


GLOBAL KNOWLEDGE TRANSFER: HOW INTERNATIONAL COMPANIES ARE BOOSTING KNOWLEDGE ECONOMIES

Transferencia global de conocimiento: cómo las empresas internacionales están impulsando las economías del conocimiento


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ABSTRACT

Globalisation has led to the rise of multinational companies (MNCs) as crucial drivers of economic development, particularly in developing countries. Their growing reputation arises from their role in fostering the development of knowledge-based economies, where information and technology collection, dissemination, and utilization primarily propel advancements. This research seeks to examine the positive influence of multinational firms on the knowledge economy's growth. This research uses qualitative analysis to investigate several instances of foreign businesses that have effectively executed knowledge transfer programs. The research shows that foreign companies play a crucial role in the growth of knowledge-driven economies by enhancing the workforce's skills, promoting innovation, and facilitating technology adoption. These efforts promote economic expansion and help achieve sustainable development goals, such as reducing poverty and improving global competitiveness.

Keywords: Global knowledge transfer, international companies, knowledge economy.

RESUMEN

La globalización ha propiciado el surgimiento de las empresas multinacionales como impulsoras cruciales del desarrollo económico, en particular en los países en desarrollo. Su creciente reputación surge de su papel en el fomento del desarrollo de economías basadas en el conocimiento, donde la recopilación, difusión y utilización de información y tecnología impulsan principalmente los avances. Esta investigación busca examinar la influencia positiva de las empresas multinacionales en el crecimiento de la economía del conocimiento. Esta investigación utiliza el análisis cualitativo para investigar varios casos de empresas extranjeras que han ejecutado eficazmente programas de transferencia de conocimiento. La investigación muestra que las empresas extranjeras desempeñan un papel crucial en el crecimiento de las economías impulsadas por el conocimiento al mejorar las habilidades de la fuerza laboral, promover la innovación y facilitar la adopción de tecnología. Estos esfuerzos promueven la expansión económica y ayudan a lograr objetivos de desarrollo sostenible, como la reducción de la pobreza y la mejora de la competitividad global.

Palabras claves: Transferencia global de conocimiento, empresas internacionales, economía del conocimiento.

INTRODUCTION

Multinational companies (MNCs) play a crucial role in promoting the growth of knowledge-based economies by facilitating the interchange of information across borders and leading innovation, especially in the context of rapid global economic integration. A plethora of academic research illustrates how multinational firms use their global networks to promote the spread of innovative ideas, boost regional competitiveness, and enter developing markets [1], [2]. Comprehending the connection between the transmission of information and economic growth is crucial since these groups play a vital role in reducing inequities in geographical knowledge.

The study conducted by Neto, Souza, and Oliveira [3] and Zhang, J., Wu, W., and Chen [4] indicates that the interaction between universities, enterprises, and other institutional players plays a crucial role in enhancing regional competitiveness and promoting the growth of knowledge-based economies. These joint endeavors demonstrate the complex nature of knowledge transfer processes. They include not only the direct transmission of information but also the subtle exchange of best practices and implicit knowledge across different fields [5], [6].

The advent of new digital technologies and methodologies has fundamentally transformed the dissemination of information, opening up new avenues for international cooperation and the sharing of specialized knowledge [7], [8]. Integrating these technologies in academic and professional environments might improve the effectiveness of knowledge transfer efforts, such as those that support sustainable business practices and provide specialist training [9], [10]

This article aims to analyze the complexities of global knowledge transfer, specifically the tactics used

by key players in the sector, such as multinational firms, to promote innovation via the sharing of information. We are primarily interested in understanding the techniques used by these organizations to overcome obstacles in transmitting information, how they improved their competitiveness and economic development, and the particular breakthroughs that resulted from these efforts. Organizations can improve their ability to innovate and support the development of knowledge-based economies by implementing effective strategies. These strategies will be identified through a comprehensive review of relevant literature and analysis of recent publications, such as Castro & Moreira [11] and Wuryaningrat et al. [12].

Our research will analyze the relationships between academic institutions, governmental agencies, local firms, multinational corporations (MNCs), and academic institutions to evaluate how MNCs contribute to the transfer of innovation and knowledge. In order to determine the elements that either facilitate or impede the sharing of knowledge, we will employ findings from influential research such as Ebersberger et al. [13] and Dąbrowski et al. [14]. Next, we shall evaluate the local and global consequences of these processes. Prevedourou et al. [6] analyze digital technologies used for knowledge transfer. Nguyen et al. [7] assess knowledge-sharing practices across different devices and sectors. Lam and Rui [10] evaluate the impact of human mobility on transnational learning and innovation. The current analysis will cover all of the previously listed issues. We will also analyze the manner in which these processes impact policy, the tactics organizations use, and the general advancement of knowledge economies.

