The Knowledge - The Invisible and Unknown Side of the Wealth of Nations

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Is Peter Drucker still actual? "The flow of economic ideas to the Romanians"¹ Information in Matter ²

Abstract: The article discusses the world economy's quarterly stage, focusing on the service sector's development. It looks at the future of human society, exploring the idea of living on other planets and the associated challenges. Who will fund this endeavor, what technology is needed, and how will education and healthcare systems function? Will these new planets cater to Earth's needs or exist independently? The first phase involves building facilities on the Moon, with DARPA [i] initiating the 10 - Year Lunar Architecture project in August 2023 [ii]. This vision emphasizes the importance of Knowledge Transfer over the next 50 - 100 years, distinguishing between Knowledge and Innovation. Knowledge derived from advanced research has the potential to revolutionize the economy. At the same time, Innovation focuses on generating profits through new technologies and approaches. The article proposes new roles for the Central Bank and offers recommendations for policymakers, drawing inspiration from Peter Drucker's theories. It lays the groundwork for a new business model preparing humanity for a future living in Space.

Keywords: Knowledge, Knowledge Transfer, Knowledge Capital, Innovation, Business model for Space Economy Stage, Central Bank, ELI - NP, Radio Romania, Peter Drucker, Adam Smith, Carlos Moedas.

1. Background

In 1776, Adam Smith, in his symbolic book, said that labor had a crucial role in wealth production [iii]. The statement is clear. Nevertheless, during the timeline, humanity changes the understanding of labor. Two hundred years later, Peter Drucker [iv], the father of modern management, emphasized that Knowledge became the most important economic factor, replacing labor, land, and capital. Today, decision - makers and managers refer to the knowledge - based economy, a term introduced and explained by Drucker, which describes industries based on Knowledge that change the nature of work and the structure of organizations.

This article focuses on the idea that Knowledge is the invisible and unknown part of the wealth of nations. Some countries understand the importance of Knowledge and the knowledge transfer process from advanced research labs to companies. These countries have a strong vision of their future, robust scientific activity, and developed powerful defense and aerospace industries during the last 70 years. The article focuses on several aspects, such as knowledge transfer as a critical tool for increasing the speed of economic development, the new role of the Central Bank as a driving force of advanced research, the export of Knowledge as a new highway for international economic relations, and how to create a center for knowledge transfer. These aspects and future jobs form the mainframe of the new economic model for the next one hundred years.

Knowledge is an endless resource for nations, scientific communities, and humanity. Inventions and innovations have

limited existence in the market. Therefore, each state must protect Knowledge until it becomes a standard value for all potential beneficiaries. Isaac Newton's (1642 – 1727) theory of the planet's gravitational force is still helpful for designers and engineers, even though Einstein developed a new theory, but Newton is unreplaceable [v]. The same context is easy to see in medical life. We discover the Universe and identify Knowledge in random mode. Why is this? We need to learn how the Universe is structured. Moving around with our casual activities, we crash into unseen walls. The most brilliant minds of a generation are open to seeing a new limited part of the Universe named Knowledge. Newton graciously presents himself as a kid on the beach picking the most colorful seashells. But Sir Isaac says, "The ocean of truth is unrevealed in front of me. "

Peter Drucker [vi] described the primary differences between industrial and Knowledge economies. The land, labor, and capital are the basis for the industrial economy. The second one, the actual economy, is based on Knowledge. Drucker concluded that Knowledge had become the crucial factor of production and that knowledge workers are essential in the modern economy. Knowledge will trigger competition between companies or economies. This view induces a dramatic change in priorities for different sectors of the current and future societies. The defense sector, the aero, and Space fields will get a more significant part of the national pie for advanced research. Espionage, counter - espionage, and counter - terrorist activities will change their priorities and potential targets to protect private and public knowledge segments. The economic competition between the USA and the E. U. with China will demand many funds. These activities will require an utterly amassing sum of funds unseen

¹ Acad. Costin Murgescu, Romania, Mersul ideilor economice la romani, 1987 & 1988

² Acad. Mihai Draganescu, Editura Academiei Romane, Bucuresti, 1990

until now. The legal framework of each country will have to develop a new package of laws referring with priority to intellectual property and the interaction with other social actors.

