# THE MECHANISM OF FORMATION OF INNOVATIONS MARKETING POTENTIAL

Edited by

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The monograph is devoted to the solution of scientific and applied problems of the development of scientific and applied positions of the marketing innovations research of the mechanism to form the marketing potential of the most promising innovations by machine-building enterprises. It is proved that within the marketing information systems the concept and methodology of functioning of market innovations research require the development, which covers the entire innovation cycle. It is shown that the development of the theoretical foundation of the formation of the marketing potential of innovation engineering in terms of the growth of entrepreneurial risks is becoming the main source of economic activities efficiency increase.

For scientists, lecturers and students of higher educational institutions.

# CONTENTS

# INTRODUCTION

The economic situation in the country makes more actual the necessity to enhance the competitiveness of the machine-building enterprises, which can be achieved through innovation activity. In turn, the validity of the innovative strategies of machine-building enterprises is impossible without a systematic approach to marketing research.

The monograph provides the solution of fundamental and applied problems of the development of scientific and applied the provisions of the marketing research innovations of the mechanism of the formation of the marketing potential of the most promising innovation machine-building enterprises. Relevance of the selected topics is in the absence of a systemic approach to innovation market research to identify the most promising innovation machine-building enterprises, their implementation and promotion on the market in new conditions of growth of entrepreneurial risks in post-industrial economy. The growth of these risks contributes to the trends of globalization, informatization, and social shifts. Therefore, if the marketing information systems were identified as mechanisms for the collection, analysis, processing and storage of information, in terms of the free movement of goods, finance, personnel, information that is not enough.

Within marketing information systems it is necessary to develop the concept and methodology of functioning market innovations research, which covers the entire innovation cycle. Innovation activity is intrinsically connected with the commercialization of the results of scientific research, so a special marketing research of machine-building enterprises is conducted throughout the innovation cycle.

The need to develop the theoretical foundation for the mechanism of the formation of the marketing potential of machine-building innovation in terms of the growth of entrepreneurial risks identified the choice of topic, purpose, objectives, logic, directions of research and the structure of the monorgaph.

Selected studies are associated with the theme of research work of the Department for Marketing of Odessa National Polytechnic University «Forming

marketing potential of innovation engineering in terms of increasing the riskiness of the market environment» (registration number 0115U000409).

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<p style="text-align:center">SECTION 1</p>

<p style="text-align:center">THE CONCEPT AND METHODOLOGY  OF MARKETING RESEARCH OF MACHINE-BUILDING ENTERPRISES INNOVATIONS</p>

### 1.1. The concept of marketing research of innovation

There is a low innovation activity of enterprises in the engineering industry of Ukraine. The average level of wearout is 68.4%, the share of export products is about 30%, and the import is 70%. Therefore, the industry is import-dependent. Herewith the substantial share of spending on scientific and scientific-technical work in the field of technical sciences is spent for the purchase of machinery and equipment (about 70%). Costs of innovative activity also in most aimed at the acquisition of machinery and equipment in the sub-branch of mechanical engineering production of electric, electronic and optical equipment, and manufacture of vehicles and equipment, "observed the significant costs of non-technologic innovation (organisational and marketing), which do not affect the performance indicators of innovative activity.

Modern sector science, judging by the number of received security documents, is effective. However, the manufacturing sector is not observed at the appropriate level of implementation of scientific products and its transformation into innovative knowledge-intensive products. Most Ukrainian companies prefer buying ready machines, mechanisms and equipment of foreign manufacturers, and don`t direct the financial resources for research. Research sector of innovative complex of Ukraine economy runs almost idle and production is with critically low indexes of knowledge-intensive products and the share of innovative products. Therefor the need for balancing the demand for scientific products manufacturing sector and its proposals to the sector is substantial. To identify research that claimed a manufacturing sector, enterprises should implement a system of marketing research.

Marketing research has two aspects: strategic and functional. Marketing research innovation machine-building enterprises by strategic aspect related to the determination of the direction of innovation, ways to increase the competitiveness of

innovative goods, and the functional aspect is the definition of the information needed to solve the problem; gathering, analyzing, and interpretating data for decision making.

In classical literature marketing research is a discrete mechanism. However, in the engineering industry, which is leading the industry with technical re-equipment, the share of which in the volume of industrial production in the developed countries reaches 50-70% market research innovation should be carried out systematically.

The system of marketing research of machine-building enterprise innovation is proposed (fig. 1.1).
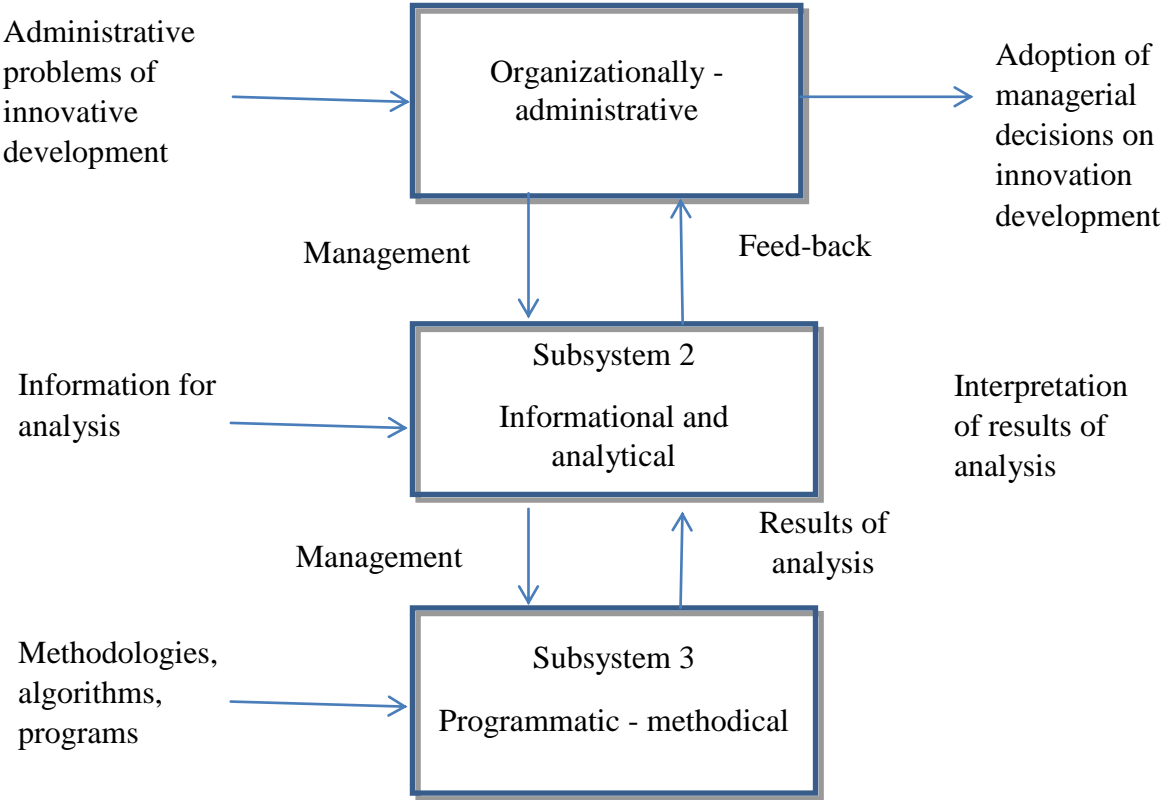
Figure 1.1 – System of marketing research of innovation

Marketing research system of machine-building enterprise innovation is a set of three subsystems: organizational management, information-analytical and program-methodical for definition, collection, analysis, interpretation and use of the information on the factors the marketing environment, which is based on a complex of procedures, techniques, methods, applications to define the strategy of innovative

development of the innovation and competitiveness of the products, reduce the risks of innovation.

Organizational and management subsystem consists of a unit in the Marketing Department of the enterprise, which maintains close relations with responsible for innovation and investment activity units, and for which the results of marketing research of innovation is the basis for management decision-making. Each of these subdivisions has a managerial problem to determine directions of innovation or the cost of innovation. These problems are the input stream for the organizational and management subsystem, thus forming a list of tasks for marketing research.

Within the information-analytical subsystems according to the management of the problem the marketing research problem is formed; information needed and methods of getting are determined; responsibility for the organization and control of marketing research, as well as the methods and scope of sampling, design research, methods of his conducting, methods of information analysis. Therefore, management problem gives rise to the problem of marketing research. If the management problem is formulated as question: what to do to the person who makes the decision, the problem of marketing research answers the questions: what information do you need to gather in order to resolve the management problem. In addition to the incoming stream of information on organizational and management subsystem, information-analytical system receives information for the analysis of other sources. This can be a secondary information, and information that is obtained for the first time to solve the problem of marketing research. Approaches to solving marketing tasks formed a package developed by marketing research marketing research package: prospects for innovation; a package of marketing research of innovation of the product, the package of research the marketing potential of innovation.

Within the program-methodical subsystems analysis and interpretation of the information obtained to resolve the problem of marketing research is perform. The selected direction research on the relevant package of marketing research marketing research method is selected. For each of the methods of marketing research methods, algorithms and software are available. Results of the analysis are transferred in a group decision-making, which is formed of representatives of innovative and

investment units. According to the results of the given information, organizational and management subsystem makes decision on the innovative development of machine-building enterprise.

Table of functions and the expected results of each of the subsystems is presented (tab. 1.1).

Table 1.1 – Functions and expected results of the activities of the components of the system of market research innovation

| Subsystem | The function of the activity | The results of activities |
|---|---|---|
| organizational and management | to organize the collection of information on issues of innovation activity and innovation development in need of marketing research | formulation of the management problems with innovation and transformation in the marketing research problem |
| information-analytical | to determine the directions of research, their design and methods, to gather the necessary data | detailing the stages of research, terms, the value of the sample size and sampling process |
| program-methodical | analyze collected information for a particular algorithm or method on a specific software | a comprehensive analysis of information for a specific algorithm or technique and interpretation of results of the analysis |

Therefore, a chain of interaction between components of a system of marketing research innovation is formed (fig. 1.2).
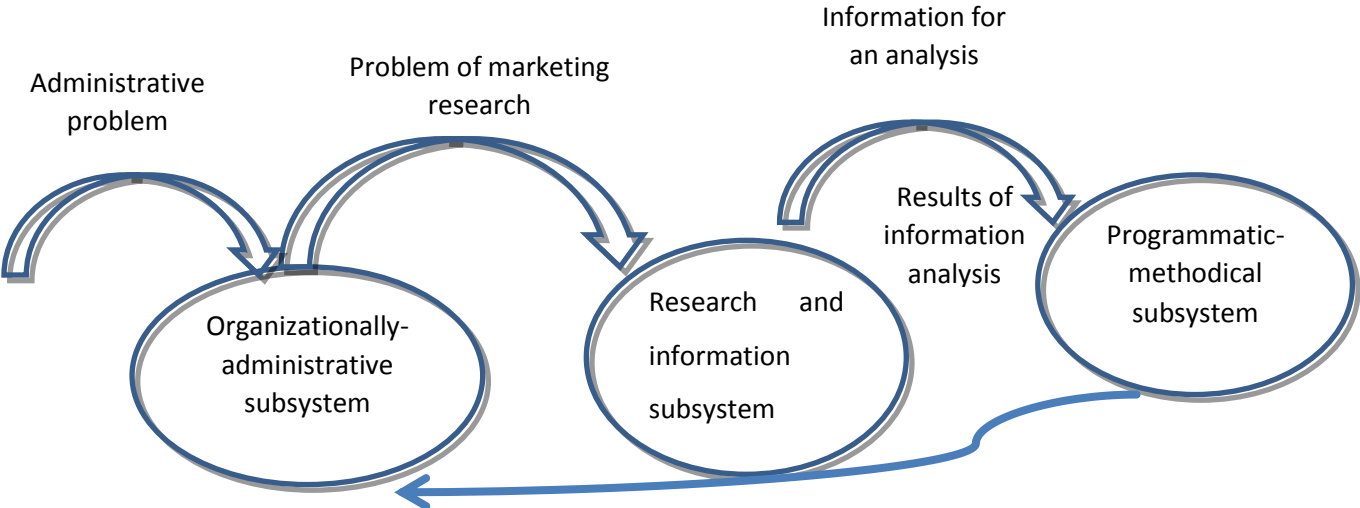


Picture 1.2 – Chain of interaction between components of a system of marketing research innovation

For the combination of information flows that come from innovation and investment units and for carrying out market research in relevant areas in the sector

analysis of marketing environment of the marketing department is formed by a group of marketing research innovation (fig. 1.3).

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                    ┌──────────────────┐
                    │ Head of marketing│
                    │    department    │
                    └──────────────────┘
     ┌──────────────────┬──────────────┬──────────────────┐
     ▼                  ▼              ▼                  ▼
┌─────────────┐  ┌─────────────┐  ┌──────────┐  ┌─────────────┐
│Sector analysis│ │  Sector of  │  │  Sales   │  │  Sector of  │
│of the marketing│ │commodity-price│ │  sector  │  │communicative│
│ environment │  │  politics   │  │          │  │  politics   │
└─────────────┘  └─────────────┘  └──────────┘  └─────────────┘
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┌─────────────┐
│  Group of   │
│  marketing  │
│researches of│
│ innovations │
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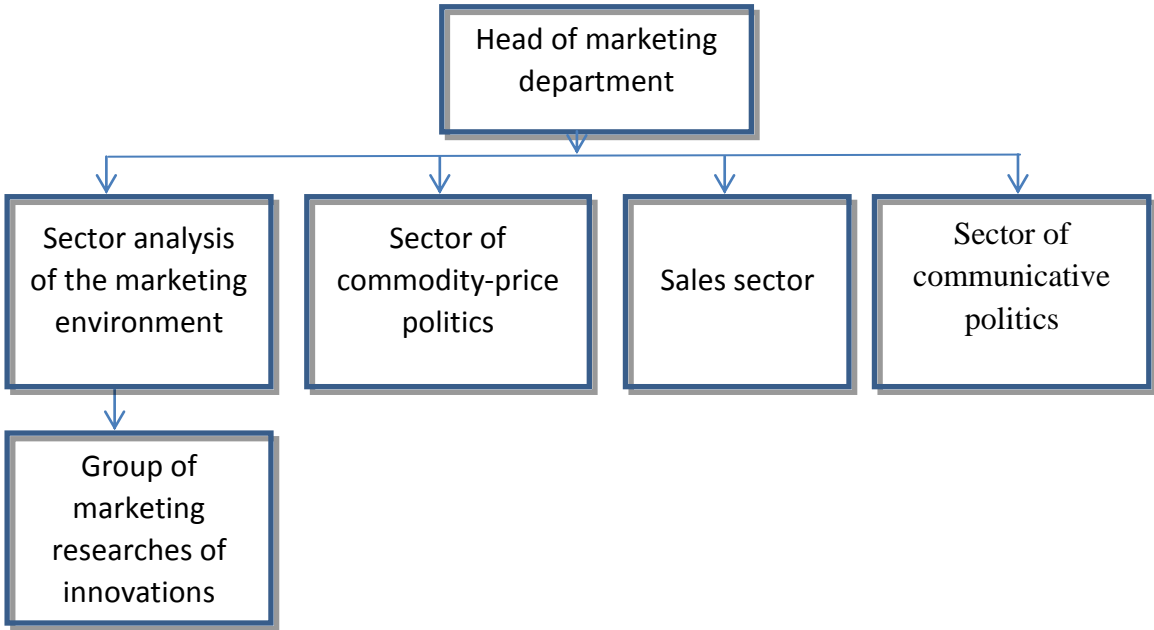
Picture 1 3 – The typical organizational structure of marketing

Group marketing research innovation is responsible for the organization and management of the system of market research innovation. It is subordinated to the Head of sector of analysis of marketing environment, Marketing Department, but has close links with other departments of the company, dealing with investment and innovative activity (fig. 1.4).
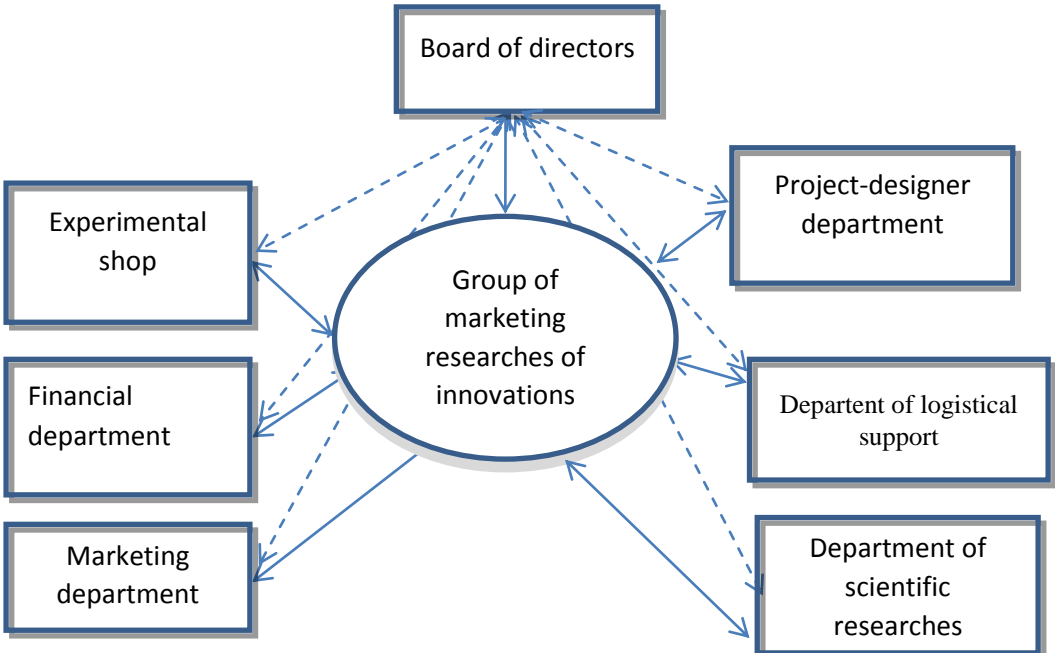


Figure 1.4 – The scheme of interaction of the Group market research innovation with other structural units of the machine-building enterprise

Division of research monitors the market of fundamental and applied scientific research in the engineering industry, identifies the areas of priority research, carries out scientific research or ordering them in other institutions. This Department is present only on industrial giants, because its activity is associated with significant investments.

Marketing Research Group innovations works with the Department of scientific research (if available) for the following main directions:

– assessment of the prospects of scientific research;

– selection of the optimal scientific subjects.

Design Department carries out the work on the development of prototypes of technologies and products from their ordeal, with technical research, monitoring of innovative technologies and products. The Department's work also requires considerable investment.

Group marketing research innovation collaborates with design and Engineering Department (if any) in the following areas:

– assessment of the period of the introduction of new technology in production;

– assessment of risks related to its implementation;

– assessment of the potential of innovative product;

– assessment of the potential of innovative products;

– monitoring of the market of innovative technologies and innovative products.

Planning and financial department gets from the Group market research innovation results of such research, including the amount of investment in innovative activities.

The Marketing Department takes into account the results of the work of the Group market research innovation in determining the prospects and plans of activity.

The Board of Directors, as the highest administrative authority takes a decision on the strategy and tactics of innovation development of machine-building enterprise, based on the results of the work of the Group market research innovation and customer marketing research with strategic directions of innovation (fig. 1.5).
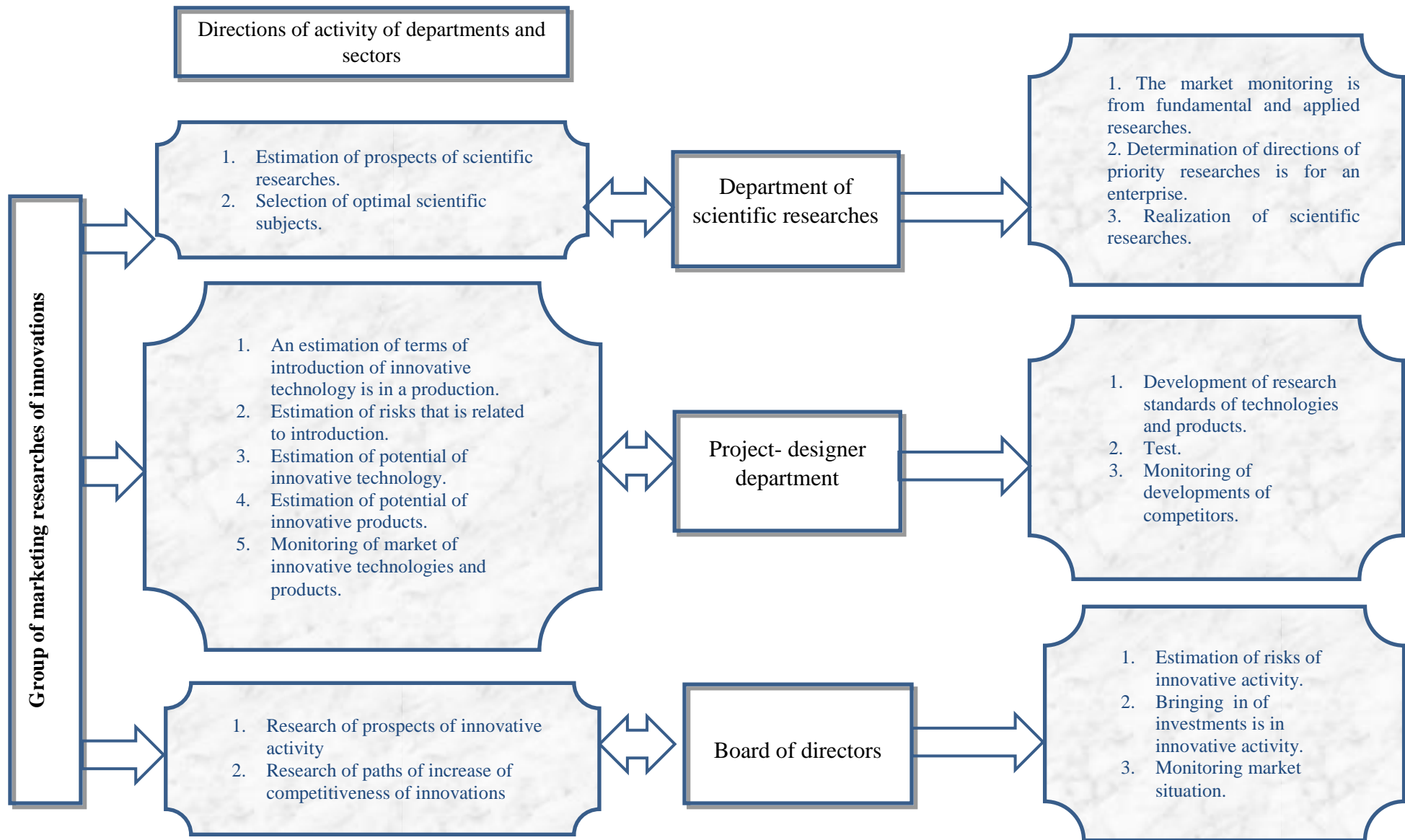
Figure 1.5 – The scheme of interaction of the Group market research innovation with innovative enterprise units

It is clear that in terms of the loss of activity of a large number of machine-building enterprises of the country following the structure of the partnership with the Division of the market research innovation cannot be produced totally. Therefore, the proposed typology of the innovative structure of the enterprises of machine-building industry by the presence in them of scientific and innovation units. Such structures propose to allocate three (table 1.2):

Table 1.2-Tipology innovative structures of the machine-building enterprises

| An innovative structure | Innovative structural subdivisions | The characteristic of innovation | Innovation focus | Scientific focus |
|---|---|---|---|---|
| innovation-full | 1) group marketing research innovation 2) sector research | the company actively develops and implements innovative products, uses advanced scientific research | very high, the company develops and implements the first technological innovation | very high, the company is developing, procuring and implementing technologies that are based on advanced scientific research |
| innovation-a sufficient | Group marketing research innovation | the company conducts r & d in other organizations, buys the license and implements innovative technologies buys machinery and equipment | high enough venture aimed primarily at the introduction of technological innovation | on average, the company does not engage in permanent scientific research |
| Pseudo-innovative | Group marketing research innovation in the structure of the marketing department is engaged in purely research the marketing potential of innovative products | the company provides first netehnological innovation | low, non-technologic innovation in the engineering industry are low-effective | very low, the company is not engaged in scientific developments, but only "takes over" marketing and organisational innovations competition |

Innovation-full structure is characterized by a group of marketing research innovation in the structure of the Department of marketing and departments of scientific research . This structure is characterized by large-businesses that are able to conduct and fund R & D;

Innovation-sufficient structure contains a group of marketing research innovation in the structure of the marketing department. This structure is as large-businesses that are not conducting independent R & D, and the average income of innovation-active companies. These businesses usually bought research or buy the necessary knowledge, technology, machinery and equipment;

Pseudo-innocative structure contains marketing group marketing research innovations, the activity of which is directed on non-technological innovation. On the enterprise, as a rule, do not conduct research and are not buying their results is not considered the possibility of purchasing licenses for innovative technologies, not purchased machinery and equipment. Innovative activities of such enterprises are aimed at the implementation of non-technological innovations (organizational and marketing). The results of correlation analysis of the obtained quantitative confirmation of the fact that the cost of technological innovation in industry production machines and equipment "the greatest influence on indicators of the effectiveness of innovative activity. The increase in these costs year by year has allowed the industry to take a leadership position in all indicators of innovative activity among other sectors of the domestic mechanical engineering. Therefore, we believe that innovation-the complete structure of the machine-building enterprises should include R & D department.

Consider the information-analytical system subsystem market research innovation. We offer the unhierarchical structure of the subsystem, which consists of four components (fig. 1.6).

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┌─────────────────────────┐      ┌─────────────────────────┐
│ Subsystem of marketing  │      │ Subsystem of researches │
│ researches of prospects │ <──> │ of marketing potential  │
│ of innovative activity  │      │ of innovations          │
└─────────────────────────┘      └─────────────────────────┘
          ↕              ╳                   ↕
┌─────────────────────────┐      ┌─────────────────────────┐
│ Subsystem of marketing  │      │ Subsystem of marketing  │
│ researches of innovative│ <──> │ researches of future    │
│ product                 │      │ innovative technologies │
└─────────────────────────┘      └─────────────────────────┘
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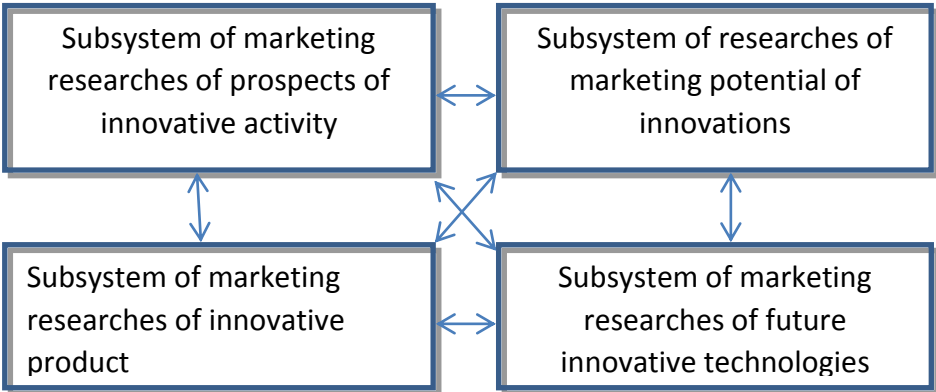
Figure 1.6 – Structure of information-analytical subsystems of a system of marketing research innovation

Marketing research innovations in machine-building enterprise have three objectives: research perspectives, innovation, research, product innovation, research, the marketing potential of innovation.

