The multifaceted role of material production in society

A Mukhin¹, G Ganina¹ S Mozgin¹, Yu Ostrovskiy¹ and A Yakovleva¹,²

¹Bauman Moscow State Technical University, 5 Second Baumanskaya Street, Moscow, 105005, Russian Federation
²Email: yakovleva525@mail.ru

Abstract.
The paper considers a new approach to substantiating the role and place of material production in a person's life. It is shown that material production performs not only the function of satisfying the material needs of a person but is also the source for the development of spiritual production. The evidence base of such allegations is given. The paper may be useful to specialists in the field of production management and development, as well as to employees of educational institutions in the field of technology, production organization, economics, and sociology.

Introduction
It is considered that production can be divided into two areas: material and ideal (spiritual) production. There are a sufficient number of publications on this topic in which attention is paid to the role of spiritual production (science, art, religion) in the life of society and, at the same time, the role of material production is further emphasized [1]. However, attention is drawn to the fact that traditionally material production in the spiritual life of society plays the role of saturating society with material products of such quantity and quality that will allow society in the spiritual sphere not to care about existence [2–9]. At the same time, some newest studies indicate the erroneousness of such a “one-sided” judgment about the role of material production and its effect on the spiritual life [10,12–16].

The main feature of this situation is that it does not notice that in the “nature” of material production there are factors that determine the character of the spiritual development of man and society at the ontological level.

If one does not notice this, relegating to material production the role of "product" provision of the spiritual life of society, it is not surprising that in some communities where any means of material support are located (besides production), production is gradually “curtailed” and this is given to quite convincing practical arguments [7,10,11]. For example, one explains this phenomenon and argues its attractiveness by the fact that the release of people from industrial activity increases the possibility of their spiritual development.

Such arguments are not only theoretical in nature - some communities or countries in practice implement such a doctrine, moving production to where labor is cheaper and operating profit from production becomes higher [8,13]. However, after some time, such communities “unexpectedly” face negative phenomena in their lives, for example, such as a “moral decline” among the non-working population, and the degradation of a part of society gradually goes on [14,15,16].

All this taken together forces ones to return production facilities back, which has some examples [9]. At the same time, one focuses primarily on the prospects for profit growth; wherein spiritual and moral
aspects are “forgotten”, although there is a positive trend of moral “cleansing” of society when production is resumed.

Such phenomena, sometimes occurring in a latent form, make us more attentive to the scientific and practical problem of the mutual influence of material and spiritual production. It requires new approaches to the study of such a phenomenon.

Materials and methods
This paper presents an approach based on the principles of ergodynamics - a new direction in science and practice, based on the study of energy conversion in various systems. In terms of the development of society, which are dynamic processes based on human labor, ergodynamics concerns, for example, ergonomics, social development [16].

For science and manufacturing practice, one applies an approach based on the regularities of the transformation of labor activity by examining the role of different forms of thinking of the decision maker. The essence of this approach is that a person with the help of his intuitive thinking mechanisms is able to form models of his activity at its various stages. In accordance with the goal, the structural model of relations between the elements of the problem situation is transformed, and this is where the creative activity of a person consists.

We can separate all possible actions of a person into two types:
• carried out on the basis of decisions made in a formal-logical way;
• performed on the basis of decisions made in an intuitive way.

The combination of purposeful actions, each of which is based on decisions made in an intuitive way, is called creative work. In contrast to the creative work, the routine work will be called a set of targeted actions, each of which is based on decisions taken in a formal-logical way.

Obviously, when a new situation appears, we are forced to make an intuitive decision, therefore, at the first stage of solving any task, by definition, work is creative. When the situation is repeated, successful solutions are remembered, which to some extent can be described in a formal-logical way. Now, in a certain situation, the availability of knowledge allows a person to use formal logical thinking, and his subsequent work, in this case, becomes routine, including by automating routine operations.

