

The company's innovation development and marketing communication as a driver of the country's macroeconomic stability: A quantitative analysis of tendencies

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Abstract. The work aims to analyse the activities of business structures in the issue of quantitative analysis of communication policy, as quantitative is more common and allows assessing the various aspects of communication policy of an enterprise in quantitative units. The tendency formed in conducting the communication policy of business structures is a natural change of the process in a certain time series. The paper graphically presents the relationship among the fundamental aspects of trend formation: time, place, and action. The study allows each promising trend selected from the previous stage of communication policy analysis to assess the success of the factors contributing to the speed of its spread to build input data for grouping trends that will further form promising areas of innovative development of industrial enterprises.

1 Introduction

The activity of business structures in modern conditions, when the global pandemic has brought to the fore the instability of trends, significant changes in pricing due to variability of supply and demand, competitive environment, essential macro - and microeconomic factors, etc., requires management to implement continuous assessment as economic potential as a whole, and opportunities for development in the future. One of the key components of any business structure of any form of ownership is marketing and communication policy. This component is closely related to both the production and financial components and therefore requires a clear and adequate assessment, including quantitative. According to the methods of measuring the results of communication policy, qualitative and quantitative indicators are distinguished, among which the quantitative one is more common, as it allows evaluating various processes and phenomena in quantitative units. The problems of evaluating the effectiveness of communication policy of business structures were

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considered and analysed by politics, scientists [1-8]. The tendency formed in the process of conducting the communication policy of business structures is a natural change of the process in a certain time series [9-11].

2 Method

The methodological basis of this study is a dialectical method of scientific knowledge, a systematic approach, modern concepts of marketing management in general, and communication in particular, the work of domestic and foreign scientists devoted to forecasting trends and quantifying them. The following research methods were used to solve the objectives of the study: comparative, system-structural, and logical analysis; cluster analysis [12-17], bibliometric analysis [18-23]. The information base of the study consisted of the results of research by international organizations, monographs, and scientific and analytical articles by domestic and foreign authors.

The bibliometric analysis was conducted. To begin with, all scientific publications dealing with the analysis of tendencies based on the Web of Science database for the keyword phrase "analysis AND tendency" in the article title until 2021 inclusive were selected. Four hundred ninety scientific publications were found. The publications on the analysis of tendencies by years were analysed as well. The analysis of co-occurrence by keywords using the program VOSviewer was selected.

This interpretation of the concept of "trend" follows two main properties that characterize it: they are directly cases of manifestation of the process (trends) and the time during which these cases occurred. Based on these properties, the essence of changing the process manifestation cases in time is based.

If talking about the occurrence of a specific case of the process under study, it must have the geographical space in which it took place.

Together, these judgments are three indicators: time, space, and quantity. These indicators form the properties of the trend, namely: time, place, and action. Confirmation of the logical relationship of the trend properties is the trinity of time, place, and direct action - the classical unity according to Aristotle.

This philosophical statement has already been adapted in economic scientific thought: the three-dimensional scheme of D. Abel [24, 25].

It should be emphasized that knowledge of change patterns over time is a complex and time-consuming research procedure, as any phenomenon studied forms many factors acting in different directions. This problem was discussed by [26]. However, without considering the time during which the trend develops, it is impossible to derive its resulting value.

From the theory of classical scientific thought, it is known that the time series is a sequence of numerically ordered numerical indicators that characterize the level of state and changes in the phenomenon under study [27].

In the essence of the quantitative expression of the trend development, there was laid down the basic principle. To know what level will reach a particular process, you need to know the average rate of change. Thus, the average change rate of the process forms the trend parameters, by which it can be quantified [28]. From the basics of physics theory, it is known that velocity is a physical quantity that corresponds to the ratio of the body movement to the period during which this movement occurs. The speed is the easiest to determine when the movement is uniform, rectilinear, i.e., covers the same distances at equal intervals. In this case, the speed is defined as the ratio of distance to time (1):

$$V = S/t \tag{1}$$

where V is the object's speed that passed the way S per t .

