

Knowledge Transfer - The First Stage of the Knowledge-based Economy

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Abstract: *This paper explores the concept of knowledge transfer (KT-to establish the acronym early on) as the first stage in developing a knowledge-based economy. It examines the channels and mechanisms involved in KT, categorizing them into education, competitiveness enhancement for export-focused companies, and new social and economic models. The study draws on global perspectives, highlighting variations in KT approaches across different cultures and economies. The paper also critiques the common confusion between knowledge and innovation, emphasizing the need for distinct strategies. Finally, the article proposes a framework for integrating KT into economic and social development strategies, underscoring its critical role in future economic models.*

Keywords: Knowledge, Knowledge Transfer, Knowledge-based Professions, Time-based Economy, Quinary Economy

1. The Approach of our Predecessors

Sir Francis Bacon's remark in 1620 is a powerful conclusion: "Knowledge is not more than power. "

Knowledge Transfer (KT) was introduced in the economic literature in the 1960s and 1970s last century. One of the first books was published in 1962 by Everett M. Rogers [1]. The author identified five stages through which individuals or organizations progress to adopt an innovation: Knowledge, Persuasion, Decision, Implementation, and Confirmation. Rogers presented the factors that affect the rate of innovation adoption. Ikujiro Nonaka and Hirotaka Takeuchi [2] wrote a book that represents the foundation of knowledge management and presents how knowledge is created and transferred within organizations. Thomas J. Allen's [3] work focuses on the flow of technological information and knowledge transfer within research and development settings. We consider the OECD's definition clear and comprehensive. U. S. Department of Defense came up in 2019 with a definition of the KT.

In the Japanese business literature [4], knowledge transfer is often called "tacit knowledge transfer" or "implicit knowledge transfer. " This type of knowledge transfer involves sharing knowledge, skills, and expertise that are difficult to formalize or articulate in writing, such as experience-based knowledge, intuition, and personal connections. Japanese companies may use various strategies to facilitate tacit knowledge transfer, including mentoring programs, cross-functional teams, and regular team-building activities. Additionally, companies may prioritize hiring and retaining employees willing and able to share their expertise and collaborate with others.

In the Korean business context, Kim Tae-hoon published an influential book 2015 about "knowledge sharing" or "knowledge management. " Time-sharing is a term used by Korean companies to transfer knowledge. One key aspect of the Korean approach to knowledge transfer is the concept of "ba, " which refers to a shared space for knowledge creation and sharing. In the Korean tradition, employees must

communicate and interact with each other. The Korean vision is the way to find new solutions and innovate.

We may translate the Chinese definition of knowledge transfer as "知识转移" (zhī shí zhuǎn yí) [5]. The definition refers to transferring knowledge or technology from one entity to another. The author of this definition is not clear, as it is a commonly used term in Chinese academia, industry, and government. However, this concept has been discussed extensively in various Chinese publications, including academic papers, government reports, and industry reports.

Israeli experts Orit Hazzan and Tami Lapidot consider KT to refer to explicit and tacit knowledge. (Quotation) In 2011, Aviad Pe'er [6] observed that KT needs multiple interactions. Israel is considered a startup nation.

Prof. Dr. Birgit Apitzsch [7], sociologist at the University of Bremen, Germany, suggests that the KT is the dialogue between science and practice. This explanation is in line with our approach.

In India, C. K. Prahalad [8] was a renowned management guru and professor at the University of Michigan's Ross School of Business. He has written several influential books on business strategy, knowledge management, and innovation ideas [9]. 2010, George Eby Mathew [10] published a book about India's innovational environment.

There are many American thinkers in the KT except Peter Drucker. We shall mention only a few. Peter Senge is an American systems thinker and author who has written extensively about organizational learning, knowledge management, and leadership in **The Fifth Discipline: The Art Practice of the Learning Organization. New York: Doubleday; 1990.** Carla O'Dell is an American knowledge management consultant and author who has worked with many organizations to develop knowledge management strategies and practices. Dorothy Leonard is an American Quintre-Searcher and author who has studied the process of knowledge transfer in organizations and has written several books on the subject. We found one American expert who came up with a correct definition of the knowledge. Ms. Amy

Zegart [11] published the article Knowledge Is Power—and the United States Is Losing It in Foreign Affairs [12], August 2024. She came up with this clear description [13]. She used to work for the Clinton Administration and is an expert in national security and intelligence federal agencies. Ms. Zegart wrote this definition at least one year later than the author of the present paper.