Group marketing research innovation is conducting yourself or orders in research agencies research perspectives of innovation activity on the following directions:

– fundamental research;

– marketing research for future innovative technologies;

– research market conditions;

– the study of business trends;

– study of the external business environment;

– a forward-looking study.

First of all, conducted fundamental research is the study of market patterns and trends, macroeconomic. Method of conduct is cabinet. the information on which is based the following research is secondary. Going to have statistical information in terms of the economy as a whole, the market of enterprise, sector/industry and analyzed by the following methods: traditional analysis; case - study ; economic-mathematical analysis; modelling; analysis of analogies. Source information is macroeconomic and industry-specific patterns and predictions. Consumers of relevant information are:

– R & D department, which on the ground identified patterns and predictions determines the need for research and development;

– Design Department, which based on the results of basic research, reveals the perspective of purchasing and sale of technologies;

– Directorate and Marketing Department of the company  take into account the results of basic research to identify innovative strategies and risks of investment.

For determining the prospects for the development of innovative products group marketing research innovation conducts market research for future innovative technologies is the definition of targeted research and development, which could be soon developed and/or implemented by the company. The method of conduct is

expert assessments. Experts are scientific and technical research and engineering departments, which provide information on promising R & D, which can be made at the enterprise, sales staff, who may assess the prospects for the sale of innovative products, planning and finance department, which provide an assessment on the possibilities of financing separate stages of scientific research, implementation and exit the market with new products. Consumers research is all the departments, which are the experts, as well as the management of the enterprise and marketing department. The results of the research potential of the innovation activity are determined by the most promising scientific and technical development and innovation development strategy/enterprise.

For more information about the market in addition to the basic research conducted by the research market is the study of the basic characteristics of the market for the manufacturers of the product, its assortment, the dynamics of sales, price diferenciation, methods of promotion and distribution. The research is conducted using the armchair and field methods (observation, survey). The information is obtained and used in most cases is primary. Research may be carried out by the forces of group marketing research of innovation of the enterprise in case of a narrow range of products, a small number of competitors, the open information about the dynamics of the sales. In other cases, such studies are ordered in the marketing research agencies. Consumers are all units that are directly in contact with the Group market research innovation.

To obtain reliable predictions on the prospects of innovative development group marketing research innovation study of business trends is the study of the main trends in the development of  business and the markets in terms of enterprises, sectors, industries. Are such studies in the secondary and primary information received both from the data of the business editions and performance of the enterprise, and with observational data, and surveys. The methods of conducting is armchair methods, expert evaluation, observation, survey. Consumers results of all divisions, which are directly in contact with the sector of market research innovation.

For a more thorough definition of the strategy of innovation development carried out a study of the external business environment is the analysis of macro-and micromarketing environments in terms of promoting innovation. Such studies are based on primary and secondary information. Studies are held by the cabinet and field methods. The input information is data about factors in the marketing environment. The result of the study is to identify the threats and opportunities of directions of innovation activity. Consumers are all units that are directly in contact with the Group market research innovation.

Based on the results of previous research, to produce quantitative indicators of innovation development prospects group marketing research innovation are forward-looking research is the application of methods of economic-mathematical, statistical and simulation modeling for obtaining forecasts of development of market indexes (dynamics of demand and supply of innovative products, forecasting sales of innovative products). Consumers have all the structural subdivisions of the innovation activity of enterprises.

Types of marketing research perspectives, innovation, inbound and outbound information, methods of research, consumer research collectively call service market research perspectives of innovation activity of machine-building enterprise (tab. 1.3).

The availability of innovative product (technology) group marketing research innovation conducts market research for product innovation in the following areas:

– research prospects to market with new technology;

– the research competitiveness of new technologies;

– study the terms development and implementation of innovative technologies;

– research of potential markets.

Research prospects to market with new technology is done using expert assessments as specialists-developers of innovative product and sales professionals and investment. The specialists of the design department provide information about the terms of the development and implementation of innovative technologies, the predicted output of innovative products, competitive advantage of innovative technologies.

Table 1.3-Pack of marketing research prospects for innovation-building enterprise

| Research | Input information | Source information | Methods of conducting | Consumers |
|---|---|---|---|---|
| fundamental research | information about the main macroeconomic trends, indicators and subfields, the characteristics of the markets | macroeconomic and branch patterns and predictions | desk research | -Scientific-Research Department; -Design Department; Directorate of the company; -Marketing Department |
| marketing research for future innovative technologies | information on promising R & D; the prospects for the sale of innovative products; the prospects of transfer of innovative technologies; financing stages of scientific research | the most promising scientific and technical development | expert assessments | |
| research the market | the main characteristics of the market for the manufacturers of the product, its assortment, the dynamics of sales, price diferenciation, methods of promotion and marketing | evaluation of competitors; evaluation of markets; assessment of the product range; assessment to determine the optimal prices for the products and methods of its promotion | desk research, observation, survey | Directorate of the company; - Design Department; -Marketing Department |
| the study of business trends | the main trends in the development of business and the markets in terms of businesses, industries, sectors | patterns and forecasts of the development of enterprises, industries and sectors | desk research, expert evaluation, observation, survey | -Scientific-Research Department; -Design department; Directorate of the company; -Marketing Department |
| a study of the external business environment | data on factors of macro-and micromarketing environment of the enterprise | identifying threats and opportunities of different directions of innovation activity | desk research, observation, survey | |
| Predictive research | factors of marketing environment enterprise, industry, the characteristics of the market | quantitative perspectives of innovative development of enterprise | methods of economic-mathematical, statistical and simulation | |

Specialists of the Planning and Finance Department provide an assessment of the risks of introduction of innovative technologies in the production, estimate volume of investment in the development and implementation, forecast sales and profits of the company. The result is an assessment of the prospects of development, introduction, transfer and exploitation of modern technology that are necessary for the definition of innovation strategy of the enterprise. Consumers are all innovative divisions.

After assessing the market potential of innovative technology survey of its competitiveness. There are a few tools to determine the competitiveness of the goods:

−the calculation of the integral product competitiveness index, which consists of individual indexes and weight coefficients;

−evaluation of the competitiveness of the goods using the polygon competitiveness;

−estimation of position of goods among analogues using multidimensional škalûvannâ.

All methods of an estimation of competitiveness are mostly based on expert assessments. Experts must be not only experts and technical department, but also employees of the Marketing Department, and future consumers innovative technology, if it was developed not only for life, but also for sale. The result of the research competitiveness of new technologies is the assessment of its technical and price parameters in comparison with competitors. Consumers research are all innovative units-building enterprise.

In that case, when the research prospects to market with new technology yielded positive results and the assessment of the competitiveness of the new technology is high, group marketing research innovation survey of terms of development and implementation of innovative technology. This detailed and thorough research for specific terms of development and implementation, as well as their financial support. Incoming information providing project Technical Department (developer) and Planning-financial Department (Investor). The consumer

is the management of the enterprise, which also makes decision on expediency of the further work.

In the presence of innovative technology or its project conducted a study of potential markets. The input information is information about the competitive environment, market share of competitors, market potential, as well as expert assessments on future sales volumes. Consumers are innovative units, which solve financial issues for innovative technologies, Marketing Department, management of the enterprise.

Types of marketing research of the innovative product, incoming and outgoing information, methods of research, consumer research  collectively call service market research product innovation of machine-building enterprise (tab. 1 .4).

A study of the marketing potential of innovation conducts group marketing research innovation in the case of the introduction of innovative product (technology). Directions of such studies related to the development of the marketing of innovative products and the definition of target market segments. These include the following areas:

– research of the product;

– research prices;

– research of distribution;

– research promotion;

– research for the segmentation of the market;

– research of the domestic business environment;

– applied research.

Product research is a marketing research aimed at defining the concept of product novelty, its characteristics, the name, packaging, service. The input information is provided design and technical department, the Department of marketing and obtained as a result of qualitative and quantitative research product news.

Table 1.4-Pack of marketing research product innovation of machine-building enterprises

| Research | Input information | Source information | Methods of conducting | Consumers |
|---|---|---|---|---|
| Research prospects to market with new technology | the timing of the development and implementation of innovative technology, the benefits of innovative technology on manufacturers; perspectives of transfer of technology; the volume of investments | agregated assessment of prospects for the development, introduction, transfer and exploitation of modern technology | expert assessments | -Scientific-Research Department; -Design Department; -Patent and Licensing Department; -Management of the enterprise; -Marketing Department |
| a study of the competitiveness of the new technology | specifications, pricing and investment characteristics of new technology | assessment of technical and price parameters of new technology in comparison with competitors | expert assessments | |
| the term research development and implementation of innovative technologies | Information from the research-technical Department (the developer) and innovative investment Division (Investor) | estimation of the timing of development and implementation, and evaluation of investment at each stage of the | expert assessments | -management of the enterprise |
| research potential markets | information about the competitive environment of the enterprise on the market share of players about the potential markets, estimates regarding future sales volumes | quantitative assessment of the predicted lower sales in different markets with estimates of risks | desk research, expert assessments | -Marketing Department; -management of the enterprise |

The existing instruments, which allow to optimize commodity characteristics: focus group projective methodology, survey of consumers, expert surveys, experiments. Consumers are the first marketing department, as well as innovative-investment Department, management of the enterprise.

Research prices is the definition of the optimal prices for the product, which takes into account potential demand, price competition, consumer value. The input information is provided by the Department of marketing and obtained as a result of marketing research. Methods of market multi-aspect research price are desk research, surveys, surveillance, economic-mathematical and simulation. The consumer is the Marketing Department, innovation-investment Department, management of the enterprise.

Sales research is determining the optimal method of marketing a product-updates, and research channels of distribution of innovative products. The input information is provided by the Department of marketing. Methods of marketing research marketing is economic-mathematical modeling, estimation of future sales, risk assessment of demand for products, evaluation of potential sales channels. The consumer is the Marketing Department, innovation-investment Department, management of the enterprise.

Research promotion is the choice of optimum complex promotion of innovative products, as well as determining the budget and schedule. The input information is provided by the Department of marketing, as well as obtained in the result of independent studies of the market research sector. Methods of marketing research promotion – research studies, focus groups, observation, survey. The consumer is the Marketing Department, innovation-investment Department, management of the enterprise.

Research for market segmentation is the Division of the market of potential consumers of innovative products, defining target segments and forecast lower sales in each of them. Input the information obtained from statistical collections acquired in research organizations, is provided by the Department of marketing or obtained the results of special investigations, which are conducted by a group of marketing

research. Research methods: laboratory researches, surveys, observation. The research results are the input information for the Marketing Department, and enterprise management are also provided for the identification of strategic markets and segments.

Research of the domestic business environment is a technological, investment, labour, management potential of the company regarding the release of innovative products. These studies are the aggregate result of all previous. The input information is provided to a group of marketing research of innovation of all innovative units-building enterprise. Using a Cabinet study calculated quantitative indicators, which characterize the effectiveness and efficiency of the release of new products. Consumer of such research is, first of all, the leadership of the company.

Applied research is research to meet the needs of enterprise in information needed for decision making. Following the concept of product innovation marketing research does not cover all the needs of the enterprise. Therefore, all other studies where necessary and aimed at improving the goods news, called the application.

Types of marketing research of innovative products, incoming and outgoing information, methods of research, consumer research are collectively call service research marketing potential of innovation-building enterprises (table 1.5).

Table 1.5- Pack of research marketing potential innovation machine-building enterprise (pack of research of innovative products)

| Research | Input information | Source information | Methods of conducting | Consumers |
|---|---|---|---|---|
| study of goods | provided design and Technical Department of Marketing Department (sector commodity-price policy) | the definition of the concept of product novelty, its characteristics, the name, packaging, service | focus groups, project techniques, survey of consumers, expert surveys and experiments | -Marketing Department; -Management of the company |
| Research prices | is provided by the Department of marketing (sector commodity-price policy) and obtained as a result of marketing research | determining the optimal prices for the product, which takes into account potential demand, price competition, consumer value the product | desk research, surveys, surveillance, economic-mathematical and simulation | |

| | | determining the optimal method of sales of goods-new distribution channels, innovative research products | economic-mathematical modeling, estimation of future sales, risk assessment, assessment of potential sales channels | |
|---|---|---|---|---|
| sales research | is provided by the Department of marketing (sales sector) | | | |
| research promotion | is provided by the Department of marketing (the communicative policy) | selection of optimum complex promotion of innovative products, determining the budget and schedule promotion | the research studies, focus groups, observation and survey | |
| research for market segmentation | obtained from statistical collections acquired in research organizations, is provided by the Department of marketing | market segmentation of potential consumers of innovative products, identifying target segments and forecast lower sales in each of the segments | the research studies, surveys, surveillance | -Marketing Department; -Management of the company |
| Research of the domestic business environment | given all the innovative units-building enterprise | Research of the technological, investment, labour, management potential of the company regarding the release of innovative products | the research study | -Management of the company |
| applied research | all other studies of innovative products, which are needed in the enterprise | | | |

Thus, the system of marketing research innovation covers the entire innovation process. Linking the stages of the innovation process with market research innovation and typology innovative structures of the machine-building enterprises will get the scheme of their interaction (fig. 1.8).
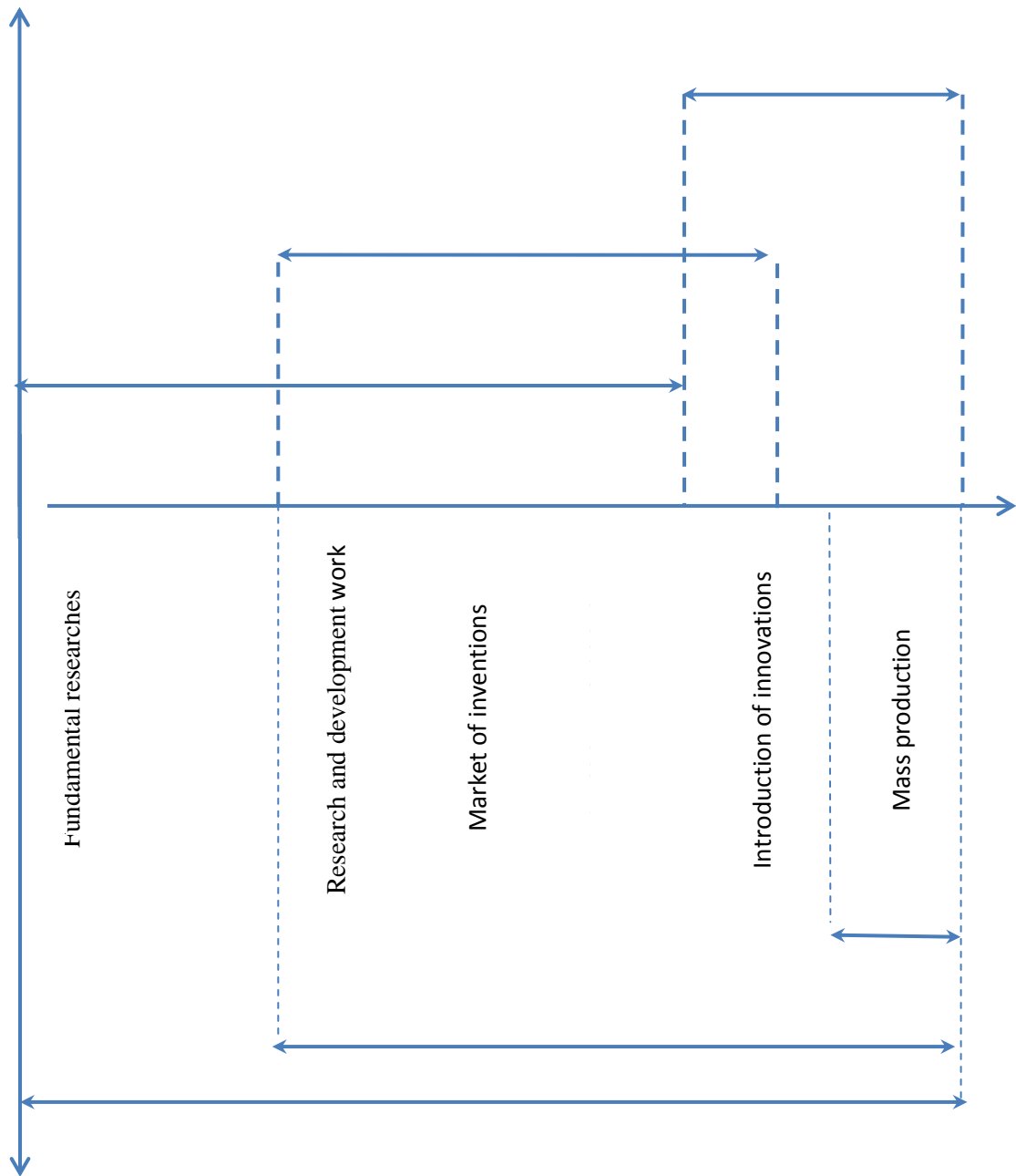
Figure 1.8 – Communication scheme of innovative structures with directions of marketing researches innovation in machine-building enterprises

The criterion of efficiency of functioning of the system of market research innovation in the enterprise is the impact of scientific research and innovation.

The proposed complex criteria and indicators of innovation system of the effect of market research innovation machine-building enterprise, which are listed in the table. 1.6.

Table 1.6-Complex criteria and indicators of innovation system of the effect of market research innovation machine-building enterprise

| The innovative structure of the company | The criterion of efficiency of functioning of | Indicators of innovation effect/cost effectiveness |
|---|---|---|
| innovation-full | the increase in the volume of sales of innovative products (goods) and innovation (technology), which is the result of R & D in the enterprise | 1. The number of R & D performed by the results of marketing research of innovation conducted by the relevant group ($a_{\& D}$). <br> 2. Number of embedded in the enterprise for innovative technologies (machines, equipment, devices, technological processes), which were developed based on the results of marketing research of innovation ($O_{Innovative\ technology} = O_{tehnol.\ processes} + O_{machines} + O_{equipment} + O_{device}$). <br> 3. Number of mastered in the production of innovative products, which are produced by innovative technologies, machines, apparatus or devices, developed by results of marketing research of innovation ($O_{Inn\ products}$). <br> 4. The volume of technology transfer ($O_{transfer}$). <br> 5. The volume of implemented innovative products ($O_{goods}$) that are produced for the technologies developed as a result of market research innovation ($O_{Innovative\ sales.\ products}$). |
| innovation-sufficient | the increase in the volume of sales of innovative products (goods) | 1. The number of embedded in the enterprise for innovative technologies (machines, equipment, devices, technological processes), which were purchased by the results of marketing research of innovation ($O_{Innovative\ technology} = O_{tehnol.\ processes} + O_{machines} + O_{equipment} + O_{device}$). <br> 2. Number of mastered in the production of innovative products, which are produced by innovative technologies, machines, apparatus or devices purchased by results of marketing research of innovation ($O_{Innovative\ products.}$). <br> 3. The volume of implemented innovative products (goods) that are produced for the technologies developed as a result of market research innovation ($O_{Innovative\ sales.\ products}$). |
| Pseudo-innovative | the increase in sales volume of standard products, which took place at the expense of marketing or organizational innovation | Volumes implemented innovative products (goods) |

Criteria of efficiency of functioning of the system of marketing research of innovation will vary for different innovation structures of machine-building enterprise.

In the case of innovation and complete organizational structure offer the criterion of efficiency of functioning of the system of marketing research to consider increasing the amount of selling innovative products (goods) and innovation (technology), which is the result of R & D at the company. Group marketing research

innovation research reveals which are the most promising for the enterprise, explores the market in terms of the competitiveness of innovative technologies and products, which will be her received, explores the market potential of innovative technologies and innovative products, doing research on market segmentation and determination of the optimal marketing mix. Therefore, if the increased sales of innovative products and the transfer of innovative technologies, it is logical to assume that the system of marketing research innovation is functioning effectively.

In the case of innovation and adequate organizational structure criterion of efficiency of functioning of the system of marketing research innovations are encouraged to consider increasing the amount of selling innovative products (goods), which produced innovative machines, equipment and technologies, which acquired the results of marketing research of innovation. Group marketing research innovation in the enterprise explores the prospects acquiring innovative technologies, machines and equipment, the prospects of entering the market with innovative products, which are produced by the acquired technologies or purchased machines or equipment, explores the market segments, the competitiveness of innovative products, explores the marketing tools of promotion of innovation on the market. Therefore, when increasing sales of innovative products believe that marketing research system of innovation is functioning effectively.

In the case of pseudo-innovative the organizational structure the criterion of efficiency of functioning of the system of marketing research are encouraged to consider increasing the sale of standard products, which took place at the expense of marketing or organizational innovation. With such a structure of the enterprise is engaged in only netehnological innovations, manufactures innovative products and do not buy innovative technologies, machines and equipment. Group marketing research innovation in the enterprise explores the perspectives of organizational innovation in terms of increased output, or reduce production costs and determines the optimal marketing tools promoting products on the market. Therefore, the increase of the sales volume of standard products of enterprises believe that the system of marketing research innovation is functioning effectively.

It is important to assess the functioning of the system of market research innovation in the enterprise by using the indicators of economic effect or cost effectiveness. Economic efficiency is always the ratio of useful results to costs. In the economic literature developed a system of indicators of economic efficiency of innovative activity. All quantitative evaluations of economic efficiency of innovative projects are divided into two groups:

a) indicators that are based on the accounting estimates (do not take into account the factor of time). They include: period of recoupment (PP), the discount rate of profitability (ARR), economic value added (EVA);

b) indicators that are based on the discounted estimates (take into account the time factor, which used the procedure of discounting). They include: net present value (NPV), profitability index (PI), internal rate of return (IRR), discounted payback period (DPP), net terminal value (NTV).

The costs of marketing research innovations are part of the cost of innovative activity, so they are taken into account in terms of economic efficiency of innovative activity. Separately calculate the relative index of useful results from developed or implemented innovative products the costs of marketing research of innovation, on which these products were obtained, it is difficult, because the indices of productivity innovation characterize the work of many departments. Also it is difficult to predict, for example, when beginning work on scientific research will give economic result.

In addition to the economic effect it is important to assess the innovation effect of the system of marketing research at the company. The proposed indicators of the innovation effect of the system of market research in enterprise to distinguish different organizational innovative structures.

In the case of innovation and complete organizational structure indicators innovation effect of the system of market research on the enterprise offered to consider the following:

− the number of R & D performed by the results of marketing research of innovation conducted by the relevant group ($O_{R\ \&\ D}$);

−the number embedded in the enterprise for innovative technologies (machines, equipment, devices, technological processes), which were developed based on the results of marketing research of innovation ($O_{Inn.\ technology} = O_{tehnol.\ processes} + O_{machines} + O_{equipment} + O_{devices}$);

−the amount of mastered in the production of innovative products, which are produced by innovative technologies, machines, apparatus or devices, developed by results of marketing research of innovation ($O_{Inn.\ goods}$);

−the volume of technology transfer ($O_{transfer}$);

−volumes implemented innovative products (goods) that are produced for the technologies developed as a result of market research innovation ($O_{Inn\ sales.\ of\ products}$).

In the case of innovation and adequate organizational structure indicators innovation effect of the system of marketing research in the enterprise does not take into account the scientific component of innovation:

−the number embedded in the enterprise for innovative technologies (machines, equipment, devices, technological processes), which were purchased by the results of marketing research of innovation ($O_{Inn.\ technology} = O_{tehnol.\ processes} + O_{machines} + O_{equipment} + O_{devices}$);

−the amount of mastered in the production of innovative products, which are produced by innovative technologies, machines, apparatus or devices purchased by results of marketing research of innovation ($O_{Inn.\ goods}$);

−volumes implemented innovative products (goods) that are produced for the technologies developed as a result of marketing research of innovation ($O_{Inn\ sales.\ of\ products}$).

In the case of pseudo-innovative organizational structure parameters of efficiency of functioning of the system of market research innovation in the enterprise not affiliated with the launch of innovative products. Therefore, the indicator of the innovation effect of the system of market research innovation can be considered the increase of the sales volume of standard products, which took place at the expense of marketing innovation.

Economic efficiency of implementation of innovative technologies on the results of market research will be described and received in the fifth chapter of the thesis.

Classic marketing research stress the following principles of:

− systematization: logics, consistency, frequency of the conduct;

− comprehensiveness: consideration and analysis of all the elements and factors in their relationship and dynamics;

− tenacity: focus on solving urgent, well-defined, pure marketing problems;

− objectivity: independence from the judgmental and impacts;

− reliability: informational and methodological support, the accuracy of the received data;

− economy: excess benefit from realization of the obtained conclusions and recommendations over the costs associated with conducting the marketing researches;

− results: the presence of the intermediate and final results that will assist in solving marketing problems;

− compliance with the principles of fair competition.

Taking into account the specifics of the subject of the research, innovation is advisable to offer the following principles of marketing research of innovation development and marketing potential of innovations in machine-building enterprise:

− innovative priority: marketing researches are conducted purely for the prioritization of innovation activity;

− regularity: marketing research directions of innovation activity on an ongoing basis;

− comprehensiveness: marketing research innovation based on organizational and managerial structure, batch complex methods for each of the areas of research, information and resource handling;

− strategic focus: marketing research innovations associated with the strategy of innovative development, so there is a basis for making strategic management decisions;

− sequence: first of all it is necessary to collect and analyze secondary information on the problem, and then move on to the primary methods of obtaining information;

− accordance: each of the following marketing research in the chain (the study of secondary information → quality → research quantitative research) should confirm or refute hypotheses that are formulated according to the results of the previous research;

− complementarity: each of the following marketing research in the chain is expanding the horizons of information regarding management and marketing problems.

These guidelines are different from the classic. Other principles of marketing research, such as objectivity, accuracy, reliability and accuracy are also fair for marketing research.

1.2 Methodology of market research the prospects for innovation and innovative product

Develop the structure, logical organization, methodic and activity in the research prospects for innovation in research & innovation product group marketing research innovation marketing department.

Marketing research prospects of innovative activity is significantly important for the enterprises with any organization of innovative structure. Most of them are usually carried out by the methods of analysis of secondary information (desk research) and expert polls.

Start researching the prospects for innovation of basic research of major market patterns and trends, macroeconomic dynamics. Information for them going from existing statistical sources.