Adaptation of this formula for the classical definition of speed was further developed in the concept of the trend speed. It was explored by [12-17]. Thus, the rate of spreading the trend is the resulting indicator of the development and spread of the trend in a certain period of time, taking into account the geographical space.

The value of the parameter S , i.e., the path taken by the trend, should be interpreted to the extent of the trend. Cases of the process manifestation that form the trend reflect the availability of a certain development of the trend, similar to the path that the body travels, i.e., develops in a certain direction [30]. The degree of spreading the trend theoretically represents the relative expression of the degree of encouraging potential consumers to the studied trend [25, 26].

The time that should be defined within the study of the rate of spreading the trend is the total period during which the trend has spread, i.e., the period from the first manifestation of the trend to the time of the study.

Adapting the formula for calculating the speed of rectilinear uniform motion of the object to the speed of the trend, the following expression is obtained (2):

$$S = DTS/T \quad (2)$$

where S is the speed of spreading the trend per year; DTS is a degree of spreading the trend; T is a period of trend existence, years.

Thus, the function of determining the rate of spreading the trend, which is of interest to the industrial enterprise, is based on two variable indicators: the degree of the trend – DTS and the time in which trends were manifested in the general period of the study – T . Both of these indicators are not negative. If at least one of the indicators has a value of 0, either the phenomenon had no actual manifestation or there was no period in which the trend was studied. Thus, the condition of the trend velocity presence is given in (3):

$$S > 0, \quad (3)$$

where S is the speed of the trend spreading.

After determining the velocities of trends, the next step is to identify the factors that influence the acceleration of their velocity.

The speed of spreading innovation trends reveals the importance of the probability degree of successful implementation of innovative ideas in the activities of industrial enterprises [31, 32]. The process that reflects further implementation of innovative ideas in the formed innovations is manifested in the diffusion of innovations. Thus, the acceleration of this process in the industrial enterprise is facilitated by certain factors, which are also key aspects of implementing the promising trends in innovative ideas, which further shape the innovative directions of development.

Different trends can evolve in different directions of innovative development, and this can take different periods. Thus, the nature of the successful implementation of the promising trends depends not only on external factors surrounding the company and on management decisions within the company but also on the very nature of the trend, i.e., indicators of a set of factors [33, 37].

E. Rogers argues that five main reasons govern the success of implementing innovations: relative superiority, compatibility, ease of implementation, probation (ease of implementation), and observation (communicativeness).

There are also additional factors that determine the pace of innovation when they already have a material embodiment in goods and services, such as the type of decision on innovation; the nature of communication channels, the nature of the social system, in which innovation is widespread, the propaganda activity of agents [38]. By analogy with the diffusion of innovation into trend dissemination, it is useful to analyse only the first five main factors contributing to dissemination. After all, by its nature, the trend is the initial stage of

substantiating innovation ideas. Its material embodiment in specific areas of innovation has not yet been found [39-41].

The five main factors that help accelerate spreading the trends are concepts that contain a significant set of aspects of the likely success of trends in the future [43]. Thus, the first factor – the relative advantage of innovation – implies that at the time of implementing the trend towards innovative development, this innovative idea will be better than the idea it stands for. Relative advantages can be represented in the improvement of cost-effectiveness, environmental friendliness, and (or) can represent technical improvements due to the trends' implementation in the innovative direction of the industrial enterprise development. Thus, the type of relative advantage that will be the most important is determined by the very nature of the trend [44].

The ease with which a trend is implemented reflects the degree to which it is easy to understand, use, and adapt to innovation. The degree of understanding, use, and adaptation are related indicators, but their meanings can vary greatly [45]. Thus, the degree of use may be much less than the degree of understanding and vice versa and the degree of adaptation, i.e., implementation in a particular direction of innovative development of an industrial enterprise [46]. The ease with which a trend is implemented is directly related to the speed with which the trend spreads, because the greater is the ease with which the three indicators are presented, the faster the rate can spread [47].