2. The author's perspective on knowledge and knowledge transfer

The debate about knowledge transfer is one of the first signs that an economy that has moved from the circular economy to the knowledge-based economy is prepared for the journey.

We consider KT a kit with multiple tools to diversify and increase the GDP. KT is a scientific and technical process that enhances the sources of life support and diversifies the quality of life. A significant number of the papers written about KT are theoretical. This means that we are at the end of a business model, the circular economy, and at the beginning of another economic and social model: the knowledge-based economy. The nations with public and private investments in the spatial economy properly understand KT. The spatial sector of the GDP operates in a business model different from that of most of the national economy. The countries pushing hard to renew day-by-day technologies, like the energy industry, will first populate the new territories of the knowledge. Two nations, the USA and Germany, but at most five, Japan and Korea, struggle to identify their actual Joshua [10]. The journey to the Promised Land is at the end but still tricky. India is searching for its way. We are unprepared to say more because we did not try to find the Indian answer to the transition. With China, the reality is more complex. Inside the Chinese economy are a few operational models: the agricultural, pre-industrial, industrial, extensive use of traditional raw materials, and knowledge-based economy models. Although it has some doctrinal and social hesitations, the Chinese Communist Party directs the economy toward competition with the economy of the United States of America. In our understanding, Chinese development faces two significant questions. a) The safety net of large traditional Chinese families has the necessary resilience to keep its members, who coexist in two to three realities, together. b) Can Chinese labor jump from one economic model to another in a short and preestablished number of years? This is not an SF movie. It is real life. We spent a few weeks in Astana, Kazakhstan, during the 2017 World Exhibition. The American quarter, the German quarter, and the French quarter were nice but empty. It was a soccer game between Romania and Kazakhstan. The men were unhappy because soccer was not part of their tradition. Kazakhstan has plenty of money from the oil industry. The GDP increased, but the leaders could not diversify its structure enough for a significant change. Also, the population was the same. The experts needed a history in the new reality. The Romanian soccer team lost that game! In Europe, two countries lost contact with the rest of the European Union: Hungary and Austria. This is the second time in one hundred years that the politicians from these countries need help understanding the future direction. The paper is dedicated to the first segment of the Knowledge-based Economy: KT.

When experts write about knowledge transfer, they often confuse knowledge with innovation, skills, and all other possible ways to increase competitiveness. This mistake affects activities and jobs, from scientific discovery to new technologies, products, and services. The decision-makers need to learn about the mistake. However, the consequence is that they allocate the budget for research based on this reality. Also, the decision-makers ask the wrong questions, and experts are part of the research chain of ideas. They ask the teams from the advanced research about new technologies and the companies' researchers about space discoveries to prepare for potential flights if their country fixes the budget.

The second area for clarification is between knowledge transfer channels and tools available for communicators. Experience in electronic media is necessary to project knowledge transfer channels. The "old" media discovered the principles of knowledge transfer; the social media ritual is just a copy. These are typically what the experts designated as channels, but in fact, there are only tools:

- Face-to-face communication
- Written documentation
- Training programs
- On-the-job training programs
- Mentorship and coaching
- Communities of practice
- Knowledge management systems
- Technology-based communication
- Social media and networking
- Workshops and brainstorming sessions
- Job rotations and cross-functional teams: moving employees across different roles or departments

Today, countries increasingly derive power from intangible resources—the knowledge and technologies such as A. I. that are super-charging economic growth, scientific discovery, and military potential. These assets are complex for governments to control once they are "in the wild" because of their intangible nature and the ease with which they spread across sectors and countries.

Knowledge is the raw material of the Quinary Economy. Knowledge is a part of the mining deposit from a diamond mine. But the mine represents the unknown Universe. The researcher is a miner who digs to find diamond-extracted rock. Depending on their results, the miner and the researcher feel lucky. But the miner needs to learn precisely how lucky he was. A miner is a hard worker and a knowledgeable worker. He is not spending his life in Amsterdam, Brussels, or Fifth Avenue in New York City to polish the stones. A miner needs to learn the structure of his stone and who will use the stone. The diamond miner will never meet the glamorous ladies wearing the former stone during a fancy evening or drama event. It is a long journey from the discovery of a stone named diamond to public visibility and popularity. One famous book that delves into the journey of a diamond from the mine to the elegant lady is *The Diamond as Big as the Ritz* by F. Scott Fitzgerald, published in 1922. A similar book about a scientist is the book written by Kai Bird and Martin J. Sherwin and published in 2005 and transformed into the script for a famous film produced by Hollywood fifteen years later [*American Prometheus-The Triumph and Tragedy of J. Robert Oppenheimer*]

Diamond studies represent part of the mineralogy. Here are some equivalences between diamond industry and scientific research:

- mining engineering-research
- gemology-scientific field of research
- jewelry design-scientific brokerage or scientific design.