The aim of the article

This article examines how multinational firms have benefited from the growth of knowledge-based

economies, especially in developing countries. This article will review relevant research, look at relevant case studies, and give examples of successful efforts to show how crucial global knowledge transfer, education and training, and cooperation are for economic growth and sustainable development. The article will conclude by arguing that multinational firms may play a crucial role in developing knowledge-based economies, which are crucial for attaining long-term economic development, encouraging innovation, and improving people's standards of living.

Problem statement

The problem statement for the article is that establishing a knowledge-based economy is essential for generating sustained economic development and innovation and enhancing people's quality of life. Nevertheless, many underdeveloped areas need more infrastructure and human capital to build knowledge-based economies. The provision of resources, expertise, and information by multinational firms has the potential to be essential in the rise of knowledge-based economies. The task is to determine effective techniques to encourage global knowledge transfer, education, and cooperation to drive sustainable development. Multinational firms may contribute to the expansion of knowledge-based economies.

LITERATURE REVIEW

The academic community has placed significant attention on studying the process of information transmission and recognizing its crucial role in promoting innovation and enhancing economic performance. This study focuses on examining the optimal methods, procedures, and outcomes associated with the dissemination of information in various contexts, including multinational corporations (MNCs), small and medium-sized enterprises (SMEs), and the

informal sector. It consolidates data from different research studies.

Liotile et al. [15] highlight the use of research from esteemed institutions to draw attention to effective strategies for disseminating information. Liotile et al. suggest that academic institutions enhance their innovation and sustainability capabilities via structured programs and activities. Castro and Moreira [11] explore the intricacies of knowledge transfers inside multinational corporations (MNCs), demonstrating how well-structured platforms and networks within an organization may enhance its innovative capacity and efficiency.

Trust has a crucial role in knowledge transmission since it enables efficient information flow and fosters innovation, as stated by Wuryaningrat et al. [12]. The study conducted by Wuryaningrat et al. asserts that trust-building tactics, such as open communication and collaborative practices, are essential for promoting effective information sharing. Ibdunni et al. (2020) further support this notion by examining how information transmission and innovation performance are interconnected among small and medium-sized enterprises (SMEs) in the informal sector. The effectiveness of knowledge transmission is influenced by the dynamics of relationships and the level of trust, as shown by the findings of Ibdunni et al. [16]. Consequently, this has an impact on the performance of innovation.

Abdullah and Alqarni [17] analyze the subject of knowledge dissemination in the field of international business, highlighting the significance of global networks and cross-cultural competencies in enhancing the exchange of information across borders. The study emphasizes the need to overcome linguistic and cultural barriers to improve the effectiveness of information sharing in international contexts. The study conducted by Mnykh et al. investigates the phenomenon of

technology transfer, specifically examining its impact on both local and foreign markets in terms of financial outcomes. Mnykh et al. emphasize the need to establish a conducive environment for fostering innovation and the necessity of aligning technology transfer projects with the requirements of businesses [18]

Dąbrowski et al. examine the barriers to knowledge sharing, particularly in relation to disseminating solutions for the circular economy. To ensure effective information transmission, the study [14] acknowledges the challenges posed by regional and contextual differences and advocates for tailored approaches. According to Ebersberger et al. [13], an analysis of European patent data reveals the efforts made by Chinese firms that entered the market later to catch up with their competitors. The study focuses on examining the international knowledge networks. Ebersberger et al. discovered that the strategic use of foreign information may enhance indigenous innovation abilities. Sharma and Garg emphasize the significance of common objectives and mutual benefits in fostering effective connections that facilitate the exchange of knowledge between academics and business [19]. Liu conducted research on social capital and organizational learning in the creative and cultural industries. The study found that social networks and shared norms significantly enhance knowledge transfer and organizational learning [20].

The process of transferring knowledge is intricate, and this study review demonstrates the multitude of aspects that contribute to its effectiveness, including cultural competency, trust, alignment of strategies, and personalized approaches. The insights presented here may be of tremendous interest to policymakers, firms, and academic institutions seeking to leverage knowledge for innovation and sustainable development.

These findings contribute to our understanding of information transmission in a globalized economy and its consequential outcomes.

PRACTICAL IMPLEMENTATION

The practical aspect of how multinational firms are strengthening knowledge economies consists of a range of programs and activities that enhance local capabilities and provide new opportunities. Here are some instances of practical actions being carried out by multinational corporations in different countries:

Investment in local research and development: Multinational firms may establish research and development centers in local areas to foster collaboration with local academics and researchers. IBM has established research labs in many countries, such as China, India, and Brazil, to engage in collaboration with local engineers and scientists. The objective is to develop advanced solutions in areas such as cybersecurity, cloud computing, and artificial intelligence. This undertaking aligns with the study conducted by Singh and Dhir, who emphasize the significance of multinational corporations (MNCs) as catalysts for knowledge transfer and facilitators of innovation via their strategic investments in local research and development (R&D) [1].

