

# THE ROLE AND IMPORTANCE OF R&D INVESTMENT AND CONTINUOUS INNOVATION AT MNC LEVEL FOR THE ECONOMIC RISE OF THE WEST AT GLOBAL LEVEL

**Ionela Beatrice IPSALAT**

"Ștefan cel Mare" University of Suceava, Romania

[ipsalationelabeatrice@yahoo.com](mailto:ipsalationelabeatrice@yahoo.com)

## **Abstract:**

*Globalisation of the world market, consumer pressure, disruptive innovations, number of patents, technologies and global trends have changed the business market. Joint-stock companies, along with limited liability companies (Ltd), are the 'engines' of globalisation and interconnectivity, facilitating global trade and collaboration. Another important aspect is partnerships between companies of different types/legal forms and universities, research centres etc. (formation of business networks). Joint stock companies are defined by their flexibility and dynamism, and are able to recover in conditions of economic change. By implementing effective and innovative strategies, they can effectively manage challenges and identify opportunities in this uncertain environment.*

*The basic idea of the present study is to analyze and argue that a small number of MNCs in the US, Europe and Asia dominate various international rankings highlighting R&D investments and innovative capacity at firm level. This 'de facto' situation explains to a large extent (but not entirely) the ascendancy/dominance of the West over the rest of the world.*

**Key words:** MNCs, West, innovation, technology, patents

**JEL classification:** Q01, Q56, M14, M16, M19, O36

Received 30 July 2024; Accepted 16 November 2024

## **INTRODUCTION**

When we refer to the historical aspects, the only characteristic that emerges is that the social and economic evolution of the West has been marked by the continuous change of the business context/environment. Drucker notes in the historical evolution of the West dramatic changes; every 50 years we can speak of a different world as society changes its perception of the world, values, preferences and social/political structures etc. (Drucker, 1998).

To use Ferguson's phrase, the West has provided the "Rest" with technology and essential values, be they ethical, political or cultural, in an unprecedented authoritarian manner. One can distinguish, however, the difference between the European and American West. A difference that has facilitated trade, competition and rivalry. The rise of the West dates back to the 1600s, when Western expansion began (Ferguson, 2008).

A series of actions such as identifying research methods, "inventing invention" or supporting research and intellectual work have also facilitated the European rise (Lades, 1990). Schumpeter sees innovation and entrepreneurship as key factors explaining the evolution of capitalist economies (McCraw, 2007). One wonders why the revolution started in England and not in China or Japan. (Boia, 2013). We can state with sufficient historical examples that Great Britain was around 1700-1800 a model of innovation and technological development for other countries existing at that time. (Ferguson, 2018). Various renowned historians, sociologists and other authors argue that the economic rise of Europe and the West began about two centuries before the Industrial Revolution (1776) and was based on technical factors but also on social reforms (i.e. what we have called social innovations) with regard to education, science, innovation and various non-material values that characterized the evolution of Christianity as a civilization or culture.

Therefore in this paper we aim to identify and analyse which were the leading companies and how they proceeded in investing in R&D and continuous innovation to give an economically dominant position to the leading Western countries at least until 2010 when China becomes the world's second largest economy.

## METHODOLOGICAL APPROACH

The paper focuses on the rise of the West, emphasizing sustainable development, innovations, R&D investments and patents obtained at the firm/company level to support countries' entry into the global economy. The article reviews the literature in this area, interprets the data and compares them. In summary, the author's research methodology includes the following issues and directions of analysis:

- ✓ In a first stage we proceeded to the "literature review" on the proposed topic as scientific research in the field of business administration;
- ✓ In the second step we have analysed relatively more analytically the BCG top for the period 2010-2023 (the following example is at the time 2023 see table no. 1.), motivated by the fact that this top gives us a sitetic picture of the main Western companies that have the most effective R&D and continuous innovation strategies;
- ✓ In the next stage of analysis we made a comparison between the top BCG companies at the time 2023 vs top 50 EU Industrial R&D Investment Scoreboard vc top 50 by Global most sustainable companies based on Corporate Knights' 100 ranking;
- ✓ Then, in the final stage of the study, we proceeded to a comparative evaluation of the various rankings in order to conclude/understand how the main Western companies have proceeded and are still proceeding in order to maintain their dominant positions at a global level. In this part of the analysis we have also highlighted, where appropriate, the increasingly strong positions held by some companies in China and other regions of the world that have been relatively late entrants to the global competition.

