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Abstract: Because of the rapid progress of information and communication technology, everyday life activities can now be easily moved to the digital world. Public administration is one of the sectors most impacted by this transition. It is clear that electronic government and mobile government apps will grow further as public administration becomes more digital. This digital base is becoming increasingly important for electronic engagement and governance. One of the technologies that arise on the basis of this environment is "blockchain technology". The aim of this study is to reveal the relationship of blockchain technology with the governance process. The method of the study is content analysis. The literature on the subject was searched and world examples were researched and analyzed. Since blockchain technology is a newly developing system, its potential use will be investigated, the definition of this system and its development, blockchain applications in the world will be revealed; By explaining the concept of governance, the benefits of blockchain technology for governance will be emphasized.

Keywords: Blockchain, blockchain applications in the world, governance, blockchain governance.

Öz: Günümüzde bilgi ve iletişim teknolojilerinin hızlı gelişimi, gündelik hayat pratiklerinin hızla dijital ortama aktarılmasına olanak tanımaktadır. Bu dönüşümün en fazla etkilediği alanlardan biri de kamu yönetimidir. Kamu yönetiminde dijitalleşme ile birlikte, elektronik devlet ve mobil devlet uygulamalarının daha da gelişeceği açıktır. Bu dijital temel, elektronik

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katılım ve elektronik yönetişim süreçleri için çok önemli hale gelmektedir. Bu ortam temelinde yükselen teknolojilerden biri de blokzincir teknolojisidir. Bu çalışmanın amacı blokzincir teknolojisinin yönetişim süreci ile olan ilişkisini ortaya koymaktır. Çalışmanın yöntemi içerik analizidir. Konuya ilişkin literatür taraması yapılarak, dünya örnekleri incelenerek analiz edilmiştir. Blokzincir teknolojisi yeni gelişmekte olan bir sistem olduğu için potansiyel kullanımı araştırılacak, bu sistemin tanımı, gelişimi, dünyada blokzincir uygulamaları ortaya konulacak; yönetişim kavramı açıklanarak blokzincir teknolojisinin yönetişim için sağlayacağı faydalar üzerinde durulacaktır.

Anahtar Kelimeler: Blokzincir, dünyada blokzincir uygulamaları, yönetişim, blokzincir yönetişimi.

Introduction

Governance mechanisms are becoming more and more important in terms of transparency, accountability and accessibility to services in public administration. Integrating public services with digital smart applications will make the operation of administrative processes more efficient. With the disappearance of the time and place difference at the stage of information and communication technologies, the cooperation between the local administration and the central government is getting much more advanced. It is assumed that today governance will mostly operate on the basis of smart cities. One of the most important and fundamental components of smart cities is digital applications. Blockchain technology is a brand new understanding and system based on consensus and trust built on all these foundations. Today, it seems possible that many bureaucratic procedures take place on the blockchain.

1. Definition of "Blockchain"

The "blockchain" system can be compared to an accounting ledger. Blockchain technology, which can also be described as a kind of digital ledger, is a database protocol that enables direct exchange of data without the need for an intermediary. The digital ledger is kept at all stations in the network, in other words, "nodes". This network is decentralized and distributed (Güven & Şahinöz, 2020: 44).

Blockchain technology is a software architecture that uses an open-source-coded, decentralized, distributed, peer-to-peer network where transactions between the parties are recorded and encrypted in blocks, verified by mathematical algorithms, past records are kept and having very little probability of changing these records as it requires the change of thousands of computer records where transactions are open to everyone, kept identities confidential (Gibson & Kirk, 2016: 1, 2).

The records of the transactions performed in the blockchain system are merged

periodically and saved in blocks. The amount of records in the blocks is available in the design of the blockchain. Summary algorithms and digital signatures are used to control data integrity during the creation of a block. Since each block is connected to each other as a chain with these summary algorithms, the system is called a "blockchain" (Werbach, 2021: 55-58).

Each block has a "hash" value that functions like fingerprints. The hash value is a value that defines the block and its contents and is calculated mathematically each time a block is created. It is very difficult to change the data in the chain as each block has its own hash value and the preceding block. SHA256, SHA384 and SHA 512 summary functions are the most known of the hashing functions (Güven & Şahinöz, 2020: 50-52).

