



Akademik Eğitim ve Sosyal Bilimler Dergisi (AJESS Journal)

Global value chains and the knowledge economy as a means of empowering small and medium-sized businesses: a theoretical and practical investigation based on successful international experience

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Article History

Received: 23/04/2026, Accepted: 11/08/2026; Published: 24/08/2026

Abstract

The study addresses how the knowledge economy is crucial for empowering small and medium enterprises (SMEs) amid rapid technological and economic changes. Despite SMEs' vital economic role, many struggle to adopt knowledge economy components to improve performance and global competitiveness. The research aims to analyse the knowledge

economy's pillars, evaluate its impact on SMEs, review successful global practices, identify adoption challenges, and propose recommendations to integrate SMEs into global value chains.

Methodologically, it combines descriptive analysis of concepts and literature, comparative studies of countries like Singapore and Malaysia, and applied case studies to understand challenges and solutions.

The conclusion emphasizes that integrating the knowledge economy with global value chains enhances SMEs' capacities and market access. Empowerment requires modernizing education and training, investing in digital infrastructure, reducing bureaucratic barriers, supporting R&D, and fostering partnerships for technology and knowledge transfer. A flexible regulatory environment that encourages innovation and equal opportunity is key for SMEs to thrive.

Overall, this integration is strategic for sustainable SME growth and building a competitive national knowledge economy.

Introduction

The world economy has completed all-round revolution from the industrial economy to knowledge economy, in which priority is given to knowledge.

The rise of the knowledge economy, which mainly depends on knowledge, innovation, and technology as important production factors rather than just conventional inputs like labour and capital, has fundamentally changed the global economy. Because they can use knowledge to improve the quality of their goods and services and increase their competitiveness in the market, small and medium-sized businesses (SMEs) have become essential to the knowledge economy.

Global value chains, on the other hand, offer an integrated framework that supports these businesses' growth and development by connecting them to the global market through successive stages of production, design, assembly, and distribution. Thus, combining value chain strategies with the knowledge economy is a good way to empower small and medium-sized businesses and boost their contribution to the domestic and international economy (OECD, 2021; Powell & Spellman, 2021).

By examining the theoretical aspects of the knowledge economy, the significance of knowledge and innovation investments, and their effects on the growth of these businesses, this study seeks to understand how the knowledge economy contributes to the expansion and empowerment of SMEs. Additionally, the study reviews the essential factors that lead to successful international operations and presents successful international experiences.

Additionally, the study reviews the essential conditions that lead to the successful adoption of the knowledge economy in this crucial sector and presents successful international experiences.

Statement of the Problem.

The knowledge economy has emerged as a key tenet for both emerging and developed economies in the wake of recent global economic upheavals and rapid technological advancements. Investing in innovation and knowledge is becoming more and more important for institutional competitiveness. Even though SMEs play a crucial role in supporting the national economy, many of them struggle to embrace the knowledge economy and use its elements to improve their operations and grow their businesses (Powell & Spellman, 2021).

Can these businesses be empowered in various economic contexts using the knowledge economy as an appropriate and successful mechanism?

Furthermore, how can small and medium-sized businesses be integrated into global value chains through the knowledge economy to improve their competitiveness and economic growth? Which technical and strategic pillars support this integration's success? And what can be inferred about this field from experiences around the world?

Research Objectives.

1. To examine the idea of the knowledge economy and its foundations and relate them to the significance of SMEs' empowerment.
2. To assess how the knowledge economy has helped these businesses perform better and become more competitive in the market.
3. To examine and evaluate successful global examples of using the knowledge economy to effectively empower SMEs.
4. To determine the present obstacles that businesses face when implementing the knowledge economy and how to get past them.
5. To offer scholarly and practical suggestions to strengthen the knowledge economy's function as an enabling tool for these businesses in regional and international settings.
6. Emphasize the fundamental tenets of combining global value chains with the knowledge economy.

Research methodology.

A multifaceted approach will be used to accomplish the research goals, integrating qualitative and quantitative instruments to guarantee a thorough and in-depth examination of the subject, as follows:

1. The descriptive analytical approach

The goal of this approach is to comprehend and define the core ideas surrounding the knowledge economy and small and medium-sized business (SME) empowerment. Reviewing scholarly works, earlier research, and government records pertaining to enterprise development and the knowledge economy are its main sources of support. It also examines the technological and economic factors that influence businesses' capacity to embrace the knowledge economy. However, research suggests that businesses can access global markets, enhance production methods, and improve product quality by integrating into global value chains.