## LITERATURE REVIEW

In adapting to changing market conditions, the company should expand its functions, continually develop so that it can begin to operate as a joint stock company. (Zeliko et al., 2010). Micklethwait J. argues that the founding of firms began slightly insubstantially, but they had the ability to expand into all fields, to reshape geography, science, the economy in general and so on. (Micklethwait and Wooldridge, 2003).

Some researchers claim that joint-stock companies date back to the 14th-17th centuries and their emergence is due to economic reforms and development, especially due to the development of manufacturing, trade and maritime business in particular. (Cuznetov and Dulgheiru, 2014). It was the Romans who founded the first joint-stock companies, calling them public companies, which specialised in collecting taxes. The most significant joint stock companies of the Middle Ages were German mining companies, Italian banks and colonial companies. (Mihalache, 2013). For Europe a good example of the rise of big business is England and Germany; Micklethwait and Wooldridge themselves highlight the idea that England was a pioneer in freeing companies from state control (Micklethwait and Wooldridge, 2003).

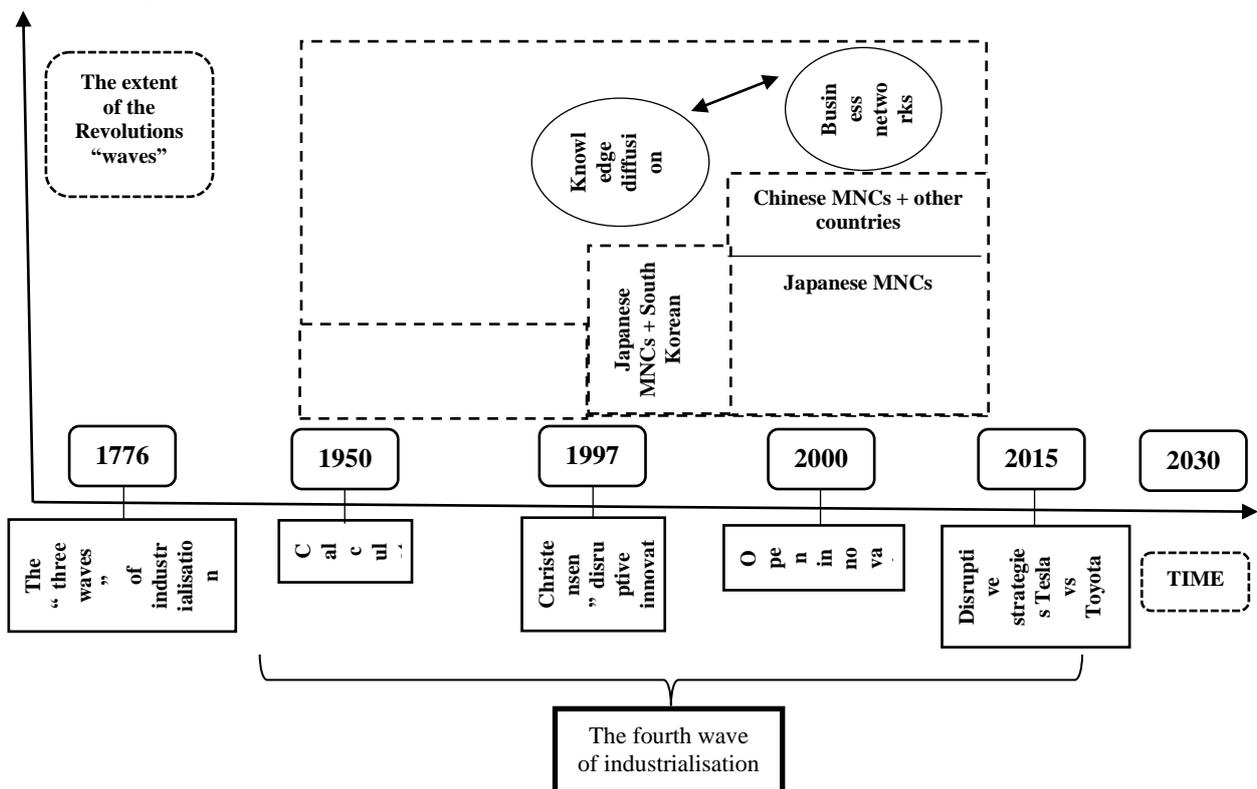
Important companies in England until 1912 include Imperial Tobacco, J&P Coats and British Petroleum. Another example of England's advantage is marketing, in which Uniliver became a marketing "machine", a novelty until that time. At the end of the 19th century the companies that were economically important and real competitors in the market were in Germany. The success of German companies was due to their focus on the new economy, similar to America. One of the distinguishing criteria between Germany and England was that Germany focused on cooperation. Another differentiating factor was that the British forbade 'agreements to prevent trade' while the Germans did not. Germany also did not have antitrust laws like America (Sherman Antitrust Act 1897). German leaders were guided in their choices by the idea that businessmen and politicians should work together to achieve the development of living standards and beyond (an idea formulated by Friedrich List). Because of the economic crisis (1873-1893) Germany had in 1905

