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COMMUNICATION OF STAKEHOLDERS IN THE PROCESS OF COMMERCIALIZATION OF INNOVATIONS IN THE WORLD MARKET¹

It is impossible to commercialize innovations without properly selected participants. Participants are the key to building a reliable commercialization chain capable of quickly and efficiently turning an idea into an innovative product. However, selecting participants in the innovation commercialization chain is a rather complex, lengthy, and appropriate process. The success and speed of commercialization of innovations depend on it. In addition to selecting participants, it is important to ensure communication between them, that is, to establish communication at a qualitative level, achieving harmonious relations. Properly constructed communication interaction will accelerate the introduction of innovations to the market and contribute to forming long-term relationships.

The article contains the results of an investigation of stakeholders in the process of innovation commercialization. The study's purpose is to analyze stakeholders' communications and interaction in

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the commercialization of innovations in the international business environment. To achieve this goal, it is necessary to implement the following tasks: to define the stages of stakeholder analysis of innovation commercialization, analyze the degree of their importance and interest, and determine methods of interaction between stakeholders in the international business environment. The main research methods used in the process of writing the article are comparative analysis of scientific publications and research on the work of commercialization of innovations, generalization and visualization map by VOS viewer software analysis of stakeholders, and methods of interaction in the process of commercialization of innovations, in particular the matrix of stakeholders, the Mendelow's Matrix ("power/interest" matrix), Mitchell-Agle-Wood Stakeholder Model, Accountability Scorecard, Stakeholder's Map. With the help of the VOS viewer software product, a visualization map was created in connection with the concepts of "commercialization of innovations", "stakeholders" and related ideas based on information from the Scopus database. While working on the article, literary sources were analyzed close to the research topic. The analysis results confirmed the theory of the forms of interaction between stakeholders in the process of innovation commercialization.

Key words: *stakeholders, communication, innovations, commercialization, technology transfer.*

Будь-який бізнес-процес потребує чітко налагодженої комунікації між його учасниками. Процес комерціалізації інновацій також не є винятком. Швидкість та успіх комерціалізації залежить від самих учасників, якості налагодженої взаємодії між ними, їхнього цілепокладання, мотивації тощо. Правильна побудована комунікаційна взаємодія не тільки пришвидшує виведення інновацій на ринок, а також сприяє формуванню довготривалих відносин. Проте підбір учасників ланцюга комерціалізації інновацій та налагодження між ними стійких гармонійних взаємовідносин є досить складним, тривалим і відповідальним процесом.

У статті наведено результати дослідження ролі стейкхолдерів у процесі комерціалізації інновацій. Метою дослідження є аналіз комунікацій та взаємодії стейкхолдерів у процесі комерціалізації інновацій у міжнародному бізнес-середовищі. Для досягнення поставленої мети необхідно реалізувати наступні завдання: визначити етапи аналізу стейкхолдерів комерціалізації інновацій, проаналізувати ступінь їх важливості та зацікавленості, визначити методи взаємодії стейкхолдерів у міжнародному бізнес-середовищі. Основними методами дослідження, які були використані при написанні статті, є порівняльний аналіз наукових публікацій та досліджень роботи з комерціалізації інновацій, узагальнення та візуалізація карти програмним забезпеченням VOS Viewer, аналіз стейкхолдерів та методів взаємодії в процесі комерціалізації інновацій, зокрема, матриця зацікавлених сторін, матриця Менделова (матриця «влада/інтерес»), модель зацікавлених сторін Мітчелла-Агла-Вуда, система оцінки підзвітності, карта зацікавлених сторін. За допомогою програмного продукту VOSviewer була створена карта візуалізації у зв'язку з поняттями «комерціалізація інновацій», «стейкхолдери» та суміжними ідеями на основі інформації з бази даних Scopus. У процесі роботи над статтею були проаналізовані літературні джерела, близькі до теми дослідження. Результати аналізу підтвердили теорію про форми взаємодії стейкхолдерів у процесі комерціалізації інновацій.

