Quality management and relation between innovation and knowledge & technology output

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Abstract:

My goal in conducting the research was to show real links between innovation and knowledge management (knowledge & technology output index) within a quality management approach worldwide in a response to the pandemic and the post-pandemic period. This is because innovation, knowledge, and technology output are becoming important questions related to quality and quality management issues, currently being discussed with increasing interest in a broader perspective from the worldwide audience. They are also part of factors of production theories and enterprise theories too.

The research methodology was (1) collecting data and information on the innovation index and knowledge management (knowledge & technology output index) worldwide, (2) describing the newly introduced ISO 56000 family of standards (ISO standards for innovation) and the newly introduced ISO family of standards (ISO standards for knowledge).

The method of the research was (1) dealing with descriptive statistics for innovation index and knowledge & technology output and handing (2) correlation and regression analysis (inferential statistics) for relationships between innovation index and knowledge & technology output. This procedure resulted in the main outcome of this research that the relationships between innovation and knowledge & technology output, statistically verified, are strong. Saying this, the general application of ISO standards and specifically, the ISO 56000 family of standards are necessary to achieve a competitive advantage.

The key recommendation of the research is that the application of ISO standards and the application of the ISO 56000 family of standards help companies to strengthen their commitment to their customers, improve outcomes of innovation and knowledge & technology output activities, improve processes and procedures and economies around the world to gain a competitive advantage in response to the crisis and post-crisis.

Keywords: Innovation, knowledge & technology output, ISO standards, quality, quality management, competitive advantage.

Introduction

When discussing innovation and knowledge & technology output, we immediately think of innovative goods and services, new combinations thereof leading to improved ones, new methods of processing, manufacturing, assembly, opening up new markets, a new way of using resources, innovative business models, etc., included. This is about the effectiveness and efficiency of processes, procedures, methods, methods, tools, and technologies involved in the production process of goods and services, as part of economic theory, especially in relations to theory.

As a general concept, innovation includes innovation processes, structures required for the process, results of activities, previous variants of products/services, and relationships at the organizational level in private and public issues, including specific, regional, and cluster levels, as part of economic theory, particularly concerning factors of production.

Knowledge & technology output, accompanied by innovation and vice versa, do not always require invention, but simple practical implementation of problem-solving techniques and decision-making, implementation of ideas based on individual and group activities.

There is currently an impressive drive and interest in innovation and knowledge & technology output, particularly in a culture of quality and ISO standards. The culture of quality serves as a guide for continuous improvement, belongs to all members of the organization (s), and also forms a link between internal customers and suppliers. They enshrine the core value of a quality culture in ISO standards, which are of increasing interest around the world to gain a competitive advantage.

Between them, the families of standards ISO 9000, ISO 14000, ISO 20000, ISO 22301, ISO 27000, ISO 30400, ISO 45000, ISO 50000, etc., and in particular the family of standards ISO 56000, directly related to innovation management, have been introduced during 2019, which also coincides with the time of the Covid-19 pandemic, are the most required standards.

Innovation, knowledge & technology output, quality, quality culture, quality culture management, and ISO standards are becoming an important part of achieving business models' competitive advantage, under the new reality and the new normal.

1. Literature review

At present, the literature on innovation, knowledge & technology output, quality, ISO standards, quality culture, etc. has been improved around the world, alongside the country and level of economic development. This is because concepts of innovation, knowledge, technological output, quality, quality management, and ISO standards when applied correctly, help private and public organizations to be more competitive in an open market when and where supply is much higher than demand. one of the main characteristics of the last 50 years of the global economy.