Naturally, being freed from routine work in some situations, a person can engage in creative work in another situation, which in turn can lead to the appearance of formal description and a new transition to routine work, see, for example, [6,18]. The set of transitions indicated here is called the ergatic transformation of human labor activity. The presence of two forms of thinking leads to a constant ergatic transformation of labor activity, regardless of the type of activity itself and the period of human development.

Material production for a long time develops as the main type of production that satisfies human needs through the manufacture of material products and the direct consumption of various means of production. In parallel with material production, humanity was engaged in the "manufacture" of products of spiritual content in such areas of spiritual production as science, art, and religion.

In Russian literature, the term “spiritual production” became popular thanks to the works of the philosopher V. P. Tugarinov [19]. He argued that the production of things and the production of ideas such as the difference between two different spheres of social life. A close approach to this is declared, for example, in the work [20] devoted to the improvement of man.

A comparison of material and spiritual production is carried out through the identification of their differences. The difficulty here lies in the fact that material and spiritual production in real conditions is inseparable. Thus, material production is carried out in accordance with the intentions of people, and the products of spiritual activity enter the public consciousness only when they acquire a material shell.

In social reality, matter and spirit do not exist separately, in a “pure” form, independently of each other. The ratio between material and spiritual production in different spheres of public life is different.

In economics, for example, material production has a relative share, and spiritual freedom is limited by material conditions. In culture, on the contrary, “the kingdom of the spirit reigns supreme,”
and the material form adapts itself to the spiritual content. In politics, material and spiritual production exchange roles, and in different eras, material, spiritual production becomes decisive.

The mutual influence of material and spiritual production is carried out through the products of activity. Nevertheless, the “product” approach when comparing both productions does not imply that they even “speculatively” can “merge” with each other, because the products of activity are fundamentally different.

The prospect of a “merger” of material and spiritual production through a producer approach may look differently, based on the general scheme of a producer system suitable for both material and spiritual production (Fig. 1).

Fig. 1. Production system for any kind of production:

Here: TS is the transforming system, NEE is the near external environment, IC is the information converter, SD – is the storage device, R is the receptor, E is the effector, x is the effect on the NEE, y is the result of the NEE conversion, u is the control influence.

The production system can be a person in the workplace, the product of which functioning is a product with certain specified requirements or a creative team whose product of activity is design documentation. Here, as the 2u" can be variable performance characteristics of the designed product.

For material production, the decisive factor is that NEE and TS are material, including all other attributes. For spiritual production, all the listed structural elements are ideal.

The unifying feature for the two types of production from the point of view of the production system (Fig. 1) is the presence of two “trajectories” of decision-making. Trajectory 1 means “movement of information” in the case when the decision on the impact of y is made formally and logically when the M based on past experience contains the logical statements \( x \land u \rightarrow y \). Trajectory 2 is typical for the case when you have to make a decision in a deliberately unknown situation (new u). In this case, the decision is made by intuitive judgment. Labor, based on trajectory 2 is creative, and labor based on trajectory 1 is routine.

Based on the fact that, in spiritual production, the predominant form of labor is creativity, and in material production, creativity is one of the main attributes of labor, it follows that creativity is an attribute property of the fusion of material and spiritual production.

The role of material production in the spiritual life of society is reduced to the fact that the process of transformation of labor activity, which releases the creative potential of production, at the same time nourishes society with creative individuals capable of developing the spiritual life of society.

Studies have shown that the fusion of material and spiritual production through creativity, as an attribute property of a merger, does not boil down only to proving that material production plays an
important role in the spiritual life of society. It is necessary to understand how significant this feature
is in human life and society; is it possible, by ignoring material production, to develop spiritual
production and what is the danger for the society of such ignoring.

It is necessary to approach the problem of merging material and spiritual production
comprehensively, due to expanding the area of interrelation and mutual influence of material and
spiritual production.