Annually Information together with Ukrainian Institute of scientific, technical and economic information (UkrINTEI) preparing analytical reference "status of science and technology, the realization of priority directions of science and

technology and the results of scientific, scientific and technical, innovation and technology transfer". In the fifth section of the analytical reference "status of innovation activity in Ukraine contains the following units by sector and sub-branch industry:

– the financing of innovation activity;

– directions of innovative expenses;

– implementation of innovative products;

– export of innovative products;

– technology transfer in Ukraine and abroad.

According to official statistics, you can conduct an analysis on the development of machine-building industry. The Group market research innovation must collect the corresponding annual and monthly information.

A study of future innovative technologies is the definition of promising research and technical developments, which may be soon implemented and/or method research potential of innovation is the expert evaluation of the research conducted in the case of innovation-full or adequate structure of machine-building enterprise (tab. 1.7).

Table 1.7 – Directions of polls in marketing research for future innovative technologies

| Experts | A question to the expert |
|---------|--------------------------|
| Innovation-full structure of the machine-building enterprise | |
| Scientists: Scientific and technical research and development departments | 1. What r & d in the long run can be made at the enterprise? 2. What are the volumes of financing and that the term is needed for the development of technology? 3. What are the volumes of financing and that the term required for its implementation? 4. What future technology has advantages over analogues (according to price and functional characteristics)? 5. What production volumes expected for the innovative technology? |
| Investors: Employees of the planning and Finance Department | 1. Assess the risks concerning the financing of the development of innovative technologies that offered academics 2. Assess the risks on the implementation of innovative technologies that offered academics 3. Assess the competitiveness of innovative technologies for the price and functional characteristics (which is planned to be purchased or offered to scholars) |

| Sale technologies employees of patent Department | 1. To which of the proposed scientists for innovative technologies, you can get a patent, in which period?<br>2. Which of the scientists proposed innovative technologies can be transferred by a transfer to the domestic enterprises?<br>3. Which of the scientists proposed innovative technologies can be transferred for service to foreign companies? |
|---|---|
| Sale of goods the employees of the Sales Department | 1. Assess the competitiveness of innovative products (commodities), will be made by innovative technology for functional and price characteristics<br>2. What sales can be expected in Ukraine?<br>3. What sales can be expected abroad? |
| Innovation-sufficient structure engineering Enterprise | |
| Investors: employees of the planning and Finance Department | 1. What innovative technology is worth a buy for the enterprise?<br>2. Assess the competitiveness of innovative technologies for the price and functional characteristics |
| Sale of goods the employees of the Sales Department | 1. Assess the competitiveness of innovative products (commodities), will be made by innovative technology for functional and price characteristics<br>2. What sales can be expected in Ukraine?<br>3. What sales can be expected abroad? |

Scientists (scientific and technical research and engineering divisions) correspond to the question as to which innovative technologies can be developed as a result of R & D, financing needed for the development and implementation of technologies that the term of the time required for the development and implementation of innovative technologies, the competitive advantages of future technologies for functional and price characteristics that predicted sales of goods manufactured by innovative technology.

Investors (employees of the Planning and Finance Department) to respond to the issue of risk assessment and implementation of innovative technologies offered by scientists or that you plan to purchase, as well as assess the potential competitiveness of innovative technologies for functional and price characteristics.

The employees of the Patent Division (technologies sales) respond to the issue of a patent on the technology and scientists offered prospects of transfer of these technologies.

The employees of the Sales department estimate future sales of goods that are produced by innovative technology, as well as provide assessments on its perspective of competitiveness for functional and price characteristics.

As a result of conducting marketing research for future innovative technologies formed the chain selection of the most promising developments (fig. 1.9).
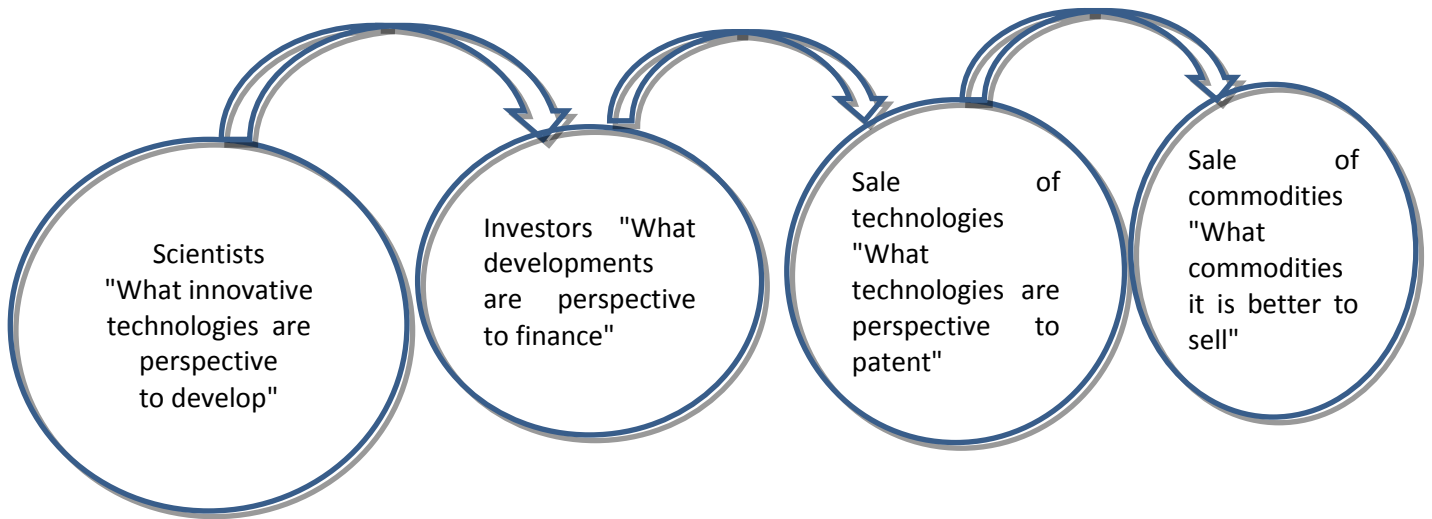
Figure 1.9 – Selection mechanism innovation in marketing research for future innovative technology of machine-building enterprises

Scientists say the technology promising to develop, investors report that technology promising funding, Patent Division, reported that the technology you can patent and subsequently sell licenses for their use, Sales Department provides information on prospects for the sale of goods received for new technologies

While conducting research for future innovative technology meets the qualitative and quantitative information from experts. Qualitative methods of obtaining expert opinions: the method Delphi, brainstorm; synectic method. They do not require the use of statistical tools for analyzing the answers of experts.

Quantitative methods of expert polls require the use of statistical tools for figuring out the consistency of their thoughts. The following methods of estimation of opinions of experts used a scale that measured their responses. In accordance with the scale can be:

− nominal is a term scheme marking where the numbers serve only as labels or tags for identifying and classifying objects;

− serial is a range scale;

− interval is when the location of the point of the beginning of the reference is not fixed, the units are chosen randomly between the values of the scale there is a constant interval;

– relative is when the location of the point of the beginning of the reference fixed. You can identify, classify, rank, and compare objects in the marketing research using a relative scale measured sales, costs, market share, number of buyers.

Consider the case when pinged one group of experts, who asked one question (tab. 1 .8).

Table 1.8 – Statistical evaluation of the results of a survey of one of the Group of experts

| # | Scale | Examples | Statistical indicators |
|---|-------|----------|------------------------|
| 1 | Nominal | Several options for new products or technologies. The experts you need to specify the number of promising option | Mode ($m_0$) |
| 2 | Range | Several options for new products or technologies. Experts need to rank them according to selected criteria: consumer value, price competitiveness | The Spirmen coefficient of correlation ($\rho$) <br> The Kendall coefficient of concordance ($W$) |
| 3 | Sequential | Expert evaluation of products or technology. Uses: <br> Five-point Likert scale: <br> – absolutely unperspective (1) <br> – unperspective (2) <br> – uncertain (3) <br> – perspective (4) <br> – very promising (5). <br> Seven-point semantic differential <br> Desâtibalna scale Stepela <br> -positive attitude (1-5) <br> – negative relation (6-10) | Median ($m_e$) <br> Range ($R$) <br> Interquartile range ($KR$) |
| 4 | Relative | Expert estimation of future sales, the potential of the market, the number of consumer price | Average ($\bar{x}$) <br> The standard deviation ($\sigma$) <br> Coefficient of variation ($V$) |

There are certain features of the definition of coherence of opinions of experts for cases applying various types of scales.

Nominal scale. In case of application of the nominal scale of experts are invited to determine the most promising option innovative products or technologies from the list above. Each of the $m$ of experts chooses one of $n$ options for innovative products or technologies and attached in the questionnaire number. Get $m$ the values of the $x_1$, $x_2$, ..., $x_m$, each of which corresponds to the number of the most promising option from the point of view of the first expert. determined such a statistical description of data like mode – the option that was chosen most often by experts.

The degree of coherence of opinions of experts proposed to define the following rule:

–the degree of coherence average is 50-70% of experts be one and the same innovative products or technology, i.e., the mode is the relative frequency of 0.5 to 0.7;

–the degree of coherence is high 70-90% of experts chose the same innovative products or technology, i.e., the mode is the relative frequency of 0.7 to 0.9;

–the degree of coherence of opinions of experts is very high – 90% and more experts have chosen the same innovative products or technology, i.e., the mode is the relative frequency of greater than 0.9.

Range scale. In case of application of range scale experts are invited to ranks $n$ the appellation of innovative products or technologies (1-most promising products or technology. $n$ – products or technology that has the slightest prospects for enterprise). If the survey involved two experts or expert opinions, comparisons of the two groups, two sequences of ranks: $x_{11}$, $x_{21}$, . . . , $x_{n1}$ and $x_{12}$, $x_{22}$, . . . , $x_{n2}$. For determining the consistency of expert assessments used the coefficient of correlation of grade Spìrmena (1.1).

$$\rho = 1 - \frac{6\sum_{i=1}^{n}(x_{i1} - x_{i2})^2}{n(n^2 - 1)} = 1 - \frac{6\sum_{i=1}^{n}d_i^{\,2}}{n(n^2 - 1)}$$

$$(1.1)$$

where $i$ -rank, which provided $i$   type of innovation products by first expert;

$k$ -rank, which provided $i$   type of innovative products by second expert;

$n$ – the number of kinds of innovative products, which is compared;

$d_i$ – the difference between the rank for each of the types of innovative products.

The coefficient of correlation of  Spìrmen varies in the range from-1 to + 1. Full congruence of estimates it is equal to the unit. Accordingly, when completely opposite assessments it is equal to-1. Expert opinions are considered to be consistent if the coefficient of grade correlation exceeds 0.7, and if $\rho \geq 0,9$ – strongly agreed.

If the survey involved more than two experts, for example, $m$ persons, and evaluated $n$ names of innovative products or technologies, we obtain the matrix (table 1.9).

Table 1.9-Matrix ranks that provide $m$ experts $n$ types of innovative products

|  | Expert 1 | Expert 2 | ... | Expert $m$ |
|---|---|---|---|---|
| Innovative products 1 | $x_{11}$ | $x_{12}$ | ... | $x_{1m}$ |
| Innovative products 2 | $x_{21}$ | $x_{22}$ | ... | $x_{2m}$ |
| ... | ... | ... | ... | ... |
| Innovative productsn | $x_{n1}$ | $x_{n2}$ | ... | $x_{nm}$ |

To determine the consistency of opinions of experts relative to the ranks $n$ names of innovative products or technologies used the coefficient of Kendall concordation that is calculated by the following formula (1.2):

$$W = \frac{12S}{m^2(n^3 - n)},$$ (1.2)

where $S = \sum_{i=1}^{n}(\sum_{j=1}^{m} x_{ij} - \frac{1}{2}m(n+1))^2.$

Concordation ratio varies in the range from 0 to 1, if it is equal to the unit, then all the experts have provided $n$ objects are the same ranks, if zero, then the expert opinions not agreed. It is believed that the opinions of the experts agreed, if $W \geq 0,7$ and if the $W \geq 0,9$ – strongly agreed.

Interval scale. in case of application of the ìntervalnoï scale, when determined by the sustainability innovation $m$ experts on Lajkert, a semantic differential scale or Stepel, the marketer researcher receives a sequence $x_1, x_2, \ldots, x_m$ with ratings that are in the range from 1 to 5 or 1 to 7, or from 1 to 10 to determine the consistency of opinions of experts need to calculate statistical characteristics such as:

−median $m_e$ – Center ordered ascending series from experts;

− scope $R$ − the difference between the maximum and minimum values that chose the experts;

–interquartile range *KR* – the difference between the second (75%) and the first (25%) quartile. It indicates the range in which there are replies 50% of experts.

It is proposed to draw conclusions about the consistency of opinions of experts depending on the ratio of span *R* and interquartile scale (table 1. 1 .10).

Table 1 10 – Determination of the consistency of opinions of experts depending on the choice of the scale measuring

| R | Scale Lajkert, KR | | Semantic differential, KR | | Scale Stepel, KR | |
|---|---|---|---|---|---|---|
|  | 0 or 1 | 2 | 0 or 1 | 2 | 0 or 1 | 2 |
| 1 | 100% consistency |  | 100% consistency |  | 100% consistency |  |
| 2 | very strong | average | very strong | strong | very strong | very strong |
| 3 | strong | average | very strong | strong | very strong | strong |
| 4 | average | weak | strong | average | strong | strong |
| 5 |  |  | average | average | strong | average |
| 6 |  |  | average | weak | average | average |
| 7 |  |  |  |  | average | weak |
| 8 |  |  |  |  | weak | weak |
| 9 |  |  |  |  | weak | weak |

Relative scale. In case of application of the relative scale experts estimate future sales of innovative products or potential market or price on innovative products. That is obtained *m* metric assessments of $x_1, x_2, \ldots, x_m$, which put *m* experts. The best consistency of opinions of experts checked using statistical characteristics such as average    and standard deviation    are calculated for them. the coefficient of variation for the following formula (1.3):

$$V = \frac{\bar{x}}{\sigma} 100\%$$ 
.                                   (1 .3)

The degree of coherence of opinions of experts is considered:
— very strong, if $V \leq 10\%$ ,
— strong if $10 < V \leq 20\%$ ,
— average, if $20 < V \leq 30\%$ .

Research of the market is the study of the basic characteristics of the market for the manufacturers of the products, the trademark range, dynamics of sales, price diferenciation, methods of promotion and distribution. This research engineering

enterprise has substantial information on identifying areas of innovations for gaining competitive advantage.

In the case of a narrow range of products of machine-building enterprises, market research can be carried out by the forces of the market research group innovations. In case of wide range, the presence of a large number of competitors, eksportoorìêntovanogo the production of such a study ordered in specialized marketing agencies. research information for the market going for such a template (table 1 .11).

Table 1 11 – Primary information collected for research market conditions

| Manufacturers | The market share of | Dynamics of changes in market share | Products | Price | Methods of sale | Methods of promotion |
|---|---|---|---|---|---|---|
| | | | | | | |

The study of business trends is the research directions of business and markets. Are such studies in the secondary and primary information received both from the data of the business editions and performance of the enterprise, and with observational data and expert polls.

In the course of the study of business trends examined specialized editions that are related to the activities of engineering, attending exhibitions and conferences. Their task is to discover:

– the most promising technologies that are used in industry and transportation industry, their potential;

– the most promising development that can be embedded in the transportation industry;

– the most promising directions of innovation activity, used by manufacturers in other countries or competitors;

– the most promising organizational structures of production, implemented in the machine-building enterprises of Ukraine and the world;

– the most promising marketing tools that are used in the machine-building enterprises of Ukraine and the world.

Thus the study of business trends associated with specific directions of innovation activity enterprise differ in technology and netehnologìčnì innovation. For technological innovation business trends it is advisable to associate with the stage of R & D, and netehnologìčnih innovation seen only their directions (tabl. 1.12).

Table 1.12 – The information collected as a result of the study of business trends

| The direction of innovation | Directions of research | Research methods |
|---|---|---|
| Technological innovation (R & D phase) | | |
| fundamental research/applied research | That fundamental and/or applied research findings and/or in the world, are the most promising for a specific industry engineering | – a poll of experts, scientists, – analysis of specialized scientific and business publications – visit the conferences |
| development | That existing development, the existing in Ukraine and/or beyond, are the most promising for introduction in production | – a poll of experts, scientists, – survey of expert investors – attending conferences, – visits to exhibitions, – analysis of scientific and business publications |
| technology | Which of the available innovative technologies in Ukraine and/or in the world, are the most promising for purchasing a license | |
| Non-technological innovation | | |
| organizational | That innovative methods of production used enterprise and/or the world. What are the most promising for a specific industry | – attending conferences, – visits to exhibitions, – analysis of scientific and business publications |
| marketing | That innovative marketing tools apply to the enterprises of Ukraine and/or the world. What are the most promising for a specific industry | |

A study of the external business environment is the analysis of macro-and micromarketing environments of machine-building enterprise in terms of the impact on innovation activity. The following are based on data collected in the marketing information system of the enterprise. To conduct the research needed to identify the factors that promote or inhibit innovation.

The influence of each factor can be rated on a scale of 10 points. The factors that promote innovation, measured from 0 to + 10 points and factors that hinder

innovation – from-10 to 0 points for the obtained estimates next may apply standard methods: SWOT -analysis, PEST -analysis, STEP -analysis, analysis of alternatives.

Predictive research is the application of methods of economic-mathematical, statistical, simulation modeling for obtaining forecasts of development of market indexes (dynamics of demand for innovative products, offer innovative products, forecasting sales of innovative products).

Consider two cases:

1) predictive studies relating to existing innovative technologies;

2) predictive studies concerning the design of innovative technologies.

In the first case to receive forecasts used data from the sale of technologies or products. The second is the expert estimations concerning the expected demand for technology and/or products. The presence of real data for obtaining predictions used instruments of economic-mathematical models, the regression model, the trend model, model decomposition of time series. The presence of expert estimations used statistical tools to identify the consistency of their thoughts and reliability provided by the assessments, as well as tools of simulation modeling.

Thus, a study of the prospects for innovation in machine-building enterprise might be a list of the methods listed in the table 1.13.

Table 1.13 – The list of methods of marketing research perspectives of innovation activity

| Tools | The content of the | Directions of marketing researches |
|---|---|---|
| 1. Trend model of dynamics | Getting the models according to the factors of innovation activity from time to time for the interpretation and prediction | –     basic marketing research<br>–     Predictive research |
| 2. Model decomposition of time series | Getting the models according to the factors of innovation activity from time to time taking into account the seasonality for the interpretation and prediction | –     basic marketing research<br>–     Predictive research |
| 3. Expert survey | Get options for policy directions of scientific and scientific-technical activity, prospects for the introduction and transfer of technologies, evaluation of potential markets | –     marketing research for future innovative technologies<br>–     marketing research business trends<br>–     Predictive research |
| 4. Observations | Study of the basic characteristics of the | marketing research market |

| | market for the manufacturers of the product, its assortment, the dynamics of sales, price diferencìacìêû, methods of promotion and marketing | conditions |
|---|---|---|
| 5. analysis of secondary information | Analysis of scientific and business publications concerning the perspective directions of research, visits to exhibitions and conferences, analysis of external marketing information | – marketing research of the external business environment <br> – the study of business trends |
| 6. Economic-mathematical modeling, statistical methods, simulation | Obtaining models of relationship factors of innovation, forecasting identified trends, simulation development, coherence of opinions of experts | – Predictive research <br> – fundamental research <br> – marketing research for future innovative technologies |

Under certain conditions the sector market research innovation conducts market research for innovative product in the following areas:

-research prospects to market with new technology;

-research competitiveness of new technologies;

-study the terms development and implementation of innovative technologies;

-research potential markets

Research prospects to market with new technology is done using expert assessments as specialists-developers of innovative product and sales professionals and investment. These experts questioned about the advantages over similar products and/or the presence of the counterparts.

Technology that is unparalleled among domestic and world manufacturers, is breakthrough technology, which is dominated by foreign or domestic counterparts for technical and price parameters, is a very promising; technology, which is dominated by foreign and domestic counterparts for technical issues or for a price, is promising.

After assessing the market potential of innovative technology survey of its competitiveness is performed. Standard methods for determining the competitiveness of goods such as the calculation of the cumulative index score polygon competitiveness evaluation of the position of goods among analogues using multidimensional scale based on the definition of the list of indicators, which are objects, expert evaluation of these indicators and the calculation of the index of competitiveness.

To evaluate the competitive advantage of innovative technologies like procesnih and production (machines, mechanisms, equipment, equipment) offers six options for which innovative product is compared with counterparts who should be considered essential for the development of (fig. 1.10):

– energy efficiency;

– environmental friendliness;

– technical characteristics;

– the cost of implementation;

– the term of implementation;

– potential for transfer.
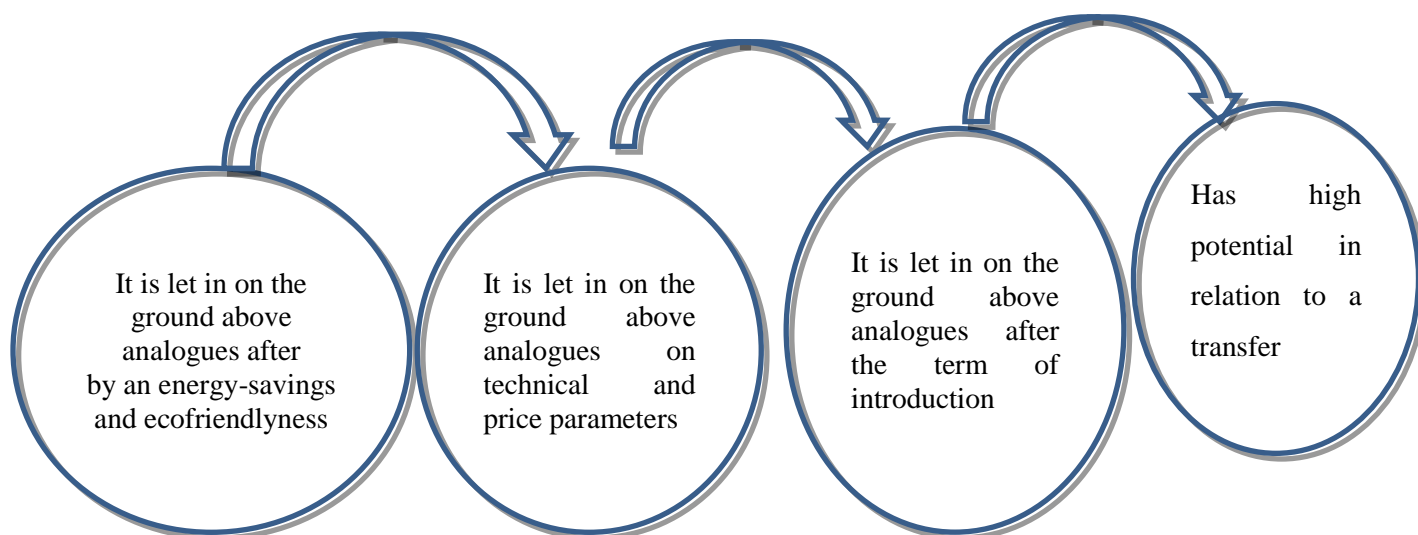


Picture 1.10-Chain of selection competitive innovative technologies

The procedure for determining the competitiveness of innovative product also based on expert surveys, representatives of all the innovative structures the enterprise. Suggested to compare innovative product with analogues on anketnim survey responses experts estimated a 5-point scale Lajkert (table 1.15).

Table 1.15 – Application to determine the competitiveness of innovative product

| | Question | Evaluation | Experts |
|---|---|---|---|
| 1 | Evaluate energy efficiency innovation in comparison with a competitor | -2 -1 0 1 2 <br> − − − − − <br> much worse so better much <br> the worst the very best | scientists |
| 2 | Evaluate environmental innovation in comparison with a competitor | -2 -1 0 1 2 <br> − − − − − <br> much worse so better much <br> the worst the very best | scientists |

| 3 | Assess the technical characteristics of the innovative technology in General and its individual characteristics in comparison with competitors | a) General characteristics<br>-2 -1 0 1 2<br>– – – – –<br>much worse so better much<br>the worst the very best<br>b) separate description (may be multiple)<br>-2 -1 0 1 2<br>– – – – –<br>much worse so better much<br>the worst the very best | scientists |
|---|---|---|---|
| | Question | Evaluation | Experts |
| 4 | Assess the validity of introducing innovative technologies in comparison with competitors | -2 -1 0 1 2<br>– – – – –<br>much more such smaller lot<br>the bigger it is smaller | scientists + investors |
| 5 | Estimate the cost of implementing innovative technologies in comparison with competitors | -2 -1 0 1 2<br>– – – – –<br>a much larger this is less a lot<br>the big thing is less | scientists + investors |
| 6 | Assess the potential transfer of innovation technologies in comparison with competitors | -2 -1 0 1 2<br>– – – – –<br>too low so high too<br>low very high | Experts on the sale of technology + investors |

The number of application corresponding to the number of experts who fill out. it is important to spend as the analysis of each form (General analysis), and the analysis of aggregated results for each answer (profile analysis). in General, the analysis are points for each question for each of the questionnaires in the questionnaire of six questions (tabl.1 15), but the third has two points. Generally in the third question may be assessed more specific characteristics, such as $k$ago ratings questionnaire will be $6 + k$., the maximum score for each questionnaire $– 12 + 2k$.

We offer competitive innovation define the following gradation:

— low – there are more than 50% of assessments questionnaire, where the technology is better than counterparts;

— the average is more than 67% of assessments questionnaire, where the technology is better than counterparts;

— high – there are more than 25% of assessments questionnaire, where the technology is far better than counterparts;

— very high – there are more than 50% of assessments questionnaire, where the technology is far better than counterparts;
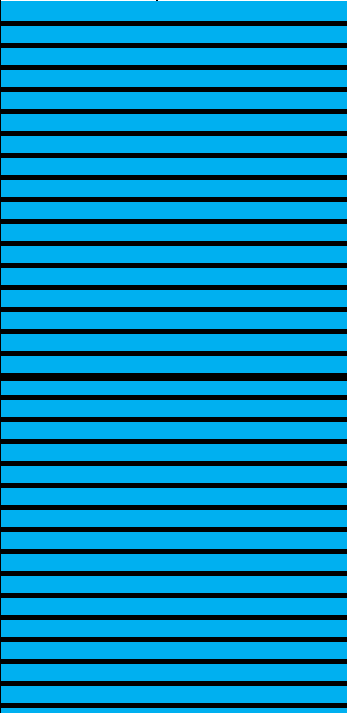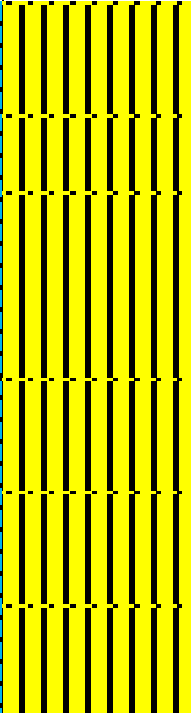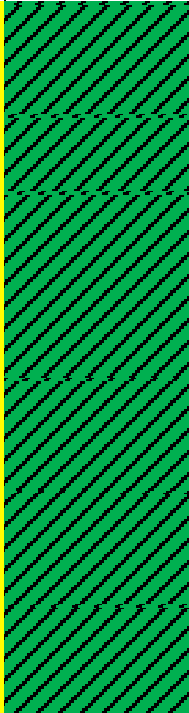
—breakthrough technology for 70-100% ratings questionnaire is much better than counterparts (table 1 .16).