The trend compatibility represents the degree of its compliance with the current system of socio-cultural values, ideas from the past, which are replaced by the positions of consumer demand. A more compatible trend is more likely to materialize from potential consumers' perspectives and more likely to spread faster [48-50]. The degree of innovations compatibility should be considered from the standpoint of socio-cultural norms and values and compared with the ideas of the past that are being replaced.

The test of the trend determines the ease of its approbation on a certain limited scale. The study of trends from the standpoint of further formation of promising areas of industrial enterprises' innovative development shows the possible testing of trends in innovations [51, 52]. When generating innovative ideas, the trend can be explored in the industrial enterprise and within the enterprise's market share. Thus, the greater is the test of the trend, the faster is its spread, and implementation within the studied industrial enterprise will be greater [53]. Besides, the innovative component in the system of proactive development management can be defined as the degree of factors' influence [54-120].

Observability or communicativeness of a trend, in general, is the visibility of innovation results to other people. That is, this factor reflects the alternatives of increasing market share by an industrial enterprise due to implementing a given trend towards innovative development and the possibility of increasing demand from existing consumers. The analysis of these factors that contribute to the diffusion of innovations and consequently the spread of trends reveals the possibility of analysing the success of trends.

3 Results and discussions

There were found 490 scientific publications in the database of Web of Science articles, reviews, book sections, abstracts, etc., published during 1997-2021, to analyse tendencies. The number of publications by year is presented in Fig. 1.

As shown in Fig. 1, the number of publications has been growing rapidly over the last ten years.

To understand the areas of research, a co-occurrence analysis was performed by keywords. Figure 2 presents the results of hierarchical cluster analysis with the number of repetitions from 3 except for geographical names in the sample. The sample includes the 490 publications based on the Web of Science database.

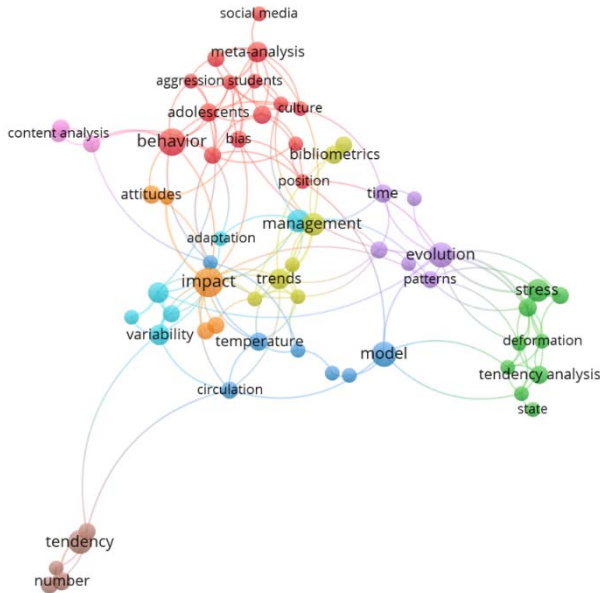


Fig. 1. The co-occurrence analysis by keywords (Web of Science database, publications, more than three keyword duplications excluding geographical names).

Fig. 2 shows that there are 9 main clusters: Cluster 1 (15 items): behaviour (Links: 9, Total links straight: 11, occurrences: 10); Cluster 2 (9 items): stress (Links: 10, Total links straight: 11, occurrences: 6); Cluster 3 (7 items): model (Links: 6, Total links straight: 6, occurrences: 9); Cluster 4 (7 items): management (Links: 9, Total links straight: 12, occurrences: 7); Cluster 5 (6 items): evolution (Links: 12, Total links straight: 15, occurrences: 9); Cluster 6 (6 items): dynamics (Links: 7, Total links straight: 9, occurrences: 6); Cluster 7 (5 items): impact (Links: 15, Total links straight: 16, occurrences: 2); Cluster 8 (5 items): tendency (Links: 1, Total links straight: 1, occurrences: 8); Cluster 9 (3 items): content analysis (Links: 2, Total links straight: 2, occurrences: 46).

