

THE ECONOMIC VALUE OF PERSONAL DATA IN DIGITAL ECONOMY

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Abstract: *Personal data can be seen as an economic asset generated by the identity and behavior of individuals who are traded in exchange for higher-quality services and products. The volume of stored personal data is increasing rapidly. In the two-sided market mechanism, online platforms act as intermediaries that collect consumer data and sell advertising slots to companies. Using personal data removes information asymmetries and contributes to the efficiency of online transactions. Consumers' lack of self-determination of personal data can lead to the uneven exchange of economic value. Unless appropriate measures are taken, such concerns about how data is used threaten to reduce individuals' willingness to share their personal information. Personal data can help businesses perform 'churn detection', identifying customers more likely to leave a retailer. Using such techniques, companies can implement marketing actions to increase customer loyalty. Detecting customer churn is important for businesses because the cost of retaining existing customers is usually lower than the cost of acquiring new customers. Targeted Internet advertising plays a useful informational role for users, as they can see adverts relevant to their potential unique interests. Voluntary data sharing by users is accompanied by explicit rewards and other promotional offers. In the current study we explore the advertisements by the online platforms and their relation with personal data transfer. To explore the economic value of personal data, we apply a survey. Correlation analysis is applied.*

Keywords: *digital economy, risk management, personal data*

JEL Classification: *K00, M2*

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EKONOMSKA VREDNOST LIČNIH PODATAKA U DIGITALNOJ EKONOMIJI

Sažetak: Lični podaci se mogu posmatrati kao ekonomsko sredstvo koje je podstaknuto identitetom i ponašanjem pojedinaca, a kojim se trguje u zamenu za visokokvalitetne proizvode i usluge. Obim uskladištenih ličnih podataka veoma brzo raste. U dvostranom tržišnom mehanizmu, onlajn platforme deluju kao posrednici koji prikupljaju podatke o potrošačima i prodaju reklamne slotove kompanijama. Korišćenjem ličnih podataka otklanja se informaciona asimetrija i doprinosi se efikasnosti onlajn transakcija. Do neravnomerne razmene ekonomske vrednosti dovodi i to što potrošači često nisu u mogućnosti da samostalno usmere lične podatke. Sve dok se ne preduzmu odgovarajuće mere, zabrinutost vezana za načine upotrebe podataka pretila da ugrozi individualnu volju za podelom ličnih podataka. Lični podaci mogu pomoći preduzećima da preduzmu „otkrivanje odliva“, identifikujući potrošače koji bi verovatno napustili maloprodaju. Koristeći takve tehnike, kompanije mogu primeniti marketinške akcije u cilju povećanja lojalnosti potrošača. Utvrđivanje odliva potrošača je veoma značajno za poslovanje jer je trošak zadržavanja postojećih potrošača obično niži od troška osvajanja novih potrošača. Ciljna internet promocija ima veoma korisnu informativnu ulogu za potrošače, s obzirom na to da na taj način oni mogu videti reklame koj su svojstvene njihovim jedinstvenim interesima. Dobrovoljno deljenje podataka od strane korisnika često je praćeno eksplicitnim nagradama i drugim promotivnim ponudama. U ovom radu se istražuju reklamne poruke upućene putem onlajn platformi i njihova povezanost sa prenosom ličnih podataka. U radu je primenjen anketni pristup kako bi se istražila ekonomska vrednost ličnih podataka, dok je u obradi podataka primenjena korelaciona analiza.

Ključne reči: digitalna ekonomija, upravljanje rizicima, lični podaci

1. INTRODUCTION

The term "digital economy" indicates a new stage in the production of goods and services using modern information technologies (Nikityuk, Tkachuk & Korotkova, 2020). The question of the development of the digital economy can be considered in theoretical and practical aspects related to personal data protection. It is relevant to the government because of the vital function of digital technology in enhancing national strategic competitiveness. This new kind of economy is a viable market model with a huge amount of resources that can become a source of national economic growth in the field of innovation development. What the crucial for a natural person is his data protection in this new economic reality of digitalization. Modern information and communication technologies are changing all social relations, forming a new information society called the "digital economy".