Table 1.16-Definition of competitiveness for each application

| The number of points for the questionnaire | $0 - 3 + k$ | $4 + k - 6 + k$ | $7 + k - 9 + k$ | $9 + k - 9 + 2k$ | $10 + 2k - 12 + 2k$ |
|---|---|---|---|---|---|
| the competitiveness of the | low | average | high | very high | perforated technology |

After an overall analysis of progress profile analysis. To do this for each questionnaire is calculated the average score is the median ($m_e$) or average ( ) and is located in the table of profile analysis in the appropriate cell (tabl. 1 .17).

Table 1.17-Results profile analysis by expert poll

| | Question form | (-2 ; -1) | (-1; 0) | (0; 1) | (1; 2) |
|---|---|---|---|---|---|
| 1 | Evaluate energy efficiency innovation in comparison with a competitor | | | | |
| 2 | Evaluate environmental innovation in comparison with a competitor | | | | |
| 3 | Assess the technical characteristics of the innovative technology in General and its individual characteristics in comparison with competitors | | | | |
| 4 | Assess the validity of introducing innovative technologies in comparison with competitors | | | | |
| 5 | Estimate the cost of implementing innovative technologies in comparison with competitors | | | | |
| 6 | Assess the potential transfer of innovation technologies in comparison with competitors | | | | |

The table of results of profile analysis of the previously divided into three zones: the blue (horizontal line), yellow (vertical line), green (diagonal line). Blue zone means that innovative technology is worse than analogues; Yellow – innovative technology where what prevails counterparts; Green – innovative technology in all respects better than counterparts.

Possible cases:

‒ all scores for profile analysis are in the green zone. Then come to a conclusion about very high competitiveness of innovative technologies;

‒ most estimates or half located in the green area, the other in yellow. In this case, the innovative technology is highly competitive;

‒ most or all of the scores in the yellow zone, the other in green. Then believe that innovative technology has high competitiveness.

For those technologies that are highly competitive, or is the claim from the results of the General and specialized analysis centre experts conducted further research.

In that case, when the research prospects to market with new technology yielded positive results and the assessment of the competitiveness of the new technology is high, group marketing research innovation survey of terms of its development and implementation. This detailed and thorough research for performance of works on development and implementation and financial support. Incoming information providing research and Technical Department (developer) and innovative investment (Investor). In the presence of innovative technology or its project conducted a study of potential markets.

The proposed methodology for conducting marketing research trohetapnih innovative technologies-building enterprise to select target segments of the markets in the event on the international markets.

a) description of the basic properties of the innovative product of the economic, technical, consumer perspectives.

b) defines possible segments of the regional markets and the characteristic of their needs.

c) estimated the importance of each of the requirements for each segment of the market, as well as the estimated opportunity to meet these needs with an innovative product. Also evaluated the degree of influence of factors of external marketing environment on activity of innovation-active enterprise. Further evaluated indices of market attractiveness for each of the segments and are selected as target segments of sales markets with the largest index.

In the first phase, experts and scientists determine the basic properties of the technology.

At the second stage, experts, investors and experts from sales determine potential markets and characterize their needs for such a template (table 1 .18).

Table 1.18-Form determination of potential target segments of the market

| # | Market | Characteristics of the market | Market needs |
|---|--------|------------------------------|--------------|
|   |        |                              |              |

In the third stage evaluates the importance of each of the needs of potential target segments of the market. The importance of the proposed measure for the ten-point scale (V = 0 is not important, V = 10 is very important).

The ability to meet the needs of the technological point of view estimated a ten-point scale among factors in the marketing environment, which affect the implementation of technology, highlighted the political and economical. Their impact on prospects for the choice of target market segment is scored on a 20-point scale (10 is extremely negative impact; + 10 very positive impact). then fold the table needs assessment of markets and the possibility of meeting them (table 1.19).

Table 1 .19 – Form score the needs of consumers and their satisfaction

| Market | The need for | The importance of the the needs of the s (V), $0 \div 10$ | Technology opportunity meet the needs of (O), $0 \div 10$ | Foreign economic factors(E) $-10 \div + 10$ | Political factor s ( P) $-10 \div + 10$ | Index market attractiveness segment, $K_{ij}$ |
|--------|-------------|------------|------------|------------|------------|------------|
|        |             |            |            |            |            |            |

Then the owners expect the index of market attractiveness    segment by need the following formula (1. 4):

$$K_{ij} = V_{ij} + O_{ij} + E_{ij} + P_{ij},$$
(1 .4)

where $k_{ij}$ - index market attractiveness $i$ market segment $j$ needs ;

$V_{ij}$ – the importance of $j$ needs of $i$ for market segment;

$O_{ij}$ – assessment of the technological capability to meet the $j$ needs of a market $i$ segment;

$E_{ij}$, $P_{ij}$ – assessment of the economic and political capacity to meet $j$ needs of the market $i$ segment.

In marketing research, innovative technology offers the use of special tools (table 1.20).

Table 1.20 – A set of methods of marketing research of innovative technologies

| Tools | The content of the | Directions of marketing researches |
|---|---|---|
| Block diagram of the evaluation of the prospects of innovative technology | Results regarding the availability of innovative technologies on the domestic and international markets | Research prospects to market with new technology |
| The method of determining the competitiveness of innovative product | Definition of competitiveness on the special list of properties of the technology with the help of expert profiles | A study of the competitiveness of innovative technologies |
| The method of choosing a target market of innovative technologies | Identify the most attractive segment of the international market index of attractiveness | Research potential markets |

Thus, the proposed portfolio of methods of marketing research of innovative technology contains the following tools: block diagram of the evaluation of the prospects of innovative technologies; technique of definition of competitiveness the innovative product; the method of choosing a target market of innovative technology.

SECTION 2
MODELS AND METHODS OF FORMING MARKETING POTENTIAL OF ENTERPRISE

2.1. Method of estimation of risk of pricing and profit optimization using regressive dependence of demand from the price (adjusting prices for innovative development)

The current pricing of most manufacturers of machine-building industry based on the market price of installation method. Market price takes into account the demand for the product, which is a derivative of the price competitors, prices for goods substituti, consumer product values and other factors of the micro-and macromarketing environment of the enterprise. The nature of the demand is determined by its elasticity, if demand for the product turns out to be flexible on price, to increase sales to manufacturers recommended to reduce the price. Here and there appear the risks: the first is the assessment of the demand curve, i.e. according to the demand of the price, and the second – when detecting elastic demand a decision to reduce the price.

Usually, it is believed that the demand for the product has constant price elasticity. When identifying the elastic the demand to increase the sale price is recommended to diminish when identifying the non-elastic demand – on the contrary. In our opinion, this issue requires further study. Reducing price on innovative products with a low level of profitability of the enterprise will receive damages. Increasing the price risk of losing customers. You must provide these guidelines more preciseness. The price of the enterprise without the risk of loss can diminish, and, most importantly, how to reduce. The price of the enterprise without the risk of losing the consumer may enlarge and zoom.

Basic pricing strategy will depend on the level of innovation of products. There are two aggregated pricing strategies:
– the strategy of capturing the market or market penetration;
– the strategy of cream removal.

If you choose the strategy of capturing the market or market penetration you want to analyze the impact of the price increase. Profits in this case may decrease with decreasing prices on product-novelty and the corresponding increase in sales.

The strategy of "removal cream", on the contrary, has the aim to form the consumer insight product novelty, as goods for chosen. In this case is not about lowering prices. The company has the goal of maximizing profits.

The proposed scientific and methodological approach regarding the editing of the prices for the innovative development of recommendations for both price strategies.

Decision on adjustment of the price it is recommended to take depending on the type of communication ꞌdue to the demand and the price of this bond is proposed to find in the form of a regression analysis according to the demand of the price.

Method of estimation of risk pricing and profit optimization regressive dependence of demand from the price that is offered, consists of two phases:

a) obtaining regression model according to the demand of the price;

b) receiving function of price elasticity of demand and risk assessment for her behavior.

Consider the situation when the manufacturer estimates the demand for innovative products according to the sale. Such data can be obtained, or in experimental sales of innovative products for evaluation methods, marketing, or in real terms, comparing the sales volumes and prices.

Stage 1. Getting statistics (regression) dependence of demand from the experimental data, where the dependent variable is sales, and an independent, i.e. describing price, build a regression model.

For approximation of the experimental data are commonly used standard regression model: linear, hyperbolic, parabolic SAR.

Among these models, you must choose the "best" from the point of view of statistics, "the best" is the most accurate, reliable, adequate on the accuracy of the model is verified using the coefficient of determination $R^2$ and the standard error of the model on reliability $-F$ -the criterion of Fisher (on the reliability of the model in general) and $t$ -the criterion of Student (on the reliability coefficients), on the adequacy of the model is verified by the remnants (e.g., coefficients of autocorrelation of the residuals).

At this stage the possible risks related to the qualifications of a researcher. The first risk is with the sample, the sample must be representative, the second risk – with a selection of models by experimental data. These risks are not subject to quantitative assessment, but affect further studies.

Stage 2. Get the function of elasticities of demand for the price and assess the risks of changes in prices depending on the graph of the function. Elasticity of prices in terms of mathematical analysis is determined by the following formula:

$$E_p(Q) = \frac{P}{Q(P)} Q'(P)$$,

where $Q(P)$ is a known function of the demand of some of the goods;

$P$ is the price of the goods.

Certain basic models are used for regression models of the demand on price dependence. We find the price elasticity functions for linear, hyperbolic and parabolic patterns of demand and evaluate the risks of price changes for each of them. The term "function of price elasticity of demand" is introduced for convenience. It is clear that the relation between price elasticity of demand and price in all the following cases is not functional but regression. But the concept of "function of price elasticity of demand" allows using tools to research function at extremes for derived regression models.

a) Linear regression of demand on prices is: $Q = a_0 + a_1 P$. Its` derivative is: $Q' = a_1$.

The function of price elasticity of demand in this case is:

$$E_p(Q) = \frac{a_1 P}{a_0 + a_1 P} \cdot \qquad (1)$$

Fig. 2.1 graphs the function (1) modulo.

$$E_p(Q)$$

$$\mid \frac{a_0}{2a_1} \mid\mid \frac{a_0}{a_1} \mid$$
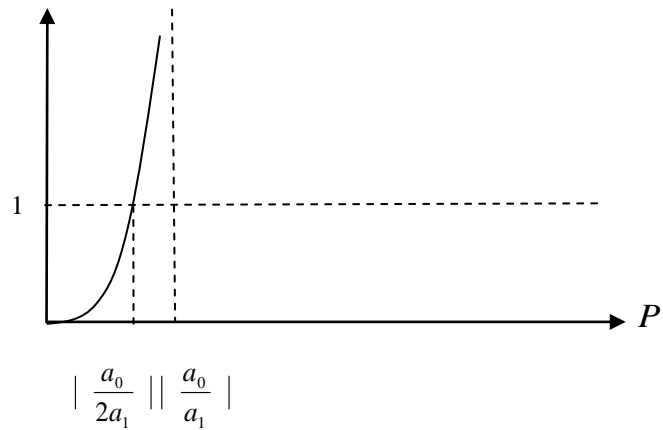
Figure 2.1 – The function of price elasticity of demand for the linear dependence of demand on price

Fig. 1 shows that the function of the price elasticity of demand for the linear model of dependence of the demand on price has a vertical asymptote, this point on the graph of demand on price corresponds to zero demand. That is when the demand that tends to zero the price elasticity index tends to infinity. At the point —— graph of the elasticity function module intersects the line $E_p(Q) = 1$ which corresponds to a single demand (the boundary between elastic and inelastic demand).

According to the graph of price elasticity of demand in the case of linear dependence of demand on price three risk pricing can be defined:

1) a low risk of price increases in the interval (0; —— ); here price increase will lead to a slight decrease in sales, as demand for this range is inelastic (graph below single elasticity);

2) zero risk of decrease in the price is in the vicinity of the point —— , price elasticity of demand index there tends to infinity, that is sales will grow at a much higher percentage than prices decrease;

3) in the interval ( —— , —— ) the risk of prices decrease evenly reduced, i.e. with the greatest risk reduction in price in the right vicinity of the point —— to zero in the left vicinity of the point —— . In this interval the demand is elastic and price elasticity index increases as can be seen from the graph function.

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b) Inverse or hyperbolic regression dependence of demand on prices is characterized by the equation $Q = a_0 + a_1/P$. Derivative function is ——. The function of price elasticity of demand for hyperbolic dependence of demand on prices has the form

$$E_p(Q) = \frac{P}{a_0 + a_1/P} \times (-\frac{a_1}{P^2}) = -\frac{a_1}{a_0 P + a_1} .$$ (2)

Investigating the behavior of function of price elasticity of demand of the price we conclude that the hyperbolic function always describes elastic demand. Minimum modulo value that is equal to 1, the function of price elasticity of demand reaches in the point $P = 0$, it will continue to increase with acceleration (Fig. 2.2).



$E_p(Q)$

1

$P$
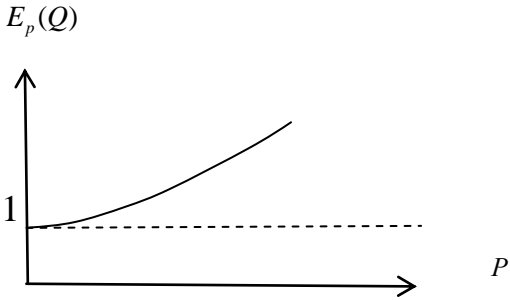
Figure 2.2 – The function of price elasticity of demand for hyperbolic (inverse) dependence of the demand on price

That is, when determining the first stage hyperbolic regressive dependence of the demand on price, elasticity index of price to any of the graphic point is more than one and the demand is elastic.

c) Parabolic (quadratic) regression model of the dependence of demand on price is: $Q = a_0 + a_1 P^2$. Derivative of the parabolic function is: $Q' = 2a_1 P$. The function of the price elasticity of demand

$$E_p(Q) = \frac{2a_1 P^2}{a_0 + a_1 P^2} .$$ (3)

Graph of the module of obtained function of elasticity of demand (Fig. 2.3) shows two intervals with different pricing risks:

– Low risk of price increase in the interval $(0, \sqrt{-\frac{a_0}{3a_1}})$. This follows from the fact that the demand function is inelastic there. Graph of the function is below the line with single elasticity.

– Low risk of price decrease in the interval $(\sqrt{-\frac{a_0}{3a_1}}, \sqrt{-\frac{a_0}{2a_1}})$. Price elasticity index increases from one to two here, characterizing elastic demand.
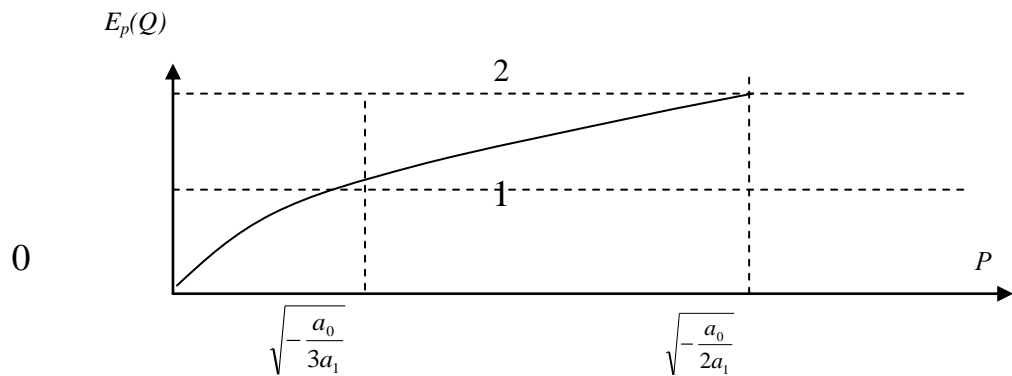


Figure 2.3 – The function of price elasticity of demand for parabolic (quadratic) model of the dependence of demand on price

Summarizing the proposed modeling of the price elasticity of demand and the risk assessment in pricing, we obtain Table 1.

Table 1 - Types of dependence of demand on price and the respective functions of price elasticity of demand and prices

| Stage | Index | The linear dependence of demand on prices | Hyperbolic dependence of demand on prices | Parabolic dependence of demand on prices |
|---|---|---|---|---|
| 1 | Dependence model | $Q = a_0 + a_1 P$ | $Q = a_0 + a_1/P$ | $Q = a_0 + a_1 P^2$ |
| 2 | Regression model of price elasticity of demand, $E_p(Q)$ | $E_p(Q) = \dfrac{a_1 P}{a_0 + a_1 P}$ | $E_p(Q) = -\dfrac{a_1}{a_0 P + a_1}$ | $E_p(Q) = \dfrac{2a_1 P^2}{a_0 + a_1 P^2}$ |

Are the two stages of the valuation of risk pricing and profit optimization for the regressive dependence of demand on price.

The first is a regression from the price demand dependence, which may be linear, hyperbolic or parabolic. The second is determined by the dependency of the

price elasticity of demand of the price for each type of relationship of demand from the price. A view of the function of price elasticities of demand are price intervals with a different type of demand and pricing risks are evaluated.

For enterprises, pricing strategy, which is to capture the market, the main thing is the second stage, which are set by the risk pricing.

2.2. Model of inventory management for industrial enterprises under energy resources price increase

Scope of industrial enterprises that buy raw materials or components with high energy costs is distinguished by a wide range of risks. One of global economic risks is a rise in energy prices ("energy shock price"). Let's consider approaches to inventory management of such enterprises on the example of concrete and concrete products manufacturers. The increase in cement stocks, purchased in the period preceding the increase in energy prices, will allow the concrete manufacturer solve two important tasks on optimization of business:

1) reduce production costs in future periods as cement was purchased for less than current prices;

2) increase the income of the company by increasing the market share as the price of concrete in the enterprise may be lower than the competition due to cheaper components.

Until recently, the main supplier of gas to Ukraine was the Russian Federation. The g as produced was used in Ukraine for needs of the population. The cost of gas, which Russian Federation exports, is tied to oil quotations. Changes in the price of gas on a certain formula are 4-8 months after the change in oil prices. The European Union calls on Russia to move from pricing gas in relation to oil prices to spot contracts in European gas hubs. This method will result in pricing depending on the share price in the spot contract.

Today, Ukraine passed through the winter 2015-2016 without Russian gas, but the gas that was bought in Europe is partly Russian. That is, after an increase or

decrease in oil prices an increase or decrease in gas prices can be expected in the long term of 4-6 months in a row.

The task, which is associated with the use of economic and mathematical modeling for assessment and risk management for manufacturers of concrete are inventory management based energy prices.

The manufacturer of concrete in subsystem of monitoring marketing information system collects information on current prices for gas and oil and the prospects of theirchanges . There are three cases:

- An increase in world oil prices is noted, so a rise in price of gas is forecast ed;

- A decrease in world oil prices is noted, so a reduce of cost of gas is forecast ed;

- No change in world oil prices is noted, so no change in the price of gas is forecast ed.

In the first case creat ion of strategic reserves of cement and inert materials for the manufacture of concrete is recommended, as this will reduce the risks of loss of market share due to rapid rise in energy. In other cases neither increase nor reduce of strategic stocks of concrete components is reccomended. It would be possible under the projected decline in energy prices to reduce the stock of components expecting price reduction, but this could lead to another risk - the failure to fulfill orders due to lack of necessary inert materials in stock.

To create a stock of components for production of concrete and concrete products the company can follow three strategies of accumulation in order to save the cost of acquisition and storage of raw materials:

- Simultaneous delivery of the total volume of raw materials, such as cement, to save the cost of acquisition;

- Even delivery of raw materials with same batches and incomplete use;

- Delivery of raw materials in smaller and then larger quantities to save resources for its storage.

According to each of these strategies we get graphic and mathematical models of inventory management which can be applied to industrial enterprises of any field of activity. In the first strategy the amount of raw materials that will satisfy forecasted

demand for the period prior to the increase of the price of gas is simultaneously supplied to the enterprise - $T_1$ and will satisfy the demand during the gas price increase - $T_2$. We assume that the demand for raw materials during the period $T_1$ is lower than $T_2$ because during the second period the company will have competitive cost advantages (Fig. 2.4).
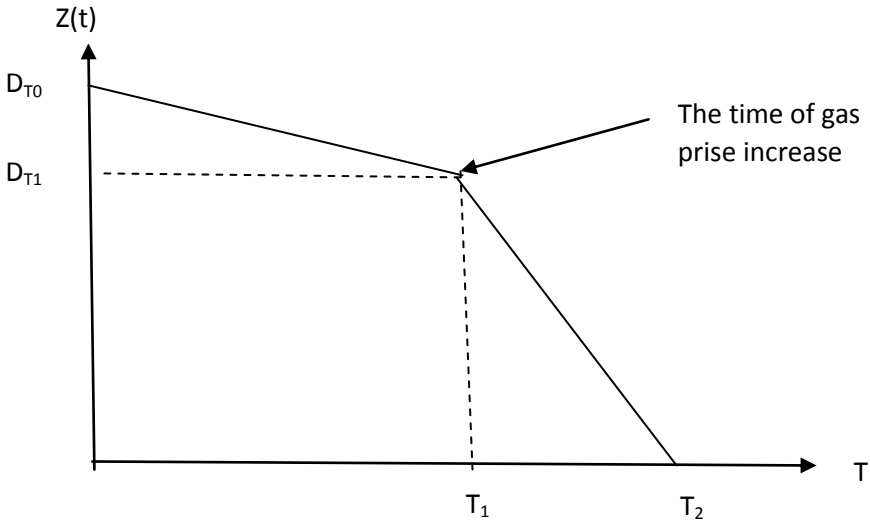


Figure 2.4. Simultaneous delivery of total volume of raw materials

On the Fig. 2.4:

Z (t) - is the volume of raw materials available in the company;

T - time;

D ($T_0$) - the amount of raw materials that will meet the demand be for e gas price increase and after;

D ($T_1$) - the demand for raw materials after the gas price increase.

Suppose that the number of raw materials in the amount of D ($T_0$) can be delivered by $k$ supplies. The cost for each $k$ supply is $Q$ currencies. Costs for storage of each unit of raw material are $g$ currency units.

In this case the costs of transporting and storing raw materials will be:

$$Qk + g (D (T_0) + D (T_1)) / 2 + g D (T_1) / 2 = Qk + g (D (T_0) + 2D (T_1)) / 2. \quad (2.4)$$

Let's analyze the inventory management model in the case of an even supply of raw materials with underutilization.

In second case, the raw materials are delivered in even identical batches (Fig. 2). Here period $T_1$ is divided into $n$ equal intervals with each of length $\tau = T_1 / n$. The size of the supply in times $t_1$, $t_2$, ..., $t_{n-1}$ is the same and equals $d$. Demand for raw materials during the period before price increase will be considered as the same for each period - $d_1$(Fig 2.5).
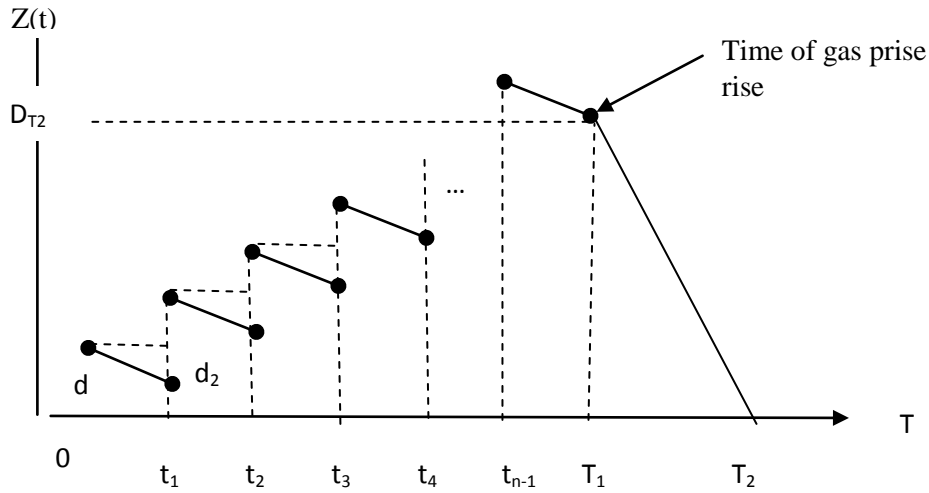


Figure 2.5 – Even importation of raw materials in identical batches

Let one consignment of shipping raw materials in volume $d$ be $Q$ currency units. The total demand for raw materials before the rise time is $D_{T1}$, so $D_{T1} = nd_1$. The total demand for raw materials before the prices rise time ($T_1$) and after ($T_2$) is D (D = $D_{T1}$ + $D_{T2}$), so D = nd. The total demand for raw materials after the rise is $DT_2$.

Total costs for delivery of raw materials to the plant and its storage in this case are:

$$Qn + g(\frac{d + (d - d_1)}{2} + \frac{2d - d_1 + 2d - 2d_1}{2} + \frac{3d - 2d_1 + 3d - 3d_1}{2} +$$

$$...+ \frac{nd - (n-1)d_1 + nd - nd_1}{2})\tau + gD_{T_2} / 2 =$$

$$= Qn + g(d(1+2+3...+n) - \frac{d_1}{2}(1+3+5+...+(2n-1))\tau + gD_{T_2} / 2 =$$

$$= Qn + g(d\frac{n(n+1)}{2} - \frac{d_1}{2}n^2)\tau + gD_{T_2} / 2 =$$

(Given that $\tau = T_1 / n$, $D = nd$, a $D_{T1} = nd_1$ and)

$$= Qn + g(D\frac{n+1}{2} - D_{T_1}\frac{n}{2})\frac{T_1}{n} + gD_{T_2}/2 \tag{2.5}$$

Formula (2.5) is a function of the cost depending on the number of intervals $F$ (n). Then the minimum cost of purchasing and storage of raw materials can be defined as *min F* (n).

$$\min F(n) = \min(Qn + \frac{g}{2}(D(n+1) - D_{T_1}n)\frac{T_1}{n} + gD_{T_2}/2)$$

Minimum of the function $F$ (n) is found using the derivative:

$$F'(n) = (Qn + \frac{g}{2}(D(n+1) - D_{T_1}n)\frac{T_1}{n} + gD_{T_2}/2)' =$$

$$= Q + \frac{g}{2}((D - D_{T_1})\frac{T_1}{n} - \frac{T_1}{n^2}(D(n+1) - D_{T_1}n) =$$

$$= Q + \frac{g}{2}((D - D_{T_1})\frac{T_1}{n} - \frac{T_1}{n}(D - D_{T_1}) - \frac{T_1}{n^2}D) =$$

$$= Q - \frac{gDT_1}{2n^2}$$

Equating the derivative to zero:

$$F'(n) = 0 \rightarrow \frac{2Qn^2 - gT_1D}{2n^2} = 0 \rightarrow n = \sqrt{\frac{gT_1D}{2Q}}$$

Thus, with the number of periods

$$n = \sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}} \tag{2.6}$$

function $F$ (n), the cost of shipping and storage of raw materials, becomes minimum. From the formula (3) it can be seen that the optimal number of periods of supply of raw materials is independent of the length of the period of consumption of raw materials after the price increase - $T_2$.