The structure of the national budget will focus on a new star – advanced research. Future decision - makers will be responsible for identifying new instruments for financing cutting - edge research. The GDP structure will show the same significant public attention for knowledge. The Nobel Prize recipient and American economist Milton Friedman did not directly play a role in creating or developing the knowledge - based economy. However, his ideas contributed to the necessary landscape for the knowledge economy. We shall come back to Friedman later in this paper.

Peter Drucker, in the article *Managing oneself*, published in 1999 in the Harvard Business Review [vii], said that in a knowledge - based economy, a company's competitive position would depend on the quality of the management of the knowledge workers. Remember that knowledge workers are not the workers from the beginning of the 20th Century because learning machines (AI) will clean up the labor market. Even so, the respected lawyers of today will soon become just history. Labor – yes, but super qualified labor! The American urbanism expert Richard Florida presented 2002 a new syntagm: *the creative class*. This new social class will lead the economy (p.4). Karl Marx will not find room in this world.

One of the most relevant young new decision - makers at the European level, Carlos Moedas, a politician and engineer with a Portuguese passport, being E. U. Commissioner for Research, Science, and Innovation (2014 – 2019), the actual mayor of Lisbon, came with significant clarification. Moedas made the following remark in Paris, France, in 2015 at the OECD Conference on the Knowledge - Based Economy. He argues that we are not speaking about technology in a knowledge - based economy. In these words, the innovative ideas of accessing and using knowledge are the key to the engine that is generating the wealth of nations. We must stress that Mayor Moedas strongly supports the ELI - NP Project. During the visit of the Romanian President to Portugal in 2023, Moedas declared ELI - NP his dearest scientific Project of his Brussels period.

In 2004, being Radio Romania's PDG, we faced the annual control from the National Court of Auditors. The inspectors asked us for the registered value of Radio Romania's Golden Music Archive. *It is priceless* was our answer. *There are recordings of national artists' voices starting from the end of the 1880s.* The financial controllers declared they wanted to see the value of the magnetic tapes in Radio Romania's financial records! It seems strange, but it is natural and logical. The Director of MIT's Media Lab, Nicholas Negroponte, found an adequate *Being Digital [ix]* expression: *They spoke about atoms, and our team talked about bits!* Negroponte's roots are Romanian!

In the present paper, Knowledge has two meanings. The first is the process of discovering the morphology, the syntax, and the functionality of the Universe. The second meaning is the result accumulated during the digging process for understanding new segments of the Universe. The Romanian language has another meaning to the plural form: interpersonal relations and network. We are referring to the first meaning of the word Knowledge.

1) International bibliography

I shall present some quotes and references from experts who have discussed the concept of a knowledge - based economy:

Manuel Castells [x] emphasized replacing industrialism with informationalism as part of the new economic development model in his book.

In a book, former U. S. Secretary of Labor Robert Reich [xi] stresses his belief that the global Knowledge - based economy must work for all citizens.

The Nobel Prize recipient for the Economy, Joseph Stieglitz [xii], was more moderate. He believes that a knowledge based economy will not embrace a pure model, as is happening in the theoretical experiments of the physicists. With his international authority, he declared that such an approach was an apparent mistake.

Peter Drucker [xiii] firmly believes that knowledge *is becoming the only factor of production*. Maybe he was too inflexible. We shall live, and we shall see!

The Japanese authors Hiroyuki Odagiri and Akira Goto [xiv] identified the key to Japan's success.

Keun Lee [xv] presents the Korean recipe:

- long term support from the Government,
- setting up education and research as national priorities,
- the development of the high tech industries.

Coming to Europe, Germany succeeded in the Knowledge based economy because of a strong engineering and research tradition - Carlota et al. [xvi]. Looking at the European experience, Diane Coyle [xvii] concluded that a knowledge based economy is a turning point and requires new management, leadership, and strategies.

We selected these examples from the beginning of the new economic era. We have seen the transition of the market. The countries with strong economies from the previous period have passed into the Knowledge Age. The USA reconfirms its leadership. Japan and Korea are firm in their efforts to be leaders in a competitive economy. The E. U. is swimming in deep waters. China is losing the competition with the first economy in the world, but China continues to impact U. S. society significantly. Russia is living a nightmare. After the war in Ukraine, a scarring movie: the actual situation of its economy on the international stage. India will play a regional and global role in the confrontation with China.