The main aim of this study is to explore personally as a new class of asset in the digital economy. We observe the relationship between personal data and online platforms – instruments for managing financial markets' fractions by reducing information asymmetry and managing adverse choice and moral hazard. A bibliometric analysis is applied to reveal the importance of the explored topic.

2. THE NEW ASSET OF THE ECONOMIC THEORY – PERSONAL DATA

The European Union Data Protection Directive (95/46/EC) defines personal data as any information relating to an identified or identifiable natural person or data subject. Personal data can be seen as an economic asset generated by the identity and behavior of individuals who are traded in exchange for higher-quality services and products. The volume of stored personal data is increasing rapidly because online platforms act as intermediaries that collect user data and sell advertising slots to companies in the two-sided market mechanism. By analyzing the data they receive from consumers, they can develop personalized advertising strategies for companies' products and services. This way, companies are theoretically more successful in marketing their products, and consumers receive recommendations tailored to their interests.

In other words, the use of personal data helps to manage the fraction of the financial markets, defined as information asymmetry and contributes to the efficiency of online transactions (Lane, Stodden, Bender & Nissenbaum, 2014). Among the many different types of privacy, the formal economic analysis puts its focus primarily on privacy as the hiding of personal information – which may be classified as a form of information asymmetry. The seller may not be aware of the consumer's "type", i.e. his preferences or preferred price for buying a product before their first interaction with the customer. The consumer may not know how the seller will use the information he receives from a transaction, once it has been communicated to him or her by way of interaction with the trader, e.g. when purchasing a product at a specific price. The former is a case of hidden information and the latter a case of hidden action. The first one may be defined as an information asymmetry problem and the second one is a possibility for the realization of moral risk.

In the late 1970s and early 1980s, some of the first important economic research on privacy appeared in literature as a result of the work of researchers who are part of what is called Chicago's School. The quality of information available on economic agents in the market can be impaired by privacy protection. Excessive protection of privacy can therefore be economically inefficient and redistributive, as it can deny the signals that the market needs to allocate, compensate, and price factors of production efficiently. Lack of data may lead

to cost shifting: an employer who does not have complete access to a candidate's CV could be responsible for the costs related to hiring someone unfit. This situation is a realization of another fraction of the markets, namely - adverse choice. Economic research based on the assumption of non-classical economic agents whose behavior may be classified as rational cannot adequately capture the nuances of transactions outside the 'logic of the market', such as those involving privacy.

According to Noneva-Zlatkova (2020) in the post-global economic and financial crisis, Europe is suffering from significantly low levels of investment. Investment in the collection and processing of personal information can also be defined as inefficient, as the use of this type of information can have a redistributive effect, leading to overinvestment in database collection. A blanket ban on the dissemination of personal data would not be in the interests of the users themselves, nor of the companies they interact with. The user may have an interest in disclosing certain personal characteristics to other companies, but the same user may have an interest in keeping other types of information secret (Acquisti, 2014).

Some researchers define personal data as “a new asset class” where they claim that each like and click possesses the characteristics of an asset (Sadowski, 2019). The classification of personal data as an asset supposes a detailed analysis of the accounting requirements. In accounting, databases are classified as intangible assets. According to the International Accounting Standards, intangible assets are defined as “an identifiable non-monetary asset without physical substance” (IAS, 38). According to Birch (2017) the assetization of personal data is observed especially nowadays when Big Tech transforms them into measurable and legible assets by “techcraft”. They claim that it is difficult to measure the value of personal information, only data which is sold or licensed can be estimated. According to Varian (2018), it is not the data that is traded, the access to personal data is. Several studies define personal data as a new type of commodity, while others define it as the new oil. They represent a far more valuable asset for the following reasons:

1. Source of economic value - Data has long been valuable to economic activity. To grant a loan to a farmer, a colonial bank had to check the local land registry to learn how much land the potential borrower owned. Ancient states conducted censuses to gather information about their subjects and facilitate tax collection. Many market activities have been registered to build trust and ensure security in the exchange of goods and services. The collection of personal data has always involved a trade-off between respecting an individual's desire for privacy -

including from the government - and reaping the commercial and social benefits that can be derived from its collection and dissemination.