1.1 Megatrends of 2020 – 2030 and worldwide economies respond to crisis and post-crisis period

The five main megatrends for the next 10 years are (1) Population growth as the core of movements in economic power. (2) The effects of global warming are all around us and are having a significant impact on yields and coastal regions. (3) The IV revolution

of industries, the revolution of digitization, with the rapid advancement of technology, AI, and machine learning. (4) Demographics at a global level (habitats, population, density, ethnic issues, their level of knowledge, etc.) are being transformed by changes at social and psychosocial levels, while this level offers new opportunities and approaches to all issues, private and public included. These megatrends underpin structural shifts, technological development, economic power shifts, etc., and have serious implications at the individual, regional, global market, and societal level around the globe. (Peter Fisk. 2019). In response to these major changes/megatrends and the crisis and post-crisis period, the world is moving towards (1) an information revolution, (2) flexible and learning organizations and innovation systems, (3) an explosion of skills, knowledge, and competencies, (4) improvement of the creation, production and distribution systems, (5) use and expansion of innovation systems, creativity, and quality management culture, etc. (OECD. 2016).

1.2 Quality and culture of quality

The core definition of quality as a set of values that contribute to how improvements can be made in the daily practice of work and related outcomes, a set of applications that are taken for granted and that form the philosophy of organizations or work groups, has been identified by several authors who have defined quality culture as a social attack that supports people in the organization to stick together. Product and service features and their improvements thrive. This culture has been demonstrated in several areas: (1) individual improvement, (2) tolerating and respecting others, (3) entrepreneurship, and (4) proven skills. A culture of quality is a set of common, respected, and integrally formed approaches to product and service characteristics identified in the culture of organizations and management systems.

The importance of quality culture, quality management culture for doing business, achieving competitive advantage, linking it to corporate social responsibility, sustainable management, business ethics, diversity issues, international, intercultural management, national/international organizational culture, culture and sectors of the economy in a country as well as current as an important part of the history of economic thinking (related to the culture of corporate governance). ISO standards, their meaning, their application in practice, etc. have been described in several publications (Wiboonrat, 2020, Vlsceanu, et al., 2007, Robbins, 1999, Harrington, et al., 1997).

Main ISO's required then most currently are:

- 9000 Family – Quality management system
- 10244: 2010 – Management of documents
- 14000 – Environment protection
- 20000 – Information technology
- 22301 : 2019 - BCMS
- 27000 – ISM
- 45000 – HSW
- 50000 – Efficiency of energy
- 56002: 2019 - IMS
- Etc.

According to the Organization of Standards, there are three main types of benefits to using standards:

Key benefit 1: Streamlining internal operations

A key finding is that standards can be used to streamline an organization's internal processes, for example by reducing the time spent on specific activities in performing various business functions, reducing waste, lower procurement costs, and increasing productivity. The case studies consistently report that the contribution of standards to companies' gross profit ranges from 0.15% to 5% of annual sales.

Key Benefit 2: Innovation and Expansion of Operations

A few case studies provide examples where standards have served as the basis for innovating business processes that enable companies to expand their supplier network or effectively introduce and manage new product lines. In other cases, standards helped reduce the risk for companies to introduce new products into national markets.

Key Benefit 3: Creating or entering new markets

Standards have been used as a basis for developing new products, opening up new markets (both domestic and export), supporting market acceptance of products, and even creating markets. In exceptional cases, the impact of standards went well beyond the figure above, with companies generating gross profit contributions of up to 33% of their annual sales, which helped them position themselves as leaders in their field for at least a period (Musa. 2014 & Studylib 2016, Nation News 2016, ISO 2014, Nanopdf 2016).

1.3 Innovation

According to an OECD report, for about 35 years entrepreneurship has been defined as an attempt to use innovative aspects that involve the use of factors of production already involved, within the framework of a new approach to the use of productive capacity, with its core the realization and use of entrepreneurial resources and as an activity of Creation that takes place and is completed along the way of the manufacturing process (Drucker, 1985, Ahmad. et al. 2007, Shane 2003, Sarasvathy. 2001, Puhakha. 2013). The OECD-Oslo Handbook Innovation was defined as the implementation of a new or significantly improved product (good or service) or process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations. In terms of economic theory, innovation is an industrial mutation that is progressively revolutionizing the economic structure from within, incessantly destroying the old one and incessantly creating a new one, which is a concept of today's global economic approach when skills, knowledge, and competencies are important.