Collaboration with local partners: Through forging robust alliances with local organizations, multinational firms may facilitate the creation of new markets and enhance the resilience of current ones. For instance, Google has partnered with African non-governmental organizations (NGOs) and local businesses to provide digital marketing education to aspiring African business owners. Fifty African organizations have collaborated with Google to provide help to aspiring entrepreneurs via the Google for Entrepreneurs initiative, which includes training, mentoring, and access to resources. Ratten supports the idea

that regional competitiveness may be enhanced by international collaboration and information exchange between firms and institutions. Ratten's research validates this method [2].

Investment in local education: In order to support the shift towards a knowledge-driven economy, multinational firms may enhance local educational institutions by providing financial support for training and education initiatives. Microsoft has implemented many initiatives across Africa to support educators and students in developing digital skills and increasing their availability of digital materials. Through its many programs, such as the Microsoft Imagine Academy, Microsoft has provided education to over 750,000 African students and educators, therefore establishing a solid foundation for the emergence of future leaders in the technology sector. Neto, Souza, and Oliveira [3] underscore the vital need to assess knowledge transfer in innovation activities. They also emphasize the significance of investing in local education as a means to enhance innovation and knowledge transfer.

Investment in local infrastructure: Multinational firms may allocate funds towards local infrastructure to provide the foundation for a knowledge-based economy. Facebook has allocated funds for the development of new underwater cables in order to enhance internet connectivity in regions such as Africa. The company's Express Wi-Fi initiative in India and other countries serves as a prime illustration of its endeavors to provide affordable internet access to underserved areas. The results of this undertaking align with the research conducted by Prevedourou et al. [6], which investigates the impact of digital technology on facilitating companies' transition towards sustainability and the exchange of information.

Promotion of social and environmental sustainability: An enhanced and fair knowledge economy may be

established by leveraging the commercial activities of multinational firms to advance social and environmental sustainability. Unilever has implemented several initiatives worldwide to exemplify the significance of sustainability and social responsibility in the business realm. Furthermore, the firm has committed to acquiring all of its agricultural raw materials sustainably by the year 2020, in addition to implementing measures to promote gender equity and environmental preservation. In their study, Dąbrowski, Varjú, and Amenta emphasize the significance of sustainability in the dissemination of information as they examine the implementation of circular economy solutions in different areas [14].

Global firms are actively strengthening knowledge-based economies in various regions via specific actions. These firms are actively contributing to the establishment of a more equitable and all-encompassing global economy via financial support for research and development, forging local connections, and lobbying for social and environmental sustainability.

METHODOLOGY

This part offers an intricate elucidation of the entire technique used to enhance knowledge economies. This encompasses a range of strategies, techniques, and categories of investments necessary to foster innovation, entrepreneurship, human capital development, information exchange, infrastructure investment, and worldwide expansion.

Approaches to boosting knowledge economies

Encouraging Innovation: An integrated strategy is essential for fostering innovation in economies that rely on knowledge. This entails significant allocations of resources towards research and development (R&D) [1], comprehensive initiatives for education and training, and the establishment of strategic collaborations with

academic institutions, industrial counterparts, and research organizations [2], [3]. The goal is to foster an environment that not only produces creative ideas but also efficiently translates these ideas into actual results.

Supporting Entrepreneurship: Recognizing the pivotal role of entrepreneurs and small and medium-sized enterprises (SMEs) in driving innovation, this approach endeavors to cultivate a business-friendly atmosphere through the provision of financial backing, mentorship programs, and the establishment of a financing framework that is conducive to growth [16]. These initiatives aim to foster an entrepreneurial mindset, which will aid in the commercialization of innovative solutions and contribute positively to economic vitality.

Developing Human Capital: Investing in education and training is essential for developing a skilled workforce for success in a knowledge-based economy [6]. Customized programs that provide the necessary skills and knowledge ensure that the workforce can efficiently meet and drive the evolving demands of the information-based economy.

Promoting knowledge Sharing: Creating networks and platforms enabling sharing of information and experience among companies and people is crucial for fostering a creative and collaborative environment [11]. Such efforts encourage the exchange of advanced ideas and best practices, increasing the collective knowledge pool.