Ключові слова: *стейкхолдери, комунікація, інновації, комерціалізація, трансфер технологій.*

Introduction. Establishing communication between interested parties, which occurs in the process of commercialization of innovations, is an important yet difficult task. Communication involves exchanging information between two or more persons, using verbal and non-verbal means to transmit and receive information [1]. Innovations, in turn, are newly created (applied) and (or) improved competitive technologies, products or services, as well as organizational and tech-

nical solutions of a production-administrative, commercial or other nature, which significantly improve the structure and quality of production and (or) the social sphere [2; 3; 4]. The innovative activity aims at the use and commercialization of the results of scientific research and development and leads to the release of new competitive goods and services to the market [5].

Commercialization of innovations involves involving objects of intellectual prop-

erty rights in economic circulation that is, using intangible (intellectual) assets in the company’s production and marketing activities [6]. It acts as a mediator between the result of scientific research work and the object of purchase and sale and contributes to obtaining profit from newly created products. In addition, the owner may also transfer the rights to the object of intellectual property for development to another entity, which will contribute to the spread of innovative products among a more significant number of consumers in various regions and industries in the process of commercialization [7; 8]. Let’s consider statistics that show how innovative European enterprises have introduced their products for the last 25 years (Fig. 1).

The statistics show that the most successful innovative companies are based in Germany, Italy, France, Turkey, and the UK. It should be noted that introducing innovation to the market is a highly complex process. A cross-country analysis of competitiveness for assessing the innovative potential of industrial enterprises is presented in [10; 11; 12; 13; 14]. Communication and interaction of stakeholders play a crucial role in the commercial success of innovative products [15].

The article aims to analyze stakeholders’ communications and interaction in the process of commercialization of innovations in the international business environment. To

adequately guide the research, the following study objectives were defined: to define the stages of stakeholder analysis of innovation commercialization, to analyze the degree of their importance and interest, and to determine interaction methods between stakeholders in the international business environment.

Research methods. The main research methods that were used in the process of writing the article are comparative analysis of scientific publications and research on the work of commercialization of innovations, generalization and visualization map by VOSviewer software analysis of stakeholders and methods of interaction in the process of commercialization of innovations, in particular the matrix of stakeholders, the Mendelow’s Matrix (“power/interest” matrix), Mitchell-Agle-Wood Stakeholder Model, Accountability Scorecard, Stakeholder’s Map.

Literature review. The study of the essence of innovation [16], along with the analysis of trends in innovative development [17; 18; 19; 20; 21; 22], allows a better understanding of the features of the process of commercialization of a particular object within a particular area of economic activity. The preliminary study and assessment of obstacles to doing business in general and the risk of loss of information and knowledge

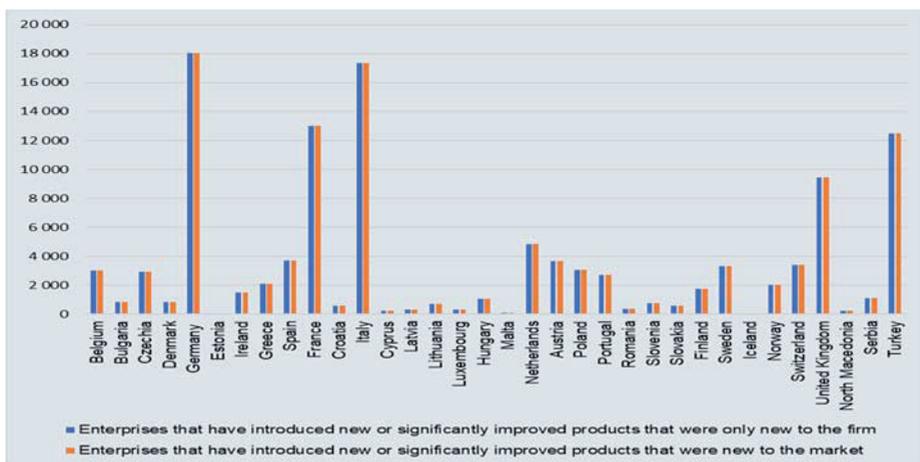


Fig.1. The number of product and process innovative enterprises in international business environment, 1995-2020

Source: build by authors based on [9]

[23; 24; 25] as an essential stage of the commercialization process, in particular, when establishing communication between stakeholders, contribute to the enhancement of the commercialization process. The necessary factors in the study of the communicative interaction of stakeholders in any process are motivation, analysis of behavioral attractors and cognitive technologies [26; 27; 28], as well as defining the essence of communication [29; 30], which accompanies the process of commercialization.