2. The Comparative Approach

This entails contrasting the experiences of multiple nations that have been successful in establishing a supportive atmosphere for the knowledge economy in order to identify the tactics and laws that have produced favorable outcomes. Singapore and Malaysia are two examples of the countries chosen to represent a variety of cases. The approach makes use of critical evaluations of official reports and case studies as well as desk research on data.

3. Case studies, or applied research

Analysing the problems and obstacles that Singaporean and Malaysian businesses have encountered, as well as the solutions they have implemented, is part of this.

The following are some of the commonly accepted definitions:

Important definitions and aspects of the knowledge economy are reviewed and analysed scientifically. From agricultural economies to industrial economies to knowledge-based economies modern models based on science and innovation as the primary drivers of growth and sustainable development economic structures have experienced significant qualitative changes over time.

1. OECD Definition:

The knowledge economy, according to the Organization for Economic Co-operation and Development, is an economic system that fosters development by obtaining, producing, sharing, and applying knowledge as a key component for sustaining economic growth. It is regarded as an economy that goes beyond conventional inputs that depend on natural resources, emphasizing instead the convergence of scientific expertise, technological capabilities, and knowledge to create goods and production methods (OECD, 2021).

2. Powell and Spellman Definition: According to this definition, the knowledge economy is a process of creating goods and services through knowledge-intensive endeavors that hasten the advancement of science and technology. This economy, which is founded on the methodical integration of research and development and customer interaction, depends more on intellectual capacities than on conventional physical resources. This leads to higher GDP, which in turn boosts overall growth rates (Powell & Spellman, 2021).

3. The 2000 APEC Definition:

According to the Asia-Pacific Economic Cooperation, a knowledge economy is one that generates wealth through information and ideas rather than material resources. Knowledge creation, dissemination, and utilization are key factors in economic expansion, wealth creation, and the expansion of job opportunities in a variety of industrial sectors

(APEC, 2000).

4. World Bank Definition: According to Bank World (2025), the World Bank defines the knowledge economy as one that focuses on the production, adaptation, and efficient application of knowledge to promote social and economic development. Innovation, digital skills, and human capital investments are emphasized as important enabling factors. **An examination of the distinctions between the industrial and knowledge economies from a scientific and philosophical standpoint .**

The knowledge economy outperforms traditional economies that rely on tangible resources like raw materials and machinery by relying on intangible resources like data, knowledge, and intellectual capital. It adds a strategic perspective on both tangible and intangible economic returns (e.g., investing in the development of human capital). Economic value is determined not only by physical production and exchange but also by the knowledge and technological impact that generates sustainable competitiveness for goods and services. This presents a new challenge for traditional economies when it comes to the concept of value in the knowledge economy.

In contrast to the industrial economy's comparatively fixed manufacturing and processing mechanisms, the knowledge economy is dynamic and creative, focusing on ongoing innovation and quick response to changes in the global business environment (Powell & Spellman, 2021).

The Knowledge Economy Concept and Its Significance for Small and Medium Businesses

The idea of the knowledge economy is examined by focusing on its distinctive features, such as information technology, innovation, research and development, and human capital, which are crucial intangible assets for the expansion of businesses, particularly small and medium-sized ones.

One of the primary drivers of small and medium-sized business development is the knowledge economy, which offers a structured framework for utilizing innovation, technology, and knowledge to boost competitiveness and boost operational and financial performance. Businesses that use knowledge economy strategies see faster growth rates and are better able to adjust to shifting market demands, according to research (OECD, 2021).

Foundational Elements of the Knowledge Economy In light of recent literature

Four major pillars support the knowledge economy:

One of the most important and competitive components of a knowledge-based economy is human capital, which is the repository of knowledge and skills.

- Research and development: as a foundation for technological innovation and a source of intellectual capital.
- Information and communication technology, which serves as a powerful intermediary to promote access, spread knowledge, and spur innovation.
- Innovation: the process by which knowledge is transformed into new goods and services that satisfy the demands of the global market and foster sustainable economic growth (OECD, 2021; Powell & Spellman, 2021).