**Results and discussion**
In order to assess the relationship of material and spiritual production, we will consider only the
"engineering" aspects of spiritual production - we will be interested in such creative specialists as
designers, technologists and other specialists who create new methods and production in general.

We summarize the known interrelationships and interdependencies in Table 1.

| № | Kind of relationship                                                                 | Predicate form          |
|---|--------------------------------------------------------------------------------------|-------------------------|
| 1 | If there is material production, then you can produce a material product that meets the needs | MS1(y) → MK1(z)         |
| 2 | If there is material production, then there is an increase in creative potential in spiritual production. If there is an increase in creative potential in spiritual production, then it is possible to organize work on the creation of advanced material production. | MS1(y) → DT1(x) DT1(x) → MS2(y) |
| 3 | If the required material product is not produced in the sphere of production, then natural resources are spent on its acquisition. | MK1(z) → MR1(u)         |
| 4 | If we continue to waste natural resources, there is no perspective for the creation of the "next" material production | MR1(u) → MS2(y)         |
| 5 | Material production at the next stage is based on material production at the previous stage. | MS1(y) → MS2(y)         |

We open the informative form of the predicate symbols presented here:

- x - people (specialists, creative professions), y - production, z - products of activity, u - resources,
- MS1 - material producer of the present time, MS2 - material producer of the subsequent time, MK1 - material product of the present time, MK2 - material product of the subsequent time, MR1 is the material resources of the present time, MR2 is the material resources of the subsequent time, DT1 is the creative potential of the spiritual producer of the present time.

For example, consider the situation around the existing standing with material production. In some communities, the possibility of comfortable existence without own material production is theoretically justified and practically realized, when the activities of the working-age population are focused on the management of financial flows from the sale or exchange of resources.

Opponents of this approach believe that the lack of their own material production in the future will lead not only to a decrease in the efficiency of spiritual production but also to a drop in the level of consumption of material products.

Without going into a philosophical discussion about the correctness of those and other judgments, we will try to describe the situation formally, using the predicate apparatus, using the symbols and relations given in Table 1.

We describe at a substantive level one of the possible tasks:

1. Having material production, one can create a material product that meets the needs of people;
2. If there is no material production in the community, then the community spends natural resources to purchase a tangible product;
3. Without material production, the community cannot count on the replenishment of creative potential;
4. Having no creative potential, the community stops working further on the creation of material production;
5. Spent resources do not allow in the future to invest in the creation of new material production;
6. If the strategy to create your own product is chosen, then the following production is created after the existing production;
7. The absence in the future of new material production cuts off the possibility of creating a new material production capable of meeting the needs of people.

To prove the verity, we apply an effective method of derivation, which is based on the proof of the contrariety of the negation of the original formula. It is important that such procedures are applicable to the formulas of the predicate logic, presented in a standard form when any matrix of a formula can be represented as a conjunction of a finite number of disjunction of atoms or their negations [21].

In this regard, statements (1 ÷ 7) are given in a form convenient for formal proof (table 2).

Table 2.

| №  | Formalization of statements  | Standard form |
|----|-------------------------------|---------------|
| 1  | $\text{MS1}(y) \rightarrow \text{MK1}(z)$ | $\text{MS1} \lor \text{MK1}$ |
| 2  | $\overline{\text{MS1}}(y) \rightarrow \text{MR1}(u)$ | $\text{MS1} \lor \text{MR1}$ |
| 3  | $\overline{\text{MS1}}(y) \rightarrow \text{DT1}(x)$ | $\text{MS1} \lor \text{DT1}$ |
| 4  | $\overline{\text{DT1}}(x) \rightarrow \overline{\text{MS2}}(y)$ | $\text{DT1} \lor \overline{\text{MS2}}$ |
| 5  | $\overline{\text{MR1}}(u) \rightarrow \overline{\text{MS2}}(y)$ | $\text{MR1} \lor \overline{\text{MS2}}$ |
| 6  | $\overline{\text{MS1}}(y) \rightarrow \overline{\text{MS2}}(y)$ | $\overline{\text{MS1}} \lor \overline{\text{MS2}}$ |
| 7  | $\overline{\text{MS2}}(y) \rightarrow \overline{\text{MK2}}(z)$ | $\overline{\text{MS2}} \lor \overline{\text{MK2}}$ |
| 8  | Conclusion | $\overline{\text{MK1}} \lor \overline{\text{MK2}}$ |
The diagram (Fig. 2) shows how new pairs (resolvents) are formed from the initial set of disjuncts sequentially by crossing out contradictory ones. For example, in pairs (MS1 ∨ MK1) and (MS1 ∨ MR1), MS1 and MS1 are contradictory, and the new disjunct is obtained from the remaining i.e. MK1 ∨ MR1.