To conduct a comprehensive analysis of literary sources, we will analyze thematic statistics and statistics of their citation according to the most famous databases - Scopus and Web of Science [31; 32; 33].

When searching in the Scopus database (TITLE-ABS-KEY (“stakeholders”, “commercialization”, “innovation”, “communications”)), we found 16 publications. Such a small sample is a result of a complex query consisting of 4 concepts. According to the analysis of these publications, citation statistics were formed for the years from 2008 to 2021 (inclusive) (Fig. 2).

On the graph we can see a positive trend of increasing the number of citations on the topic of commercialization of innovations and the involvement of stakeholders in this process. Real interest in the commercialization of innovations appeared after 2010, which is confirmed by statistical data.

Having analyzed the most cited publications in the Scopus database on the topic of this study, we propose to conduct a similar analysis using the Web of Science database. In this case, a search query was used, which has the following form: stakeholders* commercialization* communication. The previous request was limited to 3 words, i.e., a more complex query returned very few (3) results for a representative sample. As a result of the search query, a selection was made of 28 publications and an analysis of their citation by year (from 2008 to 2021) (Fig. 3).

Similarly to the graph in Fig. 2, in Fig. 3, we can see the growing trend in both the number of publications and citations. It should be noted that publications on this topic have been actively cited since 2012. In general, the growing trend of the number of citations allows to make assumptions about their growth in the future.

Comparison of citations in the two databases makes it possible to confirm the conclusion based on Figs. 2-3, which shows the growing trends and, accordingly, the growing popularity of the topic of innovation commercialization in the scientific community. At the same time, Fig. 4 shows that since 2015, the citation rate of publications in the Web of Science database has been somewhat higher than in Scopus. This difference in citation correlates with the difference in the number of publications, which confirms

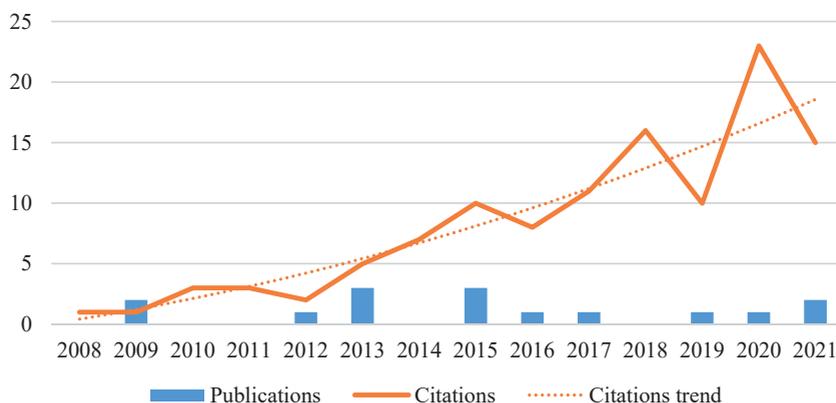


Fig.2. The total number of publications and citations in Scopus database for keywords “stakeholders”, “commercialization”, “innovations”, “communication”

Source: built by authors based on Scopus database

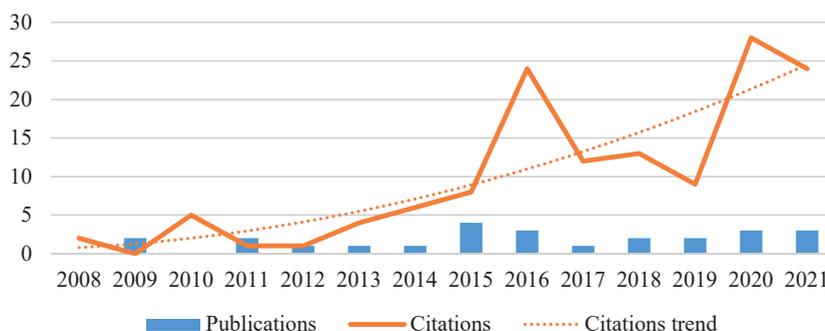


Fig. 3. The total number of publications and citations in Web of Science database for keywords “stakeholders”, “commercialization”, “communication”
Source: built by authors based on Web of Science database