2) Foster Knowledge in a new landscape and break some Consolidated Knowledge to clean up the future for new golden ideas

In their papers, Peter Drucker and other American and European scientists project an ambivalent identity of Knowledge. **In one way**, and this is the most frequent approach, Knowledge results from Innovation inside the

companies. In his book, Drucker [xviii] defines the executive role as "to foster innovation. " Innovation is generating new technologies, new products, and services. Innovation can reduce the gap between the technological level of companies or countries and generate even higher profits. The local and regional development processes relate to Innovation. Innovation is a way to reshape the use of Knowledge. Innovation is not changing the rules of the game. The classic debate: egg or chicken? We found an answer to this question! Knowledge is first. On the other hand, they suggest something more meaningful with a more considerable significance. Knowledge is the new step forward in management theory and the management of companies. Our approach is that Knowledge is the result of advanced research activity, and sometimes, but with a reduced rate of occurrence, it is the discoveries of research teams from companies. In other words, Knowledge is the result of state of - the - art research. There is no room to mix up research labs and innovative companies. This separation is evident from the end of the 19th Century and the beginning of the 20th Century. After WW2, the separation line became unavoidable. Shall we stick to this dichotomy?

Fostering Knowledge is state - of - the - art scientific research or a revolutionary activity of the restless human mind in a new field of study. Knowledge is the future of humankind. Innovation is business as usual, focusing on increasing competitive advantages and fighting for a larger market share.

A significant result in the nuclear research field may be ready to be incorporated into a knowledge transfer process not faster than 20 to 50 years. The scientific results transferred to business sooner than 20 years represent new ideas, maybe seeds for significant Innovation, but they do not represent an important step forward in science and economic development. The most relevant example from our point of view is the following: from the moment Albert Einstein concluded that gravitation force looks like gravitational waves, it took humanity 75 years for the scientific community to check Einstein's statement and another 25 years to design and set up the equipment

for scientific experiments. A great result of advanced scientific research accepted as Knowledge is pushing human thinking forward in the knowledge time with 100 years, 30 - 50 years, and 20 years.

We are working to define a methodology to estimate the degree of readiness of the potential beneficiary industries for insemination with the new element of Knowledge discovered by advanced research. The quality of the judgment is like the results presented by the meteorologists on a T. V. program 30 years ago. The efforts of research communities and decision - makers have a clear target: to reduce this array. Suppose a group of scientists, innovative entrepreneurs, and decision - makers is assessing the utility of Knowledge. In that case, they will identify the closest moment when it is possible to integrate specific expertise in developing a process. There are two

possible results: a) to speed up economic development or b) to break the rhythm. In the second situation, Knowledge is disruptive, dramatically affecting humankind. When Professor Gerard Mourou suggested to his student Donna

Strickland to study powerful lasers, she asked: 'Can this be a natural topic for PhD'? Professor Mourou, with a real sense of humor and a realistic approach, answered: 'No, this is a topic for the Nobel Prize!' He was right!

Knowledge transfer plays a catalytic role in developing a novel business model. The researchers from large scientific infrastructures are the big boys of our times. They permanently ask for new and costly toys for their activity. These toys are all state - of - the - art. The prices of scientific research equipment are up to the sky. But the decision makers are paying for this kind of equipment! It's not easy, but they are funding. They need scientific results for the next political elections.

Knowledge about the Universe undergoes adjustments and changes based on **discreet occurrences** of advanced research results. I am using the expression discreet event with the sense of the physicists (once at a time) —the **first brick** to a new knowledge approach in a completely new field of business. The national DNA or the gene of a large multi - national business group is a critical designer of future research activity. In this very field of creativity, there is no spontaneous generation. There is a minimum of 20 - 30 years between the intention of development in a new area of research and the first tangible results. **Breaking the generally accepted Knowledge, the scientific community** is cleaning up the field of study for new golden ideas. Einstein's revolutionary understanding of the Universe is the best example of such a dramatic evolution.