Innovative goods are simply put into practice ideas that materialize into new goods (products/services) or improved goods that are recognized as a new or changed entity that creates or redistributes value. According to the International Organization of Standards, innovation is a new or improved product or process that differs significantly from previous products or processes and is made available to users. This definition is consistent with those in ISO standards, so they can be useful tools for comparing and evaluating innovations within and between organizations (Schumpeter. 1942 & 1993. MAPING. 2022, ISO 2019). Very often innovation has been seen as the realization of making products more effective, the New Canvas Business Modeling aims to be more practical in terms of markets, processes, and procedures, without always requiring

inventive measures. Each state's system of innovative issues requires institutional support, laws and regulations, and written processes that clearly state how the framework establishes attracts, distributes, and deploys information, skills, competencies, and know-how to utilize them.

In emerging countries, innovative aspects relate not only to the development of local knowledge management but also to the application of existing data, information, skills, and competencies to develop, promote and improve innovative actions and outcomes, which requires a more favorable environment for entrepreneurship and business activity than required Environment for gaining competitive advantages, including research and development activities, also related to trademarks and patents (Lijster. et, al. 2018, Bhasin. et. al. 2 April 2012, Morgan 2015, Ledzik . 2013, Tjakraatmadja 2012, WB Institute 2005, Lane et al 2012, Porter et al 2008).

Innovation sources

Innovative aspects arise as a result of concentrated activity, belief, and failure of systems, as well as changes in a country's economic, industrial, market, demographic, perceptual structure, etc. (Drucker. 2002, Oculintech 2022. Dianthamatianenzo 2013).

According to Saylor and Engelberger Innovation requires:

- a recognizable need
- skilled people with proper technology
- economic push (Saylor. 2019, Engelberger 1982).

In the face of increasing global competition, global products, services, manufacturing processes, business models and markets, and the implementation of new technologies, it seems that the results of doing business are in the hands of productivity (effectiveness and efficiency) as well as in the hands of intense innovative activities, which have been considered as the main problems of the competitive advantage of doing business, as a process that arises through interactions between different actors and becomes issues of importance for the future of business and corporate success. According to several authors, it seems clear that the level of production can no longer be increased through the existence and use of classical factors of production such as labor, land, and capital, but through the use and incorporation of innovation and technological change, emphasizing the links between innovation, more inclusive Creativity, Entrepreneurship, Leadership, and Management (Greenhalgh. et. al. 2010, Anderson. et. al. 2015, Zhang. et. al. 2010 & 2015, Shin. et. al., Byron. et. al. 2015, Gilson et al 2015, Perry-Smith et al 2015).

As described above, considering competitive advantage as the main driving force for business and entrepreneurial activities, innovation and creativity should be considered as key factors that require physical and non-physical support for an optimal result. Every crisis creates threats and an environment for opportunities that leads to creative actions that create space for innovation and new solutions in all areas of human activity, including remote work, environmental approaches, and also the achievement of social goals. The crisis caused by pandemics brought before the eyes of all people around the world the importance and multidimensional approach of innovative activity to restore growth. This has been evident in multiple areas of business operations and sectors such as healthcare, insurance, banking, home working and remote, remote education and learning, e-

business, mobile solutions, etc. The COVID-19 pandemic has unleashed severe health and health damage Economic crises that will have lasting effects. Vaccine research and scientific investigations to prevent the spread of the coronavirus have raised awareness of the central role of science, technology, and innovation in economic and social development. Innovation is a development tool that plays an increasingly important role in global trade. In the last two decades in particular, the arena of world trade has changed, with economies of scale gradually being replaced by an innovation economy focused on high-value-added products and services (GII. 2021. Mungay. 2020, WIPO. 2021. Slideshare Wiziin Inc. 2021. Google Books, 2021).