2. Data has several distinctive characteristics that contribute to its unique nature as an intangible asset. They are an important determinant of their usability within different business models. Most importantly, the data is not subject to the standard depreciation of tangible assets. This means that the data can be used repeatedly without reducing its value. In principle, data can be reused at a low marginal cost. Usually, the infrastructure and analytics of the data itself are what determines the cost of re-using it.
3. They have no competitive counterpart: while the use of oil means that others can no longer use it, the same data can be used by many people. Like a new idea, society will benefit most from data when it is widely shared because more users will be able to use it to drive efficiency and innovation. But while technology makes data non-rivalry possible, policies and private decisions influence whether this will be the case in practice. Under current policies, private firms are unlikely to have incentives to give their competitors access to the data they collect, so data hoarding practices may limit market competition and the social benefits that could be derived from the data.
4. Data accounts for the impact of externalities: the collection, sharing, and processing of personal data by one agent imposes costs on others by affecting their privacy. The bottom line is that a data marketplace that lacks sufficient consumer rights to control — where data collectors do whatever they want with the data they collect — is likely to lead to too much data collection and too little privacy. A related policy challenge is to clarify the rights and obligations of actors in data markets.
5. Data can only be “partially excluded”: Storing data in interconnected systems means that controlling access to data requires continuous investment to prevent its loss through cyberattacks. A key policy question is the extent to which private data collectors and processors have adequate incentives to invest in the protection of their data, especially in the case of individual data for others. A consensus has emerged that the impact on personal reputation is insufficient and policy measures are needed to ensure that sensitive data is adequately protected.

3. PERSONAL DATA AND ONLINE PLATFORMS – INSTRUMENTS FOR MANAGING FINANCIAL MARKETS’ FRACTIONS BY REDUCING INFORMATION ASYMMETRY

Some concerns about the eventual inappropriate usage of user data are not unfounded. According to Liem and Petropoulos (2016), users are not in a position to know how their data can be analyzed or transferred on the internet platforms, and whether it is sufficiently protected. They put the focus on a statement in the New York Times which notes, that data analysis can have a potential for discrimination: "You may be denied health insurance based on a Google search you made about a medical condition. You may be shown a credit card with a lower credit limit not because of your credit history, but because of your race, gender, zip code, or the types of websites you visit." An uneven exchange of economic value may result from this lack of user autonomy in the collection of personal data. Such concerns about the use of private data are threatening to deter individuals' willingness to disclose it unless adequate safeguards are agreed. While the potential misuse of personal data and related privacy concerns are important issues that need to be dealt with by authorities, we have focused our study on the economic value of such information in a two-directional market mechanism. To improve the user experience and provide more relevant services and advertisements, online platforms such as Google and Facebook use the collected personal data. Facebook uses users' data to communicate with them, adjusts its services, provides more personalized content and advertising, makes suggestions, or creates shortcuts for users.

By making it possible to target interest advertisements at these audiences using common consumer data and demographics, internet platforms help businesses market their products or services by choosing the audience groups that will be less likely to receive unwanted advertising from them. Facebook has created a model of interest advertising, based on users' age, gender, location, and interests. To record the types of pages visited and to associate users with certain interests or demographic characteristics as a basis for targeted advertising, Google installs cookies on user's browsers. Google sets cookies in the user's browser to record the types of pages visited and to associate users with certain interests or demographic characteristics that are used as a basis for targeted advertising. These platforms base a large proportion of their revenues on advertising, which is based on the number of users who come to them because they do not impose charges for internet services. Google advertising is a major revenue generator, contributing over 90% of Google's total revenue over the last decade (Figure 1).

