme “development” overlaps with the theme’s “information”, “services”, “management”, “social”, “environmental” and “energy”.

The second most important theme is “information”, which is related to the concept’s “information”, “internet”, “technology”, “access”, “communication”, “global” and “change”. Since

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the last quarter of the 20th century, humankind has been continuously witnessing the emergence of social change due to the increasing penetration of technologies that enable continuous connectivity and social interaction. Nonetheless, the negative effects of the internet on society must not be forgotten. [154-156]. The theme "information" overlaps with the themes "countries" (concepts: countries, internet, online, digital, policy), "services (concepts: services, digital, support, potential, resources, big)", "development" and "social (concepts: social, economic, impact, growth, business, market) ".

Countries have to be aware of the need to invest in the development of the internet, and that the introduction of internet technologies have significant implications for lifestyle changes, changes in the society and an important effect on the economic growth and sustainable development [157–160]. Nevertheless, internet use and prevalence vary widely between countries. Internet prevalence, therefore, depends on the economic and social situation in each country [161]. The internet can be described as a medium that integrates all the traditional media and is not only an information broker, but also an instrument of active communication, such as the medium of business, and even of interest and political relevance [162,163]. Such an epochal technological breakthrough makes all kinds of connections possible, from entertainment and joint business to the organization of joint political and social actions. Thanks to this, there are enormous opportunities for global communication and connections between people who are in similar situations and share common material, humanitarian, political and other similar ideas and interests. These technical and communicative advances lead to a global synchronization of social and political activities. The members of a group can work together, make joint decisions and act together, regardless of the spatial separation that can be measured thousands of kilometers away. Theoretically, they could be trained on this basis to become transnational social groups and organizations, and to act as those who are located in a smaller community [164,165]. The governments of the countries are also responsible for the institutionalization of internet policy. It has been shown that it is good that the internet is protected. The adoption of an internet security policy is important only for the greater security of individuals, the economy and national security [166].

Enormous progress has been made in the fields of business, social communication, connectivity and organization. The shift of companies to the internet has led to a strong dynamization and acceleration of economic activities [167,168]. From the above, it is reasonable to expect that this circumstance will also contribute to the dynamism of social mobility, so that more and more people will have the opportunity to start their own business (e.g., on digital platforms) with little or no investment, thereby constantly improving the economic situation of the lower classes and increasing prosperity. In particular, it can be assumed that the lower strata are approaching the upper strata in the dimensions where the latter were unattainable: they represent social capital—social connections mainly based on social networks, horizontal mobility and communication, which leads to business contacts and arrangement [169–172]. The supposed well-being that the internet age can bring is most striking and experienced by Western societies. In the world's leading economy, the USA, the coefficient of inequality is 16.2 (2018), and the percentage of people living below the poverty line was around 13.1 per cent in 2018 [173,174].

The environment (concepts: "environment", "future", "important", "role"), which overlaps with the performance (concept: "performance") theme, is related to research on the importance of using sensors and environmental data from an Internet of Everything (IoE) to monitor natural resources and various energy resources. The successful monitoring of natural and energy resources reduces their consumption and has a positive impact on the sustainable management of natural and energy resources [175–177]. However, it is also going for the sociological term of human environment (work, friends, social habits, medical institutions, education institutions, financial institutions…) and the internet has been "disruptively transformed the manner in which human beings interact with their environment (e.g., via smartphones app, digital platforms)" [178–180].

The theme "energy", with the concepts "energy", "smart", "urban", "cities" and "factors", deals with the use of modern information and communication technologies such as IoT, IoS, broadband, cameras, sensors, and urban digital platforms. Increasing population growth in urban areas is driven by increasing urbanization, which in turn reinforces the development of innovative solutions (new

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building materials, control of resource consumption with sensors) that will lead to a reduction in the consumption of natural energy resources in the urban environment. In this way, innovative technologies within the smart city will enable citizens to feel at ease and develop digital city management that minimizes its environmental impact. The concept of the "smart city" is based on intelligent urban management with minimal human interaction [181–183].

The third most important theme is "data" which is related to the concepts data, system, model, network, developed, application. The theme "data" overlaps with the fourth most important theme "services" (concepts: "services", "digital", "support", "potential", "resources", "big"), and other themes "knowledge" (resources: "knowledge", "service", "health", "users") and "management" (resources: "management", "systems", "key", "challenges", "quality", "planning").

In the perspective of the Internet of Users, there needs to be support for the interactive involvement of an increasing number of different users with different needs and expectations. Within the internet of services, the focus is on service-oriented computing, contextualized and proactive services, and service orchestration. This will lead to the creation of virtual communities and the exchange of knowledge and experience among the users involved, with semantic technologies playing an important role in gathering vast amounts of information and knowledge [123,127,184].

Smart technologies can collect knowledge (even tacitly) from citizens (i.e., through the codification of habits, visualization, consulting, use of e-services) and transfer "peer" data to data processing and storage centers (cyberspace) (e.g., by providing enriched information on citizens using platforms such as e-health, e-gov, e-learning, e-social links for the elderly and e-mobility, which could also use video and audio to explain functionality, use and human control). The importance of this type of knowledge management processes has gained in importance with the emergence of the coronavirus. This will have a significant impact on further socio-economic development and accelerate the knowledge management processes in the individual's daily life [185,186].

Therefore, this has leading to the big data dilemma we face today, as well as the novel cloud computing paradigm, which has proliferated in recent years. The growth of big data is projected to continue its rapid ascent and will play a significant role in promoting the development of society [187]. The sources of big data include the web, social media, mobile applications, different types of records and databases, geospatial data, surveys, scanned traditional documents, among others [184]. The gap between the cloud and the endpoints (e.g., IoT nodes) is bridged by fog computing [182].

The last theme is "mobile" with the concepts "mobile", "education" and "networks" The emergence of the smartphones and mobile internet (e.g., 4G and 5G) "created a new social lifestyle" [188]. Thus, mobile applications are becoming increasingly important not only for m-banking, m-government and m-supply channels, but also for the "transformation of network teaching from the desktop computer to mobile teaching" [189].

6. Conclusions

This article used ACA to analyze the contents of the articles. We used the Leximancer software 5.0 to create automated content analysis. The goal of this research was to find out how to use current knowledge to explain the relationship between the internet and sustainable development. The research limitation is that this research was prepared only by using analyses of the articles from the scientific journals in the research platform Web of Science: SCI -EXPANDED and SSCI.

From an analysis of the content of the articles, it can be concluded that research in the field of digitization has increased in the context of the fourth industrial revolution. Within the development theme, research focuses on digitization (e.g., converting a factory into a smart factory, developing intelligent living) and connecting all devices to the internet, and consequently on issues of data storage and analysis based on methods using artificial intelligence [122,125,139]. It is also worth mentioning the development of the industrial internet, which, unlike Industry 4.0, goes beyond production and includes the broader adoption of the internet in other forms of economic activity [190]. The three main elements of the industrial internet are smart machines, advanced analytics and people. Machines that are networked and have control over every part of production and software are not complex. Advanced analytics is a combination of analytics based on physically advanced

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algorithms and automation as well as a wide range of knowledge about the profession itself [191]. People networked in key positions within the company help to create smarter design processes, better sustainability and a better quality of service, and this is perhaps one of the essential things—better safety at work [192,193].