about 385 cartels in 1905, their role was to pool profits and at the same time to coordinate its policies so that the objectives could be achieved. (Micklethwait and Wooldridge, 2003).

Adam Smith declared in 1776 that the joint-stock company form should be used only in large companies in four industries: the trade of banking; the trade of insuring against risk, fire, war; the trade of making or maintaining a navigable canal, and of securing the quantity of water required for a large city (Harris, 2013). In the United Kingdom, company law underwent a number of important changes in the early part of Queen Victoria's reign. The first significant change was in 1844, when the public were given the opportunity to form limited companies by registration. The Joint Stock Companies Act in 1856 removed the mandatory accounting and auditing requirements, it was possible for seven people each subscribing for one share to form a limited liability company (Maltby, 1998). In 1844 The Joint Stock Companies Registration and Regulation Act together created the register of joint stock companies (Djelic, 2013).

**RESULTS, DISCUSSIONS AND IMPLICATIONS**

The results arrived at in the present study are presented against the backdrop of developments known as the most important historical periods and moments that have succeeded each other in the West since the Industrial Revolution (1776) until today; some authors discuss a single Industrial Revolution with four technological waves that have succeeded each other in over two centuries and other authors discuss four distinct industrial revolutions. Whichever the perspective of approach, the ones presented by us in figure 1. give us a first picture of the importance of R&D inventions and continuous innovation on the three poles of the economic triad (USA, Europe, Asia).



**Figure no. 1. The 4th wave of industrialisation-the record of Oriental companies**

Source: author's elaboration, based on the international literature at the end of the article.

Figure no.1. requires the following explanations:

- a) The Industrial Revolution which began in about 1776 and included in its content a number of four distinct values of industrialization (the first three revolutions were

- manifested until 1740 and from that time onwards the fourth wave of industrialization or industry four);
- b) Schumpeter's concept of innovation, entrepreneurship and "creative destruction" (published around 1930) provided an essential theoretical foundation for the emergence of modern management (Drucker P. and paper published in 1980) (Drucker, 1993) which meant new innovations and technological developments;
  - c) Michel Polanyi's concept of "tacit knowledge" should be emphasised, which refers to intuitive knowledge, given by direct experience and which cannot be transmitted through ordinary teaching-learning processes. This 'tacit knowledge' asset has become essential since the 1970s for all types of firms, as this knowledge is a kind of 'raw material' that underpins innovative processes;
  - d) In terms of technological developments, the origins of the first computer can be traced back to around 1950. In the case of technological developments, the advent of the first computer networks and the internet around the 1980s literally revolutionised the business world and society in general. The Internet has led to an unprecedented diffusion of knowledge and is providing a technical infrastructure for business networking by thousands of firms throughout the global economy (all three poles of the economic triad);
  - e) By 1997 Christensen's concept of "disruptive innovations" had become of maximum interest to other theorists and in particular to the vast majority of MNC and SME firms;
  - f) Since 2000, some Chinese companies (e.g. Lenovo, Huawei, Xiaomi, etc.) have imitated the innovation strategy of Japanese and/or South Korean companies, taken over various Western technologies and have gradually become strong competitors in a limited number of high-tech and medium-tech industries; they continue to apply highly aggressive strategies and are trying to establish themselves in other sectors of the global economy (Yip and Mckern, 2016);
  - g) Approximately in time, also since 2000, the concept of "open innovation" is becoming more and more common in international literature, meaning a network of firms and other types of organisations (business networks) through which partners allocate resources jointly to "force" innovative processes and then jointly exploit the various results obtained. One of the best-known authors on open innovation is Chesbrough, who in 2003 published a seminal work on the subject for Harvard Press (Chesbrough, 2003). Subsequently, dozens of other authors contributed to the presentation of case studies, development and refinement of the concept of "open innovations".