1.4 Innovation as an ISO family of standards. ISO 56000

A large number of standards have been developed to help and support companies and public organizations to streamline their internal systems, processes, procedures, and records to have an open approach to innovative aspects and activities and to address any issues that contribute to the bottom line of operational activities of public and private entities that implement IMSs in innovative ways. Innovation serves as a force that propels companies into a time and period of success. It is clear that all subjects that provide their leaders and human capital with the right tools to expand and seize opportunities and achieve their goals and organizational strategic and operational goals, contribute to a broader perspective for society as a whole and a better way to Crisis and Challenges Ahead (Sancoct. 2019, ISO. 2021. Ann Brady. 2021. Muckrack. 2021). Approach to achieve competitive advantage. A family of standards with the number 56000 was published in 2019 on innovation and innovation management, which helps companies to manage innovations and innovative measures effectively and in a more structured way. Innovation is about creating something new that adds value; This can be a product, a service, a business model, or an organization. And the added value that is created is not necessarily of a financial nature, it can also be social or ecological. The ISO 56000 family will help organizations significantly improve their ability to survive in our changing and uncertain world. They enable organizations to constantly reinvent themselves (Academy Eicorn. 2021, ISO. 2020. Naden. Feb 2020. Continuous innovation. 2020).

The ISO 56000 family includes:

- 56000:2019 – Management of innovation — Innovation MS — Guidance
- 56002, Management of innovation – *Innovation MS – Guidance*
- 56003, Management of *innovation – partnership on innovation, methods, and tools – Guidance*
- 56004, Management of innovation - assessment – *Guidance*
- 56005, Management of *innovation – Int. Prop, Mngmt, Methods, and tools – Guidance*
- 56006, *Management of Innovation – SIM – Guidance*
- 56007, Management of innovation – *Management of ideas*
- 56008, Management of innovation – *IOM, methods, and tools – Guidance*

It is clear that even for the International Standards Organization the ties between innovation and creativity are strong, as the ISO 56000 family of innovation standards clearly expresses the connection by saying that the application of ISO standards in general and the Applying the ISO 56000 family of standards helps organizations strengthen their

commitment to their customers, improve innovation and creativity activities, processes and procedures, and economies worldwide to gain a competitive advantage in response to crisis and post-crisis times.

1.5 Knowledge & technology output and its relations with innovation

In most economies around the world, the agenda is shifting from efficiency to innovation. This also helps in policymaking and vice versa. Benchmarking and comparative analysis also help policy on this path to prosperity by placing competitive advantage as a central theme. Innovation activities are important prerequisites for companies because they correlate with the ability of companies to recognize new opportunities and advantages and to understand changes in the environment as well as to respond in an appropriate new way to finding solutions through managerial activities, uncertainty through new and renewed ones Clarify skills, competencies, and knowledge created through this process as a fundamental question for sustainable and viable economic performance, contribution to UNSDG, building resilient infrastructure, promoting inclusive and sustainable industrialization and fostering innovation. As a discipline, knowledge management aims for subjects to create and use knowledge, and besides, there is a lot of confusion about this topic, an approach to designing the management of knowledge should be established in every organization for t the goals they want (European norms. 2019, Vares et al., 2011, ISIEM 2020, International Afnor 2019, PHPKB 2020, CDN 2019, BSI 2019).