For example, research topics in the development of information and data focus on IoT, which covers everything that has to do with the internet, but increasingly also serves to define objects that communicate with each other. IoT consists of interconnected devices, from simple sensors to smartphones connected to a network via the internet. By combining these interconnected devices with automated systems, information can be collected, analyzed and used to solve a specific user problem. Within IoT, everything is focused on the development of networks, connected devices and large amounts of data. IoT allows devices on closed private internet connections to communicate with others, and enables the same devices to communicate not only within that network but worldwide. IoT creates a privately secured network of connected devices that actually operates and cooperates globally to exchange data with other devices. De Mauro, Greco and Grimaldi [194] identified extensive data as an information value that is so large in volume, speed and variety that it requires specific technology and analysis methods for its digital conversion to determine its value. An example of the use of large amounts of data is provided by Pejić Bach et al. [11], in the financial sector, where, in addition to structured reports, unstructured texts are also analyzed, based on which business decisions are made later. Authors analyze the use of text analysis techniques for data collection and further application in business. Marrara et al. [195] analyzed the application of disruptive technologies in small and medium-sized enterprises using FinTech technologies (large amounts of data, in-depth text analysis, blockchain, artificial intelligence) with particular emphasis on the banking sector.

Within the services, it is necessary to mention Cloud Computing, which enables the availability of computer system resources on-demand, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers that are available to many users via the Internet. Large clouds, which predominate today, often have functions distributed across multiple locations than the central server. Clouds can be limited to a single organization (business clouds), many organizations (public cloud), or a combination of the previous two (hybrid cloud) [196].

Digital technologies also play an essential role in the field of environmental protection. The increasing environmental awareness and increased producer responsibility have increased the need to develop economic, environmental, and socially sustainable business strategies, an important part of which is the integration of digital technology [197]. Here, it is especially necessary to mention waste return policies and the establishment of a high-tech manufacturing industry for waste recovery. Replacing old products with new and more technologically advanced ones has become a strategic added value for companies [198,199].

Currently, the Internet of Things (IoT) solutions play an important role in many areas, especially in smart homes and buildings, healthcare, vehicles and energy. Based on the analysis of the articles, it is possible to predict its further expansion into various areas of development of the future Internet, which include infrastructure, technologies and services. It is also necessary to mention the development of ICT and information management in the digital context and the importance of creativity [200,201]. More and more research will be focused on the fields of advanced interfaces and robotics (robotics and micro space), and nanoelectronics and photonics [202–204]. As a result, new forms of entrepreneurship are also being developed with its business models. The added value of these business models are combined with the production of goods, the supply of services, the value chain, public procurement and the importance of influencing the global social dimension [205,206]. It is precisely this further technological development and the emergence of new business models that the Japanese are counting on, in the context of resolving the long-standing deflation in the country [207]. If Industry 4.0 is a German program designed to save the German and European economies, the Japanese place Society 5.0 alongside it. In the further development of their economic and technological program, they are counting on the gradual integration of AI and other cutting-edge technologies. The Japanese thus want to go beyond the horizons of Industry 4.0 and establish Society

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5.0 as the next step in social development based on data-driven innovation. The goal of the Society 5.0 is that people will have a comfortable and vigorous live and functional system service will facilitate value creation (e.g. economic development, social transformation and economic growth) to society [19]. To implement this program, it will be necessary to introduce next-generation technologies, reform corporate governance and develop strategies for creating value for cities and communities. The programme implementation will reduce the risks associated with innovation failure. In doing so, the public and private sectors will have to work together and focus together on solving social problems (labor market, education), create an appropriate business environment that will enable the growth of entrepreneurship and competition, encourage talented people to develop knowledge and skills and to ensure the security of data exchange [146].

Author Contributions: The authors contributed equally.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Roblek, V.; Pejić Bach, M.; Meško, M.; Bertoncel, T. Best practices of the social innovations in the framework of the e-government evolution. Amfiteatru Econ. 2020, 22, 275–302, doi:10.24818/EA/2019/53/275.
2. Laudon, K.C.; Traver, C.G. E-Commerce: Business, Technology, Society, 12th ed.; Pearson: Harlow, UK, 2016.
3. Lin, D.; Geißler, P.; Ehrlich, S.; Schoop, E. IDEA: A framework for a knowledge-based enterprise 2.0. J. UCS 2011, 17, 515–531.
4. Fisher, T. ROI in social media: A look at the arguments. J. Database Mark. Cust. Strategy Manag. 2009, 16, 189–195, doi:10.1057/dbm.2009.16.
5. Porter, M. Strategy and the Internet. HBR 2001, 79, 63–78.
6. Kaplan, R.S.; Mikes, A. Managing risks: A new framework. HBR 2012, 90, 48–60.
7. Winseck, D. Reconstructing the political economy of communication for the digital media age. Political Econ. Commun. 2017, 4, 73–114.
8. Anshari, M.; Alas, Y.; Guan, L.S. Developing online learning resources: Big data, social networks, and cloud computing to support pervasive knowledge. Educ. Inf. Technol. 2016, 21, 1663–1677, doi:10.1007/s10639-015-9407-3.
9. Statista. Internet Usage Worldwide. Available online: https://www.statista.com (accessed on 9 January 2020).
10. Angeloska-Dichovska, M.; Petkovska-Mirchevska, T. Challenges of the company in the new economy and development of e-business strategy. Strat. Manag. 2017, 22, 27–35.
11. Pejić Bach, M.; Krstić, Ž.; Seljan, T.; Turulja, L. Text mining for big data analysis in financial sector: A literature review. Sustainability 2019, 5, 1277, doi:10.3390/su11051277.
12. Ahn, M.J.; Bretschneider, S. Politics of E-Gov: E-Gov and the political control of bureaucracy. Public Adm. Rev. 2011, 71, 414–424, doi:10.1111/j.1540-6210.2011.02225. x.
13. Pejić Bach, M.; Bertoncel, T.; Meško, M.; Krtić, Ž. Text mining of Industry 4.0 job advertisements. Int. J. Inf. Manag. 2020, 50, 416–431, doi: 10.1016/j.ijinfomgt.2019.07.014.
14. Schwab, K. The Fourth Industrial Revolution: What it Means, How to Respond. Available online: https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond (accessed on 27 March 2020).
15. Nejkovic, V.; Petrovic, N.; Tosic, M.; Milosevic, N. Semantic approach to RIoT autonomous robots mission coordination. Robot. Auton. Syst. 2020, 126, 103438, doi:10.1016/j.robot.2020.103438.
16. Hanna, N.K. Mastering Digital Transformation: Towards a Smarter Society, Economy, City and Nation; Emerald Group Publishing Limited: London, UK, 2016.
17. Petrović, N.; Kocić, Đ. Data-driven framework for energy-efficient smart cities. Serb. J. Electr. Eng. 2020, 17, 41–63, doi:10.2298/SJEE2001041P.
18. Buss, S.; Becker, D.; Daniels, M.; Nöldeke, G.; Blumtritt, C.; Striapunina, K. Digital Economy Compass 2019. Available online: https://www.statista.com/outlook/digital-markets (accessed on 27 March 2020).