Access to state - of - the - art scientific equipment in the ELI - NP's case can be:

- a) Merit based scientific access to beam time (in ELI NP's case includes the following steps: the researchers propose a research topic; the international scientific board decides to have the research on the research plan; the researcher creates a team of researcher engineers (for setups), and I. T. experts (to measure the results and to generate a scientific model). In 2019, the Hudson Institute hosted a conference co sponsored with the ELI NP Center in Washington, DC. The representatives of the State Department were enthusiastic about this Romanian approach.
- b) **By buying beam time** as different entities for non public research. The E. U. 's regulations limit the buying beam time to 3% of the total operational time.

Even this type of activity, advanced research, must respect the economic rules to benefit from the support of the national and international scientific community. The knowledge generator process needs to be revised to speak about productivity and the need to increase productivity. Human society can **speed up the fostering process of Knowledge**. The speeding up of the fostering process is the critical role of management in large - scale Scientific infrastructures in the 21st and 22nd centuries. American experts in public administration estimated that from 2003 to 2011, As Governor of California, Arnold Schwarzenegger pushed the state forward 25 years faster.

Advanced research is a magnet for large budgets. Looking at the map of Europe, we notice that there is no sizeable,

advanced research lab in Central and Eastern Europe except the ones created by the Extreme Light Infrastructure Project (ELI). The argument of the E. U. Commission to finance the project is that new E. U. countries need more funds to develop facilities of this size and more expertise to run such projects. Using the Cohesion Fund, the E. U. financed the ELI Project. Romania, the Czech Republic, and Hungary are hosting the three pillars of the project. The largest budget goes to Magurele for Extreme Light Infrastructure – Nuclear Physics – more than **300 million Euros**. Altogether, the three pillars had a budget of around **1 billion Euros**.

The Steps to Be Taken to Foster Knowledge and to Transfer Knowledge to set up Advanced Technology.

The significant investments in advanced research in setting up large scientific infrastructures are public or private in the pre - competitive part of the economic and commercial route. For this reason, a constant flow of general information and a permanent dialogue between the top management of the large - scale scientific infrastructure and significant target groups, including regular citizens, is one of the first responsibilities of the top management. The public decision - makers are in the same boat. The lack of public support and the absence of national or local pride for such development of the local communities represent a significant risk of cutting down the general financial allocation. Our field of activity, nuclear energy, has one of the highest risks of losing public support. The German society is an unchallenged demonstration. Even the risks of Russian economic and political influence in Germany's public life by the aggressive Russian institutions did not change the public opinion that nuclear energy has to be replaced by Russian gas and oil.

If we accept this vision, we will develop a new business model for the second part of the current Century and the next one. The cornerstone of the model is binomial: Advanced research – Knowledge. Such an approach is requesting:

- New investment instruments,
- A structure of the ownership of the advanced research results,
- A more powerful master mind as driving authority in the cutting edge research field,
- The form of the national GDP,
- Dialogue on the international stage and the economic hierarchy of the states.

The science historians usually give as examples the lost Knowledge of the Alexandria Library (World History Encyclopedia: https: //www.worldhistory. org/ Library_of_Alexandria/). The model is a regrettable behavior of humankind: the auto - destruction of our discoveries. For those afraid of A. I. 's potential risks, I invite them to look at this incredible situation: the human mind has the freedom and the ability to generate actions against its own.

3) Knowledge transfer - the business fertilization or business pollination method

In this article, we make a difference between social communication and knowledge transfer (K. T.). Most people believe that any interpersonal discussion, or in public Space, is communication. Unfortunately, usually, this opinion is not influenced by the educational level. Is the communication

capability included in our DNA? It is easy to take interpersonal dialogue as public communication. Human beings have this characteristic: they can speak. The ability to communicate requires education and training. Small talk and gossip are the trivial side of communication. It is a waste of personal and social time. With this explanation, we shall continue our argumentation by speaking about K. T.

K. T. needs highly qualified scientific researchers in the advanced research scientific facility (researchers with competence in engineering) and experts in technologies with solid theoretical scientific education (Ph. D. educational level). K. T. can start from two directions: a) leaders from the advanced scientific environment are picking up the results of their research teams that may represent the stimulus for the business actor ("to smell" the money), and b) the business community leaders are looking around to discover new Knowledge with the potential to generate the necessary intellectual matter to bridge the gaps inside their business activity. Both actors in K. T. 's social process need scientific instruments to measure the potential positive consequences of their cooperation. Are the researchers aware that their new knowledge package will be helpful to businesspersons? Usually, the first guesses must connect with the actual applications of the Knowledge. Business represents the missing piece of the puzzle on their business table. The methodology used by both parts is named "the guessing technology"!