1.5.1 The importance of knowledge management

According to the International Standards Organization, the capture, transmission, and transformation of knowledge within an organization and its knowledge ecosystem is a key driver of innovation. It is clear that collaboration between managerial levels and employees in organizations creates knowledge, and organizations derive desired and valuable results from it through productivity and the achievement of competitive advantages. Opportunities are created through increased access to knowledge and the professional development of people in the organization through learning, practice, and exchange. Organizations can no longer rely on the spontaneous dissemination of knowledge to keep up with the pace of change. Instead, knowledge must be consciously created, consolidated, applied, and reused faster than the rate of change. Geographically dispersed and decentralized organizations that perform the same processes and provide the same services in multiple locations can reap tremendous benefits by sharing practices, expertise, and learning across organizational boundaries. Attrition and turnover in today's social impact knowledge management. In many organizations, critical knowledge is often isolated and/or held by experts, at risk of being lost if the organization changes or these experts leave the company. Effective knowledge management supports collaboration between different organizations to achieve common goals. Knowledge is an intangible corporate asset that needs to be managed like any other asset. It must be developed, consolidated, maintained, shared, adapted, and applied so that people can make effective decisions and take concerted actions to solve problems based on experience and new insights for the future. Knowledge management is a holistic approach to improving learning and effectiveness by optimizing the use of knowledge to create value for the organization. Knowledge management supports existing processes and development

strategies. Therefore, it needs to be integrated with other organizational functions (KMD. 2018, Rhem. 2018, Powell, 2020).

1.5.2. ISO 30401 – Knowledge management system

ISO published a newly introduced standard in 2018, ISO 30401 Systems of Management of Knowledge Requirements, a standard within which organizations implement a management system that improves and enables value creation through knowledge and information management for the entire business unit. ISO 30401 defines what is required and provides an organization with a system of guidelines for the preparation, use, maintenance, review, and continuous improvement of the knowledge management process. (ISO.TC 260. HRM. 2018).

Other ISO standards related to this area are:

- 30415, HRM
- 30422, development and learning process
- 30424, Management of knowledge

Innovation, knowledge, and technological output are directly related to the management of business process problems. (Breyfogle. 2015).

1.5.3. GII report on knowledge

In the GII 2021 report, knowledge is linked to knowledge & technology output and knowledge & technology output. In this article, we only considered the relationships between innovation and knowledge & technology output (Sekuloska. 2014). The GII 2021 report considers knowledge & technology output as a mix of (1) knowledge generation, (2) knowledge impact, and (3) knowledge dissemination (Szmodics. 2018).

The GII report considers knowledge creation related to the Origin of patents

- Filed patents at the national patent office
- Origin of patents PCT
- Applications of PTCs
- Origin of models of Utility
- Applications registered at the patent's office under RUM
- Scientific and technical articles
- Number of scientific and technical journal articles
- Articles published in science and technology.
- Citable documents H-index

At knowledge impact report considers:

- Labor productivity growth
- GDP Rate of growth / employed persons
- Newly business entities
- New density of business
- Spending on Softs
- Certificates of ISO 9001 issued
- Manufacturing of high tech

At knowledge diffusion report considers:

- Receipts of intellectual property
- Production/export complexity
- Exports of high tech
- Export of ICT services

2. Framework of the research, the purpose of the paper research study

The scope of the study was the level of innovation and knowledge & technology output and the relationships between them in a global entrepreneurial ecosystem. Given the lack of numerical, statistical, and algebraic arguments on the relationships between innovation and knowledge & technology output, this research offers a mode of theory-building aimed at exploring the questions listed below:

1

2 Q1: There is any relation between innovation and knowledge & technology output?

3 Based on this, two hypotheses have been built:

4 Ho: There is no connection between Innovation and knowledge & technology output.

5 H1: There is a connection between Innovation and knowledge & technology output.

1. …Considering that the literature review of this research paper lists little research on the relationships between innovation and knowledge and technology outcomes, and considering that theoretical approaches to the relationships between innovation and knowledge exist, numerical, statistical, and algebraic arguments for the relationships between innovation and knowledge & technology output does not exist.