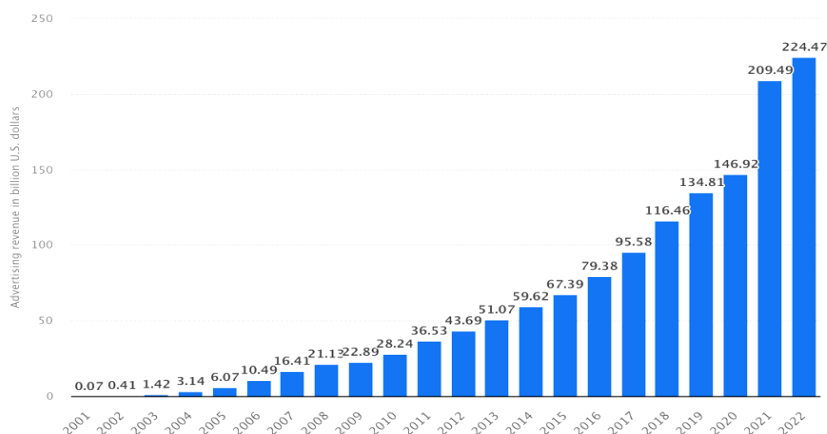


Figure 1. Advertising revenues of Google from 2001 to 2022 in billion US dollars

Note. Retrieved from Statista. <https://www.statista.com/statistics/266249/advertising-revenue-of-google/#statisticContainer>

Companies are not simply taking data from online platforms in a passive manner. They're constantly building up their consumer databases to analyze trends in demand. The additional value of such processes for businesses is not easy to calculate. However, projections suggest that the importance of personal data to organizations on both sides seems to be increasing. To help companies better target their R&D efforts and shorten the development cycle, data such as product reviews, comments on social media sites, or the use of sensors embedded in products are becoming increasingly used. To identify and prevent online payment fraud, PayPal is developing a payment verification system and combining it with users' data. This leads to improved consumer confidence in online commerce. It has been estimated that insurers and healthcare providers can achieve overall cost savings of 10-20% by using personal data.

Employers and companies use the data to screen potential employees or prospective clients, using a broader set of information. To develop corporate risk models, this applies. Personal data can help businesses carry out 'potential customer churn detection', which means identifying customers who are more likely to leave a retailer. Using such techniques, companies can implement marketing actions to increase customer loyalty. Detecting customer churn is important for businesses because the cost of retaining existing customers is usually lower than the cost of acquiring new customers. Customer churn detection can also be used to detect employee churn in some companies.

Detecting churn is done using socio-demographic information about customers, data on their use of services, and data on the characteristics of their friends/neighbors, such as the number of friends who have recently given up their services.

In principle, the targeting of Internet advertising serves as an important informational tool for consumers because they can see ads that relate to their specific interests. In some cases, explicit rewards and other promotional offers are added to the voluntary sharing of data by users. For example, Datacoup pays users for their data by advertisers' demands. Advertisers, on the other hand, will have access to a large pool of aggregated, deidentified, anonymous data about Datacoup's users. These strategies challenge the dominant model of data collection, without any financial gain, and make it clear that data can be considered as a currency for users' online activities and transactions. Therefore, it is interesting to ask whether users are willing to share their data in exchange for personalized services (recommendations and more relevant ads); and rewards/discounts or other promotional offers.

4. BIBLIOMETRIC ANALYSIS

Bibliometric methods are widely used to represent the relationship between quantitative methods and the research domain. This study proposes research questions, what are the mapping and trends of digital economy research using visual bibliometric analysis? Bibliometrics can measure research productivity at individual, institutional, and international levels. To search and classify similar documents in the global academic database Scopus, this study lists important keywords related to digital economy publications. The researchers used the Scopus database as the main source of information, as it is considered a reliable source of scholarly publications by academics. We apply VOSviewer to create a map that visualizes the relationship between the keywords: „personal data“ and „economic value“. 13 398 publication results were retrieved from the Scopus database in January 2024, which were further limited to business, law, management and accounting, economics, econometrics, and finance. The refinement reduced this to a total of 6004 results. A total of 27 864 keywords were identified in the 2004 studies that were taken into account. Of the 2004 keywords, 1296 were the keywords that appeared at least 7 times in the studies. Terms were found to have low relevance scores and their co-occurrences with other phrases followed a more or less random pattern. VOSviewer allows to exclusion of keywords with low relevance scores. After the evaluation, the total number of keywords is 199 which have a strong degree of relevance to the topic under study.