Getting an empty disjunct at the end of the procedure, as shown in fig. 2, indicates that the withdrawal process is completed and a refutation of the formula (MK1; MK2) is found. Consequently, it can be concluded that under given conditions there is MK1 and there is no MK2.

At a substantive level, the conclusion is as follows: if there is no material production in the community, then the material needs can be satisfied for a certain time due to the consumption of natural resources. However, after a while, such satisfaction will cease both due to its exhaustion, and because the community will not remain in a sufficient amount of creative potential for the organization of new material production.

This conclusion may seem obvious to many experts in the field of economy, but the formal proof held here is necessary for the following reasons:

- the verity of the above statement is not obvious to everyone, otherwise, it is difficult to explain the adherence of some economists to dogmas that lead to the curtailment of industrial production; wherein the formal proof is the highest degree of credibility;
- acquaintance of practitioners with the methods of formal proof of production statements will help them to solve practical production problems more confidently.

**Findings**

The relationship of material production with other facets of human life has long been recognized but is not always taken into account in the strategy and tactics of managing community development.

In particular, the lack of understanding of the close relationship between material production and spiritual production leads to the fact that decisions on material production are sometimes made on the basis of the sole goal - providing society with the necessary material products. Since the satisfaction of material needs can be ensured and at the expense of the consumption of natural resources, in practice, such a policy is also built.
If even in the community the potential of natural resources is great, it turns out that the absence of own material production leads to a fall in the creative potential that can start creating new production in the future.

Arguments and considerations in favor of the development of material production are not always convincing for decision makers. In this regard, it is useful to formalize task solving as the highest form of persuasiveness.

The findings of this paper, supported by formal evidence, indicate that material production not only affects all aspects of life but is also a determining principal link.