Peer-reviewed version available at Data 2020, 5, 80; doi:10.3390/data5030080

19. Fukuda, K. Science, technology and innovation ecosystem transformation toward society 5.0. Int. J. of Prod. Econ. 2020, 220, 107460, doi: 10.1016/j.ijpe.2019.07.033.
20. Cheng, M.; Edwards, D. A comparative automated content analysis approach on the review of the sharing economy discourse in tourism and hospitality. Curr. Issues Tour. 2017, 22, 35–49, doi:10.1080/13683500.2017.1361908.
21. Pucihar, A. The digital transformation journey: Content analysis of Electronic Markets articles and Bled eConference proceedings from 2012 to 2019. Electron. Mark. 2020, 30, 29–37, doi:10.1007/s12525-020-00406-7.
22. Stewart, B.M.; Zhukov, Y.M. Use of force and civil–military relations in Russia: An automated content analysis. Small Wars Insur. 2009, 20, 319–343, doi:10.1080/09592310902975455.
23. Feenberg, A. Questioning Technology; Routledge: London, UK, 1999.
24. Krippendorff, K. Content Analysis: An Introduction to Its Methodology; Sage Publications: Thousand Oaks, CA, USA, 2013.
25. Krippendorff, K. Content analysis: An Introduction to Its Methodology; Sage: Beverly Hills, CA, USA, 1981.
26. Krippendorff, K. Content analysis. In International Encyclopedia of Communication; Barnouw, E., Gerbner, G., Schramm, W., Worth, L.T., Gross, L., Eds.; Oxford University: New York, NY, USA, 1989; Volume 1, pp. 403–407.
27. Vaismoradi, M.; Turunen, H.; Bondas, T. Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nurs. Health Sci. 2013, 15, 398–405, doi:10.1111/nhs.12048.
28. Benckendorff, P.; Zehrer, A. A network analysis of tourism research. Ann. Tour. Res. 2013, 43, 121–149, doi:10.1016/j.annals.2013.04.005.
29. Kuckartz, U. Qualitative Text Analysis: A Guide to Methods, Practice and Using Software; Sage: Los Angeles, LA, USA, 2014.
30. Halmi, A. The qualitative approach to social work: An epistemological basis. Int. Soc. Work 1996, 39, 363–375.
31. Nunez-Mir, G.C.; Iannone III, B.V.; Pijanowski, B.C.; Kong, N.; Fei, S. Automated content analysis: Addressing the big literature challenge in ecology and evolution. Methods Ecol. Evol. 2016, 7, 1262–1272, doi:10.1111/2041-210X.12602.
32. Smith, A.E.; Humphreys, M.S. Evaluation of unsupervised semantic mapping of natural language with Leximancer concept mapping. Behav. Res. Methods 2006, 38, 262–279, doi:10.3758/BF03192778.
33. Blei, D.M. Topic modeling and digital humanities. J. Digit. Hum. 2012, 2, 8–11.
34. Watson, M.; Smith, A.; Watter, S. Leximancer concept mapping of patient case studies. In Knowledge-based intelligent information and engineering systems. Berlin, Springer Berlin, 2005, 1232-1238.
35. Kokkinakis, A.K.; Andreopoulou, Z.S. Teaching and learning sustainability in fisheries in lake ecosystems using ICT-based systems. J. Environ. Prot. Ecol. 2009, 10, 500–509.
36. Wilk, V.; Soutar, G. N.; Harrigan, P. Tackling social media data analysis. Qual. Mark. Res.: An Int. J. 2019, 22(2), 94-113, doi: 10.1108/QMR-01-2017-0021/full/html.
37. Kažemikaitiene, E.; Bilevičiene, T. (2008). Problems of involvement of disabled persons in e. government. Tech. and Econ. Dev. of Econ., 14(2), 184-196, doi:10.3846/1392-8619.2008.14.184-196.
38. Angus, D.; Rintel, S.; Wiles, J. Making sense of big text: A visual-first approach for analysing text data using Leximancer and Discursis. Int. J. Soc. Res. Methodol. 2014, 16, 261–267, doi:10.1080/13645579.2013.774186.
39. Campbell, C.; Pitt, L.; Parent, M.; Berthon, P. Understanding consumer conversations around ads in a web 2.0 world. J. Advert. 2011, 40, 87–102, doi:10.2753/JOA0091-3367400106.
40. Leximancer (2020). Leximancer User Guide. Available online: https://info.leximancer.com/ (accessed on 2 May 2020).
41. Kim, D.; Kim, S. Sustainable supply chain based on news articles and sustainability reports: Text mining with Leximancer and diction. Sustainability 2017, 9, 1008, doi:10.3390/su9061008.
42. Watanabe, C.; Kondo, R.; Ouchi, N.; Wei, H.H. A substitution orbit model of competitive innovations. Technol. Forecast. Soc. Chang. 2004, 71, 365–390, doi:10.1016/S0040-162500351-7.
43. Buck, M.; Helmchen, C.J.; von Moltke, K. From Rio to Johannesburg—A business perspective—The 7th International Business Forum 20–22 August 2002, Johannesburg, South Africa. Int. J. Life Cycle Assess. 2002, 7, 253–260, doi:10.1007/BF02978884.
44. Mabudafhasi, R. The role of knowledge management and information sharing in capacity building for sustainable development—An example from South Africa. Ocean Coast. Manag. 2001, 45, 695–707, doi:10.1016/S0964-569100094-7.