Causes of the Knowledge Economy's Development

The information revolution and the growth of digital networks are responsible for the emergence of the knowledge economy. In contemporary economies, over 70% of workforce activities involve the production and transmission of information, underscoring the importance of knowledge over conventional manual labor.

- Globalization increased economic competitiveness worldwide by removing regulatory and customs barriers and facilitating the cross-border movement of crafts, information, and technologies.
- A greater emphasis on knowledge globally, as evidenced by numerous studies and publications that support the idea that intellectual capital boosts economic welfare and competitiveness (APEC, 2000).

Instruments for Assessing the Knowledge Economy's Effect on Business Growth

A number of metrics are employed to assess how the knowledge economy affects growth of enterprises (Bank World, 2025).

Among them, as shown in the following table:

Table 1. Indicators Measuring the Impact of the Knowledge Economy on Enterprise Growth

Indicator	Description	Mean Score	Standard Deviation
Understanding of Knowledge Management Concept	Degree of employees' awareness of the importance of knowledge management	3.46	0.93
Awareness of Knowledge Application	Employees' awareness of the importance of applying knowledge in the enterprise	3.62	1.03
Management Acceptance and Support for Knowledge Application	Management's readiness to support and encourage knowledge application	3.88	0.80
Indicator	Description	Mean Score	Standard Deviation
Availability of Technical Resources	Extent of availability of technical resources needed to apply knowledge	3.65	0.99
Use of Technology	Percentage of computer and Internet usage in operations	3.65	0.99

Indicators of Readiness of Small and Medium Enterprises to Apply the Knowledge Economy show that The average scores for employees' awareness of the value of knowledge management, management's preparedness to support its application, the availability of technical resources, and the degree of technology use range from 3.46 to 3.88; standard deviations show that readiness varies by sector (Betache, n.d.).

Table 2: Key Indicators Assessing the Knowledge Economy Readiness of Small and Medium Businesses

Indicator	Description	Mean Score	Standard Deviation
Understanding of Knowledge Management Concept	Degree of employees' awareness of the importance of knowledge management	3.46	0.93
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Key Performance Indicators of the Knowledge Economy in Algeria

This study examines the state of Algeria's knowledge economy by evaluating key performance metrics, identifying the sector's advantages and disadvantages, outlining the obstacles to its development, and outlining the prospects for its growth.

Table 3: Algeria's Ranking in the Global Innovation Index (GII) for the Period 2018-2022

Year	Global Rank	Number of Evaluated Countries
2018	110	130
2019	115	132
2020	113	131
2021	111	134
2022	115	132

Source: WIPO, Global Innovation Index 2025

Investment in Research and Development.

To create high-value goods and services that meet the needs of the global value chains and the knowledge economy, it is essential to invest in scientific research, development, and innovation (amf.org.ae).

Due to low investments by research institutions, a lack of patents, and a weak connection between academia and industry, Algeria's innovation indicators are still limited, which causes a slowdown in the translation of knowledge into tangible economic goods and services.

Research and development spending in Algeria is still low when compared to developed nations, making up a very small portion of GDP, according to data. This has a detrimental impact on the amount of innovation and scientific output.

Table 4. showing research and development expenditure as a percentage of GDP in Algeria (2018-2022):

Year	R&D Expenditure (% of GDP)
2018	0.5
2019	0.48
2020	0.52
2021	0.54
2022	0.56

Source: World Bank Report, 2025 Infrastructure in Digital Form

Effective technological systems and a well-developed digital infrastructure serve as the primary conduit between businesses in value chains, promoting innovation and knowledge sharing while enhancing supply and operational efficiency (APEC, 2000).

Algeria's digital infrastructure is still irregular, with notable disparities in internet speed and quality, particularly in rural and inland areas, despite advancements in major cities. This hinders the broad adoption of digital economy technologies (World Bank Report, 2025).

Table 5: Digital Coverage and Connectivity Rates in Algeria, 2025

Indicator	Percentage (%)
Internet Penetration	68
Smartphone Usage	74
Average Internet Speed	15 Mbps

36.2 million Algerians, or 76.9% of the country's total population, were internet users as of January 2025. 74% of people use smartphones, and the number of mobile lines is constantly growing. Even though there are still issues with mobile internet speed, the average fixed broadband internet speed is about 15 Mbps, which is a noticeable improvement over prior years. These metrics lend credence to the digital economy's potential growth, particularly for SMEs that depend on reliable connectivity.