Investing in Infrastructure: Dąbrowski, Varjú, and Amenta [14] argue that investments in vital infrastructure, such as broadband networks, research facilities, and innovation centers, are essential for promoting innovation and enabling information sharing. These investments provide the necessary physical and digital architecture to enable efficient information interchange and

promote the cooperation essential to the knowledge-based economy.

Encouraging Internationalization: Expanding knowledge economies' impact and range beyond national borders is accomplished by encouraging international alliances and collaborations [10]. This method promotes innovation and facilitates the global sharing of technology and skills via cross-border knowledge exchange.

Methods and types of investments

R&D Investment: The R&D investment index is a crucial measure used to evaluate a country's commitment to promoting innovation and advancing technology. Economic growth and global competitiveness are determined by the percentage of GDP allocated to research and development efforts [13].

Education and Training Programs: These programs are essential for cultivating the human resources required to effectively navigate and make significant contributions to the knowledge-based economy. Investments in education and training ensure that the workforce has the necessary digital, technical, and creative skills [17].

Entrepreneurial Support: Mentorship and financing programs for small and medium-sized firms (SMEs) provide a vibrant environment encouraging economic diversity and innovation. These financial obligations promote the growth of emerging industries and enable the implementation of innovative solutions on a larger scale [12]

Infrastructure Development: Infrastructure investments, including physical and digital aspects, play a crucial role in promoting innovation and enabling information sharing. This involves the creation of innovation hubs, research institutes, and high-speed internet networks, which are the fundamental elements of a knowledge-driven economy [21]

Internationalization Initiatives: Utilizing global knowledge networks and investing in international partnerships and collaborations may enhance domestic innovation capabilities and promote economic development for governments and enterprises [22].

This methodology aims to create a knowledge-based economy that is dynamic and sustainable by incorporating various methods and investments. A culture of cooperation, innovation, and continuous growth will characterize it.

RESULTS

International companies are playing an increasingly important role in boosting knowledge economies around the world. By bringing new technologies, ideas, and expertise to local markets, these companies can help to drive innovation and economic growth, while also supporting the development of the local workforce.

One key way that international companies are boosting knowledge economies is by investing in research and development. By funding new research and working with local universities and research institutions, these companies can help to develop new products, processes, and technologies that can drive innovation and competitiveness.

Another way that international companies are boosting knowledge economies is by investing in education and skills development. By providing training and education programs for local workers, these companies can help to build the skills and knowledge needed to succeed in a knowledge-based economy. This can include everything from technical training in specific areas of expertise to broader programs aimed at developing critical thinking and problem-solving skills.

International companies can also help to boost knowledge economies by providing access to new markets and customers. By expanding into

new markets and working with local partners, these companies can help to create new opportunities for local businesses and entrepreneurs, while also driving economic growth and job creation.

They are playing an increasingly important role in boosting knowledge economies around the world. By investing in research and development, education and skills development, and new markets and customers, these companies can help to drive innovation and economic growth, while also supporting the development of the local workforce.

Intel Corporation has been investing heavily in research and development (R&D) for decades, and the company's focus on innovation has helped to drive significant growth in the technology industry. Intel has established R&D centers around the world, working with local universities and research institutions to develop new technologies and products. For example, Intel has invested in a new R&D center in Israel that is focused on developing technologies related to artificial intelligence and autonomous systems.

Samsung Electronics has a long history of investing in education and skills development, both for its own workforce and for the broader community. The company's Samsung Tech Institute, for example, provides training programs for young people and adults in areas such as mobile app development, digital marketing, and data analytics. Samsung has also established partnerships with universities around the world, working with educators to develop curricula and training programs that align with the needs of the local market.

IBM's focus on education and skills development has helped to drive economic growth and job creation in many regions around the world. The company's P-TECH program, for example, provides high school students with

the opportunity to earn both a high school diploma and a college degree in a technical field. IBM has established P-TECH schools in countries including the United States, Australia, and the United Arab Emirates, and the program has been praised for its ability to help young people develop the skills and knowledge needed to succeed in a rapidly changing economy.

Amazon's expansion into new markets has helped to create new opportunities for local businesses and entrepreneurs, driving economic growth and job creation. For example, Amazon has established a network of fulfillment centers in India, providing opportunities for local businesses to sell their products to a global audience. Amazon has also launched a range of training and education programs in India, aimed at helping local entrepreneurs and small businesses to succeed in the digital economy.

As we see, international companies are boosting knowledge economies around the world. By investing in

research and development, education and skills development, and new markets and customers, these companies are helping to drive innovation, economic growth, and job creation in many regions.

Leading companies in the world aimed at preventing the progress of human social problems due to the global expansion of the knowledge economy. Many other companies are also taking steps to address social and environmental challenges, and these efforts will likely continue to grow in the coming years.