45. Campbell-Kelly, M.; Garcia-Swartz, D.D. The history of the Internet: The missing narratives. J. Inf. Technol. 2013, 28, 18–33, doi:10.1057/jit.2013.4.
46. Berners-Lee, T.; Cailliau, R.; Groff, J.F.; Pollermann, B. World-wide web: The information universe. Int. Res. 1992, 2, 52–58, doi:10.1108/10662241011059471.
47. Sara-Meshkizadeh, D.; Masoud-Rahmani, A. Webpage classification based on compound of using HTML features & URL features and features of sibling pages. Int. J. Adv. Comput. Technol. 2010, 2, 36–46.
48. Wang, Y.C.; Fesenmaier, D.R. Towards understanding members general participation in and active contribution to an online travel community. Tour. Manag. 2004, 25, 709–722, doi: 10.1016/j.tourman.2003.09.011.
49. Fellegi, I.P. Official statistics—Pressures and challenges ISI president's invited lecture. Int. Stat. Rev. 2004, 72, 139–155.
50. Zahariadis, B.T.; Vaxevanakis, K.; Tsantilas, P.C.; Zervos, N.; Nikolaoi, A.N. Global roaming in next-generation networks. IEEE Commun. Mag. 2002, 40, 145–151, doi:10.1109/35.983921.
51. Romanowski, A.; Klank, O.; Fazel, K. Concept of a multistandard receiver for digital broadcast and communication services. IEEE Trans. Consum. Electron. 1997, 43, 662–670, doi:10.1109/30.628692.
52. Mcelroy, D.; Turban, E. Using smart cards in electronic commerce. Int. J. Inf. Manag. 1998, 18, 61–72, doi:10.1016/S0268-401200040-6.
53. Wu, Z.Q.; Lee, Y.S.; Jou, C.I. On-line signature verification based on logarithmic spectrum. Pattern Recognit. 1998, 31, 1865–1871, doi:10.1016/S0031-320300058-2.
54. De Meyer, F.; Lundgren, A.P.; de Moor, G.; Fiers, T. Determination of user requirements for the secure communication of electronic medical record information. Int. J. Med. Inf. 1998, 49, 125–130, doi:10.1016/S1386-505600021-5.
55. Holfelder, W. Interactive remote recording and playback of multicast videoconferences. Comput. Commun. 1998, 21, 1285–1294, doi:10.1016/S0140-366400196-0.
56. Hung, Y.S.; Ku, Y.C.; Chang, M.C. Critical factors of WAP services adoption: An empirical study. Electron. Commer. Res. Appl. 2003, 2, 42–60, doi:10.1016/S1567-422300008-5.
57. Brooks, F.P. What's real about virtual reality? IEEE Comput. Graph. Appl. 1999, 19, 16–27, doi:10.1109/38.799723.
58. Dorsey, E.R.; Steeves, H.L.; Porras, L.E. Advertising ecoturism on the Internet: Commodifying environment and culture. New Med. Soc. 2004, 6, 753–779, doi:10.1177/146144804044328.
59. Wang, Y.C.; Fesenmaier, D.R. Towards understanding members general participation in and active contribution to an online travel community. Tour. Manag. 2004, 25, 709–722, doi:10.1016/j.tourman.2003.09.011.
60. Loebbecke, C.; Powell, P. E-business in the entertainment sector: The Egmont case. Int. J. Inf. Manag. 2002, 22, 307–322, doi:10.1016/S0268-401200015-4.
61. Roe, K.; Muijs, D. Children and computer games: A profile of the heavy user. Eur. J. of Comm. 1998, 13(2), 181-200, doi: 10.1177/0267323198013002002.
62. Schlager, M.S.; Fusco, J. Teacher professional development, technology, and communities of practice: Are we putting the cart before the horse? Inf. Soc. 2003, 19, 203–220, doi:10.1080/01972240309464.
63. Bell, S.; Lane, A. From teaching to learning: Technological potential and sustainable, supported open learning. Syst. Pract. Action Res. 1998, 11, 629–650, doi:10.1023/A:1022136204137.
64. Eminovic, N.; Wyatt, J.C.; Tarpey, A.M.; Murray, G.; Ingrams, G.J. First evaluation of the NHS direct online clinical enquiry service: A nurse-led web chat triage service for the public. J. Med. Int. Res. 2004, 6, e17, doi:10.2196/jmir.6.2.e17.
65. Tan, J.; Cheng, W.N.; Rogers, W.J. From telemedicine to e-health: Uncovering new frontiers of biomedical research, clinical applications & public health services delivery. J. Comput. Inf. Syst. 2002, 42, 7–18, doi:10.1109/38.799723.
66. Gualerzi, D.; Nell, E.J. Transformational growth in the 1990s: Government, finance and high-tech. Rev. Political Econ. 2010, 22, 97–117, doi:10.1080/09538250903214867.
67. Stamenov, J.N.; Vachev, B.I. Monitoring and management of mountain environment. J. Environ. Radioact. 2004, 72, 121–128, doi:10.1016/S0265-931X(03)00193-0.
68. Hamilton, A.; Mitchell, G.; Yli-Karjanmaa, S. The BEQUEST toolkit: A decision support system for urban sustainability. Build. Res. Inf. 2002, 30, 109–115, doi:10.1080/096132102753436486.
69. Yalcin, G. Geo-metadata in spatial data infrastructure and e-governance. Afr. J. Bus. Manag. 2011, 5, 4650, doi:10.5897/AJBM11.050.

70. Simonovic, S.P. Two new non-structural measures for sustainable management of floods. Water Int. 2002, 27, 38–46, doi:10.1080/02508060208686976.
71. Hutchinson, G.; McIntosh, P. A case study of integrated risk assessment mapping in the southland region of New Zealand. Environ. Toxicol. Chem. 2000, 19, 1143–1147.
72. Endacott, R.; Boulos, M.N.K.; Manning, B.R.; Maramba, I. Geographic Information Systems for healthcare organizations: A primer for nursing professions. CIN 2009, 27, 50–56, doi:10.1097/NCN.0b013e31818e4660
73. Meier, R.L. Late-blooming societies can be stimulated by information technology. Futures 2000, 32, 163–181, doi:10.1016/S0016-328700060-9.
74. Suriya, M.; Raheem, A.A. Imformation and communication technology infrastructure and sustainable development in high, middle and low income countries: A comparative analysis. Int. Forum Inf. Doc. 1998, 23, 3–10.
75. Butler, B.S. Membership size, communication activity, and sustainability: A resource-based model of online social structures. Inf. Sys. Res. 2001, 12, 346–362, doi:10.1287/isre.12.4.346.9703.
76. Guarene, E.; Fasano, P.; Vercellone, V. IP and ATM integration perspectives. IEEE Commun. Mag. 1998, 36, 74–80, doi:10.1109/35.649330.
77. Rappaport, T.S.; Annamalai, A.; Buehrer, R.M.; Tranter, W.H. Wireless communications: Past events and a future perspective. IEEE Commun. Mag. 2002, 40, 148–161, doi:10.1109/MCOM.2002.1006984.
78. Pahlavan, K.; Zahedi, A.; Krishnamurthy, P. Wideband local access: Wireless LAN and wireless ATM. IEEE Commun. Mag. 1997, 35, 34–40, doi:10.1109/35.634760
79. Jutla, D.; Bodorik, P.; Dhaliwal, J. Supporting the e-business readiness of small and medium-sized enterprises: Approaches and metrics. Int. Res. 2002, 12, 139–164, doi:10.1108/10662240210422512.
80. Earl, M.J. Evolving the e-business. Bus. Strategy Rev. 2002, 11, 33–38, doi:10.1111/1467-8616.00135.
81. Simpson, S. Universal service issues in converging communications environments: The case of the UK. Telecommun. Policy 2004, 28, 233–248, doi: 10.1016/j.telpol.2003.09.001.
82. Majchrzak, A.; Rice, R. E.; Malhotra, A.; King, N.; Ba, S. Technology adaptation: The case of a computer-supported inter-organizational virtual team. MIS Quarterly. 2000, 569-600.
83. McLean, N. Matching people and information resources: Authentication, authorisation and access management and experiences at Macquarie University, Sydney. Program Electron. Libr. Inf. Syst. 2000, 34, 239–255, doi:10.1108/EUM0000000006932.
84. Westkamper, E. Platform for the integration of assembly, disassembly and life cycle management. Cirp Ann. 2002, 51, 33–36, doi:0.1016/S0007-850661459-0.
85. Andrews, A.J.; Pieyns, S.; Servat, E. The design of an international real time data collection system: SADC-HYCOS. Water Res. Manag. 1999, 13, 253–267, doi:10.1023/A:1008121628265.
86. Chen, J.C.; Chang, N.B.; Chang, Y.C.; Lee, M.T. Mitigating the environmental impacts of combined sewer overflow by web-based share-vision modelling. Civ. Eng. Environ. Syst. 2003, 20, 213–230, doi:0.1080/1028660031000094866.
87. Mabudafhasi, R. The role of knowledge management and information sharing in capacity building for sustainable development—An example from South Africa. Ocean Coast. Manag. 2001, 45, 695–707, doi:10.1016/S0964-569100094-7.
88. Zavadskas, E.K.; Kaklauskas, A.; Banaitis, A. Real estate's knowledge and device-based decision support system. Int. J. Strateg. Prop. Manag. 2010, 14, 271–282, doi:10.3846/ijspm.2010.20.
89. Kurlavičius, A. Sustainable agricultural development: Knowledge-based decision support. Technol. Econ. Dev. Econ. 2009, 15, 294–309, doi:10.3846/1392-8619.2009.15.294-309.
90. Eysenbach, G. The open access advantage. J. of Med. Int. Res. 2006, 8(2), e8, doi: 10.1371/journal.pbio.0040176.
91. Meijer, A. Understanding modern transparency. Int. Rev. of Admin. Sci. 2009, 75(2), 255-269, doi: 10.1177/0020852309104175.
92. Carter, N. J.; Wallace, R. L. Collaborating with public libraries, public health departments, and rural hospitals to provide consumer health information services. J. of Con. Health on the Int. 2007, 11(4), 1-14, doi: 10.1300/J381v11n04_01.
93. Tarby, W.; Hogan, K. Hospital-based patient information services: a model for collaboration. Bull. of the Med. Lib. Ass. 1997, 85(2), 158.
94. Danese, P. Collaboration forms, information and communication technologies, and coordination mechanisms in CPFR. International J. of Prod. Res. 2006, 44(16), 3207-3226, doi: 10.1080/00207540600557991.