Human Capital and Education

Gender parity in education has been attained, and Algeria has seen appreciable increases in higher education enrollment rates and a decline in illiteracy rates. Nonetheless, technical skill development is still required to better match education and training with the demands of the knowledge economy.

Algeria's knowledge economy has the following advantages:

- High enrollment rates, particularly in technical and scientific fields.
- Changing governmental regulations to promote economic diversification and the shift to a knowledge-based economy.
- The availability of youthful human capital that can pick up new skills and adjust to the demands of the digital age.

Limitations and Difficulties:

- Low support for innovation and poor coordination between the private sector and research institutions.
- Research projects' scope and impact are limited by a lack of funding for research and development.

- Inadequate infrastructure for information and communication technology, with uneven availability nationwide; bureaucratic obstacles and administrative intransigence impeding the adoption of new innovations (Betache, n.d.).

The Knowledge Economy's Effect on Algeria's Economic Development

Research shows that advancements in macroeconomic metrics like higher productivity, improved industrial sector competitiveness, and enhanced innovation capacity are correlated with the growth of the knowledge economy. However, the knowledge economy's full growth potential has not been realized due to flaws in some of its determinants (Bank World, 2025).

Prospects for Algeria's Knowledge Economy Development in the Future

- Increasing funding for digital infrastructure in all areas, with an emphasis on enabling small and medium-sized businesses.
- Strengthening the connection between the demands of the digital economy, vocational training, and education.
- Increasing the effectiveness of research organizations and providing funding for creative initiatives.
- Creating policies and guidelines that promote innovation and investment in the digital economy.
- Promoting regional and global collaborations in technology and research (Ministry of Industry, Algeria, 2014).

Singapore's Experience as a Model for the Transition to a Knowledge Economy

Despite having few natural resources and a small land area, Singapore was able to develop its economy into a sophisticated knowledge economy that relies on human capital, creativity, and cutting-edge technology. Since the mid-1990s, the country has followed a thorough five-year plan designed to increase growth and productivity.

Businesses struggled to match workforce skills with rapidly evolving technological demands despite high investments in education and training, necessitating ongoing program updates to prevent knowledge gaps (OECD, 2021).

Social Inequalities and The Meritocracy System's Detractors

Locally, the system is occasionally criticized harshly for enforcing a limited definition of success, which results in elite accumulation and restricts opportunities for non-traditional talents to advance in society.

Challenges in Organization and Bureaucracy

Even though the regulatory environment is effective, some SMEs have expressed dissatisfaction with the burdensome procedures and restrictions that may impede the creation of a more flexible work environment and slow down decision-making.

Changes Around the World and Globalization

Particularly for small businesses with limited access to contemporary technologies, globalization has put pressure on local businesses to adjust to open competition and ongoing innovation (Powell & Spellman, 2021).

Techniques for Overcoming Obstacles

- Improving the system of education and career training to stay up with the quick changes in technology and labor markets.
- Implementing thorough social integration policies to guarantee equal opportunities and lessen the severity of social disparities.
- Simplifying business establishment and operation processes to encourage adaptability and cut down on red tape (APEC, 2000).
- Creating global alliances to share technology and market expertise.

Malaysia's Experience in Transitioning to a Knowledge Economy: Reasons and Strategic Drivers.

Through the development of digital technological infrastructure, improved research and innovation, and updated human capital, Malaysia has been successful in incorporating the knowledge economy into its national development plans for value chains. Despite social and regulatory issues that have been resolved through responsive policies, this integration has assisted institutions in overcoming regional competition and bolstering their exports (Bank World, 2025).

A notable example with many lessons for developing nations is Malaysia's shift from a primary resource-based economy to a sophisticated knowledge economy. Numerous economic, social, and political factors fueled this shift, which had a big impact on the development of a knowledge economy-focused development vision.

Malaysia's GDP growth rate fell from about 9.5% to 4.7% per year between 1991–1995 and 1996–2002. Concerns regarding growth sustainability and the need to discover new economic growth sources outside of the conventional reliance on labor, capital, and natural resources were raised by this decline (Bank World, 2025).