The previous figure shows that the last three decades of the post-war period have seen the greatest changes among the main "players" in the global economy, both in terms of new technologies emerging and coming into use and in terms of major social innovations. In parallel with such technological and social changes in the world's major economies, it is worth noting that business administration theory has increasingly expanded in an attempt to explain how innovative companies go about gaining competitive advantage internationally. In the fourth wave of industrialisation that began with the Industrial Revolution of 1776, new dilemmas and challenges for countries, companies, universities, investors, entrepreneurs and managers in the Western world have emerged. For the purpose invoked we stress the idea that some theoretical developments related to technological change in the last three decades of the global economy remain relatively confused or even contradictory. Several questions arise that are of interest for this article and possible future articles: *Are technical or social innovations more important in a firm's performance; To what extent do various digital and/or disruptive technologies support or not the constitution of "open innovations"; To what extent does a business network formed by organizations to systematically innovate generate or not disruptive innovations/technologies; What new implications do "disruptive innovations" and "open innovations" bring for organizational theory?*

One factor in the rise of the West is the large number of companies in various fields. Large Western public companies have realised that in order to survive in this market a combination of

factors is needed: investment in R&D, innovations, partnerships, environmental responsibility, circular economy approach, knowledge, etc. According to the Boston Consulting Group the most innovative companies in 2023 are:

**Table no. 1. BCG's top 50 innovative companies per share worldwide**

1.	Apple	11.	Pfizer	21.	Roche	31.	Sony	41.	Saudi Aramco
2.	Tesla	12.	J&J	22.	Oracle	32.	Sinopec	42.	Coca-Cola
3.	Amazon	13.	SpaceX	23.	BioNTech	33.	Hitachi	43.	Mercedes-Benz Group
4.	Alphabet	14.	Nvidia	24.	Shell	34.	McDonald's	44.	Alibaba
5.	Microsoft	15.	ExxonMobil	25.	Schneider Electric	35.	Merck	45.	Walmart
6.	Moderna	16.	Meta	26.	P&G	36.	ByteDance	46.	PetroChina
7.	Samsung	17.	Nike	27.	Nestle	37.	Bosch	47.	NTT
8.	Huawei	18.	IBM	28.	General Electric	38.	Dell	48.	Lenovo
9.	BYD	19.	3M	29.	Xiaomi	39.	Glencore	49.	BMW
10.	Siemens	20.	Tata Group	30.	Honeywell	40.	Stripe	50.	Unilever

Source: elaborated by the author based on Boston Consulting Group, Most Innovative Companies 2023 – Reaching New Heights in Uncertain Times, 2023.

BCG studies and reports have become a reference in various research on innovative capabilities. Analysing this top we can see that the West dominates in terms of innovative companies. Specifically, 50% of the companies are from the US, and 11 companies are from Europe. We cannot neglect or omit the developments of the East, a number of 14 companies are from China, Japan, India, etc. In recent years we see a growth of the East, it is a direct competitor to the big companies of the West, for example Apple, which is an American company, and Samsung which is a South Korean company.