The transactions are carried out by individuals and/or groups called "data miners" who receive a reward as cryptocurrency in return by confirming the transactions with mathematical algorithms. Once verified by data miners, a block cannot be changed again. Since all records in the system are kept in the data miners, detection of the system attack is easy (Durğay & Karaarslan, 2018).

2. Development of Blockchain Technology

Blockchain technology is a powerful candidate for a wide range of practice in the public and private sectors, as it is a system that relies on no need for an intermediary. The priority area where blockchain technology is used is the "cryptocurrency system." The concept of "cryptocurrency" comes from "cryptography", which means "the science of encryption" in Greek (Takaoğlu, et al., 2018: 13-15). "Bitcoin" is the most known cryptocurrency. The philosophical basis of bitcoin is based on the "2008 Financial Crisis". Bitcoin came out in response to the 2008 Crisis and the Central Banks (Karaoğlan, et al., 2018: 16).

As it is known, the capitalist system is prone to crises. Following the "Great Depression" that occurred in 1929 and referred to world economic history as "Black Thursday", the New York Stock Exchange collapsed and Keynesian policies were introduced, which provided for state investments and interventions as a way out of the crisis (Coşkun, 2011: 57-61). Accordingly, U.S. dollar was indexed to the gold with the Bretton Woods system in 1944 and other currencies were indirectly indexed to the dollar. This system continued until the oil crisis in 1971. To recover from this crisis, information technology has started to play a leading role in public administration (Harvey, 2014: 152). Castells describes this new technology-based economic system as "informational capitalism" and calls it as "*informationalism*" (Castells, 2008: 17, 22, 265). Harvey emphasizes that this new technology-focused system is a strategy for overcoming the crises of capitalism and that this strategy focuses on "flexible production" (Harvey, 2014: 211-216).

The "2008 Crisis", another major crisis in capitalism, was caused by the explosive balloon in the real estate industry as banks distributed mortgage loans to people with no business, income or presence. Banks packaged and resold these loans and regulatory institutions delayed in taking action (Eğilmez, 2009: 57).

In the face of mintage and some economic manipulations of Central Banks and violations of data privacy, a group of mathematical, software and encryption experts who call themselves "cyberpunk" decided to develop a software architecture together and put forth a technology system that could potentially lead to a big paradigm shift by the help of a person and/or group nicknamed Satoshi Nakamoto solving a problem in the system of which group members couldn't solve. The article, which introduced by Satoshi Nakamoto in 2008, "Bitcoin: A Peer-to-Peer Electronic Cash System" presents the first arguments on cryptocurrency "bitcoin" and its software architecture "blockchain" (Nakamoto, 2008). This short article clearly shows the cornerstones of the system that could initiate a major transformation in the world economic system (Alpago, 2018: 417).

If we examine the disadvantages of blockchain technology, the excess electrical energy used by data miners for transaction validations, high volatility are some of the major disadvantages. Identity privacy provides a suitable ground for illegal transactions; however, it must be considered that money laundering is done with fiat money as of today (Güven & Şahinöz, 2020: 183, 270).

Since blockchain technology is a newly emerging and understood system, its legal infrastructure has not yet been established. However, it has started to be mentioned and included in the legal documents of states.

3. Blockchain Applications in the World

Blockchain-related practices are becoming more and more common around the world. Since the end of 2017, there have been over 80,000 blockchain-focused projects in Github, an open-source software warehouse (Werbach, 2021: 66). On 26 May 2016, the European Parliament submitted a report to the European Commission on the opportunities and risks of cryptocurrency and distributed ledger blockchain technology. In this context, the project titled "Decentralised Citizen Owned Data Ecosystem" (DECODE) by the European Commission mentions methods and processes to utilize blockchain technology for data privacy and security. This project is carried out under the European Union Research and Innovation Program "Horizon 2020" (ibid.).

Estonia is mainly one of the countries that can be described as a pilot country for blockchain applications. Estonia was the first country in the world to establish blockchain infrastructure as a result of cyber attacks in 2000 that led to the collapse of the public service system. It is also the first country to introduce e-voting since 2005. The use of the blockchain in elections has the potential to make elections more trans-

parent, less costly, having wide participation opportunity, and to achieve rapid results and reliability. Of course, this conduct of elections brings with it several risks such as violations of the secrecy of votes and cyberattacks; however, it is highly reasonable to use e-voting for smaller scale administration, e.g. municipal services (Dinçkol & Işık, 2019: 717-721).