Suppose we understand that knowledge is the new and sophisticated raw material of the Quinary and Time-based economies. In that case, the researcher is the equivalent of a knowledge-based miner. We need to generate new knowledge-based professions and marketplaces to transform the knowledge into something useful in a reasonable period. At the same time, the legal framework has to protect the researcher, the research infrastructure, the innovative company, and society as a whole. Who is the owner of the intellectual property? Who has the right to decide how to use knowledge? The most common public debate is that researchers are difficult to convince to weaponize their knowledge. The researchers speak about public responsibility. They knew the trend for their idea from the early beginning, but getting a nimb of a fighter against the public administration is fancy. All these discussions are closed down when the war is at the door, as is happening now with Russia. Decision-makers must adapt the payment and motivational systems to the new business models as soon as possible. A clear distinction between researchers and scientists is necessary. The researcher is the equivalent of a highly professional engineer. In the Middle Ages, the researcher was called a craftsman. The scientist has an interdisciplinary approach and is a highly profiled expert. In the Middle Ages, scientists were named philosophers.

The diamond industry is complex. We shall use two categories of examples from this industry to understand that software designers must rethink the process from discovering knowledge to K. T.

Key professions typically involved in the diamond industry:

Miner, geologist, lapidary, gemologist, jewelry designer: Jewelry designers, jeweler gem setter, jewelry appraiser, marketing consultant.

The key marketplaces or stages involved in the journey of a diamond stone from the mine to a famous jewelry piece:

- 1) **Mining Market:** The mining company initially sells the diamond stone to diamond traders or manufacturers, introducing the rough diamond into the market.
- 2) **Diamond Cutting and Polishing Market:** Diamond manufacturers or cutters process the stone to cut and polish it into a finished gem after purchasing the rough diamond. These diamonds, which were cut and polished, are sold to diamond wholesalers or retailers
- 3) **Diamond Wholesale Market:** Diamond wholesalers purchase cut and polished diamonds in bulk from manufacturers and then supply them to jewelry manufacturers, designers, and retailers.
- 4) **Jewelry Manufacturing Market:** Jewelry manufacturers purchase diamonds from wholesalers and incorporate them into jewelry pieces. They create settings, designs, and finished jewelry items using these diamonds.

- 5) **Jewelry Wholesale Market:** After processing, the jewelry is sold to wholesalers, who
- 6) may distribute it to retailers, boutiques, or online platforms.
- 7) **Retail Market:** The final stage involves selling the jewelry pieces to consumers at rough retail outlets, such as jewelry stores, boutiques, department stores, online retailers, or the jewelry designer's store.
- 8) **Auction Market:** Auctions may be another marketplace where diamonds are sometimes old, particularly with rare or high-value diamonds.

However, it is essential to note that companies cannot include these assets in their balance sheets.

The World Bank issues the Knowledge Economy Index. According to the latest issue, Switzerland is the top-ranked knowledge economy, followed by Sweden and the United States.

The tools presented above describe and measure the entire research and innovation process. However, applied research obliterates the core parts, such as knowledge and K. T. Innovation, a segment of our traditional thinking and accounting methods. Knowledge is difficult to assess. We were at the 2017 Expo in Astana, Kazakhstan. The founding president of the independent former Soviet Republic asked the universities and research labs in a conference what applied results they had for the new economy. It was a catastrophe! The example illustrated a typical confusion between innovation and advanced research. Reading the specialized literature about KT, we saw the same confusion: innovation, knowledge, skills, connections, and values. NO! Knowledge is part of the national wealth (quotation). Researchers, scientists, research infrastructure managers, politicians, journalists, the Minister of Finance, prosecutors, and judges must know that knowledge is part of G. D. P.

Knowledge is Scientific Discovery! Knowledge Transfer is a complex Communication Process.

The author focused on designing, generating, and establishing an effective Knowledge Transfer Process. Communication is the main activity in this package. On the research side of the channel, there are:

- *Researcher* who knows the advanced research results.
- *Scientists integrate* the results in a broader scientific picture to have a context and extend the opportunities for many industries.
- *Science Communicator or Scientific Broker:* This person translates the description of the results into "the language known on the other side of the channel."