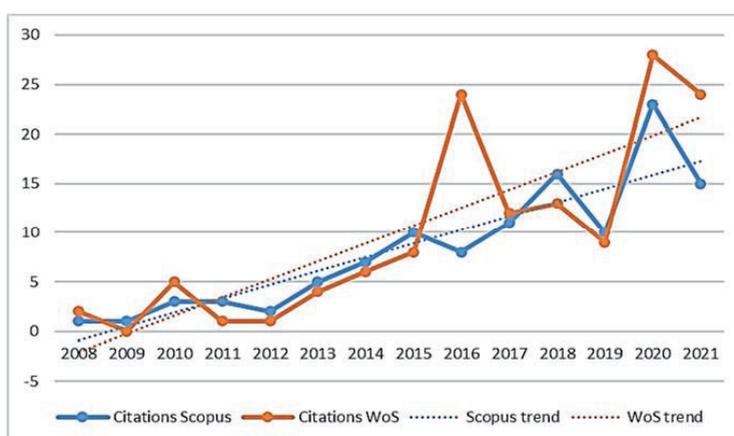


Fig. 4. Comparison of the number of citations according to the Scopus and Web of Science databases (based on Fig. 2-3) with the trend lines
Source: built by authors based on Scopus and Web of Science database

the direct relationship between the number of publications and the frequency of citation.

For a more detailed bibliometric analysis, it may be appropriate to use the VOSviewer tool and build visualization maps based on the results of search queries. Fig. 5 shows a visualization of key concepts: “stakeholders”, “commercialization”, “innovations”, and “communication”.

The visualization helped to determine 4 clusters, 25 items, and 169 links. The normalization method used is LinLog/modularity. This normalization method reflects the vast majority of connections and components, which are ordered by the density of

mentions (from the center to the edges of the visualization map). Table 1 shows the cluster distribution based on visualization results.

The clustering results reflect communications, innovation, stakeholder relations, and successful commercialization (Cluster 3). At the same time, within the framework of cluster #1, it can be assumed that enhanced communications with stakeholders can minimize risks and increase profits in the commercialization of technological innovations.

By analogy with the previous visualization, let's make a map with input data from the Web of Science database (Fig. 6).

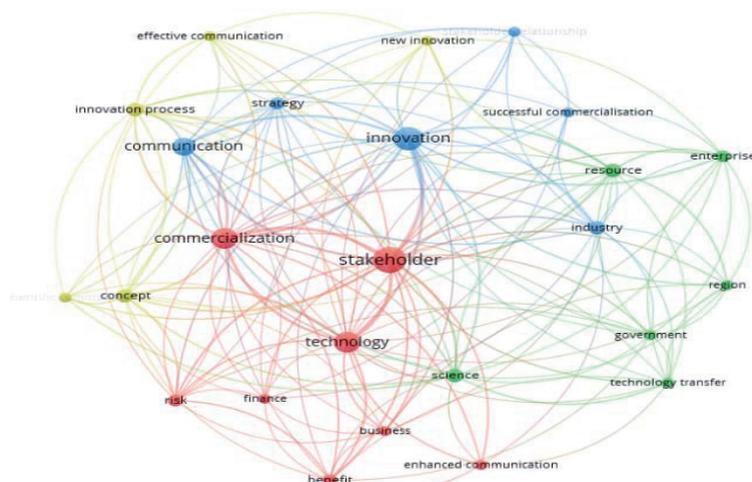


Fig.5. Network visualization map for cluster analysis based on keywords in the research subject area (Scopus)

Source: Constructed by authors via VOSviewer for the keywords “stakeholders”, “commercialization”, “innovations”, “communication” (Input data:16 documents, 1984-2021, Scopus Database, refined).