Estonia is one of the leading countries in the world in terms of digital government practices. Digital transformation is becoming more secure thanks to blockchain's powerful encryption system. In this context, more than 1,000 public services are provided with smart cards given to citizens without having to go to public institutions (Demirel, 2016).

By digitizing the energy consumption and production data in the country, the system is started to run on the blockchain. Thus, renewable energy costs are significantly reduced and the use of environmentally friendly energy is also encouraged. The blockchain system enables a transparent, accountable process between energy buyers and producers. Estonian Central Bank EestiPank is working on projects which run digital currency based on blockchain with the cash system (Blockchain Turksih Platform, 2020).

Estonia also envisages profound changes in the educational system to ensure rapid adaptation to information technologies. Restructuring of the education system has accelerated through digital technology usage and extensive broadband internet services in the majority of the country. The "Proge Tiger Program" developed within the scope of the "Lifelong Learning Strategy," aims to create individuals using information technologies and digital technologies at all levels of education and to train them in coding (Yıldız, 2018).

Common goals have been set to share digital government experiences and develop cooperation between the countries situated in the network called "Digital 5 Nations (D5)". namely UK, New Zealand, Israel, and South Korea including Estonia (Özaltın & Ersoy, 2020: 753).

The UK aims to realize social assistance payments through a secure blockchain-based mobile application (ibid.). Pilot studies are also being conducted on the use of blockchain technology in title deed transactions. Accordingly, in home buying and selling too many bureaucratic procedures are carried out in an incredibly short time, safely and transparently. In addition, the fee paid to real estate agents disappears (Tombs, 2019). As an example, in the "Digital Street Project" created using the "Corda" platform, ways are investigated to make land and home registration transactions easier, faster and cheaper with the use of blockchain technology (HM Land Registry, 2018).

South Korea is also one of the leading countries in investing in blockchain technology. Blockchain is used especially in the fields of healthcare, banking, insurance, and supply chain. With the change in the Special Reporting Law enacted in March

2020, the official entry procedure of cryptocurrencies in the country was regulated. With the "sandboxes" created, 16 companies showed growth potential with the investments made in this field (Blockchain Turkish Platform, 2020).

New Zealand is also one of the leading countries in blockchain applications. Investments are made in this technology, especially in order to follow the processes of the food and seafood supply chain. The New Zealand Government provides an incentive called the "Innovation Fund" to support blockchain technologies. In addition, cryptocurrency production is encouraged to develop economic and “digital nation” awareness (Özaltın & Ersoy, 2020: 755).

The Israeli Government is also one of the countries that focus on blockchain applications. The Government of Israel specifically provides support to innovative companies that is start-ups, that will work in the field of blockchain technology. One of the areas to support the use of blockchain is military and defense activities. In addition, the Government of Israel is cooperating with the Australian "Commonwealth Bank" for the use of distributed ledger technology in money transfers (op.cit. 755-756).

In the state of Georgia, the United States of America, in 2016, an agreement was signed between the state of Georgia and a company that develops blockchain applications to realize a one-year pilot project to move the country's entire land registry system to the blockchain platform. This project is also important in that it is the first public project to move land records to the blockchain (Shang & Price, 2018: 72-79). As a result of the studies carried out by Georgia the National Agency of the Public Registry (NAPR), citizens will be able to easily access their property information from the website and offer their property for sale (op.cit. 74-77). In this system where it is very difficult to change information, governance mechanisms will be put into practice by increasing trust in institutions.

In Indonesia, blockchain technology has started to be used in the fishing industry. Since the use of blockchains in the supply chain will increase traceability, it will lead to significant improvements in terms of reliability, quality control and auditing (Yıldızbaşı & Üstüner, 2019: 460).

4. The Definition of “Governance”

The word "governance" was first used in 1989 in the World Bank's report titled "Sub-Saharan Africa: From Crisis to Sustainable Growth". The report proposes that the relationship between the state and the economy should be redefined during the implementation of structural adjustment programs, and to this end, the relations established by the state with civil society should be reshaped according to the principle of management together, going beyond the understanding of participation in the administration. In this respect, the main premise of the report is that instead of the state that manages the society, "civil" actors outside the state should also participate in the gov-

ernment as an equal party (World Bank, 1989).

