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# Peer Production: Management, Educational Application, and Their Prospects

(Kolektif Üretim: Yönetim, Eğitim Uygulaması ve Beklentiler)

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## Abstract

Peer production, also named commons-based peer production, is a socio-economical phenomenon which has emerged within various Internet platforms and digital communities. Technological advancements have enabled individuals to collaborate for a common goal, including to produce goods, exchange knowledge, organize work, and create other kind of values by cooperation in a decentralized manner. Peer production has the potential to impact several segments of economy, social relations among the members of those groups, and individuals who are open new opportunities. The main purpose of the research is to answer the question of: Can peer production be used efficiently for educational purposes, especially in a digital post-Covid world? If so, how can it improve education? Additionally, the article briefly defines this phenomenon, outlines a theoretical approach to peer production, and discusses peer production practice in fields such as management and education. The research also identifies tools, ideas, solutions, and possibilities dedicated to improving education and educational management within the capacities of peer production. This study might be useful for educational facilities, research groups, or business entities.

**Keywords:**
Peer production, Mass Collaboration, Education

**Paper type:**
Research

## Öz

Kolektif üretim, diğer adıyla müştereklere dayalı kolektif üretim (CBPP), çeşitli internet platformları ve dijital topluluklarda ortaya çıkmış bir olgudur. Teknolojik gelişmeler, bireylerin merkezsizleşmiş bir biçimde iş birliği ile mal üretmek, iş organize etmek ve diğer türde değer üretmek dâhil olmak üzere ortak bir hedef için birlikte çalışmasına olanak sağlamaktadır. Kolektif üretim, ekonominin birçok sektörünü, bu gruplar içerisindeki bireylerin sosyal ilişkilerini ve yeni fırsatlara açık olan bireyleri etkileme potansiyeline sahiptir. Araştırmanın temel amacı şu soruyu yanıtlamaktır: Kolektif üretim özellikle Covid sonrası dünyada eğitimsel amaçlar için etkili bir şekilde kullanılabilir mi? Eğer öyleyse, eğitimi nasıl geliştirebilir? Buna ek olarak, makale bu olguyu kısaca tanımlamakta, kolektif üretime teorik bir yaklaşımın taslağını çizmekte ve yönetim ve eğitim gibi alanlarda kolektif üretim uygulanımını tartışmaktadır. Araştırma aynı zamanda kolektif üretimin kapasitesi dâhilinde eğitimi geliştirmeye adanan gereçleri, fikirleri, çözümleri ve olanakları belirlemektedir. Bu araştırma eğitim kurumları, araştırma grupları veya ticari işletmeler için faydalı olabilir.

**Anahtar Kelimeler:**
Kolektif üretimi, Kitle İşbirliği, Eğitim

**Makale türü:**
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## Introduction

Indian-American author and journalist Fareed Zakharia in his latest book, *Ten Lessons for a Post-Pandemic World,* discusses the most crucial consequences of the pandemic that started in 2020 as lessons that we, as a global society, should learn in order to live in a post-pandemic world (Zakharia, 2020). According to authors like F. Zakharia, the pandemic did not change the pre-pandemic world, but it forwarded unavoidable changes. In lesson five – Life is Digital, he states that in the past twenty years we have acknowledged the rise of a digital economy that makes it possible to live life digitally. That kind of transition generally means that part of the activities we performed, after transforming into a new model of digital economy, can be replaced with digital ones, such as video conferences instead of face to face meetings, or replacing physical products with digital services (Zakharia, 2020).