Table 1

Visualization results of the cluster distribution presented in Fig. 5

Cluster number	Cluster colour	Items	Description
1	Red	Benefit, business, commercialization, enhanced communication, finance, risk, stakeholder, technology	Publications devoted to the analysis of possible risks and economic benefits of stakeholders in the process of commercialization of innovations
2	Green	Enterprise, government, region, resource, science, technology transfer	Publications that reveal the essence of resource provision of technology transfer (as the primary type of commercialization of innovations) at three levels: state-region-enterprise
3	Blue	Communication, industry, innovation, stakeholder relationship, strategy, successful commercialization	Publications that highlight the role of communications and stakeholder relations as factors in the success of innovation commercialization
4	Yellow	Concept, effective communication, innovation process, innovation, the scientific community	Publications that highlight the importance of effective communication in the process of commercializing startups, scientific innovations, and conceptual

Source: built by authors

Based on the concepts that formed the above clusters, the following assumptions can be made:

1. Cluster No. 1, the largest one, includes all the key terms used in the search query. In addition to them, the cluster consists of internal and external organizational environments, resources, and technologies. Effective work, cooperation with stakeholders, and an appropriate communication policy are important factors in the effective commercialization of innovations.

2. Cluster No. 3 – the innovation process is associated with high risk (as in clustering according to the Scopus database).

3. Cluster No. 2 – for the effective commercialization of innovations, business, and the state need to work fruitfully in the field of technology transfer and development of communication channels.

Table 2 shows the cluster distribution based on the visualization results.

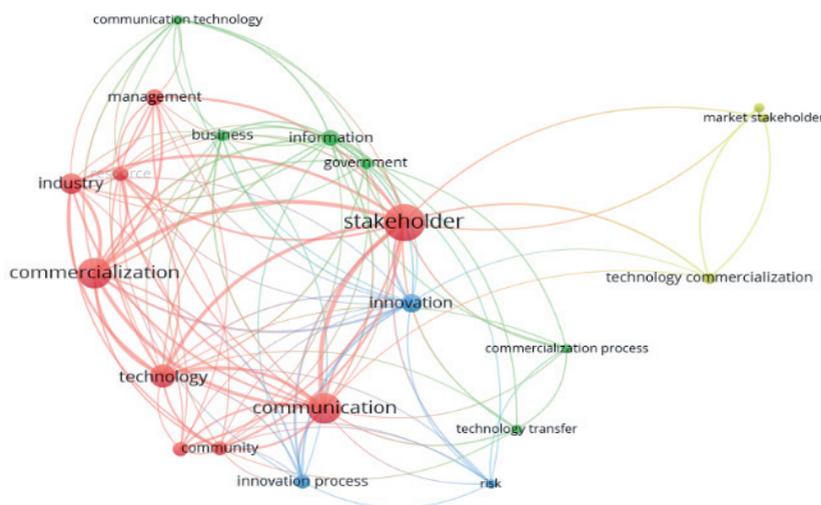


Fig.6. Network visualization map for cluster analysis based on keywords in the research subject area (WoS)

Source: Constructed by authors via VOSviewer for the keywords “stakeholders”, “commercialization”, “communication” (Input data: 28 documents, 1984-2021, Web of Science Database, refined).

Table 2

Visualization results of the cluster distribution presented in Fig. 6

Cluster number	Cluster colour	Items	Description
1	Red	Commercialization, communication, community, industry, management, organization, resource, stakeholder, technology	Publications highlighting the importance of industry-organizational communications for the commercialization of new technologies
2	Green	Business, commercialization process, communication technology, government, information, technology transfer	Publications revealing the essence of the commercialization process of communication technologies and their transfer within the private and public business sectors
3	Blue	Innovation, innovation process, risk	Publications that describe in detail the risks of introducing innovations and innovative activity
4	Yellow	Market stakeholder, potential stakeholder, technology commercialization	Publications that provide a classification of stakeholders and describe their role in the process of commercialization of technologies

Source: built by authors

Research Results

Identification of key stakeholders

Stakeholders of innovation commercialization are stakeholders (individuals or institutions) who can directly or indirectly, positively or negatively influence or be influenced by the commercialization of innovation [34].