3. Methodology

While recognizing the importance of innovation, knowledge & technology output, and quality management for the business and entrepreneurial ecosystem, empirical research to date does not explain how innovation and knowledge, and technology output influence and link quality management, apart from the fact that few serious theoretical studies show the strong link between innovation and knowledge & technology output, but not numerical, statistical and algebraic studies. Therefore, theory building supported by analysis and evidence is required. An exploratory approach should be taken using a single in-depth case study approach, capable of building an in-depth understanding of a phenomenon and allowing for a more detailed examination of theoretical constructs (Ceko. 2021).

3.1 Case selection

The case was selected based on three main criteria: a theoretical approach, adequacy of the relationships, and practical positive effects on the relationships between innovation and knowledge & technology output considering innovation as a property of the ISO 56000 family of standards. The case project ran in phases: (1) identifying the need for innovation and knowledge & technology output (2) identifying the need for

quality management and (3) ranking countries for innovation and knowledge & technology output.

3.2 Collection of data

- Innovation data collected from GII 2021.
- Data on knowledge & technology output gathered from GII 2021.

3.3 Data analysis

1. The global data on innovation was extracted from the Global Innovation Index Report 2021 (World Intellectual Property Organization, 14th edition).

2. The global data on knowledge & technology output was extracted from the Global Innovation Index Report 2021 (World Intellectual Property Organization, 14th edition).

3. Descriptive statistics for the innovation index and creativity output and a correlation and regression analysis (inferential statistics) between the innovation index and knowledge & technology output for 132 countries worldwide were carried out.

Relations between innovation and knowledge management (132 countries worldwide)

Table 1. Innovation index and Knowledge management ranking (GII, 2021)

No	Country	Innovation Index	Knowledge management
1.	Swiss	1	1
2.	Sweden	2	2
3.	USA	3	3
4.	UK	4	10
5.	Korea (Republic)	5	8
6.	Netherlands	6	7
7.	Finland	7	5
8.	Singapore	8	13
9.	Denmark	9	14
10.	Germany	10	9
11.	France	11	16
12.	China	12	4
13.	Japan	13	11
14.	Hong Kong, China	14	62
15.	Israel	15	6
16.	Canada	16	23
17.	Iceland	17	25
18.	Austria	18	19
19.	Ireland	19	15
20.	Norway	20	28
21.	Estonia	21	22
22.	Belgium	22	17
23.	Luxembourg	23	38
24.	Czech Republic	24	12
25.	Australia	25	42
26.	New Zealand	26	39
27.	Malta	27	44
28.	Cyprus	28	21
29.	Italy	29	18
30.	Spain	30	26
31.	Portugal	31	34
32.	Slovenia	32	32
33.	United Arab Emirates	33	59
34.	Hungary	34	20
35.	Bulgaria	35	27
36.	Malaysia	36	31
37.	Slovakia	37	30
38.	Latvia	38	45
39.	Lithuania	39	49
40.	Poland	40	36
41.	Turkey	41	50
42.	Croatia	42	47
43.	Thailand	43	40

44.	Viet Nam	44	41
45.	Russian Federation	45	48
46.	India	46	29
47.	Greece	47	52
48.	Romania	48	35
49.	Ukraine	49	33
50.	Montenegro	50	78
51.	Philippines	51	24
52.	Mauritius	52	93
53.	Chile	53	58
54.	Serbia	54	43
55.	Mexico	55	53
56.	Costa Rica	56	56
57.	Brazil	57	51
58.	Mongolia	58	85
59.	North Macedonia	59	57
60.	Iran	60	46
61.	South Africa	61	61
62.	Belarus	62	37
63.	Georgia	63	75
64.	Republic of Moldova	64	54
65.	Uruguay	65	63
66.	Saudi Arabia	66	69
67.	Colombia	67	72
68.	Qatar	68	79
69.	Armenia	69	64
70.	Peru	70	87
71.	Tunisia	71	55
72.	Kuwait	72	60
73.	Argentina	73	73
74.	Jamaica	74	95
75.	Bosnia and Herzegovina	75	66
76.	Oman	76	107
77.	Morocco	77	67
78.	Bahrain	78	82
79.	Kazakhstan	79	86
80.	Azerbaijan	80	115
81.	Jordan	81	76
82.	Brunei Darussalam	82	130
83.	Panama	83	113
84.	Albania	84	103
85.	Kenya	85	65
86.	Uzbekistan	86	77
87.	Indonesia	87	74
88.	Paraguay	88	117
89.	Cabo Verde	89	122
90.	Un, Rep. Tanzania	90	100
91.	Ecuador	91	97
92.	Lebanon	92	91