The optimal number of periods of supply of raw materials to the warehouse of the company (3) can be considered as an improvement to Wilson formula [2]. A similar problem is solved by Robert Wilson with the full use of raw materials imported for one period, without formation of stock reserves for subsequent periods.

Finding the length of the period $\tau$, where shipping and storage of raw materials will be minimal and considering that $\tau = T_1 / n$, we get

$$\tau = \sqrt{\frac{2T_1 Q}{g(D_{T_1} + D_{T_2})}} \cdot \tag{2.7}$$

Finding the volume of a delivery $d$, where the cost of purchasing and storage of raw materials will be minimal and considering that d = D / n, we get

$$d = \sqrt{\frac{2Q(D_{T_1} + D_{T_2})}{gT_1}} \cdot \tag{2.8}$$

Thus, with import of raw materials to the plant in the amount of $n$ even supplies, with the amount of each supply in $d$ units, the cost of each delivery of $Q$ units, the projected total demand for raw materials before its rise in $D_{T1}$ and after in $D_{T2}$ units, the use of raw materials in each of the periods in $d_1$ units:

– The volume of a delivery that will provide minimal shipping and its preservation on the stock is given by formula (2.8);

– Period of time between deliveries for which a minimum shipping and storage of raw materials cost is provided is given by formula (2.7);

– The number of periods for which the raw materials need to be put to the warehouse for providing the minimum cost of shipping and storage of raw materials is given by (2.6).

The minimum cost of transportation and storage of raw materials will be

$$F(n = \sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}}) = Q\sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}} + \frac{g}{2}(D(\sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}} + 1) -$$

$$- D_{T_1}\sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}})\frac{T_1}{\sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}}} + gD_{T_2}/2 = Q\sqrt{\frac{gT_1(D_{T_1} + D_{T_2})}{2Q}} +$$

$$+ \frac{g}{2}(D\,T_1 + \frac{DT_1\sqrt{2Q}}{\sqrt{gT_1 D}} - D_{T_1}T_1) + gD_{T_2}/2 =$$

$$= \sqrt{\frac{gQT_1(D_{T_1} + D_{T_2})}{2}} + \frac{g}{2}(D\,T_1 + \frac{\sqrt{2DT_1 Q}}{\sqrt{g}} - D_{T_1}T_1) + gD_{T_2}/2 =$$

$$= \sqrt{\frac{gQT_1(D_{T_1} + D_{T_2})}{2}} + \frac{g}{2}DT_1 + \frac{\sqrt{2g(D_{T_1} + D_{T_2})T_1 Q}}{2} - \frac{g}{2}D_{T_1}T_1 + gD_{T_2}/2 =$$

$$= \sqrt{2gQT_1(D_{T_1} + D_{T_2})} + \frac{g}{2}D_{T_2}(T_1 + 1).$$

Thus, the minimum costs for delivery and storage of raw materials make

$$\text{Minimum costs} = \sqrt{2gQT_1(D_{T_1} + D_{T_2})} + \frac{g}{2}D_{T_2}(T_1 + 1). \qquad (2.9)$$

In the third case, first raw materials are imported in smaller quantities, and further in bigger, leading to saving resources on storage (Fig. 2.6).
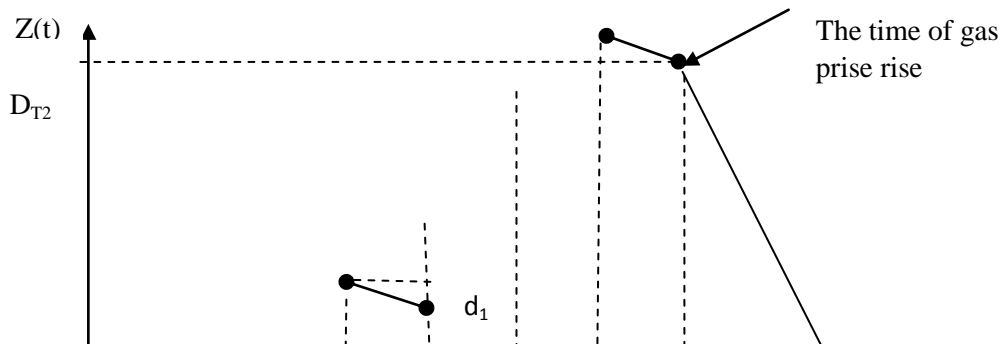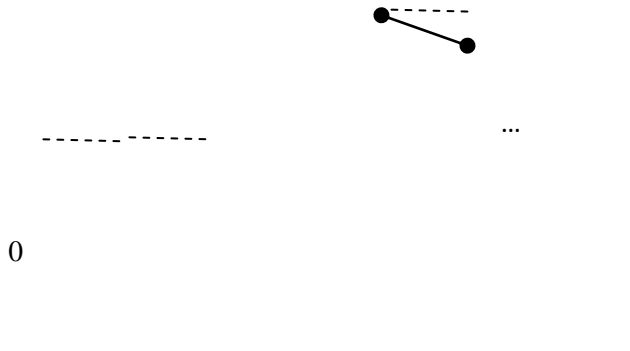
Figure 2.6. Uneven delivery of raw materials (first smaller parties, then - bigger)

Suppose that with irregular supply of raw materials for the first $k$ periods during the time $T_1$ the same batch of raw materials in volume of $d$ units comes, that are completely consumed during this period. Demand for raw materials during the period $T_1$ is $D_{T1}$. The optimum size of deliveries (d), the number of periods of supplies (k) and the length of each period ($\tau$) in this interval are determined by Wilson's formulas:

$$k = \sqrt{\frac{gT_1D_{T_1}}{2Q}} \quad , \tag{2.10}$$

$$\tau = \sqrt{\frac{2T_1Q}{gD_{T_1}}} \quad , \tag{2.11}$$

$$d = \sqrt{\frac{2QD_{T_1}}{gT_1}} \quad . \tag{2.12}$$

The minimum cost of supply and storage of raw materials on the interval $T_1$ will make

$$\text{The minimum cost } _{T_1} = \sqrt{2gQT_1D_{T_1}} \, . \tag{2.13}$$

During the period $T_2$ reserves are formed that meet the projected demand of period $T_2$ before higher energy prices and demand of period $T_3$ after the rise in energy prices. Let the required amount of projected demand for raw materials during periods $T_2 + T_3$ be $D_{T2} + D_{T3}$. Suppose that you can save it for $l$ periods. During $T_2$ before the

rise of raw material price the consumption for each of $l$ periods is equal to $d_1$. Then the number of periods $l$, the volume of supply for each period $d$, and the length of each period supplies $\tau$ are found by formulas 2.14 – 2.16, which are similar to 2.6 – 2.8:

$$l = \sqrt{\frac{gT_2(D_{T_2} + D_{T_3})}{2Q}} , \tag{2.14}$$

$$\tau = \sqrt{\frac{2T_2 Q}{g(D_{T_2} + D_{T3})}} , \tag{2.15}$$

$$d = \sqrt{\frac{2Q(D_{T_2} + D_{T3})}{gT_2}} . \tag{2.16}$$

The minimum cost of supply and storage of raw materials in the interval $T_2 + T_3$ will be:

$$\text{Minimum costs }_{T_2+T_3} = \sqrt{2gQT_2(D_{T_2} + D_{T_3})} + \frac{g}{2} D_{T_3}(T_2 + 1). \tag{2.17}$$

With simultaneous delivery of the total volume of raw materials that will meet the demand for the period before and after the price increase, shipping and storage of raw materials by the formula (2.4) are the largest. If the company-manufacturer of concrete selects this strategy, it also risks possible damage of material from long storage. In our view, the first strategy - simultaneous delivery of total volume of raw materials - should be used when competitors also begin a stock purchase of raw materials, which increases its cost before the rise of cost of energy.

When choosing strategies of even delivery of raw materials in same batches with underusage, storage costs and delivery (2.9) are much smaller than in the first strategy. The risk of material damage is also smaller than in the first case, it increases only when increasing raw material accumulation period $T_1$.

When choosing a strategy of import of raw materials first in smaller, then in larger quantities to save resources on its storage, the risk of damage from long-term

storage of raw materials is reduced. The cost of shipping and storage of raw materials (2.17) in this case is the lowest. The risk of suppliers highering prices for raw materials in case of increased demand from competitors in this case is the highest.

Let's make a comparative table with the choice of a certain strategy for inventory management for concrete manufacturers under raw material price raise for companies producing concrete and concrete products (Table. 2.2).

Table 2.2 – **Comparison of models of inventory management for industrial enterprises under energy resources price increase**

| Strategy | Cost of shipping and storage of raw material | Risk of damage from long-term storage | Risk of suppliers rising prices of raw materials with increasing demand from competitors |
|---|---|---|---|
| Strategy of simultaneous delivery of the total volume of raw | highest | highest | lowest |
| Strategy of even delivery of raw materials in same batches with incomplete use | medium | medium | medium |
| Strategy of delivery of raw materials in originally smaller and then larger parties | lowest | lowest | highest |

The manufacturer of concrete, if increase in energy prices is predictable, chooses one of three strategies assessing the risks.

2.3 Methodology the evaluation of competitiveness of innovation-active enterprises in the production of standardized products

The main instrument of data collection about the level of service to competitors is offered by using the tools of marketing intelligence (tabl. 2. 3).

Table 2.3 – monitoring Options service competitors manufacturer standardised products

| List of services | The importance of services, $q_i$ | Competitor j (j=1...m) | | Enterprise | |
|---|---|---|---|---|---|
| | | Dihotomìčna score, $a_{ij}$ | Score scale, $b_{ij}$ | Dihotomìčna score, $a_{im+1}$ | Score scale, $b_{im+1}$ |

| Service 1 | $q_1$ | Yes/No (1/0) | 1. 5 | Yes/No (1/0) | 1. 5 |
|-----------|-------|--------------|------|--------------|------|
| Service 2 | $q_2$ | Yes/No (1/0) | 1. 5 | Yes/No (1/0) | 1. 5 |
| Service 3 | $q_3$ | Yes/No (1/0) | 1. 5 | Yes/No (1/0) | 1. 5 |
| Service 4 | $q_4$ | Yes/No (1/0) | 1. 5 | Yes/No (1/0) | 1. 5 |
| $\sum q_i$ | 1 | | | | |

Marketing company can learn about the availability of services in the competition by a call under the guise of a potential customer (secret shopper) or in other ways, for example, customers of a competitor. There are also important information on the level of service that can be ocìnenim at a certain scale.

It is clear that the list of services that are provided may vary. The importance of each service determines its "weight" for the client: the greater the importance of the service has the client's point of view, the more numerical weight her. The sum of all coefficients of importance $q_i$ should be a unit for each of the competitors estimated availability of services for scale (yes/no), where "Yes" is estimated unit, and «no» is zero, as well as its provision on the Lajkerta from the unit to five, where 1 is bad and 5 is very good. Scores for dichotomous estimates for $j$ the 1st competitor $(j = 1...m)$ for each of the characteristics of the service $i$ $(i = 1.n)$ denote $a_{ij}$. Evaluation of characteristics on a scale Likert for competitor $j$ on each of the characteristics of the service $i$ let $b_{ij}$.

Dichotomous evaluation of the presence of competitor services, together with the estimated level of its provision on the Likert will get a more complete assessment of the competitiveness of the enterprise. In existing scientific-methodological development evaluation of competitiveness such as the calculation of the index of competitiveness, creation of polygon competitiveness ranking of competitiveness, is not considered the case when all the characteristics are considered standard.

For the evaluation of competitiveness of enterprises-manufacturers of standardized products offered dual approach, which is based on the calculation of two indicators of the service:

– the indicator reached the completeness of service CS (completeness of service);

– the figure reached quality of service QS (quality of services).

The indicator reached the completeness of service CS is calculated by the formula 2.18.

$$CS_j = \sum_{i=1}^{n} q_i a_{ij}, (j = 1..m)$$

(2.18)

where $c\ S_j$ – the indicator reached the completeness of service $j$-th competitor ($j = 1 ... m$);

$q_i$ -weighing factor of $i$ characteristics of service;

$a_{ij}$ – dichoic assessment of the availability $i$ the 1st characteristics of services in $j$ the 1st competitor.

The maximum value of the indicator reached the completeness of service equal to the unit, which means the presence of a competitor, the full range of investigated characteristics of the service. The minimum value is zero, which corresponds to the absence of any characteristics of the service in a given competitor.

The figure reached quality of service QS calculated using the formula of 2.19.

$$QS_j = \sum_{i=1}^{n} q_i b_{ij}, (j = 1..m)$$

(2.19)

where $QS_j$ – the indicator reached quality of service $j$ - th competitor ($j = 1 ... m$);

$q_i$ -weighing factor , and th characteristics of service;

$b_{ij}$ is quality score and 1st characteristics of services in $j$-th competitor on the Likert.

The maximum value of the indicator reached quality of service equal to five, which corresponds to the maximum assessment of all of the characteristics of service. After calculating the indicators reached the completeness of service and reached quality of service for all competitors need to determine these indicators for the investigated company. Label the investigated company number m 1. Indicators

reached the completeness of service and reached quality of service calculated in accordance with the formulas, 2.20.

$$CS_{m+1} = \sum_{i=1}^{n} q_i a_{im+1}, \qquad QS_{m+1} = \sum_{i=1}^{n} q_i b_{im+1}$$

, . (2.20)

A dual approach to the assessment of competitiveness indicators reached the completeness of service and reached quality of service should be placed in the table 2.4.

Table 2.4 – Approach to the assessment of the competitiveness of enterprises-manufacturers standardised products

| | $SS_j$ $(j=1...m)$ | Performance advantages of the enterprise-manufacturer of standardized products on each of the competitors for the availability of services, $c_j$ | $QS_j$ $(j=1...m)$ | Performance advantages of the enterprise-manufacturer of standardized products on each of the competitors for the quality of services, $L_j$ |
|---|---|---|---|---|
| Competitor 1 | $CS_1$ | $C_1 = CS_{m+1} - CS_1$ | $QS_1$ | $L_1 = QS_{m+1} - QS_1$ |
| Competitor 2 | $CS_2$ | $C_2 = CS_{m+1} - CS_2$ | $QS_2$ | $L_2 = QS_{m+1} - QS_2$ |
| ... | ... | ... | ... | ... |
| Competitor j | $CS_j$ | $C_j = CS_{m+1} - CS_j$ | $QS_j$ | $L_j = QS_{m+1} - QS_j$ |
| ... | ... | ... | ... | ... |
| Competitor m | $CS_m$ | $C_m = CS_{m+1} - CS_m$ | $QS_m$ | $L_m = QS_{m+1} - QS_m$ |

Conclusions table 2.4 with evaluation risks of competitiveness are proposed to do by the rule of table 2.5:

Table 2.5 – Risk assessment for a dual approach to the assessment of the competitiveness of the enterprise-manufacturer standardised products

| | The advantage/assignment for the availability and quality of services | Risk assessment of competitiveness |
|---|---|---|
| 1 | $C_j > 0, (j=1...n)$ $L_j > 0, (j=1...n)$ | The risk is close to zero. All the characteristics of the service the enterprise-manufacturer of standardized products is dominated by competitors. High competitiveness |
| 2 | $C_j \geq 0, (j=1...n)$ $L_j \geq 0, (j=1...n)$ | The risk is low. All the characteristics of the service enterprise prevails or not worse than competitors. Sufficient competitiveness |
| 3 | For a specific competitor $j$, $C_j > 0$ and $L_j \leq 0$ | The risk is high. In terms of the characteristics of the service the company has advantages over competitor, but the quality of the worst |

| 4 | For a specific competitor $j$, $C_j = 0$ and at the same time $L_j < 0$ | The risk is high. In terms of the characteristics of the service the company has advantages over competitor and quality worse |
|---|---|---|
| 5 | For a specific competitor $j$, $C_j < 0$ and $L_j < 0$ | The risk is very high. In terms of the characteristics of the service the enterprise-manufacturer of standardized products is inferior to a competitor |
| 6 | For a specific competitor $j$, $C_j < 0$ and $L_j = 0$ | The risk is high. In terms of the characteristics of the service producer has no advantages over competitor but quality higher |
| 7 | For a specific competitor $j$, $C_j < 0$ and $L_j > 0$ | The risk is high. In terms of the characteristics of the service producer has no advantages over competitor but the quality is much higher |

1. In the case when all the performance advantages of the enterprise according to the availability of the services Cj (j = 1, ... n) and all indicators the benefits of enterprise quality services Lj (j = 1, ... n) positive conclude about the high competitiveness of the enterprises, i.e., the risk of loss of competitiveness can be considered close to zero;

2. In the case when all the performance advantages of the enterprise for availability of services *with* $C_j (j=1...n)$ and all indicators the benefits of enterprise quality services $L_j (j= 1 ... n)$ are doing enough of the competitiveness of enterprises, that is, the company has certain advantages over competitors, or they do not yield as many of the characteristics of the service and for their quality;

3. In other cases the analysis is performed for each of the *n* competitors of the enterprise and is the comparison of pairs of indices *with* $C_j$ and $L_j$ , $(j=1...n)$:

– If $C_j > 0$ and at the same time $L_j \leq 0$ then the producer standardised products has the advantage over $j$-m number of competitor services, but inferior to their quality. In this case, the risk of losing competitiveness compared with $j$-a competitor can be considered medium. it is important to note that in this case there is a gradation of risk. Least concern observe when $L_j = 0$ and the less $L_j$ from zero, the worst score of the services of the enterprise-manufacturer standardised products in comparison with a competitor, and, consequently, the higher the risk of losing competitiveness;

– If $C_j = 0$ and at the same time $L_j < 0$ then the producer standardised products provides the same amount of services as $j$ and a competitor, but as their quality, because the risk of loss of competitiveness can be considered high;

– If $C_j < 0$ and at the same time $L_j < 0$ then the producer standardised products provides fewer services than $j$-the competitor as well as inferior in quality, so the risk of loss of competitiveness can be considered very high;

– If $C_j < 0$ and at the same time $L_j = 0$ then the producer standardised products provides fewer services than $j$ and competitor, but has a higher assessment of quality of services, because the risk of loss of competitiveness can be considered high;

– If $C_j < 0$ and at the same time $L_j > 0$ then the producer standardised products provides fewer services than $j$ and competitor, but has a higher assessment of quality of services, because the risk of loss of competitiveness can be considered medium.

# SECTION 3
## TECHNOLOGICAL FORECASTING OF INNOVATION DEVELOPMENT OF MACHINE-BUILDING ENTERPRISES

### 3.1. The role of technological forecasting in innovation development

Machine-building industry is responsible for technological re-equipment of all other sectors of the economy. Therefore, the degree of scientific and technological development affects scientific and technological development of the entire economy. It is clear that marketing research with prospects of fundamental and applied scientific research in the engineering industry of strategic importance for science and economy of the country. These studies are of high priority for the State and have performed for her immediate support, both financial and legislative.

Almost every country in the world has the priorities of the science and technology and innovation development. Promising directions of the development of science, technology and innovation are linked in the legislation countries. These areas receive primary financial support from the government and the business sector.

To identify priority areas for scientific, technological and innovation development are national prognostic systems that encompass all levels of their economy. Almost all of them predict a scientific-technological development, developing countries, regions, and cities. The procedure of forecasting the future became the common term "Foresight"

Foresight allows you to collect the necessary information for making decisions about the condition and direction of the state-funded R & D; create a new culture of cooperation between scientists and business; define the resources necessary to achieve the stated objectives [74].

The need for multilevel marketing research system of scientific and technological development at the macro-, meso-, and micro levels is due to the gap in demand for research and development of Ukrainian enterprises and suggestions of the scientific products of Ukrainian scientists and inventors. Open is the question of the choice of priority areas for strategic development of science and technology at the

level of state industries, regions, enterprises. To display multilevel marketing research system of scientific and technological development offers a new concept of the "national system of strategic marketing research of scientific and technological development.

National system of strategic marketing research of scientific and technological development is a concept to display the processes of gathering information to determine the subject of the most promising scientific and technical studies at all levels of the national economy within the appropriate priorities to balance supply and demand in the market of scientific and technological products and increasing the level of innovation of the national economy.

The structure of the national system of strategic marketing research of scientific and technological development has three levels: makrorìven, mìkrorìven, meso level (fig. 3.1).

MACRO

System of strategic marketing researches of state scientific and technological development

MESO LEVEL

System of strategic marketing researches of scientific and technical development of regions and branches

MÌCRO

System of strategic marketing researches of scientific and technological development of enterprise
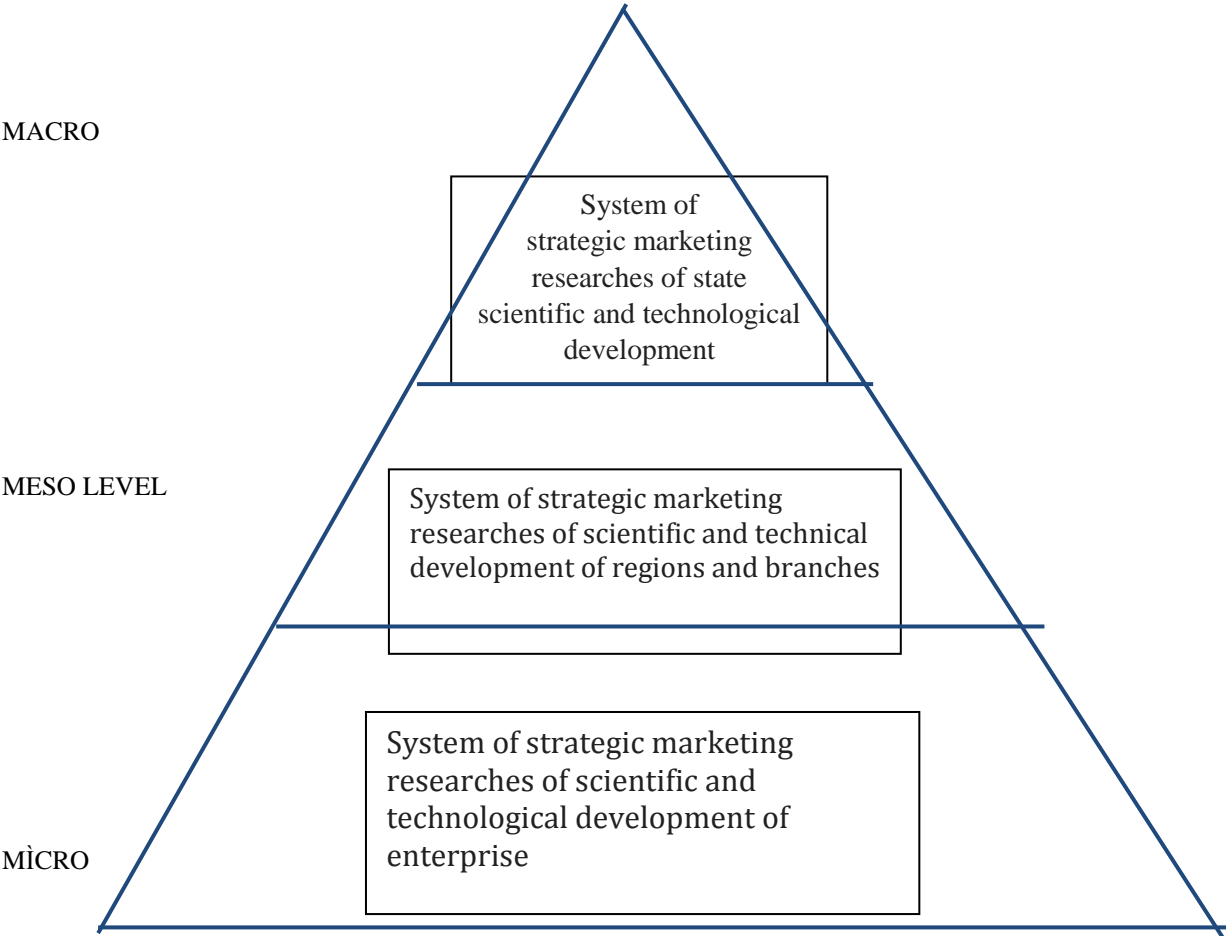
Figure 3.1 – National system of strategic marketing research research and technological development

First of all conducted by strategic marketing research for the priority directions of the scientific-technological development of the State is macro level. Each region, each branch should identify priority areas of scientific and technological development, which is also strategic marketing analyzed in meso level. Every innovative company has aimed to define the priorities of scientific and technological development and to hold strategic marketing research is mìkrorìven.

Lets proove the need for the formation of a national system of strategic marketing research of scientific and technological development.

1. Law of Ukraine "about priority directions of innovation activity in Ukraine" [58] prescribed system of formation and approval of the directions of innovation activity both in the long-term (strategic), and in the mid-term period (table 3.1).

Table 3.1 – Formation of the directions of innovation activity

*

| Directions of innovation activity | Who formed | The term formation | On the basis of the developed | Who are approved by the |
|---|---|---|---|---|
| Strategic directions of innovation activity | StateScienceInformation with the assistance of the national and branch academies of Sciences of Ukraine | in the long term not less than 10 years | developed on the basis of this analysis of global trends in socio-economic and scientific-technological development taking into account the capabilities of domestic innovative potential | Verkhovna Rada Of Ukraine |
| Medium-urgent priority directions of innovation activity: State-level industry level the regional level | StateScienceInformation of Ukraine central executive bodies industries regional bodies of State governance | for the next 3-5 years | formed within the strategic priority directions of innovation activity are formed taking into account scientific, technical and technological development of the industry and its innovative potential in the framework of the strategic and national medium-term priorities for innovation based on the analysis of the State of economic and innovative potential of the region | Verkhovna Rada Of Ukraine the respective ratings boards of central executive bodies of the industry regional councils |

Developed by [58]

2. Verkhovna Rada of Ukraine defines the following strategic directions of innovation activity in Ukraine on 2011-2021. [58]:

1) development of new technologies for the transportation of energy, introduction of energy-efficient, resource-saving technologies, the development of alternative energy sources;

2) development of new technologies for high-tech development of the transport system, the rocket and space industry, aviation and shipbuilding, armament and military equipment;

3) development of new technologies for the production of materials, their processing and connection establishment industry Nanomaterials and nanotechnology;

4) technological upgrading and development of the agro-industrial complex;

5) the introduction of new technologies and equipment for quality medical care, treatment, pharmaceuticals;

6) widespread use of cleaner production technologies and environmental protection;

7) the development of modern information, communication technologies, robotics.