This transition relates to every field of economy and social relations. In the history of our civilization such phenomenon as navigational tools, steam and motor engines or the printing press contributed to rapid development and were crucial for history's turning points. Inventing and developing the internet has become a key driver of social evolution towards a digital and information society. Digital society is defined as a "progressive society that has been formed as a result of adaptation as well as integration of advanced technologies into the society and culture" (Prantosh and Ajthal, 2019). Since a universal definition of information society has not been formed, literature points out an important feature, that it is "governed by knowledge, competence, and only informed decisions and actions. It demands and promotes clarity, precision, honesty, and openness" (Isazadeh, 2004). The Polish scholars Dariusz Jemielniak and Aleksandra Przegalinska outline another social model – collaborative society, which is formed by combining sharing and collaborative models and ideas combined with communication technologies such as social media, mobile technologies, cyber currencies and other digital services provided or distributed through digital platforms and commons (Jemielniak and Przegalińska, 2020). Terms such as collaborative economy, sharing economy, platform economy or platform capitalism seem similar to the mentioned concepts, but collaborative society (Jemielniak and Przegalińska, 2020) is a broader idea, because it includes social, economic and technological factors. The above mentioned ideas of future economy and digital environment rely on self-organized collaborations, innovation, social values and relations between peer group members, producing goods and values, utility, as independent work of their members (Frischmann, Madison and Strandburg, 2014).

## 1. Peer production - definition and characteristics

The issue of peer production and its educational application has not been extensively analyzed. Previous research mostly discussed educational tools, such as Wikipedia and learning commons or open access software, as examples of peer production, but not as a main area of concern. Researchers mostly outlined the general idea of peer production, its construction and ways of managing those groups. Recently

some publications analyzing the benefits of collaborative learning performed by peer production or mass collaboration (in a more narrow sense) have emerged. However these studies concentrate mostly on selected processes of learning, specific types of networks and cases of mass collaboration (Cress, U., Moskaliuk, J. & Jeong, H., 2016). The research presented here is unique in that it discusses both the idea of peer production and its application in education and learning. It analyzes the subject from a wider view and introduces readers to the main features of peer production. The analysis answers the question: can peer production be used successfully for educational purposes, especially in a digital post-Covid world and, if yes, how can it improve education?

Before discussing and determining a point of view on this article's main topic, we must define the following terms in order to understand management, education and work in a collaborative society. Originally, commons refers to a common source of resources utilized collectively, such as land, meadows, fisheries or infrastructure (Ostrom, 1990; Ostrom, 2000), but for this article, the most important is a contemporary meaning of commons understood within a cultural or digital sphere. Digital commons is defined as " information and knowledge resources that are collectively created and owned or shared between or among a community and that tend to be non-exclusive, that is, be (generally freely) available to third parties. Thus, they are oriented to favor use and reuse, rather than to exchange as a commodity. Additionally, the community of people building them can intervene in the governing of their interaction processes and of their shared resources" (Fuster Morell, 2010). Other types of commons are knowledge commons - socio-technical systems of knowledge production relying on mostly online collective projects (Papadimitropoulos, 2020). In other words, knowledge commons are groups of people arranged in a community manner coordinated by rules or soft-law outline. They rely on cooperation between participating units (people) using (mostly) new technologies or methods of communication to produce intellectual values, products or other (Frischmann, Marciano and Ramello, 2019). These projects can be open or limited to a certain group of people, regulated or unregulated, structured or diffused, relying on legal property rights or opened right to use (Hess, 2012). The most recognized digital commons are Wikipedia, free software and open-source hardware projects, digital libraries, open design movement, open-source research, and open educational resources.

One of the most discussed, fast spreading and improving among other collaborative-based ideas is peer production. Among other similar ideas or models, peer production seems to be the most universal and flexible. Despite being called a collaborative socio-economic or digital phenomenon, which may seem quite unconventional, the main point of this idea is to establish an efficient and appropriate model of organization and work environment for digital era/society. Peer production is characterized by "three core characteristics: (a) decentralization of conception and execution of problems and solutions, (b) harnessing diverse motivations, and (c) separation of governance and management from property and contract" (Benkler, 2016). Originally, peer production emerged as an internet, open-software or open

access collaboration that expanded to other fields of activity, mostly digital and innovative practices performed in a collaborative and open manner (Benkler, 2016; Benkler and Nissenbaum, 2006).

Peer production and mass collaboration are treated as synonyms by a part of scholars (Doan, Ramakrishnan and Halevy, 2010). Some scholars write about mass collaboration only in a specific context or due to specific problems, such as knowledge management and production of goods (Tapscott and Williams, 2008). Both terms are defined differently. Mass collaboration is defined as "the ability of large numbers of people, who may have no preexisting connection, to effectively work against a common goal" (Bradley, 2021), so the core of both conceptions remains, and in the article both designations will be used interchangeably. Apart from their designation, discussed in the paper, method or methods of collaborative work is a conductor of a specific idea that focuses on collaboration, group experimentation without supervision boundaries, voluntary participation, innovation and open sources used in work.