Alongside the interest in innovation, we consider investment in R&D to be an important factor in the development of companies. In particular, looking at *The 2023 EU Industrial R&D Investment Scoreboard* the top companies are as follows:

**Table no. 2. Top 50 R&D investing companies**

1.	Alphabet	11.	Merck US	21.	Qualcomm	31.	Bayer	41.	Boehringer Sohn
2.	Meta	12.	Pfizer	22.	Alibaba	32.	Cisco Systems	42.	Taiwan Semiconductor
3.	Microsoft	13.	GM	23.	Robert Bosch	33.	Honda Motor	43.	Salesforce
4.	Apple	14.	Astrazeneca	24.	Ford Motor	34.	SAP	44.	Advanced Micro Devices
5.	Huawei	15.	Bristol-Myers Squibb	25.	BMW	35.	Abbvie	45.	Gilead Sciences
6.	Volkswagen	16.	Toyota	26.	Nvidia	36.	NTT	46.	Broadcom
7.	Samsung Electronics	17.	Novartis	27.	Eli Lilly	37.	IBM	47.	Nokia
8.	Intel	18.	Mercedes-Benz	28.	Stellantis	38.	Siemens	48.	Takeda Pharmaceutical
9.	Roche	19.	Tencent	29.	Sanofi	39.	GSK	49.	Ericsson
10.	J&J	20.	Oracle	30.	China State Constr.Eng.	40.	Sony	50.	Amgen

Source: elaborated by the author based on European Commission, 2023 EU Industrial R&D Investment Scoreboard, 2023.

The top analysis of the study carried out by the European Commission highlights the US companies, 23 to be precise, approximately half of the total number of companies in the benchmark. After the US, companies in Europe total 16 companies. In last place are 11 Western companies. To the same extent as in the first ranking, the West dominates in terms of R&D investment.

Based on the number of patents - more precisely the *Top 300 Organizations Granted U.S. Patents in 2023* by the Intellectual Property Owners Association - the selection of the top 50 companies is:

**Table no. 3. Top 50 organizations granted U.S. patents in 2023**

1.	Samsung Electronics (9036)	11.	Micron Technologies (2267)	21.	Medtronic Plc (1379)	31.	Saudi Arabian Oil (1033)	41.	Meta Platforms (919)
2.	LG Corporation (4170)	12.	Intel Corporation (2263)	22.	Ford Motor Company (1306)	32.	Capital One Financial (1029)	42.	Murata Manufacturing (898)
3.	International Business Machines (3953)	13.	RTX (2144)	23.	Panasonic Corporation (1277)	33.	Toshiba (986)	43.	NEC Corporation (888)
4.	Qualcomm (3886)	14.	Sony Corporation (2057)	24.	SK Group (1206)	34.	Texas Instruments (978)	44.	Honeywell International (880)
5.	Taiwan Semiconductor (3719)	15.	Hyundai Motor Company (2052)	25.	Telefonaktiebolaget LM Ericssons (1206)	35.	Robert Bosch (976)	45.	GM (870)
6.	Canon K.K. (3199)	16.	Dell Technologis (2010)	26.	General Electric Company (1164)	36.	Applied Materials (949)	46.	Mitsubishi Electric (861)
7.	Toyota Jidosha K.K. (2667)	17.	Microsoft Corporation (1927)	27.	Seiko Epson Corporation (1143)	37.	Siemens (942)	47.	Boeing (845)
8.	Alphabet (2579)	18.	Amazon (1857)	28.	Honda Motor Company (1142)	38.	US Federal Government (935)	48.	Oracle (812)
9.	Apple (2568)	19.	Boe Technology Group (1695)	29.	Fujifilm Holdings (1133)	39.	Cisco Systems (933)	49.	Nippon Telegrap&Telephone (773)
10.	Huawei Technologies (2290)	20.	J&J (1489)	30.	Hitachi (1086)	40.	Broadcom (932)	50.	Denso (743)

Source: elaborated by the author based on Intellectual Property Owners Association, Top 300 Organizations Granted U.S. Patents in 2023, 2023.

In terms of patents, the US again holds 50% of the top 50 companies. Companies in the Orient 22 and Europe with 3. Clearly patents require very large financial and other investments. We have examples globally of some previously unheard of practices. Companies like Tesla and Toyota are applying completely new/disruptive strategies with regard to patent exploitation in the EV industry. Specifically, I was referring to the moment in 2015 when Toyota applied for the first time in the world a disruptive strategy regarding the exploitation of patents for EV improvement, a strategy that was also followed by Tesla, which remains the largest EV manufacturer. With this "disruptive strategy" the two companies make available to any company, including competitors, their own patents for EV improvement without requiring payment of annual royalties (this decision interrupts a centuries-old practice regarding patent exploitation in any industry; as mentioned above).