Latest program initiatives of leading companies in the world aimed at preventing the progress of human social problems due to the global expansion of the knowledge economy

Table 1. Initiatives by leading companies to address social challenges arising from global expansion of knowledge economy

Company	Program Initiative	Description
Google	Google.org	Google.org is a philanthropic initiative that aims to address social and environmental challenges through technology and innovation. It provides grants to nonprofit organizations, supports social entrepreneurs, and uses technology to tackle issues such as climate change, poverty, and education.
Microsoft	AI for Accessibility	Microsoft's AI for Accessibility program is aimed at using artificial intelligence to empower people with disabilities. The program provides grants to developers, universities, and non-profits to develop AI-based solutions to accessibility challenges.
IBM	P-TECH	IBM's Pathways in Technology Early College High Schools (P-TECH) program aims to provide high school students with the skills and education needed to succeed in the 21st-century economy. P-TECH schools offer a six-year program that combines high school and college education with real-world work experience.
Apple	Supplier Responsibility Program	Apple's Supplier Responsibility Program aims to ensure that its suppliers meet high standards for labor and human rights. The program includes regular audits of suppliers, training programs for workers, and the creation of programs to address issues such as forced labor and child labor.
Amazon	The Climate Pledge	The Climate Pledge is an initiative launched by Amazon to achieve net-zero carbon emissions by 2040. The initiative aims to encourage other companies to join in the effort to combat climate change and to invest in technologies and solutions to reduce greenhouse gas emissions.

The results of how international companies are boosting knowledge economies are multi-faceted and varied. Some of the positive impacts of international companies on the development of knowledge economies include:

Increased investment in research and development: International companies often invest heavily in research and development to remain competitive in global markets. This investment can lead to the development of new technologies, products, and services that can help to drive economic growth and create new opportunities.

Increased employment opportunities: International companies often create new job opportunities in local economies, both through direct employment and through the establishment of supply chains and support services.

Transfer of knowledge and expertise: International companies often bring valuable knowledge and expertise to local economies, which can help to improve local capabilities and

enhance the quality of goods and services.

Increased competitiveness: The presence of international companies can help to stimulate competition in local markets, which can lead to increased efficiency and productivity.

However, there can also be negative impacts of international companies on the development of knowledge economies, such as the potential for exploitation of local resources and labor, the displacement of local businesses, and the concentration of wealth and power in the hands of a few large corporations.

Overall, the impact of international companies on the development of knowledge economies is complex and depends on a range of factors, including the policies and regulations in place to govern their activities, the level of collaboration between companies and local stakeholders, and the specific context of the local economy.

Table 2. International Companies' Knowledge Economy Initiatives

Program	Company	Example	Country	Results
Google for Entrepreneurs	Google	Partnership with iHub	Kenya	Over 170 startups have been incubated at iHub, generating over \$20 million in revenue and creating over 1,200 jobs
Amazon Web Services Activate	Amazon	Partnership with NUMA	France	Over 100 startups have participated in the program, receiving training and technical support to help them scale their businesses
Intel Teach	Intel	Partnership with Ministry of Education	Mexico	Over 430,000 teachers have been trained to integrate technology into their classrooms, improving educational outcomes for over 12 million students
Microsoft YouthSpark	Microsoft	Partnership with TechSoup	South Africa	Over 2,000 nonprofit organizations have received support to improve their technology infrastructure and better serve their communities
IBM SkillsBuild	IBM	Partnership with Government of India	India	Over 40,000 learners have completed the program, gaining new skills and improving their employability

Cisco Net-working Academy	Cisco	Partnership with Ministry of Education	Brazil	Over 2 million students have completed the program, gaining skills and certifications in areas like networking, cybersecurity, and Internet of Things
SAP Young Thinkers	SAP	Partnership with Ministry of Education	Colombia	Over 600,000 students have participated in the program, gaining skills and knowledge in areas like coding, data analytics, and entrepreneurship
HP Learning Initiative for Entrepreneurs	HP	Partnership with TechnoServe	Kenya	Over 600 entrepreneurs have received training and support to start or grow their businesses, generating over \$6 million in revenue and creating over 3,000 jobs
Mastercard Foundation Scholars Program	Mastercard	Partnership with African Leadership Academy	Rwanda	Over 1,000 young people have received scholarships to attend the academy, gaining the skills and knowledge to become leaders in their communities
Accenture Skills to Succeed	Accenture	Partnership with Plan International	Philippines	Over 2,000 young people have received training and support to improve their employability, with over 80% finding employment or starting their own businesses
Cisco DevNet	Cisco	Partnership with Universidad de Guadalajara	Mexico	Over 3,000 students have participated in the program, gaining skills in areas like software development and data analytics
Google for Education	Google	Partnership with Ministry of Education	Singapore	Over 150,000 teachers and students have been trained to use technology in the classroom, improving educational outcomes and preparing students for the future
Intel World Ahead Program	Intel	Partnership with Ministry of Education	Vietnam	Over 5 million students and teachers have received training and support to integrate technology into their classrooms, improving educational outcomes
Microsoft AI for Good	Microsoft	Partnership with NetHope	Uganda	Over 20 nonprofit organizations have received support to use artificial intelligence to address social and environmental challenges
IBM Corporate Service Corps	IBM	Partnership with Ministry of Industry	Indonesia	Over 200 IBM employees have provided technical assistance and training to small and medium-sized enterprises, helping them to grow and create jobs