95. Li, F. The internet and the deconstruction of the integrated banking model. Br. J. Manag. 2001, 12, 307–322, doi:10.1111/1467-8551.00212.
96. Centeno, C. Adoption of internet services in the acceding and candidate countries, lessons from the Internet banking case. Telemat. Inf. 2004, 21, 293–315, doi:10.1016/j.tele.2004.02.001.
97. Lu, J.; Lu, Z. Development, distribution and evaluation of online tourism services in China. El. Comm. Res. 2004, 4(3), 221-239, doi: 10.1023/B:ELEC.0000027981.81945.2a.
98. Nunkoo, R.; Ramkissoon, H. Travelers' E-purchase intent of tourism products and services. J. of Hos. Mark. & Man. 2003, 22(5), 505-529, doi: 10.1080/19368623.2012.680240.
99. Kokkinakis, A. K.; Andreopoulou, Z. S. Teaching and learning sustainability in fisheries in lake ecosystems using ICT-based systems. J. of Env. Prot. and Ecol. 2009, 10(2), 500-509.
100. Koutroumanidis, T.; Andreopoulou, Z.S. E-learning in the internet supporting quality of life and environment within sustainability in the EU. J. Environ. Prot. Ecol. 2009, 10, 1227–1242, doi:10.3846/1392-8619.2009.15.294-309.
101. Ellaway, R.; Martin, R.D. What's mine is yours–open source as a new paradigm for sustainable healthcare education. Med. Teach. 2008, 30, 175–179, doi:0.1080/01421590701874058.
102. Kumar, R.; Best, M.L. Impact and sustainability of e-government services in developing countries: Lessons learned from Tamil Nadu, India. Inf. Soc. 2006, 22, 1–12, doi:10.1080/01972240500388149.
103. Simpson, S. Universal service issues in converging communications environments: The case of the UK. Telecommun. Policy 2004, 28, 233–248, doi:10.1016/j.telpol.2003.09.001.
104. Sawyer, S.; Allen, J.P.; Lee, H. Broadband and mobile opportunities: A socio-technical perspective. J. Inf. Technol. 2003, 18, 121–136, doi:10.1080/0268396032000101171.
105. Akimaru, H.; Finley, M.R.; Niu, Z. Elements of the emerging broadband information highway. Ieee Commun. Mag. 1997, 35, 84–91, doi:10.1109/35.587711.
106. Chochliouros, I.P.; Spiliopoulou-Chochliourou, A.S.; Lalopoulos, G.K. Radio local area networks (R-LANs)—An enabler of the European broadband perspective. J. Commun. Netw. 2004, 3, 59–65.
107. Papies, D.; Clement, M. Adoption of new movie distribution services on the Internet. J. Med. Econ. 2008, 21, 131–157, doi:10.1080/08997760802300530.
108. Nugroho, Y. NGOs, the Internet and sustainable rural development: The case of Indonesia. Inf. Commun. Soc. 2019, 13, 88–120, doi:10.1080/13691180902992939.
109. Turk, T.; Blažič, B.J.; Trkman, P. Factors and sustainable strategies fostering the adoption of broadband communications in an enlarged European Union. Technol. Forecast. Soc. Chang. 2008, 75, 933–951, doi:10.1016/j.techfore.2007.08.004.
110. Tranos, E.; Gillespie, A. The spatial distribution of Internet backbone networks in Europe: a metropolitan knowledge economy perspective. Eu. Urb. and Reg. Stud. 2009, 16(4), 423-437, doi: 10.1177/0969776409340866.
111. Holden, N. Why marketers need a new concept of culture for the global knowledge economy. Int. Mark. Rev. 2004, 21(6), 563-572, doi: 10.1108/02651330410568015.
112. Li, F. The internet and the deconstruction of the integrated banking model. Br. J. Manag. 2001, 12, 307–322, doi:10.1111/1467-8551.00212.
113. Gatautis, R.; Vitkauskaitė, E. eBusiness policy support framework. Inžinerinė Ekon. 2009, 5, 35–47.
114. Matlay, H.; Westhead, P. Virtual teams and the rise of e-entrepreneurship in Europe. Int. Small Bus. J. 2005, 23, 279–302, doi:10.1177/0266242605052074.
115. Olson, J.R.; Boyer, K.K. Internet ticketing in a not-for-profit, service organization. Int. J. Oper. Prod. Manag. 2005, 25, doi:10.1108/01443570510572259.
116. Loose, W.; Mohr, M.; Nobis, C. Assessment of the future development of car sharing in Germany and related opportunities. Transp. Rev. 2006, 26, 365–382, doi:10.1080/01441640500495096.
117. Menou, J.M. Information behaviour of the "Google generation" as a factor in sustainability for Mexican cities. Aslib Proc. 2010, 62, 165–174, doi:10.1108/00012531011034973.
118. Lankauskienė, T.; Tvaronavičienė, M. Interrelation of countries' developmental level and foreign direct investments performance. J. Bus. Econ. Manag. 2011, 12, 546–565, doi:10.3846/16111699.2011.599412.
119. Goswami, R.; De, S.K.; Datta, B. Linguistic diversity and information poverty in South Asia and Sub-Saharan Africa. Univers. Access Inf. Soc. 2009, 8, 219–238, doi:10.1007/s10209-008-0139-7.
120. Friedewald, M.; Raabe, O. Ubiquitous computing: An overview of technology impacts. Telemat. Inf. 2011, 28, 55–65, doi:10.1016/j.tele.2010.09.001.