Stakeholder analysis includes four stages [35]: identification of stakeholders; identification of the impact of the initiative

on stakeholders; identification of possible types of cooperation between stakeholders; development of a stakeholder engagement plan based on the type of cooperation and initiative.

The main stakeholders in the process of commercialization of innovations are producers of innovative products, consumers, higher education institutions, innovation entities (venture funds, business incubators, technology parks, crowdfunding, and information platforms), society, government agencies, financial institutions [36;

37]. The following tools for stakeholder analysis have been reported in the literature [38]:

- the matrix of stakeholders is compiled in the form of a table, where experts evaluate both the degree and strength of the stakeholder's influence on the business, and his interests in terms of the activities of the economic entity, as well as possible interaction strategies are determined (Table 3);

- Mendelow's Matrix ("power/interest" matrix) involves the classification and grouping of stakeholders according to their attitude to the power they possess and the extent of their interests (influence on managerial decision-making is strong/weak; interest is high/low). The matrix allows identification of the stakeholders who are able and willing to influence the organization. Accordingly, the degree of influence of a stakeholder is determined by both his power and interest (Fig. 7);

- Mitchell-Agle-Wood Stakeholder Model involves the identification of interested parties depending on a combination of one, two, or three attributes and their division, according to them, into latent, those that are expected or categorical (Fig. 8);

- the accountability Scorecard makes it possible to describe the interaction of the enterprise and stakeholders using two types of connections, inputs, and stimulus responses;

- Stakeholder's Map is visual representation of various relationships with stakeholders. Most often, the visualization of stakeholder groups takes place according to the criteria of the level of interest "high/low" and the level of influence "strong/weak". Forms of visualization can also be different: radar, schematic image, etc.

Table 3

Stakeholder matrix of innovation commercialization

Stakeholder influence	The importance of stakeholders			
	Significant	Certain	Insignificant or absent	Obscurely
Significant	developer, producer, consumer,	suppliers		
Certain	partners, creditors	government, mass media		
Insignificant or absent		competitors	society	
Obscurely	owners			environment

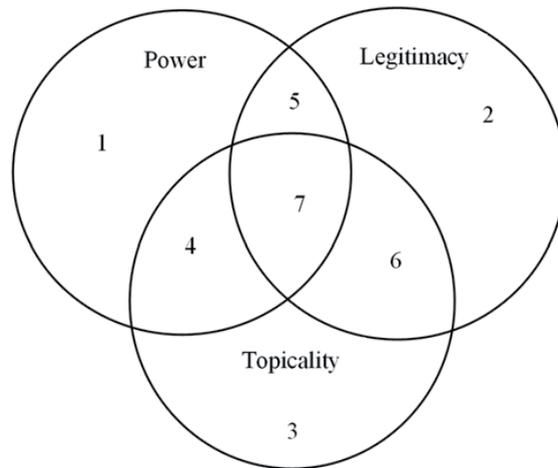
Source: built by authors

Level of power	High	Rivals		Owners, clients, consumers
	Medium		Government, mass media	Personal
	Low		Suppliers	
		Low	Medium	High

Level of concern

Fig. 7. The Mendelow's Matrix

Source: built by authors



Note: 1 – passive stakeholders, 2 – controlled stakeholders, 3 – demanding stakeholders, 4 – dominant stakeholders, 5 – dangerous stakeholders, 6 – depending stakeholders, 7 – determining stakeholders.

Fig. 8. The concept of Stakeholder Salience (Mitchell-Agle-Wood Stakeholder Model)

Source: built by authors

The main purpose of these tools is to identify possible contradictions between the enterprise and interested parties, their strength, importance, urgency, and, accordingly, priority for resolution. The stakeholder map of each enterprise will differ due to the variety of activities, business conditions, mutual expectations and wishes, and strategic and tactical goals, but the sequence of such an analysis is universal.

Forms of stakeholders' interaction within the process of innovation commercialization.

During the interaction of stakeholders, the following methods of commercialization of innovative products can be identified: investing in startups, engineering, industrial cooperation, technology transfer within joint ventures, technical assistance, franchising, and leasing.