OECD highlights six principles on governance. These are accountability, transparency, effectiveness and efficiency, sensitivity, farsightedness and legality (OECD, 2006).

The United Nations has attributed the same meaning as of the World Bank and OECD to the concept of governance for underdeveloped countries. In addition, the United Nations organizes and develops the concept of "governance" as "global governance", and also puts the term into practice in national areas with the works called "National Governance Project" by the United Nations Development Program. Initiatives have been initiated to practice the term in the local area, based on the "Local Agenda 21" studies that have been carried out since 1992 and aim to ensure sustainable development at the local level, in order to increase the quality of life of people (UNDP, 1992: 285).

Also referred to as "good governance" in the literature, "governance" is a political system refers to an economic order where participation and regulation in the state administration, an effective civil society, decentralization, accountability, openness and transparency in management, quality and ethics, compliance with alternative service provision and digital technologies are present (Aktan, 2003: 176).

5. Development of the "Governance" Concept

When we look at the multifaceted changes in the world, it is observed that the traditional management approach is shaped by four different processes. These are, respectively, the transition from the industrial society to the information society, the transition from Fordist production to flexible production, the transition from the nation world to the global and local world and finally the transition from modernist to postmodern thought. Although these processes do not eliminate traditional management, they lead to the emergence of new searches. Here, "governance" is a concept that emerged and developed in these pursuits. Governance points to a shift in the balance of responsibility from the state to civil society in guiding the society. Together with a multi-actor system, it suggests a process of guiding through mutual interaction (Tekeli, 1996: 48-50).

Firstly, analyzing the "new public administration approach" as the theoretical ground on which governance concepts and principles rise provides us with useful conceptual tools.

In the "new public administration approach," which is driven by the adaptation of the private sector's entrepreneurship and management logic to public bureaucracy and the increasing flexibility, efficiency, result-oriented and effective public administration, the government will play a catalyst role in creating an environment suitable for the private sector (Klicksberg, 1993: 52).

Frederickson highlights six dimensions of the "new public administration" movement. First, “the need for change” emerges as the dominant theme in the "new public administration" movement. Although the key point of the conceptualization of "new public administration" is based on systems logic, the approach includes a relatively sophisticated change concept that is more process-oriented, based on the concept of “change” developing a criterion that can assess variable organizational forms and efficiency, institutionalizing change processes and emphasizing decreases as much as increases. “Change” is expressed by pairs of words that divide into two parts: “steering rather than rowing”, “authorizing rather than serving”, replacing bureaucratic processes with market processes, meeting the needs of citizens, not bureaucracy, “earning more than spending”, “preventing rather than healing”, “shifting from hierarchy to participation and teamwork” (Frederickson, 2010: 5-8).

The "new public administration" seeks “responsiveness”, “appropriateness”, and “empowerment” based on disappointment against bureaucratic models. Most of the "new public administration" literature is concerned with a vision aimed at active citizen participation, an elevated concept of citizenship; It assumes that citizens are not just individuals and self-serving interests in government and public administration. It is important to emphasize the commitment/responsibility of the "new public administration" to the public service and the equal distribution of public services. Public administration ethics, especially democratic, participatory governance, human ethics, and social equality ethics are essential for the "new public administration". The understanding of “rationality” defined by Frederickson as the “buffered rationality” of “new public administration” tries to define the best effects of rationality, free from some unwanted side effects, in unity of purpose. The new public administration focuses on the quality of the service and is task-centered and result-oriented in this regard. “New public administration” refers to the authority in the working group rather than the hierarchy on the approach to management and leadership. Finally, the concepts of “rationality”, “epistemology” and “methodology” are important for new public administration (Frederickson, 2010: 8-12).

Although the concept of “governance” stands as a new concept other than the "new public administration approach", it is one of the concepts that arise based on the arguments of the new public administration approach. As a result of the continuation of financial crises in the world in the 1990s, the state is given an effective reorganization role to overcome the crisis of capitalism, focusing on the harmonization of public administration with entrepreneurial mechanisms and the emphasis on "governance" based on state-market-non-governmental partnership gains importance (Osborne and Gaebler, 1993: 76-80). Governance is a system based on multiple governments. Since private sector and non-governmental organizations will also participate in the decision-making process within this system, the policies created are multi-centered. From

this point, the primary function of the state will be "making laws"; It will be based on network structures by ensuring coordination between institutions and will transfer its service delivery to the private sector and non-governmental organizations (Güzelsarı, 2003: 24).