3. According to the mentioned areas we consider it necessary to introduce a national system of strategic marketing research science and technology development in Ukraine. Law of Ukraine "about priority directions of development of science and technology" [59] does not define a systemic approach to their definition, we are talking only about government priorities. But an innovative economy provides innovative orientation of most businesses in the country, drawing up strategic and medium-term plans of innovative development of enterprises, industries, regions on why can build innovative plans as the plans of scientific and technological development. Therefore it is extremely necessary to settle the demand for innovation by enterprises and offer scientific and technological products (ETP) by the scientific organizations.

Also consider that the national system for strategic market research allows you to identify the scientific and technological research, with the maximum probability through 5-10 years into innovations within the priority areas for each hierarchical level of the economic system.

The prioritization of scientific development must involve all the institutional State-owned unit. You need to deal with company R & D results of which they can be in the middle or strategic period to implement in production. It is necessary that States were determined that research or development will contribute to their economic development. It is necessary that industry committees determined not only medium-term directions of innovation, as well as areas of scientific research that contribute to this development.

4. The Cabinet of Ministers of Ukraine with the assistance of the National Academy of Sciences of Ukraine, academies of Sciences, the central bodies of the Executive power, on the soil of the State target program of forecasting of science and technology and innovation development of Ukraine, every 10 years formed a State priority directions of development of science and technology, which are approved by the Verkhovna Rada of Ukraine [59]. These areas are the basis for the formation of thematic areas of scientific and technological research, in the framework of which is determined by the subject of the most relevant and promising scientific research that will lead to the creation of breakthrough (which does not have analogues) and/or critical (developments in various branches of science) innovative technologies.

In 2007 the Cabinet of Ministers approved the Concept of the State program of forecasting scientific and technological development at 2008-2012. For its implementation the Government Resolution was approved the State program of forecasting scientific and technological development at 2008-2012. In fact, this is the second program of this kind in Ukraine. The State program of forecasting scientific and technological development at 2008-2012. In section 4. Conduct prediction-analytical researches "among a number of measures intended, in particular, the following:

– carrying out strategic marketing research to identify promising directions of development of new technologies based on expert assessments;

– development of the list of the priority thematic areas of research and development, and the list of critical technologies, their passports.

With 2008 r. prediction-analytical information Department of the Ukrainian Institute of scientific, technical and economic information (ukristei), conducted by strategic marketing research of scientific and technological development. Research is conducted with the help of expert polls for such groups of specialists:

– the scientists - scientists who most actively working in a certain direction;

– managers – the most competent in a certain direction representatives of central executive bodies, industry associations, and business communities;

– entrepreneurs – representatives of enterprises, where possible the introduction of new technologies or the release of innovative products.

Expert Panel generates prediction-analytical Department Ukristei and expert advice for the appropriate direction. Specialists of the Department conducted the poll of experts according to the specially developed application for each group, determine the degree of coherence of opinions of experts for certain methods of statistical analysis. The result of these studies is a list of passports of the critical and breakthrough technologies for each priority. These passports are publicly available on the website of Ukristei [69]. Formed by experts and approved by the scientific and technical Council of the program, the list of critical technologies for each of the priority areas is sent to the Cabinet of Ministers for implementation during the formation of the Government of the State order on scientific-technical products and innovative projects. In addition, the list of sent industry ministries and regional state administration.

In September-November 2008, for the first time conducted an Internet survey of experts in "energy and energy efficiency» at the State level. The pilot strategic marketing research of scientific and technological development carried out on the

basis of UkrINTEI to check the effectiveness of the functioning of the scientific-methodical support.

In the first survey made by about 100 experts, most of them - experts-scientists, about equally were experts on the part of management and entrepreneurship.

During the first survey of experts identified more than 100 new technologies that may receive as a result of scientific research from leading Universities and institutions. Was analyzed all of the forms of experts. Selected for further analysis 24 the newest technologies, which provide the experts of all three groups to finance necessary to elect those scientific studies that interest entrepreneurs and can be implemented at Ukrainian enterprises.

For selected technologies was formed the previous passports of new technologies and put them on the site. The experts who provide these technologies in the first survey was sent out the invitation to take part in the second poll. Each of the experts, once on the site, was by invitation to all 24 previous passports and make corrections. During the second survey, the experts assessed the competitiveness of new naukoêmnoï products, which can be made by selected technology, comparing it with domestic and foreign counterparts. Based on expert assessments of each group of relatively new naukoêmnoï products, checking the consistency of opinions of experts in each of the groups and between the groups was composed of 14 passports of new technologies with priority "energy and energy efficiency (fig. 3.2).

У результаті проведеної роботи УкрІНТЕІ було вперше в Україні сформовано базу даних енергозберігаючих технологій та їх паспортів. Методом відбору провідними спеціалістами - членами експертної ради Програми за напрямом "Енергетика та енергоефективність" було визначено 14 пріоритетних критичних (ключових) технологій та сформовано 14 їх паспортів.

Водночас було розроблено проект переліку семи пріоритетних тематичних напрямів, за якими сформовано зазначені критичні технології:

- **когенераційні технології**, їх призначення: підвищення ефективності забезпечення об'єктів сфери промисловості та житлово-комунального господарства електроенергією та теплом;
- **енергозабезпечення будівель і споруд**, призначення: використання альтернативних джерел енергії для забезпечення теплом житлово-комунального господарства;
- **електроенергетика**, призначення: ефективне електро- та теплозабезпечення житлово-комунального господарства;
- **нові види палива і енергоресурсу**, призначення: заміщення споживання нафтопродуктів та природного газу;
- **технології горіння**, призначення: підвищення ефективності використання хімічної енергії палива та альтернативних джерел енергії, покращення екології довкілля;
- **теплонасосні технології**, призначення: забезпечення енергозбереження в народному господарстві, утилізація низькопотенційного скидного тепла;
- **енергетичне машинобудування**, призначення: підвищення ресурсу та зменшення енергоємності обладнання, що експлуатується в енергетиці.

Відповідно до зазначених напрямів сформовано Перелік критичних технологій, визначених за результатами стратегічних маркетингових досліджень науково-технологічного розвитку за напрямом "Енергетика та енергоефективність":

1. Когенераційні технології
   1. Технологія створення енергогенеруючих потужностей на основі комбінованих когенераційних і теплонасосних установок

2. Енергозабезпечення будівель і споруд
   1. Технологія опалення та гарячого водопостачання житлових та комунально-побутових приміщень на основі використання сонячної енергії
   2. Технологія енергоефективного екобудинку з використанням відновлюваних джерел енергії

3. Електроенергетика
   1. Технологія удосконалення та структурної оптимізації енергетичних мереж згідно намірів гармонізації з енергетичною системою країн ЄС
   2. Технологія зменшення втрат в елементах транзитних електричних мереж
   3. Технологія використання модульних систем у малій вітроенергетиці

Figure 3.2 – Results of a marketing research

Further strategic marketing research of scientific and technological development were carried out in 2009, in the directions of "Biotechnology" and "new materials" and in 2011, in "Information and communication technologies" (Figure 3.3).

In spite of the functioning of the State system of strategic marketing research of scientific and technological development, the innovative development of the country is not improving. Research and development scientists to improve statistical reporting data and information. The number of scientific researches, reporting that this agency is embedded, far exceeds the number of actually implemented at the enterprises. Consider the reasons for such discrepancies.

Figure 3.3 – the results of the strategic marketing research

In 2011 The law of Ukraine «about priority directions of development of science and technology the new list of priority directions of science and technology for the period until 2020 [59]:

1) fundamental research of the most important problems of scientific, technical, socio-economic, socio-political, human potential to ensure the competitiveness of Ukraine in the world and sustainable development of society and the State;

2) information and communication technologies;

3) energy and energy efficiency;

4) rational nature;

5) life sciences and new technologies to prevent and treat common diseases;

6) new substances and materials.

In the previous list (the 2004-2012) was missing the first of the above-mentioned areas.

By definition, the law of Ukraine "About scientific and scientific-technical activity, fundamental research is a scientific theoretical and experimental activity aimed at obtaining new knowledge about the patterns of the development of nature,

society and man, their relationship" [57]. It is known that fundamental research was originally not aimed at achieving practical purpose or solve a particular task, it is the goal of the applied research and development. Therefore, it is doubtful that 48.2% embedded scientific-technical products in the field of "fundamental research" raise the innovative level of Ukraine's economy. This confirms the statistical reporting.

We believe that it is necessary to fix the ETP implementation primarily at Ukrainian enterprises in the real sector of the economy, and not to approach this question formally. You'll also need separate priority areas of scientific and technological development, which contribute to increasing the innovation component of the economy of Ukraine and directions that are necessary for further development of science, engineering and technology. The first should be financed not only from the State budget, as well as have the investment support from businesses. Such is the world of practice. So, in the European Union on R & D is spent 3% of GDP (2/3 due to the investments of private industry and on 1/3 – Government spending). In the UK, Germany, Hungary, France, Spain and the propaganda of R & D carries out first of all the Government, in Sweden, Italy and Portugal in investing R & D business circles have a greater share.

In the table 3.2 structure of the formation of the priority thematic areas national system of strategic marketing research of scientific and technological development. In Ukraine already operates a system of strategic marketing research scientific-technological development of the State is makrorìven.

Each branch of the economy of Ukraine has the priorities of innovation development. Therefore, it appears necessary to organize the definition of areas of research and scientific and technical developments that will provide an innovative component of each industry. Define the directions of scientific researches and scientific and technical developments, central executive authorities in the framework of Government priorities to ensure the innovative development of the industry. Approved by the respective ratings boards of central executive bodies.

Table 3.2 - structure formation of the priority thematic areas national system of strategic marketing research of scientific and technological development

| Areas of strategic marketing research | Who formed | The term form-ation | On the basis of the developed | Who are approved by the |
|---|---|---|---|---|
| **Macrolevel** State the priority thematic areas of scientific research, scientific and technical developments | Information with the participation of other interested central bodies of executive power, the National Academy of Sciences and academies | up to 10 years | in the framework of the priority directions of the development of science and technology in order to ensure their implementation | The Cabinet of Ministers of Ukraine |
| **Meso level** Industry priority thematic areas of research and scientific and technical developments | central executive bodies industries | up to 5 years | within the framework of Government priorities to ensure the innovative development of the industry | the respective ratings boards of central executive bodies of the industry |
| **Meso level** Regional priority thematic areas of research and scientific and technical developments | regional State administration bodies | up to 5 years | within the framework of Government priorities to ensure the innovation development of region | Regional councils |
| **Microlevel** Priority thematic areas of research and scientific and technical developments of enterprises | Guide enterprises | up to 5 years | in the framework of the strategy of innovative development of enterprise and required for the scientific and technological research | The bodies of management of the enterprise |

Just need a justification of and regional priorities of scientific and scientific-technological development. Regional priorities for scientific and scientific-technological development are determined by regional bodies of State administration in the framework of Government priorities to ensure the innovation development of the region. Approved by regional councils.

Most of the enterprises are still innovative passive. Guidance should be determined by the priorities of scientific and scientific-technological development

within the strategy of innovative development of enterprise. They are approved by the management bodies of the company (table 3.2). It is necessary to develop a series of measures to encourage them to innovation and scientific and technical research. Such measures can be both financial instruments (providing attractive loans for R&D, reducing the load by fiscal bodies), and communication.

Strategic marketing research of scientific and technological development at each of the institutional levels can according to expert polls. About how such research is conducted at the State level, already mentioned above. With regard to sectoral level concept does not change; the relevant structures of the sectoral ministries formed the Panel of scientists, managers and entrepreneurs and their survey about the definition of advanced scientific and technical research for innovative development of the industry. Industry directions may coincide with the State, and may differ by virtue of limited prospective directions of scientific and technological research, defined in the law. The results of the survey have to be coordinated on a industry conferences. In the first place on these studies need to direct funds to public and private investors (table 3.3).

Table 3.3 – Functioning of the national system of strategic marketing research of scientific and technological development

| Areas of strategic marketing research | Who helds | The frequency of conducting | Someone questioned |
|---|---|---|---|
| **Macrolevel** State the priority thematic areas of scientific research, scientific and technical developments | Department of prediction-analytical innovation Ukristei | every five years for each of the priority areas of the State | for each priority are three panels: – experts and scientists; – Experts-managers; – Experts-entrepreneurs |
| **Meso level** Industry priority thematic areas of research and scientific and technical developments | prediction-analytical departments of innovative development ministries | every five years for each of the sectoral priorities | for each priority are three panels: – experts and scientists; – Experts-managers; – Experts-entrepreneurs |
| **Meso level** Regional priority thematic areas of research and scientific and technical developments | prediction-analytical departments of innovation development of the region | every five years for each of the regional priority areas | for each priority are three panels: – experts and scientists; – Experts-managers of the region; – Experts-entrepreneurs |

| | | | from the region |
|---|---|---|---|
| **Macrolevel** Priority thematic areas of research and scientific and technical developments of the enterprise | Group marketing research innovation in the enterprise or agency of marketing researches | every five years for each of the priority areas of scientific and technological development of the enterprise | for each priority are three panels: – experts and scientists; – management of the enterprise; – investors of the company; – consumers |

At the regional level the strategic marketing research of scientific and technological development should hold a special structural units that create the bodies of local self-government. The expert panel should include representatives of the Administration and enterprises of the region, the scientists can be also from other regions of Ukraine – the main thing is that they are engaged in research that can be implemented at the enterprises of the region and promote regional innovation development.

Strategic marketing research of scientific and technological development at the level of the enterprise should carry exactly the company or agency for marketing research or scientific organization that will bring to this enterprise. The content of these studies is identifying the most promising for innovative R & D activities. for the largest automobile companies of the world, such as General Motors, Ford Motors, Reno, Volkswagen is characterized by a strategy of cooperation, a combination of efforts in the development of innovations that are intellectually and financially expensive. Automobile companies, in various countries, cooperating for the development of high-tech innovation Ukrainian scientists also offer the implementation of the strategy of integrating the businesses of certain sectors of mechanical engineering on the ground of R&D. Such a strategy will save time and financial costs of similar R & D, strengthen the scientific potential of the research, to develop common standards for new technologies. The integrated structures in the Western region are offered are: JSC «Borislav experimental Foundry mechanical factory ", Research mechanical factory " Karpaty ", JSC "Drogobych machine-building plant", JSC" Autoloader", JSC «Lviv experimental mechanical plant», JSC «Kalush plant construction machinery", JSC "Drogobych truck crane plant", OJSC

"Kovelsilmash", JSC «Plant Lvivmash», JSC «Plant Rivenmash», OJSC «Karpatnaftomash», JSC «Lviv plant of «Metalist». The creation of the strategic alliance will set technical standards in the field of agricultural engineering, access resources and knowledge of these companies, conduct joint research, development and production of technologically sophisticated products. Reduce the time for implementation of studies in the life of ... " [30].

The following enterprises of railway engineering as JSC "Azovmash" OJSC Dniprovagonmash ", JSC "Stakhanov machine building plant", JSC «Holding company «Luganskteplovoz», OJSC «Krukivskij carriage works are competitors, but needs in scientific and technological research are shared – enhance energy saving and energy efficiency, reduce emissions, increase the power of engines.

The results of the functioning of the national system of strategic marketing research of scientific and technological development in Fig. 3.4 Every 10 years, according to the scientific technological and innovation development of Ukraine structures of the Academy of Sciences on behalf of the Cabinet of Ministers of Ukraine, list of State priority directions of development of science and technology. This list is fixed in laws and is a priority in obtaining public funding for scientific research.

For each direction of Public Information priority areas initiated by the strategic marketing research. Today they conducted Department of prediction-analytical innovation UkrINTEI. According to the results of strategic marketing research of scientific and technological development for each priority formed list of most promising thematic trends, as well as the passports of new technologies in those areas. Very important is the fact that the passports of new technologies are posted on the website of UkrINTEI. Enterprises can for these passports to assess the prospects of scientific research, order research or purchase a license for the use of technology in developers. Conducted by strategic marketing research scientific-technological development every five years. Research funding comes from the sources of financing of forecasting scientific, technological and innovation development of Ukraine.

| State priority directions of development of scitech | Branch priority directions of development of scitech | Regional priority directions of development of scitech | Directions of scitech development of enterprise |
|---|---|---|---|
| State priority thematic directions of scientific researches and scientific and technical developments | Branch priority thematic directions of scientific researches and scientific and technical developments | Regional priority thematic directions of scientific researches and scientific and technical developments | Priority thematic directions of scientific researches and scientific and technical developments of enterprise |
| Passports of the newest technologies are after each of priority directions that is on a website UkrINTEI | Results of the expert uestioning (passports technologies), that are promulgated on the state web-sites | Results of the expert questioning, that is promulgated on the web-sites of regional organs of self-government | Results of researches (most perspective directions, passports of technologies), that are property of enterprises |

Figure 3.4 – Results of the functioning of the national system of strategic marketing research of scientific and technological development

Initiate and conduct industry strategic research prospects for scientific and technological development of central bodies of executive power industries (specialized Ministry), which should be created for forecasting and analytical departments of innovation development. Industry-specific priority areas of scientific and technological research are formed primarily from analysis of the needs of the industry, and given the State the priority directions of development of science and technology. For these areas the soil expert polls formed list of thematic areas and their passports. Publication of research results it is recommended to carry out the official websites of ministries. Industry strategic marketing research of scientific and technological development also recommended spending every five years. Financing strategic marketing research of scientific and technological development in the

branch of the economy should be compatible with public funds and funds of the industry who are interested in the results of the research.

Regional priority thematic areas of research and scientific and technical developments are formed of specially created units, for example, for forecasting and analytical departments of innovation development of the region, which is subordinated to the Executive Committee or the Executive Committee. According to expert surveys determined the main directions of scientific research, which are caused by regional needs. These directions can also be formed with the State scientific and technical priorities. By their areas formed the Panel of experts, who as a result of a questionnaire survey form the passports of new technologies. Regional strategic marketing research scientific and technological development carried out at the expense of communities, as in previous cases, their results should be made public, for example, on the website of the Executive. The term research is every five years. Funding of regional strategic marketing research of scientific and technological development is carried out at the expense of local budgets and reìonu who are interested in the results of the study.

Priority thematic areas of research and scientific and technical developments of the Enterprise/Association aimed at ensuring competitiveness, increase market share, the conquest of new markets. R & D directions are defined by the enterprise or administrative body of science and technology of the Association within the framework of the strategy of innovation development. The results of the research there is a list of promising research directions and/or a list of passports of new technologies, are the property of the company and have not announced.

Strategic marketing research scientific-technological development of the company is part of the marketing research directions of innovative development. But the company is carrying out marketing research at all stages of the innovation process, which consists of: basic research, applied research, experimental work, the stage of implementation and diffusion stage. The first three stages is R & D, the last two are the commercial phase of the innovation process, in which the results of R & D are perceived or nehtuûtsâ market.

At each stage of the innovation process addresses the specific task and engaged experts, knowledge, opinions, experience and skills that are useful to determine the direction of further action, decision making, reduce risks in business. In the first three stages of the innovation process in the strategic marketing research experts are involved, of which above are scientists, managers, and entrepreneurs. On the last two stages should involve the fourth group of experts are consumers innovative products (business intermediaries or end-users).

In the table 3.4 are the essence of each of the stages of the innovation process, the challenge that resolve the experts on each of the stages, the Group of experts to involve at some point and evaluation that can provide experts.

Table 3.4 – The involvement of experts in each of the stages of the innovation process

| Stage | Content of phase | Expert evaluation/ Task | Experts/ Group | Methods of expert polls |
|---|---|---|---|---|
| Fundamental research | The generation of new knowledge and ideas | Promising ideas for innovation | Scientists | 1. Brain attack 2. Synectic 3. The Delphi Method |
| Applied research | The transformation of ideas into new products and processes | 1. Evaluation of the commercial potential of innovation 2. Evaluation period of development and innovation | Scientists Managers Entrepreneurs | 1. The Delphi Method 2. Questionnaire 3. Poll |
| Experimental work | Sampling of new products or new process | 1. Assessment of market potential 2. Estimation of the period of implementation of innovation 3. Score Implement ownership innovations | Scientists Managers Entrepreneurs Consumers | 1. Focus groups 2. Questionnaire 3. Poll 4. The market experiment |
| Introduction | Market testing of new products or new process | 1. Evaluation of the perception of market innovation 2. Assessment of market potential 3. Competitiveness innovation | Consumers Entrepreneurs Managers | 1. Panel Survey 2. Questionnaire 3. Focus groups 4. Observation-Committee |
| Diffusion | Spread of a new product or a new process | 1. Assessment of the prospects for the expansion of the market 2. Assessment of the prospects for the sale of licenses for the production of 3. Assessment of the prospects for expanding the line of innovative products | Consumers Entrepreneurs Managers | 1. Panel Survey 2. Focus groups 3. Observation-Committee |

Fundamental research aimed at obtaining new knowledge and ideas. Marketing research opinions at this stage of the innovation process concerning the prospects for the development of ideas and discoveries of fundamental research for innovation. The experts at this stage act scientists. Usually in marketing research at this stage used qualitative methods for obtaining opinions: the method Delphi, brainstorm; synectic method. These methods do not require the use of statistical tools for analyzing the answers of experts.

At the stage of application studies are determined by the ways of practical application open at the stage of basic research of phenomena and processes. Here are the tools of market research are much broader: can be used as a qualitative methods for obtaining opinions of experts is a method of Delphi and quantitative: surveys and questionnaires. The experts at this stage can be scientists, who estimate the period of development of new innovative products; managers who evaluate the commercial potential of innovation; entrepreneurs who assess the possibility of introducing innovation.

At the stage of experimental works produced samples of new products and identify market prospects. The experts at this stage acting entrepreneurs who more accurately compared with the previous phase of the estimated dates of introduction of innovations; managers who can accurately assess the commercial and market potential of innovation; the scientists who evaluate the technological opportunities to improve innovation, enhance its competitiveness, cost; consumers who provide assessment of attractiveness of innovation for the economic and qualitative parameters. This stage requires both qualitative and quantitative assessments of the opinions of experts.

The stage of implementation of the applied quantitative methods for evaluating the opinions of experts. This stage is the result of R & D, it begins the life cycle of the product. She can go to the stage of growth in the case of the success of a new product on the market, and can move on to the stage of the recession in terms of rejection of the goods consumers. According to statistical information from 60% to 85%-novelties are not perceived by the market. The main experts at this stage, there

are consumers. They provide assessment of the perception or ignoring market innovation, their behavior experts-managers can assess the market potential of innovative products, and experts of the entrepreneurs – competitive innovation.

In the case of the transition stage of implementation in the stage of growth begins the diffusion of innovation, that is, the spread of innovations in the new conditions or locations. At this stage, used both quantitative and qualitative methods to assess the opinions of experts. Experts-managers estimate the prospects of selling licenses for the production of innovation experts entrepreneurs assess the prospects of expanding the limits of market innovation, experts estimate consumers expanding line of innovative products.

The statistical tools of checking consistency of opinions of experts depends on several factors:

– the number of groups of experts;

– the number of questions to the experts, which checked the consistency of their responses;

– the scales on which the experts provide answers to questions.

The proposed concept of a national system of strategic marketing research has purpose: to scientific and technological activities of the majority of Ukrainian enterprises; increasing demand for scientific-technical products of Ukrainian scientists; promoting the innovative development of all institutional units.

The results of the functioning of the national system of strategic marketing research of scientific and technological development, are important sources of information enterprise about priority directions of development of science and technology at the level of the State, region, and industry. The results of the research, research-and-development tehnological should serve as reference points for the machine-building enterprises in the selection of areas of innovation development, acquisition of the results of research or funding.

3 .2. Methodological support of technological forecasting for innovation development

National system of strategic marketing research scientific-technological development consists of determining the priority directions of the development of science and technology at all levels of the economy: State, regions, industries, enterprises.

Methodological basis for carrying out strategic marketing research on each of the levels of the national system has similar features. In the course of strategic marketing research on any level economics addresses the three tasks:

– determining the priority directions of the development of science and technology;

– determine research directions within the framework of priorities and preparation of certificates of innovative technologies;

– ranking of passports of new technologies according to certain criteria.

The most significant and global strategic marketing research of scientific and technological development carried out at the State level. Consider the more detailed methodological basis for carrying out such studies, as an example, in which you can conduct similar research at all other levels.

State system of strategic marketing research of scientific and technological development aimed at the detection of the position of the experts on the prospects for the impact of scientific research on the innovative development of the national economic system.

The purpose of the State system of strategic marketing research of scientific and technological development is evaluation and selection for financing , development and introduction of the newest technologies on the following grounds:

– the forecasted period of development and introduction of the newest technologies;

−projected amount of financing development and introduction of the newest technologies;

−projected annual sales of the new scientific product, which is produced by new technology;

−projected benefits of new scientific products for functional and price characteristics over the world analogues;

−ensuring the national security of Ukraine, in particular, its technological security.

The above objective can be reached by:

−getting through the survey information from experts about the most promising innovations for the priority thematic areas;

−development passports of new technologies;

−ranking of passports of new technologies for selected signs.

On the basis of the the results of the expert the survey formed the list of new naukoêmnoï products, mass production with introduction of new technologies may be started at Ukrainian enterprises over the next 10 years. Consists of a package of key factors of the commercial success of new scientific products. Promising products is compared with the existing domestic and foreign analogues. It turns out the list of industries, businesses, where the introduction of new technologies.

In General, the new scientific products should provide:

− contribute to the acceleration of GDP growth, improving its structure and increasing the competitiveness of the economy;

− ensuring the national security of Ukraine, in particular, its technological security.

Experts, it is advisable to select using a deterministic or non-deterministic sample. For example, a priority of the Energy and energy efficiency is the power, hydropower, nuclear power, alternative energy sources, etc.

On the "Science" block there are two options for implementing sampling:

a) 1 option. Selected organizations that are engaged in scientific developments in the direction of "energy efficiency" (institutes of Ukraine, institutes of the NAS of

Ukraine, branch institutions). These organizations are the most reputable scientists who are competent with each type of energy "power, hydropower, nuclear power, alternative energy sources, etc", such as citation index. So get a panel of expert scientists.

b) 2 option. For each direction of energy is elected by the most reputable scientist, who points to the following specialists, and they – on the following.

By "Managers" it is recommended to carry out a survey of certain employees of the Ministry of fuel and energy, and other employees of the central bodies of State administration, duties that apply to a specific type of energy.

On "Entrepreneurs" produced with ucilne survey of entrepreneurs, working on energy then this list should be supplemented with the companies that will show scientists and managers.

Necessary to carry out the survey in two "waves". In the first poll (first wave) all the questions are open. With the second survey experts assess the competitiveness of new scientific products with passports of the newest technologies, chosen according to certain signs in the first stage, and also have the ability to adjust the passports of new technologies. The second phase received passports of new technologies. Application for the two surveys is given in Appendix D and Appendix C.

For the implementation of the survey experts have developed special software, which conducted the online poll as the first and second waves.

For each group of experts had developed a specific form (Appendix A, Appendix B) that take into account their specialization. A sequence of research, see fig. 3.6.

The first survey. Each expert receives the invitation to take part in the online survey on the special website for individual password. Choosing the priority and group – scientist, top manager wants, entrepreneur - expert answers to the questions of the questionnaire. The answers of experts partially formed the passports of new technologies.