The first characteristic of peer production (also called commons-based peer production) relies on the collective character of the peer group organizational and institutional model. Most modern organizations are built on a hierarchical pattern of management, in which employees or members perform tasks directed by management officers appointed by executive management or directly by the owners (Steindl, 1945). In peer production groups, members solve problems independently, if necessary, collaborating with other group members to achieve the mutual goals. This type of relationship relies on self-governance and finding problem solutions in collective or independent work rather than competition between members of a centralized organization. As a result, a decentralized organization, according to the peer production concept,, is flattened or parallel complementary, which in practice means that members perform their tasks without taking orders, or that the group's structure is constructed with as few organization layers or supervision as possible (O'Neil and Broca, 2020; Benkler, 2016).

In the system of peer production, management, supervision and control are replaced with governance, leadership and peer review. In most collaborative-type organizations, governance provides basic organizational frames and does not tend to control the performance part of their members' work (Bauwens, 2005). In a traditional company, that includes management of work and ensuring that a company's needs are fulfilled. According to peer production theory, group members perform their tasks independently, without supervision, relying on self-control in organizing their work, as well as providing the best possible effect. In organized groups, part of the members need some sort of guidance, aid or consultation. In a traditional enterprise hierarchical management model, a worker is directed by a person who is responsible for the effect of his work and should be (at least in theory) more experienced and wise (Bauwens, 2005). Peer production differs from traditional forms of management in that aspect because it prefers leadership to control (Shaw and Hill, 2014). In effect, in collaborative groups, instead of managers, leaders or informal leaders, other participants show the right approach to solve problems, give advice and share values in a non-binding

manner. As a result, each group member should have in mind that self-organization and cooperation are essential for the group's success (efficient outcome), which can be perceived as the participant's success (O'Neil and Broca, 2020; Bruns, 2016; Fuster Morell, 2015). Another important factor in providing quality to group outcome is peer review, defined by Wikipedia as "evaluation of work by one or more people with similar competencies as the producers of the work". In most cases it plays a quality control role in temporary work and a group's outcome. In summary, decentralization of conception and execution of problems and solutions means that each participant works independently, without strict management control, but at the same time the group members solve problems and find solutions collectively (Bruns, 2016).

Another core characteristic of peer production, according to Y. Benkler, is various motives of project participants. In a traditional enterprise workers' motives are mostly monetary, but in peer production they correlate with theories of self-determination and satisfying social needs. Scholars distinguish intrinsic motivation – when the act of performing a task and participation in a project is a kind of reward. Spaeth and Niedergofer (2021) highlight the following intrinsic motives: enjoyment and fun, kinship amity, altruism, ideology. Extrinsic motivation relies on a situation in which the result of the work is a reward for the participant. Monetary motivation is the most common and probably the strongest motivation among workers worldwide and plays an important role for many people gathered in peer production groups. Another example of an extrinsic motive is self-improvement. A peer may join a group, and even work for free, hoping to improve and boost their career or gain useful skills. Another category of motivation is internalized extrinsic group motivation (containing features of both motives), defined as "an active, natural process in which individuals attempt to transform socially sanctioned mores or requests into personally endorsed values and self-regulations" (Spaeth and Niedergofer 2020). This means their motives are internalized extrinsic. Examples of that kind of motive are: own use value, learning, reciprocity and reputation, which contain elements of joy in performing tasks, but also reward from this performance. Theoretical and empirical research prove that multiple motives can be seen which may change during the performance of tasks in peer production groups or when facing free-market rules (Spaeth and Niedergofer, 2020; De Filippi, 2015; Deci and Ryan, 2000; Czetwertyński, 2019). Some researchers state that the most "pure" type of motive for joining a peer production group is a volunteer non-monetary purpose, but studies do not prove that commercial or financial motives collide with efficient performance of tasks or involvement in particular projects.