Rhodes points out six different usage areas or meanings of the concept of "governance". These are "governance as a minimal but effective state", as "corporate governance", in terms of "new public management", "good governance", "socio-cybernetic system" and "self-organizing networks". Governance refers to a "new" management style that introduces a change in the meaning of "management" or a new method by which society is managed. The interesting point in his discussion, Rhodes states that in the 1980s a new page was opened on forms of government and he describes this new situation as "we can now add 'networks' to the 'market and hierarchy". He explains that none of the market-oriented and bureaucracy-oriented management structures are inherently good or bad; He states that the choice between these two is not a necessary and inevitable ideological persuasion problem, but the main issue is the question of applicability and the conditions under which governments can work effectively. Thus, Rhodes states that the British Government is looking for a different "operating code" and that "governance" will answer this quest (Rhodes, 1996: 652-658).

Rhodes explains the uses of "governance" in detail. According to this; "*Governance in the sense of minimal state*" redefines the downsizing of the state and limitation of the state interventions through privatizations and cuts; however, while the share of public expenditures in the Gross National Product is reduced, the share of local governments and national health services is partially increasing compared to other expenditures. As "*corporate governance*", the term "governance" is used in the sense of a system that explains all organizations, including the public sector. Accordingly, public and private sector organizations need openness and disclosure of information; integrity or honest agreement; It applies to three basic common principles such as accountability, responsibility-sharing and completeness. "*Governance as the New Public Governance*" has two meanings, one of which is "business administration", the other is "corporate economy". While the first one covers the application of business-specific techniques to public administration; "Corporate economy" is based on the principle of competitiveness within the framework of the market mechanism. "*In the sense of good governance*", governance means a political and economic order in which representation, participation and control in the state administration is ensured through an effective civil society and is compatible with competition and market economy. Rhodes characterizes "good governance" as "*the marriage of new public management and the advocates of liberal democracy*". "*In governance as a socio-cybernetic system*", there is a management style in which the central government is not the only superior power; Besides, there are

various social, political and administrative actors and interdependencies between them. "*In governance in the sense of self-organizing networks*", the provision of services is not only through the government; It describes a system consisting of various networks in which private and voluntary organizations are included, interdependency is increasing, and even international organizations participate in the way these services are provided. The purpose of governance is to operate these networks (Rhodes, 1996: 660-667).

It is not only the government in the production and distribution of public services that we inevitably encounter in the face of developments in scientific and technological fields; At a time when private and voluntary organizations and even international organizations are involved and mutual dependency is increasing, with the phenomenon of "governance" aiming to operate these networks; which is to ensure the functioning or management of growing, complex and hard managed structures, a new relationship, a new management style is aimed to be created by taking the discourse of "state-market partnership" between economy and politics as the basis. This is tried to be achieved based on a kind of compromise, which Rhodes describes as the marriage of "liberal democracy" and "new public administration". As for Rhodes's argument that "governance" is a new form of management that should be preferred, today when the perception of time and space is changing rapidly, it is inevitably influential in analyzing the management structure, which we see the projections of these transformations. However, it can be criticized for not presenting a road map on how to follow possible new contradictions in the search for ways to keeping up with the information age and society of the old traditional management style.

6. Blockchain Governance

Today, we are going through a period where trust in companies and governments is decreasing and trust in technology for change is increasing. "Blockchain" is emerging as a brand new trust architecture based on encryption and mathematical algorithms, rising in the environment created by the internet (Werbach, 2021: 44).

Blockchain is based on consensus and trust among participants. It should be noted here that the system goes beyond the authors of algorithmic rules and codes and leaves the domain of the creators on which the power of the system depends. The system itself functions as governance mechanisms to coordinate consensual behavior (Werbach, 2021: 143). However, it should not be forgotten that it is human beings who design the software and act as a router.