The visualization map of the keyword network is presented in Figure 2. In the resulting visualization, each term is represented by a circle. We observe 4 clusters with keywords with the following main terms: data privacy, data protection, human, machine learning, and economic value. The distance between the two circles indicates the proximity of the two keywords. The connecting lines in the figure depict the relationships between the elements. Also, the thicker the line, the stronger the relationship between the items. Figure 2 shows if two keywords appear together in the explored studies. The cluster which includes the following terms: blockchain, cryptography, deep learning, machine learning, internet of things, and cyber security information management may be considered as a cluster of the techniques and instruments of the digital economy. The co-occurrence map reveals the impact of the digital economy on the process of “assetization” of personal data.

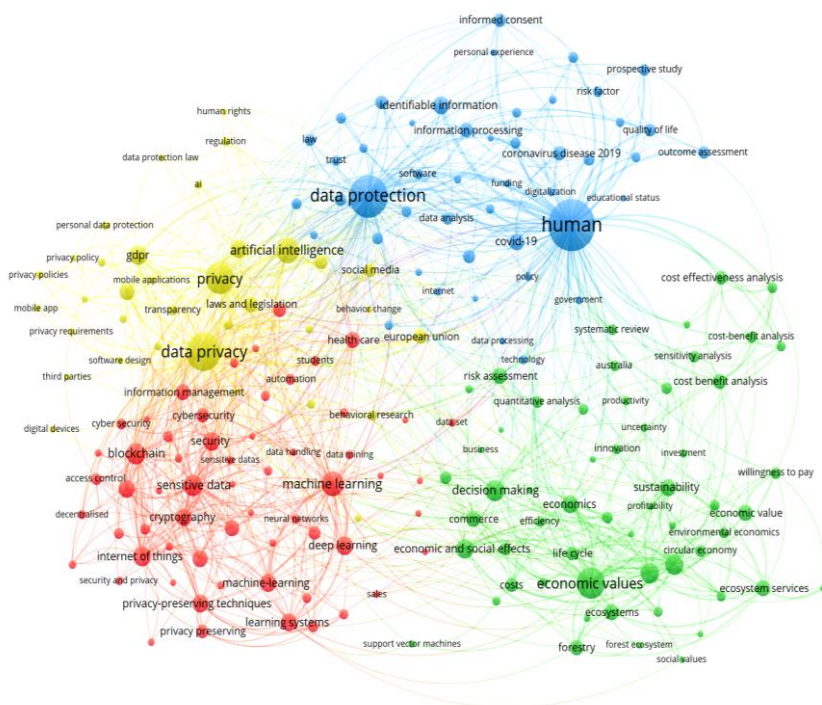
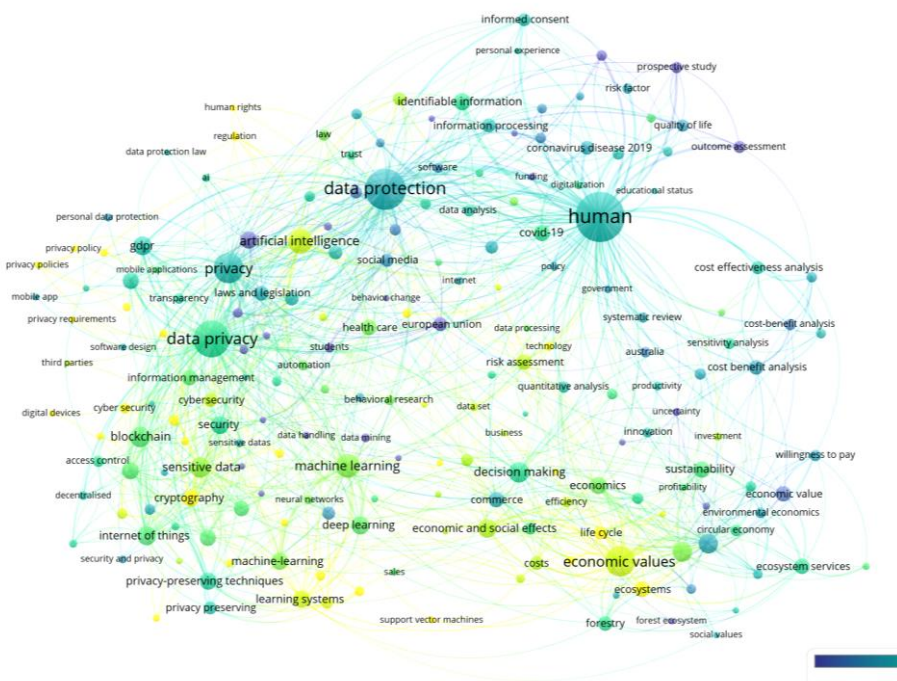