The third core characteristic of peer production "separates governance and management from property and contract" (Benkler, 2017) and relates to separation of ownership from control and participation in a project from contractual obligations. Peer production groups are mostly owned by the common – a group type of ownership or are organized in a scheme in which ownership can't be directly established. The participants don't perform their tasks because they are obligated by a contract executed by state officials (for breach of contracts or torts), but because their

motivation drives then to work efficiently for the group (Benkler, 2017; Bauwens, 2015; De Filippi, 2015).

## 2. Current issues in education

Due to the recent Covid crisis and rapid changes leading to a digital economy and society, one of the article's significant questions remains: how can education be adjusted to the following and how can knowledge be managed? Schleicher states in an OECD report (The Impact of COVID-19 on Education. Insights From Education at a Glance 2020) that the pandemic resulted in a serious economic slowdown in many developing countries, as well as in highly developed ones, and the spread of the virus caused a decline in gross domestic product, which in consequence lowered investments and government spending on education. According to some predictions, spending on education will maintain its level as before the pandemic, but nominally it will decrease (UNESCO Global Education Monitoring Report, 2020). New realities for education affected by COVID Cost predictions.). Some countries implemented immediate financial measures to support students, domestic educational systems, universities and other types of educational platforms. Government programs included: reducing costs of professional on-line courses and tuition (Australia and New Zealand), equipping schools with digital platforms and tools for distance learning, lending digital devices to less well-off students, and training school staff in methodologies and techniques for distance learning (Italy), supporting the cost of education for children that cannot attend school (England). The OECD reports that due to a lack of learning possibilities in educational facilities during the pandemic, state institutions have implemented online learning platforms, which were in some cases newly created for government use, some already existed but were contracted for state use during the pandemic or, as in Estonia, the government had already relied on private online platforms.

A United Nations Report (Policy Brief: Education during COVID-19 and beyond) concludes that distance learning provides a range of opportunities and challenges. Online courses and classes demand hardware and software tools, teachers have to be prepared for digital learning and last but not least – new solutions have to be supported by decision makers. Hopefully there is another side of this situation for developing countries or marginalized regions. Students and course participants have an unprecedented opportunity to participate in classes, seminars, courses and other learning events without having to travel (Zakharia, 2020). Before the digital society or digital age, a person desiring knowledge or wanting to participate in a scientific project in a science center was limited by time, space and resources. If a person participates in online courses, traveling, accommodation and living costs diminish. In most mentioned situations political borders and limits vanish, because it eliminates the need to apply for an entry, and people can participate in such events even in countries that seem unfriendly due to political matters. Online courses in a local or even global perspective seem to open new possibilities for a sustainable and, in some ways, egalitarian learning system (Policy Brief: Education during COVID-19 and beyond).

The paper International Commission on the Future of Education. 2020. Education in a post-COVID world: Nine ideas for public action, a part of the 2030 Agenda for Sustainable Development, provides many of the necessary signposts and guidelines are presented nine ideas for concrete actions that will advance education tomorrow:

1. Commit to strengthen education as a common good;
2. Expand the definition of the right to education so that it addresses the importance of connectivity and access to knowledge and information;
3. Value the teaching profession and teacher collaboration;
4. Promote student, youth and children's participation and rights;
5. Protect the social spaces provided by schools as we transform education;
6. Make free and open source technologies available to teachers and students;
7. Ensure scientific literacy within the curriculum;
8. Protect domestic and international financing of public education;
9. Advance global solidarity to end current levels of inequality.

At least six of the points above are strongly connected with new ways of learning, and five postulates can be realized through peer production or mass collaboration. Also, most of the following guidelines with learning schemes in which students or researchers play an active role and research activity generates a concrete outcome. Collaborative learning through mass collaboration (or peer production, depending on context or methodology) represents an innovative approach to activities, such as university research and science, business, or any other innovative projects (Fischer, 2016). It works best when: "(1) the objects of production are digital facilitating sharing and remixing; (2) the tasks can be modeled as nearly decomposable systems and can therefore be chunked into "pieces" that individuals can contribute; (3) the costs of integration and aggregation in a global, shared repository is reasonable" (Fischer, 2016). In other words, to fulfill these requirements, a lecturer or a leader must be active simultaneously to a student's activity. Students in this kind of composition must cooperate and participate equally, according to their abilities and roles in tasks they can perform collectively or individually. The objects and values students work on should be shared in a common place, eventually processed and used in a current or future project. The same ideas and patterns of collaboration are used in peer production or mass collaboration groups in high tech industries, open access projects aggregating millions of users, producing goods that are used in school teaching, education or research. In that production and learning model, a participant works individually performing his task, but also stays a part of a group exchanging ideas and values (Elliot, 2016).