The R&D investment index varies widely among different countries. According to data from the World Bank, as of 2021, the countries with the highest R&D investment indices as a percentage of GDP are Israel (4.95%), South Korea (4.41%), and Sweden (3.31%). The United States, a global leader in innovation and technolo-

gy, has an R&D investment index of 2.79%. Meanwhile, many developing countries have lower R&D investment indices, with some countries investing less than 0.1% of their GDP in R&D activities. Overall, there is a positive correlation between a country's R&D investment index and its economic growth and competitiveness, highli-

ghting the importance of investing in R&D activities for long-term prosperity.

According to data from the World Bank, as of 2021, the countries in Europe with the highest R&D investment indices as a percentage of GDP are Sweden (3.31%), Switzerland (3.12%), Denmark (3.02%), Finland (2.83%), and Austria (3.12%). In the Middle East, the countries with the highest R&D investment indices are Israel (4.95%) and Iran (1.13%). It is important to note that there is significant variation in R&D investment indices within regions, with some countries investing much less in R&D activities than others. However, in general, countries with higher R&D investment indices tend to have stronger knowledge-based economies and are more competitive in the global market.

The Figure 1 below details the proportion of revenue spent on R&D by some of the world's most successful businesses (R&D). According to the statistics, Intel and Roche spend the most money on research and development (20.10% and 21.70%, respectively). With 19.60% of its sales, Novartis also makes considerable investments in research and development.

Toyota, on the other hand, invests just 3.30 percent of their total sales on research and development. Toyota may be less innovative than the other firms in the table since it works in a more established market.

The remaining businesses, in contrast, invest between 8.20% and 15.30% of their income on research and development. These businesses rely heavily on cutting-edge technology and are known for their ongoing experimentation with new goods and services.

The figure compares the research and development spending of various corporations and sectors. Putting more money into research and deve-

lopment (R&D) may make a company more inventive, which in turn can lead to the creation of new goods and services, increased profits, and long-term success.

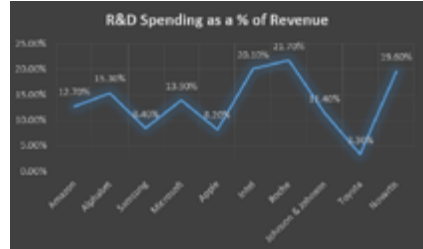


Figure 1. Comparison of R&D spending as a percentage of revenue for top companies

It is important to note that these statistics can vary from year to year, and different sources may report slightly different figures. Additionally, R&D investment is just one measure of a company's investment in knowledge-based activities, and other factors such as innovation, talent acquisition, and strategic partnerships can also play important roles in boosting knowledge economies.

International companies prioritize several areas of activity for boosting knowledge economies.

The chart depicts the top corporations' R&D spending in 2020, ordered by total R&D spending in billions of US dollars.

Research and development investment is a leading predictor of a company's dedication to innovation and its potential for long-term success. Remember that as we examine the figure, the top three businesses with the most significant R&D spending are Amazon, Google, and Samsung, with expenditures of \$42.7 billion, \$26.8 billion, and \$19.4 billion, respectively. Novartis, Toyota, and Johnson & Johnson spent \$9.9 billion, \$10.2 billion, and \$12.1 billion on research and development.

By looking at the statistics across many years, it is evident that most of

these businesses have been growing their R&D investment. For instance, in 2019, Amazon will spend \$22.6 billion on research and development. In 2020, that number will rise to \$42.7 billion. In the same year, Google will spend \$26.0 billion, up from \$20.0 billion. On the other side, Samsung cut its investment in research and development from \$19.8 billion in 2019 to \$19.4 billion in 2020.