93.	Dominican Republic	93	108
94.	Egypt	94	70
95.	Sri Lanka	95	68
96.	El Salvador	96	124
97.	Trinidad and Tobago	97	83
98.	Kyrgyzstan	98	102
99.	Pakistan	99	71
100.	Namibia	100	119
101.	Guatemala	101	90
102.	Rwanda	102	96
103.	Tajikistan	103	80
104.	Bolivia (Plur. State of)	104	112
105.	Senegal	105	88
106.	Botswana	106	101
107.	Malawi	107	84
108.	Honduras	108	118
109.	Cambodia	109	111
110.	Madagascar	110	99
111.	Nepal	111	121
112.	Ghana	112	104
113.	Zimbabwe	113	109
114.	Côte d'Ivoire	114	110
115.	Burkina Faso	115	106
116.	Bangladesh	116	92
117.	Lao People's Dem. Rep.	117	127
118.	Nigeria	118	123
119.	Uganda	119	105
120.	Algeria	120	125
121.	Zambia	121	120
122.	Mozambique	122	116
123.	Cameroon	123	98
124.	Mali	124	94
125.	Togo	125	128
126.	Ethiopia	126	81
127.	Myanmar	127	89
128.	Benin	128	131
129.	Niger	129	114
130.	Guinea	130	132
131.	Yemen	131	126
132.	Angola	132	129

Table 2. Descriptive statistics for Innovation Index

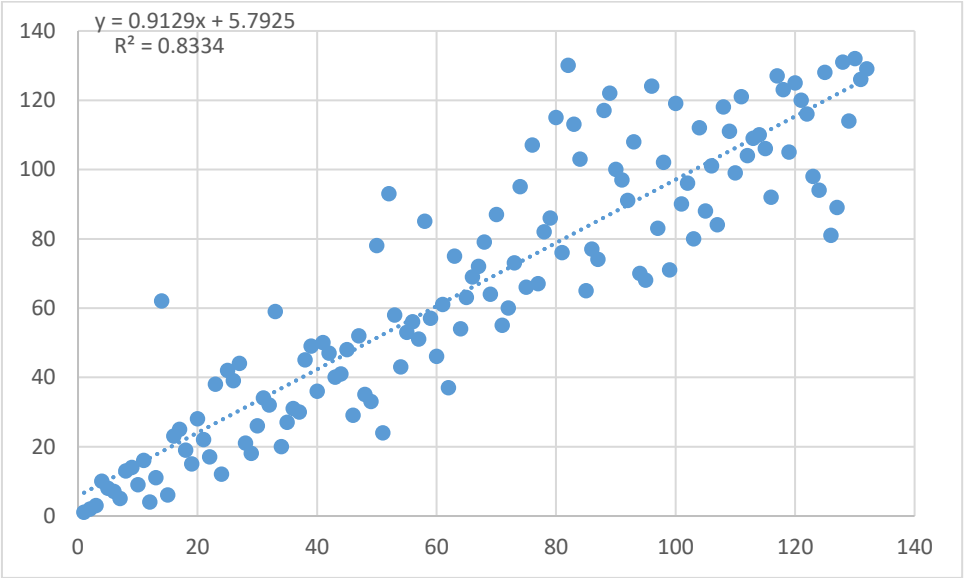
Innovation Index	
Mean	66.5
Standard Error	3.329164059
Median	66.5
Mode	#N/A
Standard Deviation	38.249183