A constant flow of K. T. is enhancing the process's quality and utility. It is necessary to use K. T. technology. The K. T. process has three main actors: advanced research, industry, and Government. These are the most significant steps of the K. T. activity:

- a) Identify helpful Knowledge to generate a higher level of comparative competitiveness.
- b) Develop long term partnerships and collaboration.
- c) Build protective shields for intellectual property. All three actors have to accept the mechanism of protection.
- d) Find funds and other necessary resources.
- e) Create a sensor toolkit to measure the cooperation results in the K. T. process.

We intend to develop a two - way dialogue of the ELI - NP Infrastructure with potential beneficiary industries based on the know - how of *The European Center for Knowledge Transfer*. This step requires strong players in the knowledge field and the business community. The first initiatives presented positive results. The next European budget will represent an excellent opportunity to transform the Center into an E. U. agency with its headquarters in Romania.

One of the projects dedicated to this ambitious objective is **Advanced Research = The Smart Future**. The kids in classes I to IV and their grandparents will be the project's main stakeholders. During the 2023 summer, we ran two pilot projects. In Sighetu Marmatiei, Maramures County, Romania (Northern Romania, near the border with Ukraine, the town where The Nobel Prize for Peace recipient Ellie Wiesel was born and from where the Hungarian army deported him and his family to Auschwitz), our partner was the City Hall of Sighet and the Mayor of the Municipality. In the Commune Rucar, Arges County, Romania – a village in the middle of

Romania in the Carpathian Mountains) the partner was the Orthodox Christian Parish from the Center. The results exceeded our expectations. Also, we collected opinions from an extensive range of Gheorghe Lazar College students, from the Prime Minister's Control Agency, 24th International Conference "New Cryogenic and Isotope Technologies for Energy and Environment" - EnergEn 2023 - National Research and Development Institute for Cryogenic And Isotopic Technologies (ICSI). The National Bank of Romania designated a professional team to work together under the go - ahead signal from the Governor, Academician Mugur Isarescu. Dr. Calin Ur, the ELI - NP Facility's Director, was a constant supporter of the project and a generator of suggestions for a proper approach to the problematic Romanian public landscape. One of the lessons learned in the last months is leaving the kids to decide if they have the qualities to be part of the project. The project offers equal opportunities for each of them with some conditions: to team up with 5 - 6 other colleagues and convince their grandparents to join them and register as participants. The project is open to kids from all countries. What social and economic impact may we generate if children from classes I to IV play with the most sophisticated research tools available today using augmented reality? We hope to see - 20 years ahead - a more creative generation able to design new equipment for advanced research very fast after their acceptance in the labs of tomorrow. The answer is positive.

In an interview for Radio Romania with us at the beginning of the 1990s, the Romanian philosopher Henry Wald stressed that words are not the clothes of the thoughts; they are the thoughts. An empirical perception or a piece of scientific information becomes Knowledge only if verbal or written versions of a concept, model, or paper are generated. To develop the **knowledge** side of the nation's wealth, we request that the knowledge network be augmented first at the national level and very quickly at the international level. The social communication process is a necessity and not an entertainment activity.

4) The role of the Central Bank in Knowledge fostering and knowledge management.

We identify three new potential responsibilities for the Central Banks:

- a) **Mastermind** in the process of setting up priorities for fostering Knowledge as part of the monetary policy implemented by the Central Bank
- b) Acting as the custodian of the Knowledge deposited at the Central Bank. Also, the Central Bank will stay vigilant in using this as a new segment of the national wealth.
- c) Generator of new methods to finance advanced research: The Central Bank may significantly contribute to identifying, together with the national Government, an effective financial strategy model to budget advanced research.

The mission of a central bank varies depending on the country and its economic system. However, in general, the primary role of a central bank is to promote financial stability and growth by managing monetary policy and overseeing the banking system.

5) Knowledge export – a new highway for international commercial exchanges

Knowledge will become more and more the new merchandise of the international markets. Professional associations and the Government must design a new strategy for export and new professions. The first phase of the Knowledge export will have a negligible impact on the Gross Domestic Product. By reaching 1% of GDP, this new type of commodity for export will play a significant role in the trade balance.