## 3. Practical application of peer production

Collaborative learning shares some common problems with peer production. As researches point out, lack of motivation, exhaustion, or free-riding, friendship bias, and lack of collaborative skills are main problems in group knowledge projects (Le, Janssen and Wubbels, 2018). In monetary or ideologically motivated groups, such

problems can also occur, but they are mostly solved by leaders, or they fade if the motivation of the group's participants is stronger than personal animosities or other issues that could distract collective work (Le, Janssen and Wubbels, 2018). The scientific study of naming, defining and classifying groups of biological organisms based on shared characteristics (taxonomy) points out five activities applied from research of this science in general learning: (1) discussion, (2) reciprocal teaching, (3) problem solving, (4) graphical information organizing, (5) collaborative writing. Each of the mentioned activities can be used on a different ground for a different purpose, depending on the task's or participants' objectives (Zamiri and Camarinha-Matos, 2019). Even such factors as cultural context are very important for the group's efficiency, for example, if some or all of its participants' cultural background prohibits discussion, or the discussion is performed but does not lead to an actual solution. To avoid inefficiency in group work, group leaders, organizers or the group by itself should design such solutions and patterns that would ensure the best outcome in particular conditions (Le, Janssen, Wubbels, 2018; Baggetun, Rusman and Poggi, 2004).

After the discussion of theoretical aspects, some practices of mass collaboration and peer production in education and learning can be distinguished. Massive Online Courses (MOOC) are mostly courses held for a large number of people. They are provided mostly by technology platforms, but MOOCs can also participate in creating an intellectual and innovative environment, not only as a provider of services, but as a place where tools for teaching and research can be embedded. These include other internet tools or websites, such as blogs, discussion groups, chats, articles or projects performed by the members in or out of MOOC (Fischer, 2016). That form of participation can be a simple on-line course, but if students are motivated to develop their knowledge and feel free to participate, their cooperation and involvement creates new value that can be processed and reused by using more advanced tools.

Some scholars compare modern digital libraries to the ancient library of Alexandria, which gathered multiple volumes of books and documents provided not only by the authorities or the ruling class, but also by citizens of ancient Egypt. Today virtual, collective and sharable libraries create new types of libraries that not only collect volumes of books, but also accumulate knowledge and allow readers to participate actively. Participants can publish their own works in open-access publishing and share works that would not be found in most public or university libraries (Zamiri and Camarinha-Matos, 2019). Although mass collaboration is not an alternative for academic publishing, since that kind of work is reviewed by scholars in a formal manner, it can fulfill the needs of a particular research, be a great supplement for academic work or play the role of a source of information for people who seek practical, non-academic or niche knowledge. The quality of open-access publishing can be ensured by peer review or experiment and experience in a particular project. In that kind of project, research is performed by its members. Generated knowledge (also a value) circulates and is used to created new values in researches conducted in a particular project or used in new initiatives. Digitalization of work enables people to share, cross-reference and repurpose information (knowledge) within networks of

public and private institutions, universities, firms and other subjects beyond borders, but also disciplinary, institutional, commercial or other boundaries (Tapscott and Williams, 2008).

Wikipedia is often used as an example of peer production or an example of how peer production evolved from network societies to the broader phenomenon of a collective and voluntary internet phenomenon. It represents some features not mentioned in the article yet. It is created in a disintegrated way by thousands of users working individually on individual tasks, which are reviewed by experts in a certain field. These reviewers either already have an expert reputation when joining Wikipedia or gain their reputation by their performance (Jemielniak and Przegalińska, 2020). Despite their disintegration, all the Wiki projects create a single product and seem to be conceived by many people as a monolith – one encyclopedia or one group of articles. In this model, governance is more traditional than with peer production groups, because of hierarchy and a specific set of rules that position a participant as a performer of a single task that is checked by other members. The outcome is a free-access conglomerate of individual work available for everyone (Jemielniak and Przegalińska, 2020; Tkacz, 2010; Tapscott and Williams, 2008)