Sample Variance	1463
Kurtosis	-1.2
Skewness	8.94958E-17
Range	131
Minimum	1
Maximum	132
Sum	8778
Count	132
Largest(1)	132
Smallest(1)	1
Confidence Level(95.0%)	6.585880645

Table 3. Descriptive statistics for Knowledge & technology output

Knowledge management	
Mean	66.5
Standard Error	3.329164059
Median	66.5
Mode	#N/A
Standard Deviation	38.249183
Sample Variance	1463
Kurtosis	-1.2
Skewness	-4.26826E-16
Range	131
Minimum	1
Maximum	132
Sum	8778
Count	132
Largest(1)	132
Smallest(1)	1
Confidence Level(95.0%)	6.585880645

Graphic 1. Correlation between Innovation index and Knowledge management (drawn by authors, using GII 2021 data) where at X axes is the innovation index and at Y axes is business sophistication



SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.912895
R Square	0.833377
Adjusted R Square	0.832095
Standard Error	15.67307
Observations	132

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	159719.1	159719.1	650.2028	1.98E-52
Residual	130	31933.86	245.6451		
Total	131	191653			

		Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
b =	Intercept	5.792505	2.743907	2.111043	0.036684	0.364013	11.221	0.364013	11.221
a =	Innvt. Index	0.912895	0.035801	25.49907	1.98E-52	0.842066	0.983723	0.842066	0.983723

$$Y = ax+b$$
$$y = 0.9129x + 5.7925$$
$$R^2 = 0.8334$$
$$r = 0.91291$$

With these results, we have verified that there is a connection between Innovation, Knowledge, and technology output (Hypothesis 1)

- Implications for theory and practice

The theory based on the final results of this research opened a new window for further research in the field of relationships between innovation and knowledge & technology output (Sekuloska. 2014), using it as a way to achieve a competitive advantage approach was considered both as individual companies and for the economy of the country. The article not only contributes to the question of how and how much innovation promotes knowledge but above all how and how much knowledge & technology output promotes innovation and its new forms. The article examines approaches that promote innovative activities. This is a theoretical article based on empirical study, employing quantitative methods, a practice-oriented paper expressing actual changes in the global economy, society, and science, and a debate for the long-term perspective of the issue of the relationships between innovation and knowledge & technology output.

- Limitations and further research

This research was conducted using a large amount of data on the Innovation Index and Knowledge & technology output for 2020-2021. Further research is needed to verify whether these relationships hold for other periods, particularly the future.

Conclusion and recommendations

1. Towards fixedness of natural resources and restrictions on boundless economic growth approach, the direction of innovation and knowledge management, technology developments, and the output are important in overcoming resource constraints.
2. There is a tendency for innovations to save on scarce resources. If technological progress will be fixed-factor saving, then fixed factors may not be a large barrier to growth. The same argument and logic can be applied to knowledge & technology output and quality management, since both of them are not fixed resources, and are strongly connected with innovation.
3. Achieving competitive advantage requires a positive approach towards innovation, knowledge & technology output, and quality management, requiring improvement of innovation, knowledge & technology output, quality management, and business climate in SMEs, seeing this as a general microeconomic perspective too, while, in a broader context, this study extends the general understanding of the innovation, knowledge, and technology output and quality management relations to be used for a future managerial approach/mechanism in real-world situations, suggesting future research could focus on developing and validating the proposed framework and investigate the issue in more contexts and settings.
4. A connection between the innovation index and the knowledge & technology output has not only been demonstrated in theoretical aspects but verified by a regressive analysis and ISO 304040 helps companies to strengthen their commitment to their customers, innovation, and knowledge & technology output Improve activities, processes and procedures and economies around the world to gain a competitive advantage in response to crisis and post-crisis times.

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