Figure 2. Co-occurrence map of the explored keywords

Note. Authors' estimation.

The overlay visualization (Figure 3) shows that in recent years measuring the economic value of personal data has gathered more attention among researchers compared to the discussion on the relationship between personal data and data



Note. Authors' estimation.

4. RESULTS AND DISCUSSIONS

We advocate that it is necessary to outline the profile of Bulgarian respondents in terms of their gender, age, education, occupation, and their awareness of the possibility of gaining income by “selling” their data. The results show that 81.2

% of the respondents are women (total amount of respondents 126). The highest share of respondents aged between 29 and 38 years was identified as 41.5 % in terms of the age range. This may be explained by the fact that the younger population uses digital technologies more actively. 52,3 % of the respondents have a higher education and 51.62% have a personal income above 1500 BGN.

Table 1

Correlation matrix based on results of the applied survey

	Education	Personal income	Usage of digital technologies	Personal data protection awareness
Education	1			
Personal income	0.796258461	1		
Usage of digital technologies	0.458123792	0.581934521	1	
Personal data protection awareness	0.684203152	0.384502642	0.850289451	1

Note. Authors' calculation.

Applying the survey we construct our null hypothesis: There is a strong level of correlation between the digital economy and personal data protection awareness. This hypothesis reflects the structure of the survey: it is divided into four sections: Education, Personal income, Usage of digital technologies, and Personal data Awareness. We observe a strong positive correlation between personal income – education and personal data protection awareness – education. This proves that the level of education and qualification defines your salary and your willingness to protect your personal information because of better estimating the risk possibilities. On the other hand personal income has a weak correlation with personal data protection awareness with a coefficient equal to 0.384502642. The strongest positive co-dependence is observed between the usage of digital technologies and personal data protection. These results confirm the null hypothesis and confirm the importance of data protection in the era of digitalization.

5. CONCLUSION

In this study, we observe the process of assetization of „personal data“ defining its main characteristics as an economic asset. Personal data can be seen as an economic asset generated by the identity and behavior of individuals who are traded in exchange for higher-quality services and products. The volume of

stored personal data is increasing rapidly. In the two-sided market mechanism, online platforms act as intermediaries that collect consumer data and sell advertising slots to companies. Using personal data removes information asymmetries and contributes to the efficiency of online transactions. Consumers' lack of self-determination of personal data can lead to the uneven exchange of economic value. Detecting customer churn is important for businesses because the cost of retaining existing customers is usually lower than the cost of acquiring new customers. Targeted Internet advertising plays a useful informational role for users, as they can see adverts relevant to their potential unique interests. Voluntary data sharing by users is accompanied by explicit rewards and other promotional offers. In the current study we explore the advertisements by the online platforms and their relation with personal data transfer. Applying a bibliometric analysis the impact of the digital economy on the process of “assetization” of personal data is proved. By correlation analysis, the aforementioned results are confirmed.

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