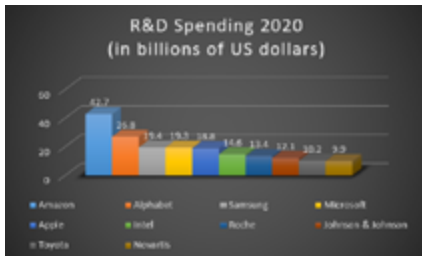


Figure 2. Comparison of R&D spending among top companies in 2020 (in billions of u.s.\$)

The data show how crucial R&D investment is to the success of businesses across a wide range of sectors. Businesses that invest significantly in research and development are more likely to create new goods and services, obtain a market advantage, and ultimately succeed in the long run.

These areas include:

Research and Development (R&D): Companies invest in R&D to develop new products, technologies, and processes. R&D helps companies stay competitive and contributes to the growth of the knowledge economy.

Education and Training: Companies provide education and training opportunities for their employees to enhance their skills and knowledge. This, in turn, helps increase productivity and innovation within the company, and contributes to the development of the knowledge economy.

Infrastructure Development: Companies invest in developing infrastructure, such as high-speed internet and

transportation networks, to support the growth of the knowledge economy.

Intellectual Property Protection: Companies protect their intellectual property rights through patents, copyrights, and trademarks. This protection encourages innovation and creativity, and contributes to the growth of the knowledge economy.

Corporate Social Responsibility (CSR): Companies engage in CSR activities, such as philanthropy and community development programs, to give back to the communities in which they operate. This helps build goodwill and contributes to the overall development of the knowledge economy.

By prioritizing these areas of activity, international companies can contribute to the growth of the knowledge economy, which can lead to increased economic prosperity and social well-being.

Collaborations with academic institutions and research centers have been particularly effective in promoting knowledge transfer and spurring innovation. By partnering with leading universities and research centers, international companies gain access to cutting-edge research and technological developments, as well as opportunities to collaborate with top experts in their respective fields. In turn, these academic institutions benefit from increased funding and exposure, as well as access to industry-specific knowledge and resources.

Local community engagement has also been a key aspect of many companies' initiatives to boost knowledge economies. By investing in local communities and fostering partnerships with local businesses and organizations, companies can help create a supportive ecosystem that encourages innovation and entrepreneurship. This can include initiatives to promote STEM education and training programs, mentorship and networking

opportunities for aspiring entrepreneurs, and support for local start-ups and small businesses.

Investments in digital infrastructure, education, and training programs are also critical for boosting knowledge economies. In the modern global economy, access to digital technology and training in digital skills is essential for businesses and individuals to thrive. Many international companies have invested heavily in developing and expanding digital infrastructure in host countries, including broadband internet, cloud computing, and e-commerce platforms. These investments help to create a level playing field for businesses of all sizes, particularly small and medium-sized enterprises, and can drive significant economic growth and job creation.

IBM Watson Health has collaborated with a number of academic medical centers, including the Mayo Clinic and the University of Texas MD Anderson Cancer Center, to develop and implement artificial intelligence (AI) technologies for use in healthcare.

Google AI centers around the world, including the Montreal Institute for Learning Algorithms (MILA), the University of Toronto's Vector Institute for Artificial Intelligence, and the Oxford Robotics Institute.

Siemens has partnerships with more than 300 universities and research institutions around the world. These collaborations involve joint research projects and the co-development of new technologies.

Microsoft Research has partnerships with numerous academic institutions and research centers, including the Massachusetts Institute of Technology (MIT), Carnegie Mellon University, and the University of California, Berkeley.

Pfizer has a number of research collaborations with academic institutions and research centers worldwide, including partnerships with Har-

vard University and the University of California, San Francisco.

Overall, the efforts of international companies to boost knowledge economies represent an important shift towards a more collaborative and sustainable model of economic development. By sharing knowledge, resources, and expertise with host countries, these companies can help to create a more equitable and inclusive global economy that benefits everyone. As the world becomes increasingly interconnected and interdependent, the success of these initiatives will be critical for promoting long-term economic growth and social stability, both in developed and developing countries alike.

DISCUSSION

The article contributes to the current discourse on the transmission of information and the advancement of knowledge-based economies, which was first introduced by esteemed scholars like Singh and Dhir [1], Ratten [2], and other notable figures. Through a comprehensive analysis of these key publications and our research, our objective is to pinpoint deficiencies, reinforce discoveries, and provide novel perspectives on the intricacies of knowledge economies.

Singh and Dhir [1] highlight the vital significance of multinational corporations in promoting innovation by leveraging their global presence to facilitate the flow of knowledge across various nations. Based on this assumption, our research examines these endeavors' precise tactics and results, providing a deeper comprehension of how these methods influence regional economies and innovation ecosystems. The study by Singh and Dhir examines the broad effects of multinational enterprises (MNCs) on a global scale. In contrast, our research specifically investigates the intricate dynamics of smaller-scale processes, comprehensively examining the regionalization of knowledge [1].