It is possible to trace the evolution of scientific research on keywords in the years. Thus, since 2016, the most commonly used terms used and the concept of Trends have become Impact, Variability, Time, Management, Position, Adaptation. The emergence of new terms in determining trends indicates the relevance and variability of this concept in scientific studies. It determines the further scientific development of this concept and the need for its adaptation in forming the macroeconomic stability.

For further analysis, this research proposes to evaluate each promising trend selected in the previous stage of communication policy analysis for success by the factors that contribute to the speed of its spread to build input data for grouping trends that will further form promising areas of innovative industrial development. A set of factors contributing to the rate of spreading trends and their components with the symbols of each are summarized in Table 1.

Trends formed in the process of analysis of business structures' communication policy by their nature differ significantly from each other, as well as the influence of constituent factors that contribute to their spreading speed. Thus, it is proposed to use different methodological approaches to quantitative assessment for each component of the factor in assessing its impact on the trend.

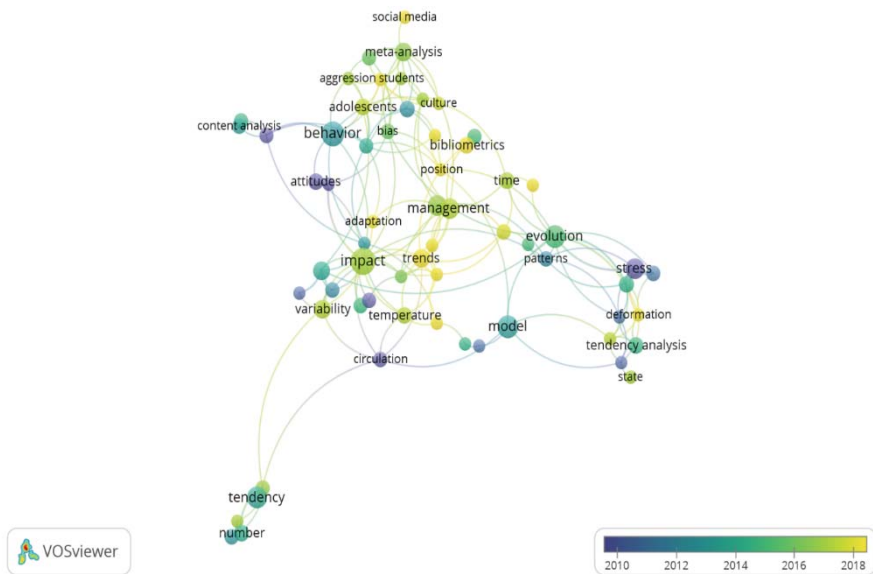


Fig. 2. A co-occurrence analysis by keywords (the Web of Science database, publications, more than three keyword duplications excluding geographical names).

The main purpose of determining the calculation is to establish the degree of the constituent factors' influence on each trend. Studying the features of the constituent factors, existing scientific and practical approaches and features of the resulting communication policy of business structure trends, there have been identified the main techniques that can be used for further analysis, which are summarized in Table 1. To analyse the degree of factors' influence on future trends, it is proposed to use different calculation methods for each component. But to determine the relative estimates, it is proposed to find a degree of value that will bring trends to the reference value, i.e., one that already exists in the market in a particular embodied innovation. Suppose the component of the factor depends on several indicators. In that case, their sum with the same weights is the numerator in the calculation, and the set of dependencies is considered a single component of the factor.