121. Wollschlaeger, M.; Sauter, T.; Jasperneite, J. The future of industrial communication: Automation networks in the era of the internet of things and industry 4.0. IEEE Ind. Electron. Mag. 2017, 11, 17–27, doi:10.1109/MIE.2017.2649104.
122. Qiu, T.; Chen, N.; Li, K.; Atiquzzaman, M.; Zhao, W. How can heterogeneous Internet of Things build our future: A survey. IEEE Commun. Surv. Tutor. 2018, 20, 2011–2027, doi:10.1109/COMST.2018.2803740.
123. Liu, C.H.; Wang, J.S.; Lin, C.W. The concepts of big data applied in personal knowledge management. J. Knowl. Manag. 2017, 21, 213–230, doi:10.1108/JKM-07-2015-0298.
124. Yousefpour, A.; Fung, C.; Nguyen, T.; Kadiyala, K.; Jalali, F.; Niakanlahiji, A.; Kong, J.; Jue, J.P. All one needs to know about fog computing and related edge computing paradigms: A complete survey. J. Syst. Archit. 2019, 98, 289–330, doi:10.1016/j.sysarc.2019.02.009.
125. Paiola, M.; Gebauer, H. Internet of things technologies, digital servitization and business model innovation in BtoB manufacturing firms. Ind. Mark. Manag. 2020, doi:10.1016/j.indmarman.2020.03.009.
126. Dominici, G.; Roblek, V.; Abbate, T.; Tani, M. Click and drive: Consumer attitude to product development: Towards future transformations of the driving experience. Bus. Proc. Manag. J. 2016, 22, 420–434, doi:10.1108/BPMJ-05-2015-0076.
127. Barrett, M.; Davidson, E.; Prabhu, J.; Vargo, S.L. Service innovation in the digital age: Key contributions and future directions. Mis Q. 2015, 39, 135–154, doi:10.25300/MISQ/2015/39:1.0.
128. Batty, M.; Axhausen, K.W.; Giannotti, F.; Pozdnoukhov, A.; Bazzani, A.; Wachowicz, M.; Ouzounis, G.; Portugali, Y. Smart Cities of the Future. Eur. Phys. J. Spec. Top. 2012, 214, 481–518, doi:10.1140/epjst/e2012-01703-3.
129. Kowal, J.; Paliwoda-Pękosz, G. ICT for global competitiveness and economic growth in emerging economies: Economic, cultural, and social innovations for human capital in transition economies. Inf. Syst. Manag. 2017, 34, 304–307, doi:10.1080/10580530.2017.1366215.
130. Mao, C.; Koide, R.; Brem, A.; Akenji, L. Technology foresight for social good: Social implications of technological innovation by 2050 from a Global Expert Survey. Technol. Soc. Chang. 2020, 153, 119914, doi:10.1016/j.techfore.2020.119914.
131. Toms, S.; Wilson, N.; Wright, M. Innovation, intermediation, and the nature of entrepreneurship: A historical perspective. Strateg. Entrep. J. 2020, 14, 105–121, doi:10.1002/sej.1310.
132. Cai, C.W. Disruption of financial intermediation by FinTech: A review on crowdfunding and blockchain. Account. Financ. 2018, 58, 965–992, doi:10.1111/acfi.12405.
133. Forman, C.; van Zeebroeck, N. Digital technology adoption and knowledge flows within firms: Can the Internet overcome geographic and technological distance? Res. Policy 2019, 48, 103697, doi: 10.1016/j.respol.2018.10.021.
134. Sanin, C.; Haoxi, Z.; Shafiq, I.; Waris, M.M.; de Oliveira, C.S.; Szczerbicki, E. Experience based knowledge representation for Internet of Things and Cyber Physical Systems with case studies. Future Gener. Comput. Syst. 2019, 92, 604–616, doi: 10.1016/j.future.2018.01.062.
135. Cortellazzo, L.; Bruni, E.; Zampieri, R. The role of leadership in a digitalized world: A review. Front. Psys. 2019, 10, 1938, doi:10.3389/fpsyg.2019.01938.
136. Edelenbos, J.; van Meerkerk, I.; Schenk, T. The evolution of community self-organization in interaction with government institutions: Cross-case insights from three countries. Am. Rev. Public Adm. 2018, 48, 52–66, doi:10.1177/0275074016651142.
137. Zhao, L.; Tang, Z.Y.; Zou, X. Mapping the knowledge domain of smart-city research: A bibliometric and scientometric analysis. Sustainability 2019, 11, 6648, doi:10.3390/su11236648.
138. Szarek-Iwaniuk, P.; Senetra, A. Access to ICT in Poland and the co-creation of urban space in the process of modern social participation in a smart city—A Case Study. Sustainability 2020, 12, 2136, doi:10.3390/su12052136.
139. Atzori, L.; Iera, A.; Morabito, G. Understanding the Internet of Things: Definition, potentials, and societal role of a fast evolving paradigm. Ad Hoc Netw. 2017, 56, 122–140, doi: 10.1016/j.adhoc.2016.12.004.
140. Kumar, R.; Best, M.L. Impact and sustainability of e-government services in developing countries: Lessons learned from Tamil Nadu, India. Inf. Soc. 2006, 22, 1–12, doi:10.1080/01972240500388149.
141. Oztemel, E.; Gursev, S. Literature review of Industry 4.0 and related technologies. J. Int. Manag. 2020, 31, 127–182, doi:10.1007/s10845-018-1433-8.
142. Yao, X.; Zhou, J.; Lin, Y.; Li, Y.; Yu, H.; Liu, Y. Smart manufacturing based on cyber-physical systems and beyond. J. Int. Manag. 2019, 30, 2805–2817, doi:10.1007/s10845-017-1384-5.