In terms of governance mechanisms, this system operates on a basis similar to the governance proposal of Nobel Prize winner Elinor Ostrom. Such an understanding of governance is inherent in the blockchain system, based on the cooperation mechanisms of the participants outside the market and the state to manage the commons, and the agreements between them and the supervision of the participants (Ostrom, 1990:

16-19).

Werbach states that societies are historically based on three "architecture of trust". The first architecture is based on interpersonal trust, as is the case with families and clans. This system is based on the partnership system established without written rules and forms the basis of structures that function as an effective governance mechanism. The society based on the second architectural trust consists of the state deals with the monopoly of violence through a social contract and a modern society built on the rules of law that protect property and bureaucratic rules. The social structure based on the third trust architecture is "intermediary." In this structure based on platforms that allow various transactions to be performed on the Internet, there are intermediary institutions such as commercial banks and other financial institutions and there is a society that waives control over personal data. These platforms also control the markets with intermediary powers by holding the information monopoly and according to Werbach, the blockchain offers a brand new model of architecture of trust that none of the aforementioned trust architectures encompass. This is a new and powerful but not impeccable architecture of trust (Werbach, 2021: 40-44).

The Financial Crisis of 2008 showed us the boundaries of all confidence architectures (Eğilmez, 2009: 57). A new architecture of trust is now needed and the blockchain was born in this environment. The first area where the blockchain is used is cryptocurrency. The area where blockchain technology is used based on reconciliation and trust is much wider. It has a high potential for use in many araeas of the public and private sectors.

Banking, notary public, a title deed, tax tracking, smart contracts, cloud storage, electronic voting, citizen identity records, supply chain management, verification of social assistance payments, health system, patient records, intellectual property, licenses and so on are used in many transactions, which constitute the basis for fast, safe and cheap transactions. However, as it is a very new system, pilot studies are currently being conducted (Güven & Şahinöz, 2020: 79-81).

For citizens to benefit from public services, their identity information must be registered and verifiable. Fast and secure authentication will be possible with blockchain technology (Durukal & Öztürk, 2019: 450).

Irregularities in the handling of land registry records, land management and land measurement are frequent acts, especially in developing countries. As is known, the fundamental classical-liberal rights of property rights, also referred to as the first generation of rights and freedoms are under rule of the European Convention on Human Rights selected from the United Nations Universal Declaration of Human Rights. These ideas were based on Locke's and formed the fundamental value system of 'Enlightenment' and had a strong impact on modern economic and political thinking (Capra, 1992: 71).

It is the fundamental duty of the democratic constitutional state to keep the land registry records open and unchangeable to protect the fundamental human right of property. Blockchain technology is the strongest candidate to provide a reliable infrastructure to ensure the right to property in ensuring the unchangeable records, clarity and transparency.

One of the most important public uses of the blockchain is "smart contracts". Agreements can be made between stakeholders without the need for a central authority and can be tracked through a series of algorithms. For the time being, it is more reasonable using blockchain in the agreements for automated instructions as self-executing contracts (Werbach, 2021: 73-75).

One of the areas where blockchain will be effective is electronic voting (e-voting). The use of electronic voting in public opinion polls, in various public and private polls, and in general or local elections has the potential to provide a favorable environment for governance by supporting citizens' participation in decisions on a very useful ground in terms of time, space, cost and transparency (Akçay & Gürfidan, 2020: 149-152).

Conclusion

It can be said that blockchain technology and cryptocurrencies have the potential to form the cornerstones of a new socio-economic structure based on mathematical algorithms, encryption and software. The disappearance of intermediaries and the consensus-based mechanism increases the size of participation in the administrative process and the infrastructure for the conscious and effective participation of citizens is provided.

As the use of blockchain does not include falsification of data, but includes a transparent and open management approach, allowing citizens to participate fully and directly in the public process and depending on mutual consensus among them, blockchain overlaps with the understanding of governance and it can be said that it constitutes the digital infrastructure of governance. Transparency, efficiency, sustainability, participation, accountability in management with blockchain will be realized much better than in previous periods. In this context, public administrations need to digitize all data before using the blockchain. Legislation studies need to be done.

As a result, there is no doubt that the blockchain offers a new trust architecture. We can assume that algorithms are neutral, but we should not overlook that they are ultimately man-made and at the service of those who wrote them, and bear the prejudices of their creators.

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