There are three main advantages: cost-effectiveness, technical improvements, and environmental friendliness. To assess the cost-effectiveness of the author's approach, it is proposed to compare the economic effect that will be obtained due to the introduction of a promising trend with the basic set of existing characteristics. To determine the competitiveness of an innovative idea among potentially existing ones and to be determined by comparing the innovation that will be obtained based on implementing a promising trend with similar products of competitors by comparing the consumption price of products. The price of product consumption consists of three main components: the cost of purchase, operation cost, and disposal cost. Thus, for an innovation to find its buyers on the market, it must meet two requirements: to have appropriate consumer properties, i.e., to be useful for personal or public consumption, and to be competitive to make its purchase more profitable and convenient for consumers than others with the same functions or the similar competitor. Mathematically, the dependence of the economic effect on the components is presented in the following expression (4)

$$DTE = f(C_b, C_o, C_u) \quad (4)$$

where *DTE* is a degree of the trend efficiency;

C_b is the cost of buying an innovation, the idea of which is based on implementing a promising trend;

C_o is the cost of operation of the innovation, the idea of which is based on implementing a promising trend;

C_u is the cost of utilizing innovation, the idea of which is based on implementing a promising trend.

Table 1. Factors contributing to the speed of the trend.

Factor symbol	Factor	Factor Characteristics	Factor's component symbol	Factor's component	Method of factor's component calculating
X_1	The relative benefits of innovation	The degree of advantage that innovation has over other types of products (similar products)	X_{11}	Profitability	Degree of Trend Profitability
			X_{12}	Technology and producibility	Degree of technology and producibility trends
			X_{13}		Degree of Environmental friendliness trend
X_2	Simplicity in innovation implementation	Degree of simplicity for realizing, usage, and adaptation of the innovation	X_{21}	Degree of simplicity for realizing	Consumer marketing surveys
			X_{22}	Degree of simplicity for usage	Experimental analysis
			X_{23}	Degree of simplicity for adaptation	Analysis of the production potential of the enterprise
X_3	Compatibility of innovation	The degree of compliance of the innovation with the current value system, experience, and consumer needs.	X_{31}	Compatibility of innovation with the needs and demands of consumers	Marketing field study
			X_{32}	Compatibility of innovation with social norms	Marketing desk study
X_4	Probation	Possibility of approbation in certain limited scales	X_{41}	Possibility of approbation at the industrial enterprise	Analysis of the production potential of the enterprise
			X_{42}	Possibility of approbation on the occupied market share	Trial marketing, consumer focus groups
X_5	Communicativeness of innovation	Opportunity to spread innovation among other consumers	X_{51}	Ability to increase market share	Diagnosis of the competitive environment
			X_{52}	The possibility of increasing demand	Diagnosis of competitiveness of marketing communications

Technical relative advantages that will be embodied in innovation, the idea of which is based on implementing a promising trend, can be manifested in several components, namely: ergonomics, aesthetics, technicality, manufacturability. This task was explored by Delanoy,

N., Kasztelnik, K. [17], Lyulyov, O., Lyeonov, S., Tiutiunyk, I., & Podgórska, J. [33]. Mathematically, this relationship is shown in (5)

$$DTPT = f(ER, AES, TECH, PR) \quad (5)$$

where *DTPT* is a degree of technology and producibility trends;

ER is a degree of ergonomic advantages of innovation, the idea of which is based on implementing a promising trend;

AES is a degree of aesthetic advantages of innovation, the idea of which is based on implementing a promising trend;

TECH is a degree of technical advantages of innovation, the idea of which is based on implementing a promising trend;

PR is a degree of producibility advantages of innovation, the idea of which is based on implementing a promising trend.

The environmental relative benefits of innovation, the idea of which embodies a promising trend, can be assessed as a degree of environmental impact, which is manifested at such stages of innovation as: production, consumption and disposal. This statement is transformed into a mathematical dependence (6):

$$DETF = f(R_{pr}; R_{con}; R_{ut}) \quad (6)$$

where *DETF* is a degree of environmental trend friendliness;

R_{pr} is a degree of benefits caused by the reaction to the production of environmental innovations, the idea of which is based on implementing a promising trend;

R_{con} is a degree of benefits caused by the reaction to the consumption of environmental innovations, the idea of which is based on implementing a promising trend;

R_{ut} is a degree of benefits caused by the reaction by reducing the eco-destructive impact of the disposal of environmental innovations, the idea of which is based on implementing a promising trend and improving the environment as a result of its implementation.