143. Ghahramani, M.; Qiao, Y.; Zhou, M.; Hagan, A.O.; Sweeney, J. AI-based modeling and data-driven evaluation for smart manufacturing processes. IEEE/CAA J. Autom. Sin. 2020, 1–12, doi:10.1109/JAS.2020.1003114.
144. Jenkin, T.A.; McShane, L.; Webster, J. Green information technologies and systems: Employees' perceptions of organizational practices. Bus. Soc. 2011, 50, 266–314, doi:10.1177/0007650311398640.
145. Strategic Council for AI Technology. Artificial Intelligence Technology Strategy; Strategic Council for AI Technology: Tokyo, 2017.
146. Council of Science, Technology and Innovation. Social Principles of Human-Centric AI; Government of Japan: Tokyo, 2019.
147. Sauvé, S.; Bernard, S.; Sloan, P. Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. Environ. Dev. 2016, 17, 48–56, doi: 10.1016/j.envdev.2015.09.002.
148. Wu, J.; Song, G.; Huawei, H.; William, L.; Yong, X. Information and communications technologies for sustainable development goals: State-of-the-art, needs and perspectives. IEEE Commun. Surv. Tutor. 2018, 20, 2389–2406, doi:10.1109/COMST.2018.2812301.
149. Popa, C.L.; Carutasu, G.; Cotet, C.E.; Carutasu, N.L.; Dobrescu, T. Smart city platform development for an automated waste collection system. Sustainability 2017, 9, 2064, doi:10.3390/ijerph16040634.
150. Bengtsson, M.; Alfredsson, E.; Cohen, M.; Lorek, S.; Schroeder, P. Transforming systems of consumption and production for achieving the sustainable development goals: Moving beyond efficiency. Sust. Sci. 2018, 13, 1533–1547, doi:10.1007/s11625-018-0582-1.
151. Mei, G.; Xu, N.; Qin, J.; Wang, B.; Qi, P. A Survey of Internet of Things (IoT) for Geo-hazards prevention: Applications, technologies, and challenges. IEEE Internet Things J. 2019, doi:10.1109/JIOT.2019.2952593.
152. Gruin, J.; Knaack, P. Not just another shadow bank: Chinese authoritarian capitalism and the 'developmental'promise of digital financial innovation. New Political Econ. 2020, 25, 370–387, doi:10.1080/13563467.2018.1562437.
153. Sempere-Ripoll, F.; Estelles-Miguel, S.; Rojas-Alvarado, R.; Hervas-Oliver, J.L. Does technological innovation drive corporate sustainability? Empirical evidence for the European financial industry in catching-up and Central and Eastern Europe countries. Sustainability 2020, 12, 2261, doi:10.3390/su12062261.
154. Bessiere, K.; Kiesler, S.; Kraut, R.; Boneva, B.S. Effects of Internet use and social resources on changes in depression. Inf. Community Soc. 2008, 11, 47–70, doi:10.1080/13691180701858851.
155. Lissitsa, S.; Chachashvili-Bolotin, S. Life satisfaction in the internet age–Changes in the past decade. Comput. Hum. Behav. 2016, 54, 197–206, doi:10.1016/j.chb.2015.08.001.
156. Hofkirchner, W. A critical social systems view of the internet. Philos. Soc. Sci. 2007, 37, 471–500, doi:10.1177/0048393107307664.
157. Salahuddin, M.; Gow, J. The effects of Internet usage, financial development and trade openness on economic growth in South Africa: A time series analysis. Telemat. Inform. 2016, 33, 1141–1154, doi:10.1016/j.tele.2015.11.006.
158. Billon, M.; Crespo, J.; Lera-López, F. Educational inequalities: Do they affect the relationship between Internet use and economic growth? Inf. Dev. 2018, 34, 447–459, doi:10.1177/0266666917720968.
159. Kim, H.; Joshanloo, M. Internet access and voicing opinions: The moderating roles of age and the national economy. Soc. Indic. Res. 2020, 1–21, doi:10.1007/s11205-020-02298-8.
160. Szeles, M.R.; Simionescu, M. Regional Patterns and Drivers of the EU Digital Economy. Soc. Indic. Res. 2020, 1–25, doi:10.1007/s11205-020-02287-x.
161. Na, H.S.; Hwang, J.; Kim, H. Digital content as a fast Internet diffusion factor: Focusing on the fixed broadband Internet. Inf. Dev. 2020, 36, 97–111, doi:10.1177/0266666918811878.
162. Jahng, J.; Jain, H.; Ramamurthy, K. Effective design of electronic commerce environments: A proposed theory of congruence and an illustration. IEEE Trans. Syst. Man Cybern. -Part A 2000, 30, 456–471, doi:10.1109/3468.852439.
163. Sandoval-Almazan, R.; Gil-Garcia, J.R. Towards cyberactivism 2.0? Understanding the use of social media and other information technologies for political activism and social movements. Gov. Inf. Q. 2014, 31, 365–378, doi:10.1016/j.giq.2013.10.016.
164. Brown, J.; Broderick, A.J.; Lee, N. Word of mouth communication within online communities: Conceptualizing the online social network. J. Interact. Mark. 2007, 21, 2–20, doi:10.1002/dir.20082.

165. Spyridou, P.L.; Veglis, A. The contribution of online news consumption to critical-reflective journalism professionals: Likelihood patterns among Greek journalism students. Journalism 2008, 9, 52–75.
166. Hoesl, M.; Kniep, R. On the trails of a policy field: The institutionalization of Internet policy within German ministries. Berl. J. Soziologie 2020, doi:10.1007/s11609-020-00397-4.
167. Coltman, T.; Devinney, T.M.; Latukefu, A.; Midgley, D.F. E-business: Revolution, evolution, or hype? Calif. Manag. Rev. 2001, 44, 57–86, doi:10.2307/41166111.
168. Kang, L.; Liu, S.; Gong, D.; Tang, M. A personalized point-of-interest recommendation system for O2O commerce. Electron. Mark. 2020, 1–15, doi:10.1007/s12525-020-00416-5.
169. Hogendorn, C.; Frischmann, B. Infrastructure and general purpose technologies: A technology flow framework. Eur. J. Law Econ. 2020, 1–20, doi:10.1007/s10657-020-09642-w.
170. De Vos, D.; Lindgren, U.; van Ham, M.; Meijers, E. Does broadband internet allow cities to 'borrow size'? Evidence from the Swedish labour market. Reg. Stud. 2020, 1–12, doi:10.1080/00343404.2019.1699238.
171. Anagnost, A. From 'Class' to 'Social Strata': Grasping the social totality in reform-era China. Third World Q. 2008, 29, 497–519, doi:10.1080/01436590801931488.
172. Hoang, L.; Blank, G.; Quan-Haase, A. The winners and the losers of the platform economy: Who participates? Inf. Commun. Soc. 2020, 1–20, doi:10.1080/1369118X.2020.1720771.
173. Hope, D.; Martelli, A. The transition to the knowledge economy, labor market institutions, and income inequality in advanced democracies. World Politics 2019, 71, 236–288, doi:10.1017/S0043887118000333.
174. OECD. Income Inequality. Available online: https://data.oecd.org/inequality/income-inequality.htm (accessed on 4 May 2020).
175. Markovic, D.S.; Zivkovic, D.; Branovic, I.; Popovic, R.; Cvetkovic, D. Smart power grid and cloud computing. Renew. Sustain. Energy Rev. 2013, 24, 566–577, doi:10.1016/j.rser.2013.03.068.
176. Rathore, H.; Mohamed, A.; Guizani, M. A Survey of blockchain enabled cyber-physical systems. Sensors 2020, 20, 282, doi:10.3390/s20010282.
177. O'Dwyer, E.; Pan, I.; Acha, S.; Shah, N. Smart energy systems for sustainable smart cities: Current developments, trends and future directions. Appl. Energy 2019, 237, 581–597, doi:10.1016/j.scs.2018.01.053.
178. Wang, Y.; Hao, F. Does internet penetration encourage sustainable consumption? A cross-national analysis. Sustain. Prod. Consum. 2018, 16, 237–248, doi:10.1016/j.spc.2018.08.011.
179. Sousa, M.J.; Rocha, Á. Skills for disruptive digital business. J. Bus. Res. 2019, 94, 257–263, doi:10.1016/j.jbusres.2017.12.051.
180. Dufva, T.; Dufva, M. Grasping the future of the digital society. Futures 2019, 107, 17–28, doi:10.1016/j.futures.2018.11.001.
181. Li, X.; Fong, P.S.; Dai, S.; Li, Y. Towards sustainable smart cities: An empirical comparative assessment and development pattern optimization in China. J. Clean. Prod. 2019, 215, 730–743, doi:10.1016/j.jclepro.2019.01.046.
182. Yigitcanlar, T.; Kamruzzaman, M.; Foth, M.; Sabatini-Marques, J.; da Costa, E.; Ioppolo, G. Can cities become smart without being sustainable? A systematic review of the literature. Sustain. Cities Soc. 2019, 45, 348–365, doi:10.1016/j.scs.2018.11.033.
183. Grah, B.; Dimovski, V.; Peterlin, J. Managing sustainable urban tourism development: The case of Ljubljana. Sustainability 2020, 12, 792, doi:10.3390/su12030792.
184. Asghari, P.; Rahmani, A.M.; Javadi, H.H.S. Internet of Things applications: A systematic review. Comput. Netw. 2019, 148, 241–261, doi: 10.1016/j.comnet.2018.12.008.
185. Roblek, V.; Mesko, M.; Dimovski, V.; Peterlin, J. Smart technologies as social innovation and complex social issues of the Z generation. Kybernetes 2019, 48, 1–107, doi:10.1108/K-09-2017-0356.
186. Kim, E.; Huh, D.H.; Kim, S. Knowledge-based power monitoring and fault prediction system for smart factories. Pers. Ubiquitous Comput. 2019, 1–12, doi:10.1007/s00779-019-01348-4.
187. Chen, C.P.; Zhang, C.Y. Data-intensive applications, challenges, techniques and technologies: A survey on Big Data. Inf. Sci. 2014, 275, 314–347, doi:10.1016/j.ins.2014.01.015.
188. Wang, W. Smartphones as Social Actors? Social dispositional factors in assessing anthropomorphism. Comput. Hum. Behav. 2017, 68, 334–344, doi:10.1016/j.chb.2016.11.022.
189. Roden, J.A.; Jakob, S.; Roehrig, C.; Brenner, T.J. Preparing graduate student teaching assistants in the sciences: An intensive workshop focused on active learning. Biochem. Mol. Biol. Educ. 2018, 46, 318–326, doi:10.1002/bmb.21120.