**Table no. 4. Top 50 by Global most sustainable companies based on Corporate Knights' 100 ranking**

1.	Schnitzer Steel Industries Inc	10.	Dassault Systèmes SE	21.	Atlantica Sustainable Infrastructure PLC	31.	Kering SA	41.	SAP SE
2.	Vestas Wind Systems A/S	12.	Xinyi Solar Holdings Ltd	22.	McCormick & Company Inc.	32.	Beijing Enterprises Water Group Ltd	42.	BCE Inc

3.	Brambles Ltd	13.	Ørsted A/S	23.	Novozymes A/S	33.	ASM International NV	43.	Coloplast A/S
4.	Brookfield Renewable Partners LP	14.	Sims Ltd	24.	Iberdrola SA	34.	StarHub Ltd	44.	Koninklijke KPN NV
5.	Autodesk Inc	15.	Banco do Brasil SA	25.	BT Group PLC	35.	SunPower Corp	45.	Cogeco Communications Inc
6.	Evoqua Water Technologies Corp	16.	Rockwool A/S	26.	Alphabet Inc	36.	Xerox Holdings Corp	46.	First Solar Inc
7*.	Stantec Inc	17.	Johnson Controls International PLC	27.	Vitasoy International Holdings Ltd	37.	Telus Corp	47.	Puma SE
7*.	Schneider Electric SE	18.	Chr Hansen Holding A/S	28.	City Developments Ltd	38.	Unilever PLC	48.	Cisco Systems Inc
8.	Siemens Gamesa Renewable Energy SA	19.	Kone Oyj	29.	Neste Oyj	39.	HP Inc	49.	Atea ASA
9.	Taiwan High Speed Rail Corp	20.	Cascades Inc	30.	Ecolab Inc	40.	VMware Inc	50.	Konica Minolta Inc

Source: elaborated by the author based on Corporate Knights' Global most sustainable companies 100 ranking, <https://www.corporateknights.com/rankings/global-100-rankings/2023-global-100-rankings/2023-global-100-most-sustainable-companies/>

Europe tops the sustainability league table with almost half the total number, followed by the US and finally Asia. Similarly as in the other rankings, the West dominates, which is also a response to its rise.

Companies from the East are in direct competition with Western companies. However, as is well known at the end of the Second World War (1945), the United States of America was the most powerful economy in the world at that time and was already exerting a real influence on some European and Asian countries, both as a social, political and management model applied by American MNCs. The implementation of the Marshall Plan for Western Europe as well as other support instruments for Japan and other Asian countries literally strengthened the position/influence of the US globally during the first post-war decades. It is not by chance that some authors, such as Schroter H., discuss a veritable wave of 'Americanisation' of the European economy in the first decades of the post-war period (Schroter, 2005). A similar process of influence or Americanisation was exercised by the US in its relations with Japan (in the 1950s and 1960s) and later in its relations with South Korea and other Asian countries.

The Industrial Revolution of 1776 originated in Britain, then spread rapidly to the main European countries and to the component states of the USA. Starting in the first decade of the last century, around 1910, the US took over the industrial, scientific and educational leadership in Europe and has managed to remain dominant in all three directions to this day. Even though some major inventions (writing paper and printing press) and/or social innovations (the textbook, modern education and the patent) originally originated in ancient China and were later developed by Europe; the United States was able to take such major inventions/innovations and adapt them to the size of domestic markets and the cultural pattern of the American nation. Since the 1950s, Japanese MNCs have gradually taken over technologies and organisational know-how from large American corporations and have gradually developed their own inventions and adapted this knowledge to the Japanese cultural model. During the period of the first three post-war decades (roughly until around 1980) Japanese MNCs managed to establish themselves in certain industries and in certain international markets. From this point onwards, the Trilateral Commission (1973) was set up at international level and the so-called "economic triad" began to be discussed. It was only later, in the 1980s, that some South Korean companies (Samsung) began to become internationally known and to be considered direct competitors to American and European firms.