The Communication Channel is a kit the Science Communicator and Science Trader Designer use to facilitate dialogue between the two sides. Both characters have high credibility in their professional community. The channel's structure and functions are adapted to KT's specificity.

The first character on the other side of the communication channel is the *Science Trader Designer*. This person knows the language of the advanced research, the language of the beneficiary, and the dialect used inside the communication

channel. He designs the cooperation format and the necessary documents.

The scientists from the business community side are as follows: A person with a scientific education can assess advanced research results based on their utility for the commercial entities involved in the communication process.

The business community representatives are the final participants and users of the advanced research results. In some cases, *startups* created by the research team may represent the business community.

The author of the present paper considers that Knowledge Transfer has three highways with specific final destinations:

- 1) **Knowledge-Channel for Transfer-*Knowledge* used for Education.**
- 2) **Knowledge-Channel for Transfer-*New Technologies* for competitive companies focus on exports.**
- 3) **Knowledge—Channel of Transfer—*Social and Economic model* based on new *Values, Fundamental Knowledge, and New Social Rules.***

Peter Drucker equated Knowledge and Innovation, but current observations suggest this must be rewritten. Now is the moment to stress that innovation occurs when technologies developed based on knowledge need improvement to increase companies' competitiveness, especially in international markets. With this clarification, it is evident that knowledge and innovation are entirely different entities. Innovation is a way to prolong the functioning of technologies without investing in advanced research. Knowledge begins a new production chain on the timeline, and innovation represents a rejuvenating drug to extend the life cycle. Knowledge is the first laser beam using the model of the world's most powerful laser located in Romania. Innovation, skills, and transfer between companies represent the laser beam. There are pumps for energy on the road to the destination (increasing the competitiveness and the exports). The laser beam becomes powerful. At the end of its path, the laser beam can destroy the target. Knowledge is the nest of innovation. Knowledge without innovation can exist. Vice versa, it is impossible.

The most frequent risks in the K. T. process are:

- 1) *The researcher can have strong property feelings.* We met cases in our more than 20 years of experience when the researcher believed to be able to be a researcher, scientist, or owner of a business organization. A clear contract between the researcher and the scientific facility will help to avoid unnecessary discussions.
- 2) *The businessperson considered the research results public property, easy to take and use because public funds financed the scientific infrastructure.* The scientific organization's top management is harsh in such situations. If the research community wholeheartedly hates something, it is to see a person stalling the intellectual property. The doors of the scientific facility are closed forever for that person, and the lawyers are going to court for prejudices.
- 3) Lack of scientific and business glossary. For example, when mineralogists say that a rock may not resist enough, they may have a period shorter than 1 billion years in

mind. The construction engineers are thinking of 100 years.

- 4) Time for research may generate a misunderstanding. For a researcher, the minimum timeframe to finalize a research project is three years. The maximum timeframe for a small How should we match these so different requests?
- 5) Return on investment is a concept that only exists in a researcher's mind. The businessperson thinks about 6 to 12 months.

3. The author used different methods to analyze the knowledge transfer process.

3.1 Qualitative analysis.

3.1.1 We conduct thirty **interviews** with top and middle managers from scientific research facilities, innovative companies, and high public servants from national agencies. The research infrastructures are from the following fields: nuclear physics, hydrogen energy, chemistry, and food. We were focused mainly on the Extreme Light Infrastructure - Nuclear Physics Center, Magurele, Romania, and the National Research and Development Institute for Cryogenic and Isotopic Technologies - ICSI Ramnicu-Valcea, Romania. We used the same battery of questions for all interviewed persons. Of course, some minor variations did not influence the final analysis.

3.1.2 The author had the chance to conduct two **study cases** with the advanced research facilities mentioned above and two with innovative companies from the Magurele High Tech Cluster.

3.2 Controlled experiments. We conducted two controlled experiments to verify the proposed methodology for KT.

3.3 To draw conclusions, we made comparisons between time periods and studied the cultural differences between advanced countries on the route to a knowledge-based economy.

4. Conclusions

In conclusion, this paper comprehensively analyzes knowledge transfer as a fundamental component of the knowledge-based economy. By examining various global approaches and clarifying the distinction between knowledge and innovation, the study provides valuable insights for policymakers and business leaders. The proposed framework for knowledge transfer underscores its potential to drive economic and social progress, paving the way for future developments in the quinary and time-based economies.

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