The process whereby members of a group collect, share, modify or review their knowledge, data, skills and other intellectual values for the purpose of solving societal issues is called collective intelligence (Zamiri and Camarinha-Matos, 2019). A very significant element of that definition is a moving and dynamic process, not a final product or definite outcome of collective work. It emerges from collaboration and shared values and the fruit of its members' work and is an improving part of a project. Another possible feature is the manifestation of some features of an individual person, because gathered data is processed by connected peers like a "collective IQ", while at the same time augmenting human intellect and creating spontaneously new value (Fu, 2016). Collective intelligence shares mutual values with other forms of collective work highlighted in the article. It aggregates shared and elaborated knowledge, and in some conditions, the experience and choices of multiple participants. The data entered into the common space is processed in a manner adequate to the group's goals, rules and specific character (Zamiri and Camarinha-Matos, 2019; Fu, 2016). However, aggregating and processing data by participants, or by an algorithm, is not an ultimate goal of collective intelligence. A comprehensive database elaborated and processed by many active users exchanging knowledge may be a very useful tool, but the main objective of collective intelligence is to solve problems and find solutions. Its role in learning and research conducted by peer production groups is to provide a more efficient search, process and extract information and to some extent, to create self-learning patterns. The most important feature and reason for creating such a phenomenon is to improve the collective outcome of the group. More advanced systems created by researchers or business generate intelligent behavior to provide solutions but regularly to achieve particular goals and apply computed solutions. The capability of collective intelligence is determined by the participant's performance and cooperation (Zamiri and Camarinha-Matos, 2019; Benkler, Shaw and Hill, 2015).

## 4. Conclusions

Over recent decades authors have uncovered new ideas, patterns and processes to perform, implement, and develop peer production (mass production) for educational and management purposes. Studies improving theoretical aspects and empirical analysis of data, metrics and results have created new organization concepts and solutions that allow to apply this approach in teaching, education and research, and in business and management. Collaborative work, if performed by a group of people with mutual ideas, seems to be a sufficient and modern design of an entity or project convivial for its participants. For educational facilities, it provides many new opportunities, such as on-line distance classes, forming groups consisting of a large number of students, on-line digital libraries and knowledge databases. It can also be treated as a tool for group work, giving an opportunity to boost its performance. This and other factors highlighted in the article lead to the conclusion that peer production can help create a great environment for students, especially those pursuing better skills, knowledge and who are willing to find new solutions.

From an analysis of the phenomena above and their influence on education, knowledge and related management, emerges a positive influence on teaching, knowledge processing and governing processes. As a consequence, applying peer production idea opens new prospects for educational institutions. First is starting classes, courses and research groups for people connected worldwide? It seems that in a new digital era borders would not matter in affiliating to a certain research or student group, instead it could agglomerate people of mutual ideas, values and interests wanting to work together. As a consequence, it gives educational facilities the possibility to extend their reach from local to global by lowering costs, because those facilities would bear the expenses of on-line infrastructure. These circumstances facilitate the gathering of participants and leaders who would manifest the will to create an environment of people sharing similar values and goals, which is a sine qua non condition for peer production group success.

Another advantage of transforming a traditionally managed educational facility into an institution applying a peer production model and values is the ability to transform a student group into a research group. Learning in a peer production manner is strictly connected to active participation, collecting and processing materials and data. As a result, a study group performs activities that are mostly associated with research, because on higher educational levels, research participants concentrate on the study of materials and sources in order to establish facts and reach new conclusions. Peer production concepts are similar to processes used while conducting research, therefore a group learning by research is more likely to transfer to critical thinking and cooperate to achieve mutual goals and use adequate tools.

Predictions made by such authors as F. Zakharia and by academics on the subject discussed lead to another conclusion. The changes mentioned will also be inevitable for teaching and research. New technologies and redefined globalization will allow people to connect and search for knowledge and ways of realizing their projects in a boundless manner. Also, access to education will be available, and the distance

between a student or a researcher to an educational or research facility will be shorter than ever before.

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