The Ministry of Foreign Affairs will discover the necessity to foster Culture and Science Diplomacy on one hand and Knowledge Diplomacy on the other. Knowledge, in the mind of the diplomats, will become not only merchandise but also a projection of the economic and scientific national power on the international stage. Behind Knowledge, it is easy for experts to see the advanced industries (especially the aerospace and defense industries) and the military capability.

The utility of our theory received its first public recognition. The Romanian National Council for Export decided that the presence of advanced research and the private business sector in the OSAKA World Exhibition 2025 will have Knowledge and knowledge transfer as main priorities.

Representative industries and national research institutes will represent Romania.

6) Measuring the volume of Knowledge from a company can be a complex effort. It is necessary to apply a set of methods. However, several approaches can estimate the Knowledge a company owns or/generates.

One approach is to examine the number of articles and publications the company has produced. The number of pieces can indicate the company's level of expertise in a particular field. To measure this, one could count the number of articles, papers, and reports the company or its employees authored and track their citations by other researchers. Another approach is to look at the number of patents the company has filed. The measurement tool can indicate the company's innovative capacity and the amount of Knowledge it has generated. Measuring the volume of Knowledge from a company is a challenging task. However, combining these methods makes it possible to better understand the company's Knowledge and expertise in transforming it into products, services, or technologies.

2. Conclusions

- 1) **The advanced research** seeks a long term visionary partnership with the Central Bank and Governmental agencies. It is not a profit generator for the Government in the short term. **The advanced research** needs to be part of the national development strategy team, and a constant flow of funds is a condition for expecting effective results.
- 2) **Knowledge production** represents a fast growing part of the national economy generated by the advanced scientific infrastructures located on the national territory or in the international facilities where Romanian researchers do the best job they know (such as CERN or ESA).

- Published articles published in international professional magazines and advanced research initiatives are the outcomes of specific pieces of Knowledge.
- 4) **The number of industries** influenced by the new Knowledge is also essential.
- 5) **Knowledge Capital** is an intangible asset that helps us understand a part of the Universe, acquire skills, and connect with support and beneficiary industries, including innovative companies.
- 6) **The national esteem for researchers** starts with the technological and social impact on humankind, determined in labs.
- 7) Knowledge Transfer is a permanent two way dialogue between advanced research infrastructures and beneficiary industries. Knowledge can be transferred from scientific infrastructure to society when projected in the educational process. Knowledge contribution to the enhancement process of innovative companies has to be measured. Knowledge transfer will become more critical for the social and economic process than public communication. The flow of Knowledge will produce a structural change in the GDP's structure.
- 8) ELI NP can become an integrated knowledge center for advanced research.
- 9) **The Central Bank may extend its role** to stimulate the knowledge segment of national wealth.
- 10) The ELI NP Facility allows Romania to design the next world economic model actively. A creative and significant part of this role is the next generation training based on advanced research results.

NOTES

[i] DARPA - Defense Advanced Research Projects Agency – A military research agency

[ii] https: //www.darpa. mil/program/ten - year - lunar - architecture - luna - 10 - capability - study, "It is the year 2035, and a thriving lunar economy exists on the Moon. How did we get there?

DARPA supports a future model where the National Aeronautics and Space Administration (NASA), international governments, and commercial industry can rapidly scale up lunar exploration and commerce, enabled and supported by the deployment of an efficiently combined, integrated lunar infrastructure framework. An integrated framework would upend the current technical paradigm, whereby each lunar lander or activity must organically support all required resources such as survival power, communications, and data storage.

The 10 - Year Lunar Architecture (LunA - 10) will explore the rapid development of foundational technology concepts designed to move away from individual scientific efforts within isolated, self - sufficient systems and toward a series of shareable, scalable, resource - driven systems that interoperate – minimizing lunar footprint and creating monetizable services for future lunar users.

LunA - 10 Topic Area 1 (TA - 1) focuses on a portfolio of lunar providers and users who will, together, define a series of future integrated lunar frameworks that take advantage of commercial development and nongovernmental funding streams. Each integrated system design and framework will be backed by a quantitative analysis of needs, validated analysis for anticipated use case (s), concepts of operations, scaling analysis for foundational systems, and metrics for integrated system performance. Performers will identify current investments and future technical challenges toward achieving these goals. "

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