References

[1] H. Braun und M. Riedel (Hg.). Natur und Geschichte. Karl Lowithzum 70. Geburtstag. Stuttgart, 1967. pp. 132—155.
[2] How Automation And Key Performance Indicators (KPI’s) Contribute To Sustainable Development In The Mining Industry Juliana Parreira, Zoe Mullard, John Meech, Magaly Garcia Vasquez Second International Conference on Multinational Enterprises and Sustainable Development, Nancy-Mets, France 2009
[3] David H. Autor Why Are There Still So Many Jobs? The History and Future of Workplace Automation. – Journal of Economic Perspectives. – Volume 29, Number 3. – Summer 2015. – pp. 3-30
[4] Robots at Work Georg Graetz, Uppsala University, Guy Michaels, London School of Economics - February 27, 2015
[5] Robots and industrialization in developing countries. – UNCTAD policy brief, 2016. – UNCTAD/PRESS/PB/2016/6 (No. 50)
[6] Osipkov, V., Ksenevich, T., Belousov, B., Karasev, O. et al., "Intelligent Transport Systems: Revolutionary Threats and Evolutionary Solutions," SAE Technical Paper 2016-01-0157, 2016, https://doi.org/10.4271/2016-01-0157.
[7] Chernikov, B.V., Antonchikov, S.N. Modeling of adaptive organization (2017) Proceedings of 2017 10th International Conference Management of Large-Scale System Development, MLSD 2017, paper № 8109605.
[8] Cf. Gerald Epstein and Dorothy Power, "The Return of Finance and Finance’s Returns: Recent Trends in Rentier Incomes in OECD Countries, 1960-2000, Research Brief, Political Economy Research Institute (University of Massachusetts Amherst). – no. 2, November 2002.
[9] Vida Vanchan Rachel Mulhall John Bryson. Repatriation or Reshoring of Manufacturing to the U.S. and UK: Dynamics and Global Production Networks or from Here to There and Back Again. – Growth and Change, Vol. 49, Issue 1, March 2018, pp. 97-121. Accessmode: https://doi.org/10.1111/grow.12224 (dateofappeal 26.10.2018).
[10] K. Lynette James, Dave Barlow, Anne Bithell, Sarah Hiom, Sue Lord, Pat Oakley, Mike Pollard, Dave Roberts, Cheryl Way, Cate Whittlesea The impact of automation on pharmacy staff experience of workplace stressors. – International Journal of Pharmacy Practice, Volume 21, Issue 2, pages 105–116, April 2013. – DOI: 10.1111/j.2042-7174.2012.00231.x
[11] Akberdina Victoria V., Tretjakova Oksana V., Vlasov Andrey I. A Methodological Approach To Forecasting Spatial Distribution Of Workplaces In An Industrial Metropolis. Problems and Perspectives in Management, 2017, 15(4), pp. 50-61.
[12] Vertakova, Y., Larionov, V., Kondratova, E. Accounting of environmental imperatives in the public regulation of sustainable energetics development (2017) Proceedings of the 29th International Business Information Management Association Conference - Education Excellence and Innovation Management through Vision 2020: From Regional Development Sustainability to Global Economic Growth, pp. 1982-1994.
[13] Daron Acemoglu, Pascual Restrepo Robots and Jobs: Evidence from US Labor Markets. – Working Paper Series (National Bureau of Economic Research). – no. w23285. Access mode: http://www.nber.org/papers/w23285 (date of appeal 26.10.2018).

[14] Mike Davis, Prisoners of the American Dream. Politics and Economy in the History of the US Working Class. - London: Verso, 1986

[15] Naomi Klein, The Rise of Disaster Capitalism. Rebuilding is no longer the primary purpose of the reconstruction industry. – The Nation, 14 April 2005, Access mode: https://www.thenation.com/paper/rise-disaster-capitalism (date of appeal 26.10.2018).

[16] Tim Di Muzio, “The Art of Colonisation: Capitalising Sovereign Power and the Ongoing Nature of Primitive Accumulation” – New Political Economy, 12(4). – 2007, pp.519, 531-2

[17] Venda Valery F., Venda Yuri V. Dynamics in ergonomics, psychology, and decisions: Introduction to Ergodynamics. – Norwood, NJ.:Ablex Publishing Corporation, 1995. – 503 p.

[18] Larionova A.A., Zaitseva N.A., Fadeev A.S., Zhenzhebir V.N., Filatov V.V., Pshava T.S. The Use of Organizational and Technological Innovations in the Process of Managerial and Engineering Personnel’s Training. Eurasian Journal of Analytical Chemistry, 2017. - Vol. 12. - N 7b. - pp.1573-1580

[19] James J. O'Rourke The Value Theory Of V. P. Tugarinov in Studies in Soviet Thought 28 (1984) 109-116. 0039-3797/84/0282-0109 © 1984 by D. Reidel Publishing Company.

[20] Merkur. Heft 243. Juli 1968. S. 591-610; Merkur. Heft 244. August 1968. pp. 682-693

[21] J. A. Robinson. A machine-oriented logic based on the resolution principle. Journal of the Association for Computing Machinery, vol. 12 (1965), pp. 23-41.