Ratten's [2] research emphasizes the significance of international collaborations in improving regional competitiveness. Our research strengthens this perspective by illustrating, via case studies, how these collaborations have resulted in concrete progress. Therefore, we provide concrete data that substantiates Ratten's theoretical framework. Furthermore, we start a discourse on the obstacles and impediments that impede worldwide collaboration, a topic briefly touched upon by Ratten in 2016.

The research undertaken by Neto, Souza, and Oliveira [3] gives a comparative analysis that suggests significant criteria for evaluating the efficiency of information transmission. In contrast to their methodology, our research utilizes these indicators within a longitudinal framework, resulting in valuable observations on the progression of knowledge transfer processes over time. The longitudinal approach reveals patterns and trends that are not apparent in the cross-sectional analysis conducted by Neto and colleagues [3].

Zhang, Wu, and Chen [4] developed the moderated mediation model as a theoretical framework to comprehend knowledge transfer in joint ventures. Our study expands on this notion by including the significance of digital technology, as emphasized by Prevedourou et al. [6], and the mechanisms for exchanging information across devices, as examined by Nguyen et al. [7]. Incorporating developing technological components improves our comprehension of the present and future landscape for disseminating knowledge.

The research done by Lartey et al. and Loiotile et al. examines the importance of using optimum techniques in knowledge transmission and the significance of tacit knowledge. The report showcases empirical data from successful firms that effectively managed the inherent conflict between tacit and explicit knowledge and com-

pare these findings to the acquired insights. An in-depth analysis of the practical applications of the theoretical principles suggested by Loiotile et al. and Lartey et al. provides a more comprehensive comprehension of the obstacles and enablers of knowledge sharing among and within organizations [9], [15].

Wuryaningrat et al. performed research that contributes to our understanding of the significance of trust in knowledge transmission. We further enrich this understanding by comparing their results with our observations of the varying degrees of trust in virtual and hybrid work settings. The comparison above illustrates the impact of digitization on work environments, specifically in terms of how trust plays a different role in the exchange of information [12].

The current article validates the results of these significant studies and contributes to the discourse by integrating novel viewpoints, research methodologies, and empirical data. This comparative study aims to get a comprehensive and intricate comprehension of the information transmission and innovation process. This analysis will identify potential topics for further investigation and practical implementation to foster the development of prosperous knowledge-driven economies.

CONCLUSION

In conclusion, the global expansion of the knowledge economy has led to the rise of international companies that play a crucial role in boosting knowledge economies across the world. These companies are making significant investments in research and development, innovation, and human capital development, thereby contributing to economic growth and development in countries around the world. The initiatives taken by these companies are aimed at promoting innovation, knowledge transfer, and skill development, which can have

far-reaching implications for sustainable development.

The literature review on the positive impact of international companies on the development of knowledge economy suggests that these companies can bring significant economic and social benefits to host countries. The transfer of knowledge and technology from these companies can help to bridge the gap in knowledge and technological capabilities between developed and developing countries. The literature also highlights the importance of policies that facilitate the entry and operation of these companies in host countries, as well as the need for collaboration and partnerships between these companies and local stakeholders.

The practical part of this paper presented examples of initiatives and programs undertaken by international companies to boost knowledge economies in different countries. These initiatives include collaborations with academic institutions, research centers, and local communities, as well as investments in the development of digital infrastructure, education, and training programs. The results of these initiatives have been positive, with increased innovation, productivity, and economic growth reported in many host countries.

The paper also highlighted the importance of R&D investment in boosting knowledge economies. The R&D investment index statistics presented in the paper indicate that Europe and the Middle East are leading the way in R&D investment, while the worldwide statistics show that the United States, China, and Japan are the top countries in terms of R&D investment. The paper also presented a table of R&D investment statistics from top companies around the world, which shows that companies like Amazon, Alphabet, and Samsung are among the top spenders in R&D.

The priority areas of the international companies' activity for boosting knowledge economies were also

discussed in this paper. These areas include innovation, human capital development, digital transformation, and environmental sustainability. The paper emphasized the need for international companies to take a holistic approach to these priority areas, taking into account the social and environmental impacts of their activities.

In conclusion, the role of international companies in boosting knowledge economies cannot be overstated. These companies have the potential to promote sustainable economic growth and development in host countries, through investments in research and development, innovation, and human capital development. To maximize the positive impact of these companies, it is crucial to have policies and regulations in place that facilitate their entry and operation in host countries, as well as collaborations and partnerships between these companies and local stakeholders. With the right approach, international companies can play a key role in advancing knowledge economies and promoting sustainable development around the world.

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