Therefore, the whole post-war context was quite "fragmented" with respect to the innovative capacity of firms in the three poles of the economic triad, respectively:

- Until 1980, American MNCs remained by far the dominant ones, but in some industries Japanese companies also became representative; for a period of about 4 decades (1970-2010) Japan was the world's second largest economy after the US in terms of annual GDP;
- Since the 1980s, the Asian power pole has been significantly strengthened by the fact that, alongside Japanese MNCs, some South Korean companies have become increasingly successful internationally;
- Since the 1980s, the first major reforms are implemented in China and the application of "managed capitalism", and in 2010 China becomes the second largest economy in the world after the US in terms of absolute annual GDP.

## CONCLUSION

Innovation is the 'engine' that fuels economic progress; it is essential for addressing sustainability challenges in a creative and effective way. By bringing new products and services to market, innovators create opportunities for growth and post-perpetuity. Especially in the context of sustainability, technological innovations enable the development and adoption of environmentally friendly solutions such as renewable energy sources, emission reduction technologies and natural resource management. In particular, advances in renewable energy, energy efficiency in buildings or recycling systems are the result of technological innovation and their application in practice. Investment in R&D is key to driving innovation; continued investment in R&D secures the West's position while remaining able to respond to global challenges (climate change). Patents are a crucial tool to protect and encourage innovation. They provide legal protection and motivate inventors to invest in developing new technologies. In addition, patents enable the transfer of knowledge and technologies between countries and companies, thus maximising collaboration and accelerating progress on sustainability.

In conclusion, innovation, R&D investment and patents are the pillars on which the economic and sustainable development of the West is based. By promoting these and creating an environment conducive to innovation, the West can continue to be a leader in developing sustainable solutions that meet its needs and therefore those of the whole planet.

## REFERENCES

1. Boia, L., 2013. *Sfârșitul Occidentului? Sprea lumea de mâine*. Humanitas, București.
2. Chesbrough, H., 2003. *Open Innovations The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press, USA.
3. Cuznețov, A., Dulgheiru, D., 2014. Apariția și evoluția societăților pe acțiuni. *Rev. Națională Drept*.
4. Djelic, M.L., 2013. When Limited Liability was (Still) an Issue: Mobilization and Politics of Signification in 19th-Century England. *Organ. Stud.*
5. Drucker, P., 1998. *Peter Drucker on the Profession of Management*. Harvard Business School Press.
6. Drucker, P., 1993. *Innovation and Entrepreneurship*. Harper Colins Publisher, New York.
7. Ferguson, N., 2018. *Empire How Britain Made The Modern World*. Penguin Books.
8. Ferguson, N., 2008. *The Ascent of Money*. Penguin, UK.
9. Harris, R., 2013. The Private Origins of the Private Company: Britain 1862-1907. *Oxf. J. Leg. Stud.* 33.
10. Lades, D., 1990. Why are we so rich and they so poor? *Am. Econ. Rev.* 80.
11. Maltby, J., 1998. UK joint stock companies legislation 1844-1900: accounting publicity and "mercantile caution." *Account. Hist.* 3.
12. McCraw, T.K., 2007. Prophet of Innovation-Joseph Schumpeter and Creative Destruction. *Pres. Fellows Harv. Coll.*

13. Micklethwait, J., Wooldridge, A., 2003. *The Company A Short History of a Revolutionary Idea*. Weidenfled&Nicolson.
14. Mihalache, I., 2013. *Societatea pe acțiuni-o privire sintetică asupra cadrului juridic*. Rev. Națională Drept.
15. Schroter, H., 2005. *Americanization of the European Economy - A compact survey of American economic influence in Europe since the 1880s*. Springer, SUA.
16. Yip, G.S., Mckern, B., 2016. *China's Next Strategic Advantage from Imitation to Innovation*. The MIT Press, London.
17. Zeliko, D., Rado, M., Zivoslav, A., 2010. *Key performance indicators in a joint-stock company*. Afr. J. Bus. Manag. 4(6).