Investing in start-ups increases success in the commercialization of innovation [39]. Thus, in 2018, equity funding for tech startups in Africa doubled to more than \$1 billion – around 2.5 percent of total FDI [40] (Fig. 9).

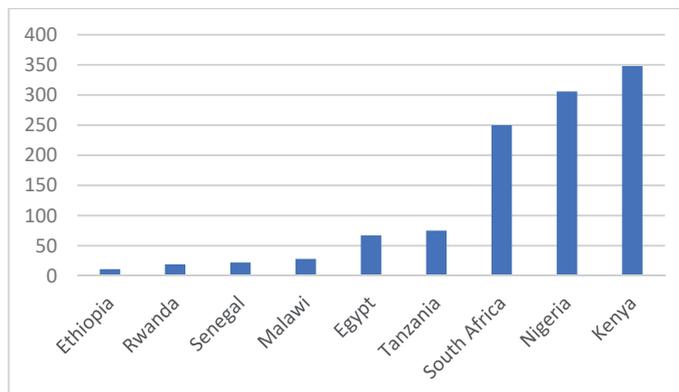


Fig.9. Equity funding to startups in Africa in 2018, selected countries (\$ million)

Source: built by authors [40]

Conclusions. Based on the conducted stakeholder analysis, it can be concluded that in the process of commercialization of innovations, an exhaustive list of stakeholders arises: manufacturers of innovative products, consumers, higher education institutions, innovative entities (venture funds, business incubators, technology parks, crowdfunding, and information platforms), state authorities, financial institutions, society and the environment. In general, stakeholder analysis includes four stages: identification of stakeholders, identification of the impact of the initiative on stakeholders; identification of possible types of cooperation between stakeholders; development of a stakeholder engagement plan based on the type of co-

operation and the initial stage. To conduct stakeholder analysis, the following tools can be used: the matrix of stakeholders, Mendelow's Matrix ("power/interest" matrix), Mitchell-Agle-Wood Stakeholder Model, Accountability Scorecard, and Stakeholder's Map.

These features and benefits were identified as a result of stakeholder interaction in the process of commercializing innovations. The interaction of stakeholders in the global market can take the form of investments in start-ups, engineering, industrial cooperation, technology transfer as part of the implementation of transactions, participation in assistance, franchising and leasing.

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STAKEHOLDERS' COMMUNICATION IN THE PROCESS OF INNOVATIONS COMMERCIALIZATION ON THE GLOBAL MARKET

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It is impossible to commercialize innovations without properly selected participants. Participants are the key to building a reliable commercialization chain that can quickly and efficiently turn an idea into an innovative product. However, selecting participants in the innovation commercialization chain is a rather complex, lengthy, and appropriate process. The success and speed of commercialization of

innovations depend on it. In addition to selecting participants, it is important to ensure communication between them, i.e., to establish communication at a qualitative level, achieving harmonious relations. Properly built communication interaction will accelerate the introduction of innovations to the market and will contribute to the formation of long-term relationships.

The article presents the results of a study of stakeholders in the process of commercialization of innovations. The study's purpose was to analyze stakeholders' communications and interaction in the process of commercialization of innovations in the international business environment. To achieve this goal, the following objectives were set: to define the stages of stakeholder analysis of innovation commercialization, analyze the degree of their importance and interest, and determine methods of interaction between stakeholders in the international business environment. The main research methods used in writing the article are comparative analysis of scientific publications and research on the work of commercialization of innovations, generalization and visualization map by VOS viewer software analysis of stakeholders, and methods of interaction in the process of commercialization of innovations, in particular the matrix of stakeholders, the Mendelow's Matrix ("power/interest" matrix), Mitchell-Agle-Wood Stakeholder Model, Accountability Scorecard, Stakeholder's Map. With the help of the VOS viewer software product, a visualization map was created in connection with the concepts of "commercialization of innovations", "stakeholders" and related ideas based on information from the Scopus database. While working on the article, literary sources were analyzed close to the research topic. The analysis results confirmed the theory of the forms of interaction between stakeholders in the process of innovation commercialization.

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