First questioning of experts. On the special web-site the questionnaires of the first questioning take place for three groups of experts. Every expert gets an individual password for filling of questionnaire and does not have an access for the review of questionnaires of other experts and summarizing tables and charts

| A questionnaire is for experts - scientists | A questionnaire is for experts of managements | A questionnaire is for experts - businessmen |

Processing of data of the first questioning. Stowage of intermediate passports of the newest technologies

Second questioning of experts. The questionnaires of the second questioning, that contain information of intermediate passports of the newest technologies and question on new наукоємної products that will be made after these technologies, take place on the same web-site. Experts have the opportunity to become familiar and amend in the intermediate passports of the newest technologies

Processing of data of the second questioning of experts (tables of statistical analysis of answers of experts from every group, results of dispersible and cluster analysis of answers of experts of different groups). Realization of focal group is for the concordance of points of view of experts.

A stowage of passports of the newest technologies is after priority directions.

Claim of the got passports of the newest technologies by Expert advices after priority directions

Packet of the newest technologies, that consists of six groups, assembly. In every group the newest technologies of проранжовано are on such signs:
1)term of implementation of scientific research and term of introduction of the newest technology;
2)volumes of financing of scientific researches and volume of charges are on introduction of the newest technology;
3)amounts of types of new sientific products;
4)annual volumes of sale of new sientific products;
5)functional and price descriptions of new sientific products;
6) providing of national safety of Ukraine, in particular, her technological safety.

A choice of the newest technologies is for financing

Figure 3.6 – The algorithm of functioning of the State system of strategic marketing research of scientific and technological development

The second poll after the formation of the first part of the passport examiners receive an invitation to take part in the second wave of the survey. Results of the second survey are processed by using specially developed software (for alternative 4th option may use the software SPSS).

Experts with the second survey are processed using statistical methods. And questionnaire of the second survey consists of two parts: the first one is the integrated responses of experts of a specific group (scientists, managers or entrepreneurs) the first survey formed part of the passport and the newest technologies; the second question relating to the properties of a new naukoêmnoï of products that can be manufactured according to the latest technology.

Experts choose the newest technology and with the proposed list (table 3.5 ), then they get the characteristics of technology (part of the passport of the newest technology), since the first survey by a group of experts answers.

Table 3.5 – List of latest technology, received the first poll

| #<br>p/n | Name of the technology |
|----------|------------------------|
| 1 | Technology 1 |
| 2 | Technology 2 |
| 3 | Technology 3 |

With these characteristics, the experts can agree or change them. Changes the characteristics of the new technologies are automatically stored in the database on the site and processing the results of the second survey are entered in the passport of the newest technology.

In the second part of the application experts choose new science-intensive products from the list of products that can be produced in the chosen modern technology. All three questionnaires (for scientists, managers, entrepreneurs) contain the same questions about the properties of the selected products (table 3.6).

Table 3.6 – issues common to all application forms:

"The Rate of functional-cost characteristics of domestic new science-intensive products (services), which can be obtained by this latest technology, in comparison with the existing domestic and foreign analogues"

| # p/n | New science-intensive products (services) | Domestic analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new naukoêmnoï products (services) in points (1 to 4) | |
|---|---|---|---|---|---|
| | | | | Functional | Pricing |
| | | | | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
| | | | 1) | | |
| | | | 2) | | |
| | | | | Functional | Pricing |
| | | | | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |

Statistical analysis application of the second wave is based on comparing the answers of experts on this issue. Intergroup coherence of opinions of experts compares the responses to this question, one group of experts intergroup coherence of opinions of experts compares the responses to this question the experts of different groups. For answers to common questions (table 4.6) for each group of experts is formed by a table of estimated new scienceproducts (table 3.7).

Table 3.7 – Evaluation of new science-intensive products in comparison with the domestic/foreign analogue

| New sientific products | | |
|---|---|---|
| Experts | The average functional score | Price estimation |
| Expert 1 | $x_1$ | $y_1$ |
| Expert 2 | $x_2$ | $y_2$ |
| Expert 3 | $x_3$ | $y_3$ |
| ... | ... | ... |
| Expert N | $x_n$ | $y_n$ |

Each expert points to see the five mostimportant functional characteristics of new science-intensive

products and exhibit theratings for these characteristics in comparisonwith domestic and foreign analogues.

A set function is estimated for each expert calculated the average functional score is $x_i$. Price assessment of the new product in comparison with domestic and foreign analogues indicated $y_i$.

Consistency of opinions of experts of one group of checked following statistical values:

– $\bar{x}_1 = \frac{1}{n}\sum_1^n x_i$ – the average functional score new naukoêmnoï products in

the Group of scientists (calculated for ratings comparison with domestic counterparts and for evaluations comparison with foreign counterparts);

– $\bar{x}_2$ – the average functional score new naukoêmnoï products in the Group of managers;

– $\bar{x}_3$ – the average functional score new naukoêmnoï products in the Group of entrepreneurs;

– $\bar{x}_1^2 = \frac{1}{n}\sum_1^n x_i^2$ is the average of the squares of the functional

assessments of new naukoêmnoï products in the Group of scientists (similarly as for a group of managers and entrepreneurs);

– $D = \overline{x_1}^2 - (\overline{x_1})^2$ is the variance of the functional assessments of new naukoêmnoï products in the Group of scientists (similarly as for a group of managers and entrepreneurs);

– $S_{x_1} = \dfrac{n}{n-1}\sqrt{D}$ – medium-quadratic deviation of functional assessments of new science-intensive products in the Group of scientists (similarly as for a group of managers and entrepreneurs);

– $V_1 = \dfrac{S_{x_x}}{\overline{x_1}}$ – the coefficient of variation of the functional assessments of new science-intensive products in the Group of scientists (similarly as for a group of managers and entrepreneurs).

Next we use table (tabl.е3.8) from which statistical characteristics, for which the researcher analyzes the vnutrìšnogrupovu consistency of opinions of experts. A comparison with a foreign counterpart has a similar table of source data to verify the ingroup consistency.

Table 3.8 – Imprint ingroup consistency

*New sientific products 1*
Ingroup consistency
Domestic analogue

| | Scientists | | Managers | | Entrepreneurs |
|---|---|---|---|---|---|
| The average functional score | $\overline{x}_1$ | | $\overline{x}_2$ | | $\overline{x}_3$ |
| The average quadratic deviation | $S_{x_1}$ | | $S_{x_2}$ | | $S_{x_3}$ |
| The coefficient of variation data | $V_1$ | | $V_2$ | | $V_3$ |
| | *Scientists* | | *Managers* | | *Entrepreneurs* |
| Average price estimation | $\overline{y}_1$ | | $\overline{y}_2$ | | $\overline{y}_3$ |
| The average quadratic deviation | $S_{y_1}$ | | $S_{y_2}$ | | $S_{y_3}$ |
| The coefficient of variation data | $V_1$ | | $V_2$ | | $V_3$ |

For these tables, it is convenient to examine consistency of opinions of experts in each group. The smaller the average quadratic deviation, the more consistent answers expert in the corresponding group, and, on the contrary, the more the average

quadratic deviation, the answers are less consistency. Coefficient of variation shows , that part of the middle is the standard deviation. It is clear that the less the coefficient of variation, the more consistent answers expert in to a specific group. The interval from 0 to 0.1 ensures very high coherence of opinions of experts one group. Iterval from 0.1 to 0.2 guarantees high consistency experts opinions of one group. interval from 0.2 to 0.3 guarantee average consistency of opinions of experts of one group.

For objective compilation of passport and the latest technology it is important , to consistent were expert as in each of the three groups, and between these groups. Intergroup coherence of opinions of experts checked using cluster and variance analysis.

In marketing research functional and price advantages for future new science-intensive products on domestic and foreign analogues it should be perform cluster analysis to determine the number of optimistic and pessimistic-minded experts. Figure. 3.7 shows the ideal situation cluster experts. The number of optimistic-minded experts, i.e. those who set high scores price (variable 1) and functional (variable 2) advantages of science-intensive products, exceeds the number of pessimistic minded experts – those that put the lowest evaluation price (variable 1) and functional (variable 2) preferences.
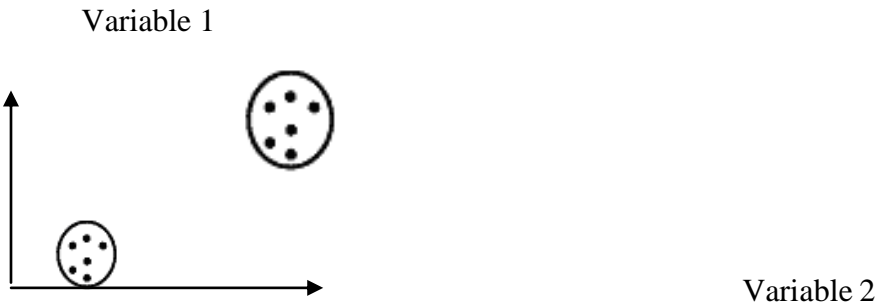


Figure 3.7 – Cluster analysis of expert answers

Classification of experts allows to compare their responses both within each group (scientists, managers, entrepreneurs) , and between the groups. Calculating the

percentage of optimistic and pessimistic-minded experts can detect the discrepancy between the opinions of experts of different groups.

For this purpose, with log wool for each type of new product naukoêmnoï six tables (fig. 3.8). The first three tables contain the number of optimistic and pessimistic-minded experts about new naukoêmnoï products in comparison with the national counterpart in each of the three groups of experts. The other three tables showing the number of optimistic and pessimistic-minded experts about new naukoêmnoï products in comparison with a foreign counterpart.

### *New sientific products 1*

Domestic analogue

| Price estimation | high | Scientists | | 
|---|---|---|---|
| | | | ***The optimists*** number/% |
| | low | ***Pessimists*** number/% | |
| | | low | high |
| | | Functional assessment | |

| Price estimation | high | Managers | | Price estimation | high | Entrepreneurs | |
|---|---|---|---|---|---|---|---|
| | | | ***The optimists*** number/% | | | | ***The optimists*** number/% |
| | low | ***Pessimists*** number/% | | | low | ***Pessimists*** number/% | |
| | | low | | | | low | high |
| | | Functional assessment | | | | Functional assessment | |

Foreign analogue

| Price estimation | high | Scientists | |
|---|---|---|---|
| | | | ***The optimists*** number/% |
| | low | ***Pessimists*** number/% | |
| | | low | high |
| | | Functional assessment | |

| Price estimation | high | Managers | | Price estimation | high | Entrepreneurs | |
|---|---|---|---|---|---|---|---|
| | | | ***The optimists*** number/% | | | | ***The optimists*** number/% |
| | low | ***Pessimists*** number/% | | | low | ***Pessimists*** number/% | |
| | | low | | | | low | high |
| | | Functional assessment | | | | Functional assessment | |

Figure 3.8 – Cluster analysis mìžgrupovoï consistency of opinions of experts

Each of the four central squares of the table shows the number and percentage of under-minded experts in each group. Pricing assessment, which can select experts, consists of four options:

1 – higher counterpart;

2 – on the level of counterpart;

3 – lower the price;

4 – there are no analogues.

We will assume that the expert has put a low price evaluation, if it is 1 or 2. Ie. , the price of new science-intensive products can be produced, is projected at the level of an analogue (domestic/foreign) , or higher analog. high price evaluation, respectively, 3, 4. Ie price new naukoêmnoï products can be produced, is below the price or production counterparts.

As with functional assessments:

[1-2.5) is high;

[2.5-4] is low.

Expert opinions of different groups on the clustered analysis are considered to be consistent if the number of optimistic and pessimistic-minded experts groups of scientists, managers and entrepreneurs close by percentage value. If the discrepancy between the opinions of experts about new science-intensive products – should hold focus group.

*Analysis.* Statistical method differences between selective medium for two or more populations. Analysis can be single-and multifactor, it depends, how many factors considered. Factor is the categorical independent variable.

In our case the factor this is the expert belonging to one of three groups (scientists, managers, entrepreneurs) due to the dispersive analysis verified by reason of the differences of the average functional or price estimates, asand various groups of experts that a new science production (fig. 3.9).

X

I - scientists II - managers III - entrepreneurs

In functional or price evaluation science-intensive products

Figure 3.9- Onefactor analysis

The reason may be that the experts of the different groups differently assess science-intensive products then the variance analysis results are statistically significant, or the difference in the estimates is explained by different groups of statistical variation, that is, evaluation differ, but not significantly.

Performing one-factorial analysis , first, find the average assessment (functional and price) , provided by the new science-intensive product experts in each of the three groups (scientists, managers, entrepreneurs) Then compare them, favoring factor belonging to an expert to one of three groups. This will give an opportunity to argue that the average scores are different because the experts from different groups differently estimated the new science-intensive products or these estimates differ slightly.

Input data for conducting the variance analysis is the score (the average functional or price), which was proposed by the experts of various groups of new science-intensive products (table 3.9).

Table 3.9 – The original data of variance analysis

*New sientific products 1*
*Domestic analogue*

| Scientists | |
|---|---|
| Expert 1 | $x_{11}$ |
| Expert 2 | $x_{21}$ |
| Expert 3 | $x_{31}$ |
| . . . | . . . |
| Expert n | $x_{n1}$ |
| Just *n* of experts | |

| Managers | |
|---|---|
| Expert 1 | $x_{12}$ |
| Expert 2 | $x_{22}$ |
| Expert 3 | $x_{32}$ |
| . . . | . . . |
| Expert k. | $x_{K2}$ |
| Total *k* experts | |

| Entrepreneurs | |
|---|---|
| Expert 1 | $x_{13}$ |
| Expert 2 | $x_{23}$ |
| Expert 3 | $x_{33}$ |
| . . . | . . . |
| Expert village | $x_{via\ C3}$ |
| Total *c* experts | |

Explanation of the table. 3.9.

$-x_{ij}$ – score (the average functional or price), which exhibited expert and group j;

$-N = n + k + c$ – the total number of experts who have chosen a new science-intensive products 1.

Foreign analogue output table is formed similarly.

The estimated matrix according to the variance analysis table. 4.8 has the following form.

**I** (scientists) **II** (managers) **III** (entrepreneurs)

| | | |
|---|---|---|
| $x_{11}$ | $x_{12}$ | $x_{13}$ |
| $x_{21}$ | $x_{22}$ | $x_{23}$ |
| $x_{31}$ | $x_{32}$ | $x_{33}$ |
| . . . | . . . | . . . |
| $x_{n1}$ | $x_{K2}$ | $x_{\text{via C3}}$ |

Implementation of the one-way variance analysis consists of five stages:

1) determination of dependency and independent variable;

2) decomposition of complete dispersion;

3) measuring of effect;

4) seetest significance;

5) interpretation of results.

Analysis is a standard statistical method of determining the differences in averages two or more populations. We've provided step by step so that the software product for this algorithm was developed the program in the PHP.

**1.** The dependent variable is x-assessment experts;

The independent variable – (takes values I, II, III) – expert group.

Find general secondary

$$\overline{X} = \frac{1}{N}\left(\sum\nolimits_1^n x_{i1} + \sum\nolimits_1^k x_{i2} + \sum\nolimits_1^c x_{i3}\right).$$

Find the Group averages:

$$\overline{X}_1 = \frac{1}{n}\sum_1^n x_{i1} - \text{average group of scientists;}$$

$$\overline{X}_2 = \frac{1}{k}\sum_1^k x_{i1} - \text{average group managers;}$$

$$\overline{X}_3 = \frac{1}{c}\sum_1^c x_{i1} - \text{average group of entrepreneurs.}$$

**2** The full Decomposition one-factorial dispersion of dispersive analysis is the separation of a variation of a variation in the dependent variable, the agreed difference averages between groups, plus the variation, the agreed intergroup variability.

The total variation of the $SS_x$ can be decomposed into two components:

$SS_y$ (ingroup variation is the variation between variable categories);

$SS_{errors}$ (ingroup variation is the variation of x inside each group x)

$SS_x = SS_{in} + SS_{errors}$

where $SS_x = \sum_{1}^{n}(x_{i1} - \overline{X})^2 + \sum_{1}^{k}(x_{i2} - \overline{X})^2 + \sum_{1}^{c}(x_{i3} - \overline{X})^2$ ;

$SS_y = n(\overline{X}_1 - \overline{X})^2 + k(\overline{X}_2 - \overline{X})^2 + c(\overline{X}_3 - \overline{X})^2$ ;

$SS_{errors} = \sum_{1}^{n}(x_{i1} - \overline{X}_1)^2 + \sum_{1}^{k}(x_{i2} - \overline{X}_2)^2 + \sum_{1}^{c}(x_{i3} - \overline{X}_3)^2$ .

**3.** Dimension effect. Exposure variable on x is measured with a $SS_y$. $SS_y$ grows with the increase of differences between average values of x in groups.

The effect of the impact of the variable x in the formula to calculate the

$$\eta^2 = \frac{SS_y}{SS_x} \text{ -correlation ratio;}$$

$\eta^2$ – the measure of variations, explained the influence of the independent variable in the;

$\eta^2$ varies from 0 to 1. It is equal to 0, when all the Group medium level, i.e. does not affect x. $\eta^2 = 1$ when inside each group variability is not available, but

there is some variation between groups. We believe that the variable $Y$ affects on the $X$ when $\eta^2 > 0,6$.

**4.** Check the value in the one-factorial dispersive analysis to test the null hypothesis that states that the Group medium level

$N_0$: $\overline{X}_1 = \overline{X}_2 = \overline{X}_3$ .

The zero hypothesis test using $F$-statistics:

$$F = \frac{SS_y / 2}{SS_{\text{пошибки}} / (N - 3)} = \frac{MS_{\text{ф}}}{MS_{\text{пошибки}}}$$

where $MS$ – the middle square.

These statistics under the ordinal F-distribution with the number of steps of freedom (df), what up equals 2 and N-3.

The final table of the one-way variance analysis, which generates the program for each kind of new sientific products separately for domestic and foreign analogues, has the form (table 3.10).

Table 3.10 – Imprint the one-way variance analysis

| The source of the variance | Sum of squares | Degree of freedom | Medium square | F-statistics | The value of the F -the Fisher criterion |
|---|---|---|---|---|---|
| Ingroup | $SS_y$ | 2 | $MS_y$ | F | F-critical |
| Intergroup | $SS_{\text{errors}}$ | N - 3 | $MS_{\text{errors}}$ | | |
| Total | $SS_x$ | N - 1 | | | |

**5.** Interpretation of results if the null hypothesis of equality of group averages do not reject, then the independent variable does not have a statistically significant influence on the dependent variable.

If the null hypothesis value is rejected, then the effect of the independent variable on the dependent is treated as statistically significant. In other words, the average value of the dependent variable is different for different groups of the independent variable.

In the case of consistency of opinions of experts of different groups consist of passports of new technologies (fig. 3.10).

Passport of the newest technologies

_____
(name)

**Priority direction of** _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

The date _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

1. The main purpose of technology
_____

2. Scientific research aimed at the development of technology and organization-developers
_____
_____

3. The World Organization (country) leaders in conducting relevant research
_____
_____

4. Term of fulfilment of scientific research to the implementation of the technology (years)
_____

5. The scheduled year of creation technology
_____

6. The total amount of funding of scientific research to the implementation of the technology (ths.)
_____

7. the minimum, average, and maximum terms of introduction of technologies (years)
_____

8. the minimum, average, and maximum amounts of the costs of the introduction of technologies (ths.)
_____

9. Company/sector implementation of technology _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_____

10. Production of new science-intensive products (services)

| # p/n | New science-intensive products (service) | Start of production | | | | |
|---|---|---|---|---|---|---|
| | | during the year, | After 1-2 years | through 3-5 years | 6 – 10 years | more than 10 years |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

11. Annual sales of new science-intensive products (services) of cost indicators

| # p/n | New science-intensive products (service) | The annual sales volume | | | | |
|---|---|---|---|---|---|---|
| | | up to 1 million. USD. | 1-10 million. USD. | 11-50 million. USD. | 51-100 million. USD. | more than 100 million. USD. |
| | | | | | | |
| | | | | | | |

12. Annual sales of new science-intensive products (services) in natural indicators

| # p/n | New science-intensive products (service) | Consumers | Annual sales (natural indicators) | |
|---|---|---|---|---|
| | | | National market | the world market |
| | | | | |
| | | | | |

13. Assessment of the competitiveness of new naukoêmnoï products (services)

| # p/n | New science-intensive products (service) | Compared with foreign counterparts | | Compared with domestic counterparts | |
|---|---|---|---|---|---|
| | | Functional | Pricing | Functional | Pricing |
| | | | | | |
| | | | | | |

Figure 3.10 is the Passport of the newest technologies

Passport is the cumulative result of the work of experts of all three groups. Experts and scientists respond to questions concerning the terms of development, the volume of funding for scientific research and the benefits of the new naukoêmnoï product, which will be produced by the latest technology. Experts-managers estimate the capabilities of enterprises for the production of new naukoêmnoï products and the future demand for innovative technology and new science-intensive products. Experts-entrepreneurs assess opportunities and production on your venture and the demand for new science-intensive products.

The Expert Council for priority areas approved by the passports of new technologies. Then formed a package of new technologies with six groups (depending on the direction of research groups may be less). In each of these technologies will get the proper significance of rank (1st place greatest importance and it is reduced). customer selects the newest technology for the financing, based on this information.

Obtained passports technologies ranked behind certain featured , among which:

− the forecasted the term the development of new technologies and the term her implementation;

− the forecasted funding for research and the costs of implementing the newest technologies;

− the number of types of new naukoêmnoï products;

− projected annual sales of new naukoêmnoï products;

− functional and price characteristics of new naukoêmnoï products;

− ensuring the national security of Ukraine, in particular, its technological security.

Strategic marketing study of scientific and technological development of regions and industries can have a goal, for example, improving the infrastructure of the region or improving the innovation component of the industry. According to the goal are objectives and criteria for selection of the newest technologies. The term of the development and implementation of the results of scientific research in these cases may be considerably less than 10 years.

Enterprises of their respective industries can get acquainted with the results of the strategic marketing research at the level of the State and the industry and choose for yourself a promising activities with the use of the proposed technologies or order of scientific and technical development of innovational technologies in the research organization, the developer. Strategic marketing research at the level of the enterprise (scientific-technical cooperation of enterprises) can also be done by agreement with the Agency for marketing research or in-house by the above methods.

3.3. Software for technological forecasting for innovation development

As already mentioned, for the realization of holding polls within the State system of strategic marketing research of scientific and technological development has been developed site (fig. 3.11 ).
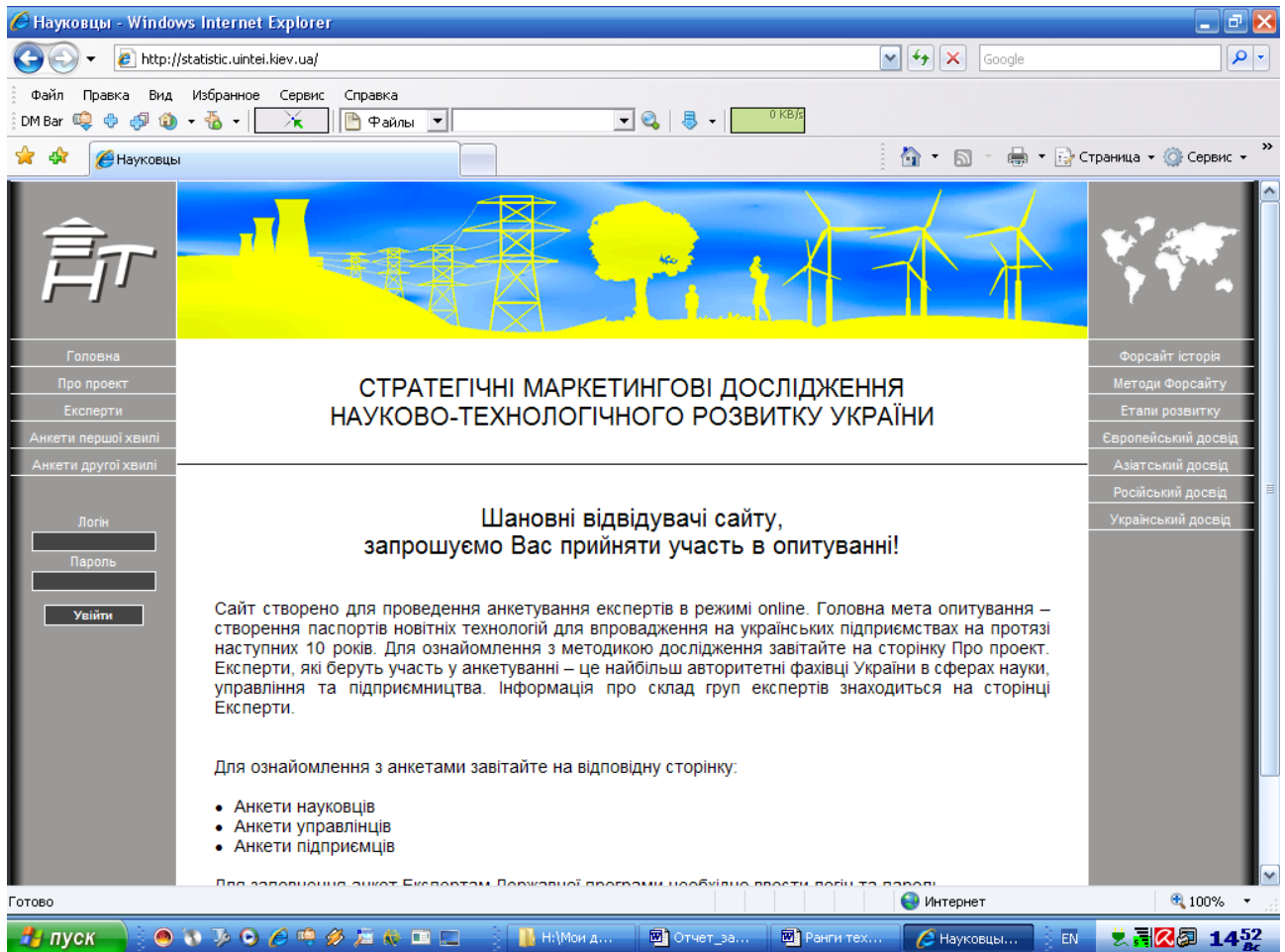
Figure 3.11 – home page of the site

On the main page are an invitation to experts and the main rules of use of the site.

On the page « About the project » in brief is a methodology for conducting a strategic marketing research that allows the experts to find out the purpose, methods and main stages of the study

On the page « Experts » locks experts answer questions on application forms (tabl. 3.11).

Table 3.11 – Page layout site Experts

| Scientists | | Managers | | Entrepreneurs | |
|---|---|---|---|---|---|
| NAME and SURNAME, position | A note about the survey | NAME and SURNAME, position | A note about the survey | NAME and SURNAME, position | A note about the survey |
| | | | | | |

Page created for providing project transparency and creating publicity honorary status « An expert of the State program » Additionally, it allows an administrator to keep records of the number of experts who have given answers to the questions.