The calculation of a degree of influence of the factor "Ease of innovation" for different components is proposed to be carried out by different economic analysis tools, namely: a degree of ease to understand through consumer marketing surveys, where there is the actual value for innovation, which will embody the trend. The degree of ease to use is determined based on the experimental analysis at the enterprise. The specific feature of this method is that it considers the probabilistic nature of forecasting. There are many methods for making forecasts based on statistical analysis, but they do not cover random changes in the behaviour of the forecast object. The impact of random events can be assessed with the help of experts and their assessments. The advantage of the experimental method of forecasting is that the specialist in each field knows all the activity features and problems and sees alternatives for further development using innovations. The degree of ease to adapt is proposed to be determined based on the analysis of the production potential of the enterprise carried out by the representatives of the enterprise. Compatibility of innovation is determined based on marketing research, namely: compatibility of innovation with the needs and demands of consumers - marketing field research; compatibility of innovation with social norms - marketing desk research. Probation of the innovation, which will be based on information about the essence of the promising trend, consists of the possibility of testing in an industrial enterprise, determined by analysing the production potential of the enterprise, and the possibility of testing in the market share, which in turn is set by trial marketing and (or) involving focus groups of potential consumers. Communicativeness of innovation is considered an opportunity to increase market share (diagnostics of the competitive environment of an industrial enterprise is carried out) and an opportunity to increase demand (diagnostics of competitiveness of marketing communications is performed). For each of the indicators, a relative assessment is determined compared to the basic sample of innovation

already implemented in the market. The obtained relative estimates represent the degree of influence of the constituent factors on spreading the given perspective trends.

4 Conclusion

Thus, analysing the activities of business structures in the current unstable pandemic, marketing and communication policy continue to play a leading role in the work of enterprises. It is the trend formed in conducting the communication policy of business structures that affects the cases of the process itself, the time during which these cases occur, and the geographical space in which the studied processes take place. The above statements result in three indicators: time, space (place), and quantity (action).

In essence, the quantitative expression of the trend development in implementing communication policy laid the principle that, knowing the average rate of the process change leads to answering the question of what level this process will reach. The average rate of the process transformation forms the parameters of the trend by which it can be quantified. It follows that the rate of spreading the trend results from the development and spread of the trend in a certain period, taking into account the geographical space. The degree of spreading the trend expresses the degree of potential consumers' encouragement to the studied trend.

However, in addition, a few factors influence the acceleration of the trends' spread. After all, the speed of spreading the innovative tendencies shows the value of the degree of probability of successful realization of innovative ideas in the industrial enterprises.

The successful implementation of promising innovation trends depends not only on external factors of the enterprise but also on the very nature of the trend, i.e., indicators of a set of factors. The ease of implementation is directly related to the rate of spreading the trends (the greater is the ease of the trend, the speed of its spread may become more important). A more compatible trend is more likely to materialize from the perspective of potential consumers but is also more likely to spread faster. When generating innovative ideas, the trend can be explored both in the industrial enterprise and within the enterprise's market share. The communicativeness of the trend is reflected in the visibility of the innovation results to other people.

For further analysis, it is proposed to assess each promising trend for success by the factors that contribute to speed up its spread to group trends that will further form promising areas of innovative development of industrial enterprises.

The main purpose of the calculations was to establish the degree of the constituent factors' influence on each trend. And also, the basic techniques which were used in the further analysis were defined.

To assess the cost-effectiveness, it was proposed to compare the economic effect obtained because of introducing a promising trend; to determine the competitiveness of an innovative idea among potentially existing ones and to be determined by comparing the innovation that will be obtained based on the implementation of a promising trend with similar products of competitors by comparing the consumption price of products.

Communicativeness of innovation was considered an opportunity to increase a market share (i.e., when diagnosing the competitive environment of an industrial enterprise) and the possibility of increasing demand (performing diagnostics of the marketing communications competitiveness). For each of the indicators, a relative assessment was determined compared to the basic sample of innovation that has already been introduced in the market. The obtained relative estimates represent the degree of influence of the constituent factors on the rate of spreading the given perspective trends.

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