Malaysia's international competitiveness rankings steadily fell during the 1990s, from 18th in 1994 to 23rd in 1996 and then to 25th and 29th in 2000 and 2001, respectively. This made it evident that the country needed to re-engineer its economy with an emphasis on knowledge and innovation (Bank World, 2025).

Moving from an economy based on traditional inputs to one based on knowledge and innovation, Malaysia faced significant challenges in increasing productivity, particularly total factor productivity. This led to a focus on knowledge accumulation and the use of technology as new sources of economic growth.

Malaysia also faced fierce competition from nearby Asian nations that depend on cheap labor and a wealth of natural resources, including China, India, Vietnam, and Indonesia. Malaysia urgently needed to transition from traditional resource diversification to a knowledge economy based on innovation in order to preserve its competitive advantages.

Malaysia's Knowledge Economy Strategy

In order to make Malaysia a high-intensity knowledge economy that is capable of adapting, innovating, and creating

as well as assimilating modern technologies in information, communications, and production, the Malaysian government has laid out a developmental vision.

The development of human capital, boosting research and innovation, strengthening institutional capacities, and advancing technical infrastructure are some of the pillars upon which this vision is based.

Malaysia's rankings in the World Bank's global knowledge economy indicators have improved as a result of this vision.

Malaysia's Obstacles in Bringing the Knowledge Economy to SMEs Revising Human Capital

Malaysia struggled to match workforce skills with the rapidly changing demands of the digital economy, even with large investments in technical training and education. One of the primary barriers preventing SMEs from fully embracing modern technologies was the absence of ongoing updates to training curricula.

Diversifying the Economy Outside of Primary Sectors

Reducing reliance on natural resources and conventional industries like tin and rubber extraction presented difficulties, as did the requirement to develop new knowledge capacities that support sustainability and added value in knowledge- and innovation-based economic sectors.

Competition on a Regional and Economic Level

Emerging nations like China, India, Vietnam, and Indonesia, which profit from cheap labor and an abundance of natural resources, posed a serious threat to Malaysia. This pressure increased the need to shift towards a knowledge economy by focusing on innovation and productivity improvement.

Some Areas Have Weak Digital Infrastructure

Even though major cities saw substantial infrastructure development, remote areas experienced inadequate digital connectivity, which hindered SMEs' ability to implement knowledge economy practices.

Administrative and Organizational Complexities

Businesses struggled with intricate bureaucratic processes that impeded innovation and development processes essential to the knowledge economy, slowing down decision-making and the adoption of new technologies and practices.

Economic and Social Inequalities

Even with prosperous economic expansion, there are still significant differences in how the benefits are distributed, which limits some groups' access to technology and education and makes it difficult to develop human capital in a comprehensive and equitable manner.

Suggested Remedies for Difficulties

- Constant modernization of educational and career-training programs to meet changing market and technological needs.
- Giving remote areas priority while offering balanced support for the development of digital infrastructure across all regions.
- Introducing comprehensive programs to lessen social disparities by expanding access to education and training for all citizens;
- Streamlining regulatory processes and providing effective e-government services to increase the speed and flexibility of investment in the knowledge economy

Conclusion.

This study demonstrates that integrating value chains and the knowledge economy helps small and medium-sized businesses grow their capabilities and gain access to global markets.

The knowledge economy is a powerful strategic instrument that can help small and medium-sized businesses grow sustainably and become more competitive in both domestic and international markets. To achieve this, education and vocational training systems must be updated frequently to satisfy the demands of the digital economy. Enhancing investments in digital infrastructure is necessary to create a cohesive technological environment that encourages the adoption of contemporary innovations. In addition to national programs that support research and development and connect businesses with universities and research centers, it is imperative to streamline bureaucratic processes to make it easier for these businesses to be established and run.

To maintain this developmental path, policies that promote local and international collaborations for technology and knowledge transfer must be combined with a strong emphasis on workforce skill development and human capital support. Taking into account successful international experiences, the difficulty is in maintaining a flexible regulatory framework that promotes innovation and equal opportunity for businesses, strengthening SMEs' capacity to meet rapidly evolving technological and economic challenges.

This strategy not only supports the growth and empowerment of businesses but also lays the groundwork for creating a robust national knowledge economy that can compete globally and achieve all-encompassing economic development.

One crucial strategic avenue for empowering small and medium-sized businesses and boosting their long-term competitiveness on a national and international scale is the integration of value chains and the knowledge economy.

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