Peer-reviewed version available at Data 2020, 5, 80; doi:10.3390/data5030080

190. ur Rehman, M.H.;Yaqoob, I.; Salah, K.; Imran, M.; Jayaraman, P.P.; Perera, C. The role of big data analytics in industrial Internet of Things. Future Gener. Comput. Syst. 2019, 99, 247–259, doi: 10.1016/j.future.2019.04.020.
191. Sisinni, E.; Saifullah, A.; Han, S.; Jennehag, U.; Gidlund, M. Industrial internet of things: Challenges, opportunities, and directions. IEEE Trans. Ind. Inform. 2018, 14, 4724–4734, doi:10.1109/TII.2018.2852491.
192. Fernando, Y.; Jabbour, C.J.C.; Wah, W.X. Pursuing green growth in technology firms through the connections between environmental innovation and sustainable business performance: Does service capability matter? Resour. Conserv. Recycl. 2019, 141, 8–20, doi: 10.1016/j.resconrec.2018.09.031.
193. Secundo, G.; Ndou, V.; Del Vecchio, P.; De Pascale, G. Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. Technol. Forecast. Soc. Chang. 2020, 153, 119917, doi:10.1016/j.techfore.2020.119917.
194. De Mauro, A.; Greco, M.; Grimaldi, M. A formal definition of Big Data based on its essential features. Libr. Rev. 2016, 65, 122–135, doi:10.1108/LR-06-2015-0061.
195. Marrara, S.; Pejic-Bach, M.; Seljan, S.; Topalovic, A. FinTech and SMEs: The Italian Case. In FinTech as a Disruptive Technology for Financial Institutions; Rafaj, A., Ed.; IGI Global: Hershey, PA, USA, 2019; pp. 14–41.
196. Wang, L.;Ma, Y.; Yan, J.; Chang, V.; Zomaya, A.Y. pipsCloud: High performance cloud computing for remote sensing big data management and processing. Future Gener. Comput. Syst. 2018, 78, 353–368, doi: 10.1016/j.future.2016.06.009.
197. Fernando, Y.; Jabbour, C.J.C.; Wah, W.X. Pursuing green growth in technology firms through the connections between environmental innovation and sustainable business performance: Does service capability matter? Resour. Conserv. Recycl. 2019, 141, 8–20, doi: 10.1016/j.resconrec.2018.09.031.
198. Stock, T.; Obenaus, M.; Kunz, S.; Kohl, H. Industry 4.0 as enabler for a sustainable development: A qualitative assessment of its ecological and social potential. Process Saf. Environ. Prot. 2018, 118, 254–267, doi: 10.1016/j.jclepro.2016.04.146.
199. Baumgartner, R.J.; Rauter, R. Strategic perspectives of corporate sustainability management to develop a sustainable organization. J. Clean. Prod. 2017, 140, 81–92, doi: 10.1016/j.jclepro.2016.04.146.
200. Lu, H.P.; Chen, C.S.; Yu, H. Technology roadmap for building a smart city: An exploring study on methodology. Future Gener. Comput. Syst. 2019, 97, 727–742, doi:10.1016/j.future.2019.03.014.
201. Cooper, D.R.; Gutowski, T.G. Prospective environmental analyses of emerging technology: A critique, a proposed methodology, and a case study on incremental sheet forming. J. Ind. Ecol. 2020, 24, 38–51, doi:10.1111/jiec.12748.
202. Beckerle, P.; Castellini, C.; Lenggenhager, B. Robotic interfaces for cognitive psychology and embodiment research: A research roadmap. Wiley Interdiscip. Rev. Cogn. Sci. 2019, 10, e1486, doi:10.1002/wcs.1486.
203. Vasconez, J.P.; Kantor, G.A.; Cheein, F.A.A. Human–robot interaction in agriculture: A survey and current challenges. Biosyst. Eng. 2019, 179, 35–48, doi:10.1016/j.biosystemseng.2018.12.005.
204. Yan, W.; Dong, C.; Xiang, Y.; Jiang, S.; Leber, A.; Loke, G.; Xu, W.; Hou, C.; Zhou, S.; Chen, M.; et al. Thermally drawn advanced functional fibers: New frontier of flexible electronics. Mater. Today 2020, doi:10.1016/j.mattod.2019.11.006.
205. Müller, J.M.; Buliga, O.; Voigt, K.I. The role of absorptive capacity and innovation strategy in the design of industry 4.0 business Models-A comparison between SMEs and large enterprises. Eur. Manag. J. 2020, doi:10.1016/j.emj.2020.01.002.
206. Machado, C.G.; Winroth, M.P.; Ribeiro da Silva, E.H.D. Sustainable manufacturing in Industry 4.0: An emerging research agenda. Int. J. Prod. Res. 2019, 58, 1462–1484, doi:10.1080/00207543.2019.1652777.
207. Cabinet Office. Annual Report on the Japanese Economy and Public Finance 2017; Cabinet Office, Tokyo, 2017.