On the pages « Application of scientists » , « Application of managers » , « Application of entrepreneurs » are application experts of relevant groups for previous acquaintance with the questions (figure. 3.12 ).
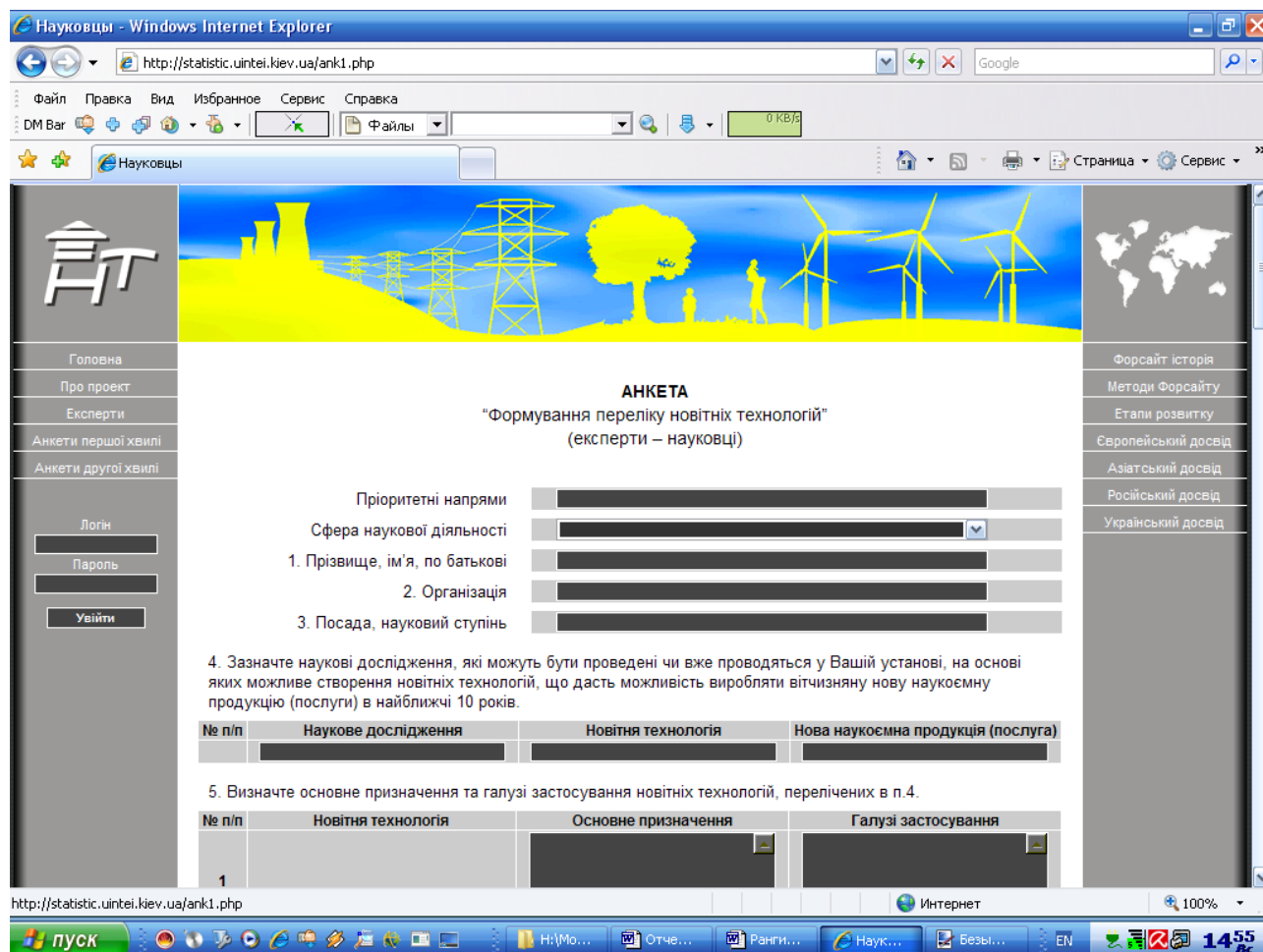


Figure 3.12 – The page with the form experts-scientists (for questions)

Right corner of the site contains several informational pages about Foresight (fig. 3.13 ). Foresight is the method of prediction of scientific and economic and social development of a country, city, region. The methods of Foresight are actively used by the developed countries of the world.
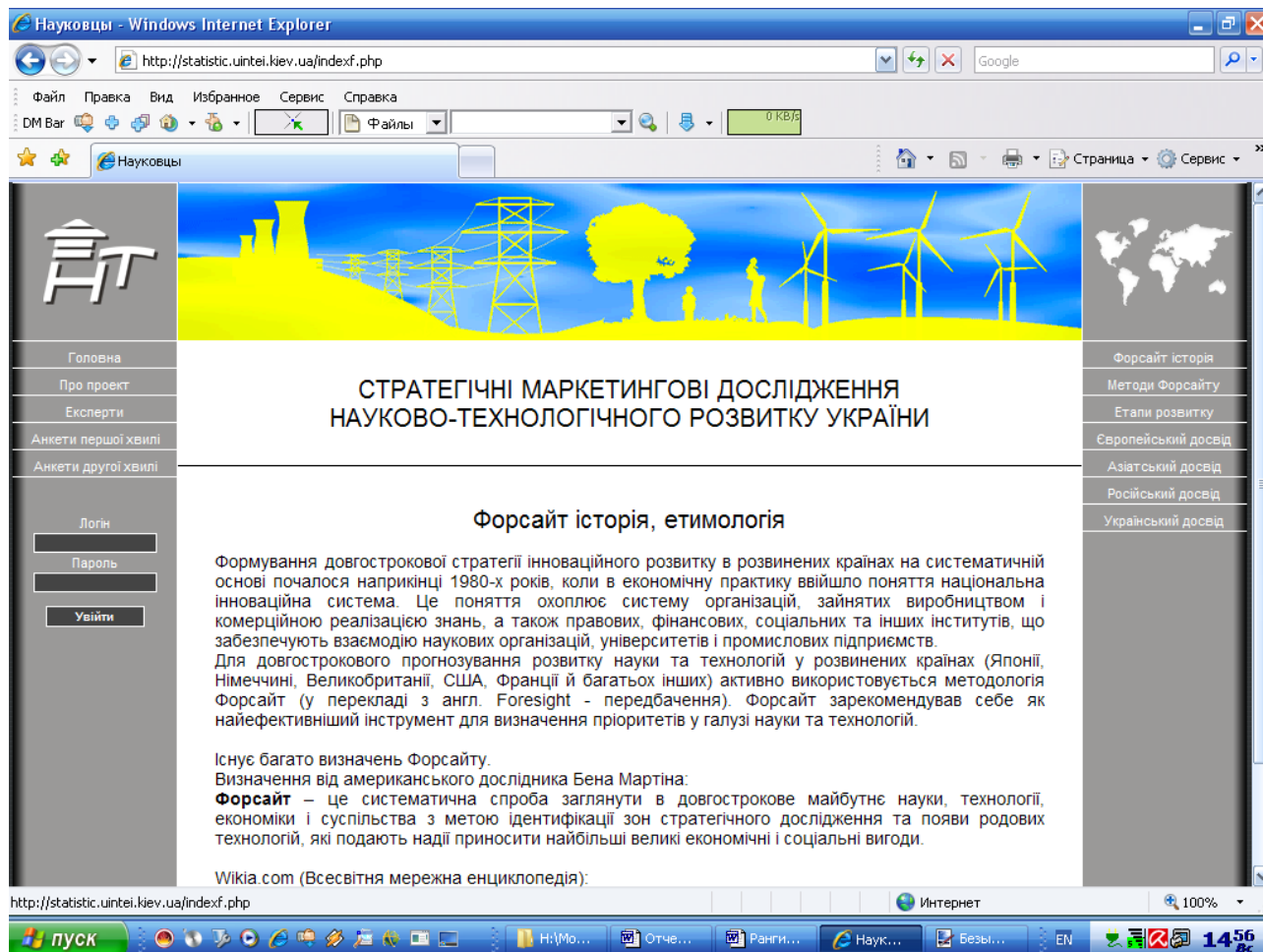
Fiure 3.13 – A page on the history and etymology of Foresight

The site provides convenient opportunities to Administration (figure. 3.14 ). The administrator can easily see the answer in the form of questionnaires, as they filled and aggregated tables, where are the answers to all the experts in the respective group. The administrator gives each expert login and password, notices, which group it is attributed (scientist, top manager wants or entrepreneur) and automatically sends an email with login and password to e-mail an expert.

During the second survey administrator automatically statistical analysis answers of experts on each of the technologies in each group, and the results regarding the consistency of responses in different groups using cluster and varience analysis.
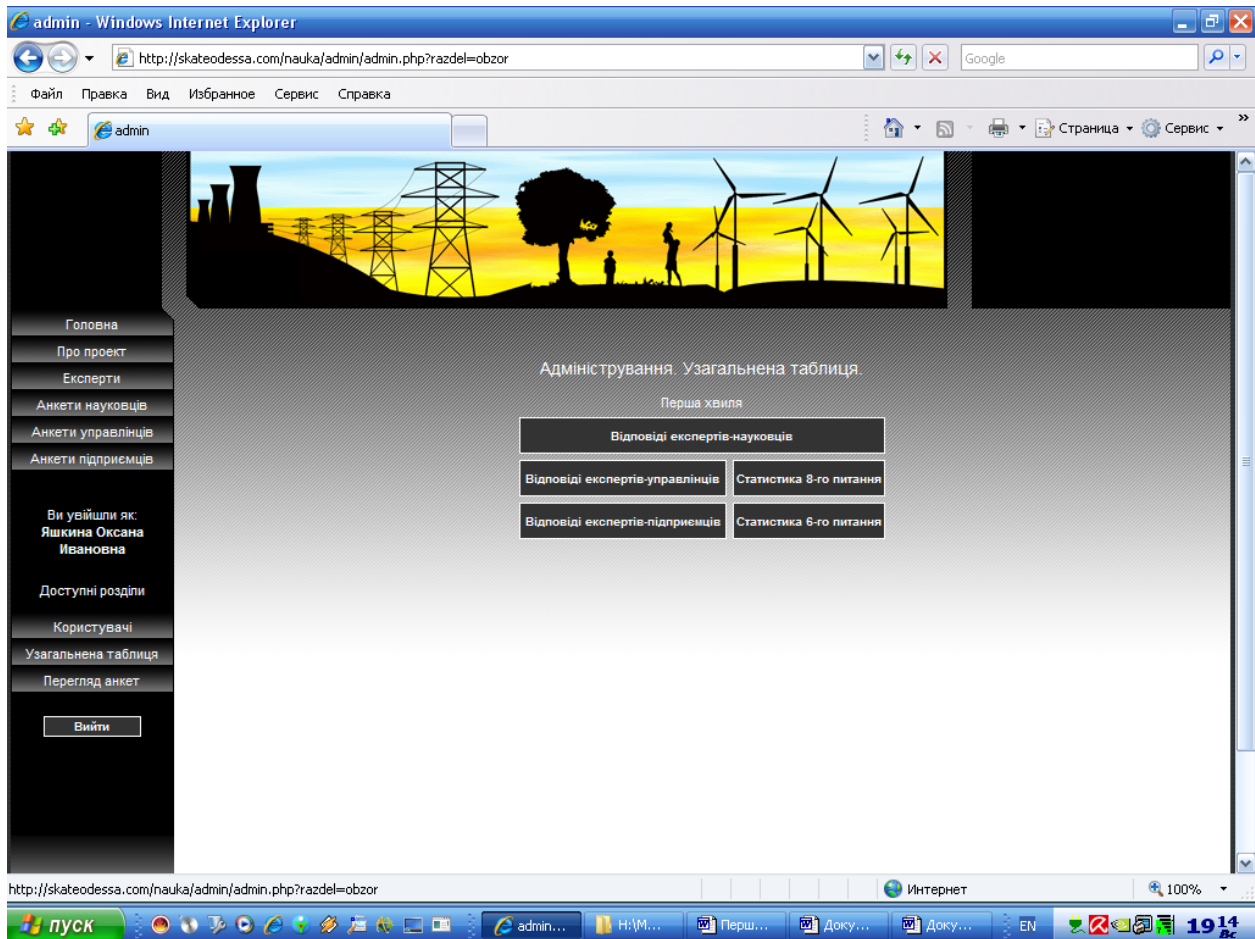
Figure 3.14 – Page of the site administrator

The work site at the first poll set to save irannâ and storage answers expert. Because all the questions are open, the analysis of the questionnaires and passports for the first survey is conducted manually.

For example, when conducting strategic marketing research with the «Energy and energy efficiency» during the first survey identified more than 100 new technologies that may receive as a result of scientific research from leading Universities and institutions.

According to the first survey was analysed all of the forms, since the questions were worn open. Together with the main organization, UkrINTEI, was 24 of the latest technology.

1. the creation of the power-generating capacity on the basis of cogeneration plants .

2. technology of manufacture of transducers and control systems .

3. technology of synchronous generator with a capacity of up to 5 kW with permanent magnets .

4. tubular fuel gas combustion technology .

5. the technology of thermal energy oil and gas wells and waste heaps of coal mines .

6. the use of high-temperature superconductivity in electric machines, devices and other electrical devices .

7. the efficiency of the photovoltaic power systems .

8. the use of modular systems in the "small" wind energy .

9. the technology of heating and hot water supply of residential and municipal and domestic consumers through the use of solar energy .

10. Technology of electricity and lighting of dwellings and household consumers through the use of wind energy .

11. high-performance technology of anaerobic methane fermentation of organic matters on industrial farms .

12. Newest technology for efficient use in integrated heat pump systems with several dissimilar on natural properties (Sun-soil) renewable sources of energy .

13. rational use of latest technology in combined heat pump systems heat the water table for heating purposes and to provide consumers of drinking water at odnorazovomu warned of the consequences of the flooding of houses .

14. the latest technology of the rational use of secondary heat back lines of heating network for the purpose of hot water .

15. development of methods of monitoring parameters of electrical networks and loss of electrical energy of organizational and technical recommendations to reduce losses in the transport of transit networks.

16. production of synthetic fuels .

17. production of thermal and electrical energy through the use of waste as an alternative energy source .

18. the technology of continuous burning alternative fuels (straw, peat, sawdust), which is characterized by low emission of solid časttinok and products of incomplete combustion, suitable for implementation in hot water boilers .

19. technology of motor fuels with alternative raw materials (coal, biomass, wastes and domestic garbage) .

20. the technology of methane- substitute natural gas (LNG) from alternative raw materials .

21. the technology of preparation of water-coal fuel.

22. the use of catalysts for heat .

23. the technology of magnetoidine sealing for a significant increase in resource equipment that is operated in the energy equipment .

24. development of environmentally friendly equipment for modernization, control and management of hydraulic turbines .

For the second survey are replaced with the appropriate application form and the attached code for their processing. The answers is checked ingroup and intergroup consistency of opinions of experts in case of consistency of the responses formed the passports.

For example, passport the creation of the power-generating capacity on the basis of cogeneration plants this final appearance (Figure 3.15).

Passport of the newest technologies
The creation of the power-generating capacity on the basis of cogeneration plants

| Priority area | Energy and energy efficiency |
|---|---|
| Sphere of activity | Heat power engineering , the power-plant engineering |
| 1. The main purpose of technology | A highly effective combination of ensuring industrial and household consumers of electricity and heat. |
| 2. Scientific research aimed at the development of technology and organization-developers | The development of cogeneration technologies that will simultaneously produce heat and electricity. Institute of engineering Thermophysics of NAS of Ukraine, Kiev |
| 3. The World Organization (country) leaders in conducting relevant research | United States, China, United Kingdom, Japan, Denmark, The Netherlands, Finland, Austria, Finland |
| 4. Term of fulfilment of scientific research to the implementation of the technology (years) | 2 |
| 5. The scheduled year of creation technology | 2010 |

| 6. The total amount of funding of scientific research to the implementation of the technology (ths.) | 150 |
|---|---|
| 7. the minimum, average, and maximum terms of introduction of technologies (years) | 2, 3 |
| 8. the minimum, average, and maximum amounts of the costs of the introduction of technologies (ths.) | 250 |
| 9. Company/sector implementation technology | Institute of engineering thermophysics<br>Institute of applied research in energy |

10. Production of new science-intensive products (services)

| # p/n | New science-intensive products (service) | Start of production | | | | |
|---|---|---|---|---|---|---|
| | | during the year, | After 1-2 years | through 3-5 years | 6 – 10 years | more than 10 years |
| 1 | Cogeneration technologies that will simultaneously produce heat and electrical energy | 6 thousand. MVT | 8 thousand. MVT | 10 thousand. MVT | 16 THD. MVT | |

11. Annual sales of new science-intensive products (services) of cost indicators

| # p/n | New n science-intensive products (service) | The annual sales volume | | | | |
|---|---|---|---|---|---|---|
| | | up to 1 million. USD. | 1-10 million. USD. | 11-50 million. USD. | 51-100 million. USD. | more than 100 million. USD. |
| 1 | Cogeneration technologies that will simultaneously produce heat and electricity. | X | | | | |

12. Annual sales of new naukoêmnoï products (services) in natural indicators

| # p/n | New naukoêmna products (service) | Consumers | Annual sales (natural indicators) | |
|---|---|---|---|---|
| | | | National market | the world market |
| 1 | Cogeneration technologies that will simultaneously produce heat and electricity. | Industry, industrial heat power engineering, gas transport system municipal and household sector. | 20-50 installations | 10-20 installations |

13. Assessment of the competitiveness of new naukoêmnoï products (services)

| # p/n | New naukoêmna products (service) | Compared with foreign counterparts | | Compared with domestic counterparts | |
|---|---|---|---|---|---|
| | | Functional | Pricing | Functional | Pricing |
| 1 | Cogeneration technologies that will simultaneously produce heat and electricity. | 3 | 3 | 3 | 3 |

Figure 3.15 – Passport of newest technology «The creation of the power-generating capacity on the basis of cogeneration plants»

In future passports was ranked for certain signs and permanently left 14 breakthrough of new technologies.

The method implemented in the activity of branch prediction-analytical ensuring of innovative activity of the Ukrainian Institute of scientific, technical and economic information of the Ministry of education and science of Ukraine.

On the basis of the proposed methodology were developed by the passports of the newest technologies in priority areas:

«Energy and energy efficiency» (14 priority critical (key) technology and formed 14 of their passports);

« Biotechnology» (the "medicine" - 3 technology, the "Pharmacy" – 2 technology, the "Industry" – 6 technologies, the "Agriculture" – 5 technologies);

« New materials " (the "composite materials and methods getting" - 3 technology, the "construction materials and methods getting" - 3 technology, the "Nanomaterials and methods getting" – 6 technologies ", the" functional materials and methods getting " – 9 technologies, the other materials and methods getting" – 1 technology).

« Information and communication technologies» (16 priority critical (key) technology and formed 14 of their passports).

The results obtained in the foundation:

-Law of Ukraine "About priority directions of innovation activity in Ukraine" Sep. 2011 # 3715, which identified strategic directions of innovation activity at the 2011-2021 years.

– Decree of the Cabinet of Ministers of Ukraine "On approval of the list of the priority thematic areas of research and scientific and technical developments in the period up to the year 2015" from 07.09.2011 # 942.

– Decree of the Cabinet of Ministers of Ukraine "Some question the definition of medium-term priority directions of innovation activity of national level to 2012-2016 years of 12.03.2012, no. 294.

Industry and regional system of strategic marketing research of scientific and technological development can be provided with the same software product that functions according to the above principles.

CONCLUSIONS


1. To underline the features of innovative activity in the field of mechanical engineering and the need for special tools to its research suggested in the terminology of marketing research to introduce a new term: market research innovation. Marketing innovation research is a systematic process, which is carried throughout the innovation cycle and involves the planning, collecting and analyzing information to determine the directions of innovation activity and optimization of parameters of product innovation and innovative products the company. Marketing innovation research in machine-building enterprise are the three vectors: marketing research perspectives, innovation, marketing research marketing research and product innovation potential of innovation.

2. For the implementation of the innovation proposed by the concept of forming and functioning of market research innovation machine-building enterprises. It combines the three subsystems: 1) organizational and management (defines problems, organizes research creates expert panel interacts with innovative units); 2) information-analytical (provides information as a result of the involvement of a package of marketing research perspectives, innovation, product innovation market research package, a package of research marketing potential of innovative products); 3) program-methodical (methods of research, software products for information processing), emphasizing the principles of structure (innovative priority, frequency, complexity, strategic focus, consistency, compliance, complementarity) and criteria and indicators of innovation, that opens up opportunities for the development of the innovation strategy of the machine-building enterprises

3. For the implementation of marketing innovation research methodology of the system of market research innovation machine-building enterprises is proposed, which is a structural building contains: 1) set of methods of research in three directions (the prospects for innovation; product innovation properties; the marketing

potential of innovative products); 2) complex scientific-methodological approaches to research to optimise innovation activities (evaluation of the competitiveness of innovative technologies, development of marketing innovative products depending on the type of markets); 3) package for automatic information processing, that allows you to use the techniques, mechanisms, tools of marketing research at all stages of the innovation activity of the machine-building enterprises

4. Engineering enterprise is part of the innovative complex of the country. The key innovation of the enterprise is state support for identifying, financing and provision of information to the enterprise of the most promising areas of scientific and technological development. To implement interaction of entrepreneurial institutions with government proposed a tiered system of marketing research innovation machine-building enterprises. It involves conducting research to identify the subject of the most promising scientific and technical research on all the hierarchical levels of the economy and can be displayed with the term "national system of strategic marketing research"

5. For the implementation of a multilevel system of marketing innovation research in the proposed methodological approach of technological forecasting, which is carried out by strategic marketing research of scientific and technological development and implemented a survey of three groups of experts (scientists; managers; entrepreneurs). For each group of experts developed certain forms which take into account their competence. The answers of experts on specific issues questionnaires checked agresment t their thoughts in each of the groups and between the groups and in the case of agreement is formed by innovative technology passport.

6. For well-founded management transformation problems of innovative development in the marketing research problem in the proposed tipology market research innovation machine-building enterprises for purposes of using signs "stage of innovation". This sign at the first stage stand out marketing research prospects for innovation activities (assessment of market conditions, business trends, the competitive environment, etc.), the second – marketing research innovative product (assessment of the prospects for commercialization). In the third stage highlighting

the marketing research of innovative products (risk assessment of the choice of target market segments, development of marketing innovative products, the introduction of innovative products on the market).

7. The ability to implement innovative transformation due to the structure of the company. To identify opportunities for innovative development and its trends was offered typology innovation-active machine-building enterprises for the availability of scientific and innovation units in the organizational structure. Under this sign are allocated three organizational structures: innovative complete, innovative enough and pseudoinnovative.

8. Most of the studies on the prospects of innovation, innovative technologies of the future and existing innovative technologies based on expert polls. In working out the further development of scientific and methical approaches to marketing research according to expert surveys, in which the proposed multi-stage procedure: determining the consistency of opinions of experts for answers based on interval scales; evaluation of the competitiveness of innovative technologies for the basic signs (energy efficiency, environmental friendliness, technical benefits, the period of implementation, the cost of implementation, the potential for transfer); choice of the target segment of the market index of attractiveness.

9. Pricing is a key step in the marketing research of innovative products. In the work of the substantiated scientific-methodological approach to the evaluation of the price elasticity of demand for innovative products, which takes into account the different nature of the behavior of the function of the price elasticity of demand for different regression models of dependence of the demand on the price. For the regressive model, using limit analysis, a function of price elasticity of demand was built and by its behavior the spacing of the high and low risk increase/decrease in price were determined.

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APPLICATIONS

## THE FIRST POLL

QUESTIONNAIRE
"The forming of new technologies»
(experts-scientists)

**Priority direction**_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _

Sphere of activity_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _ _ _ _
(choose from the offered list)

1. Surname, name, patronymic_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _

2. Organization _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Position, scientific degree _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _

4. Specify the scientific research that can be carried out or already in your organization, on the basis of which it is possible to create new technologies that will enable to produce patriotic new science-intensive products (services) in the next 10 years

| # p/n | Scientific research | Latest technology | New science-intensive products(service) |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

5. Determine the primary purpose and field of application of the newest technologies, listed in article 4.

| # p/n | The newest technology | The main purpose of | Field of application |
|---|---|---|---|
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

6. Identify the main technical and performance characteristics of new science-intensive products (services), listed in clause 4, and name the technology required for its production.

| # p/n | New science-intensive products (Service) | The main technical and performance data | The technology needed for the production, in addition to the selected new technologies |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

7. Enter the term and annual funding of scientific research, listed in article 4.

| # p/n | Scientific research | The term scientific research to the implementation of the results (years) | The annual financing (ths.) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

8. Evaluate the impact of scientific research, are listed in section 4, to achieve the relevant goals (4 points – first, 1 point – in the least).

| # p/n | Scientific research | improving the quality of life of the population | high rates of sustainable economic growth | create the potential for future development | increasing the level of national security |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |

9. Name the annual sales volume of new science-intensive products (services), listed in paragraph 4.

| # p/n | New science-intensive products (Service) | Annual sales (in natural indicators) | | The company manufacturer |
|---|---|---|---|---|
| | | the internal market | foreign market | |
| | | | | |

10. Name the scientific organizations that are leaders in the conduct of scientific research, listed in article 4.

| # p/n | Scientific research | Organization | Country |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

# QUESTIONNAIRE
## "The forming of new technologies»
### (experts-managers)

Priority direction of _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Sphere of activity of _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
(choose from the offered list)

1. Surname, name, patronymic of the _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. Organization of the _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Position, scientific degree of _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

4. What are the most important problems of the specified areas of activity require the carrying out of scientific research?

| # p/n | Problem | Name of the organization that conducts scientific research | The latest technology, which can be created |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

5. Production of which domestic new science-intensive products (services) can be initiated in the next 10 years based on the latest technologies listed in paragraph 4?

| # p/n | Latest technology | New naukoêmna production (service) | The company manufacturer |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

6. Determine the basic properties of a new science production (services), listed in paragraph 4 and the name of the technology that are necessary for its production.

| # p/n | New science-intensive products (Service) | The main technical and performance data | The technology needed for the production, in addition to the selected new technologies |
|---|---|---|---|
| | | | |

| | | | |
|---|---|---|---|
| | | | |
| | | | |

7. What industry can become consumers of new naukoêmnoï products (services) and assess its potential annual sales volume.

| # p/n | New science-intensive products (Service) | Consumers | Annual sales (natural indicators) | |
|---|---|---|---|---|
| | | | the internal market | foreign market |
| | | | | |
| | | | | |

8. Name the domestic scientific organizations that make the greatest contribution to the innovative development of enterprises. Your sphere of activity for the past 5 years.

| # p/n | Organization | Directions of research | Embedded innovation for research results |
|---|---|---|---|
| | | | |
| | | | |
| | | | |

# QUESTIONNAIRE
"The introduction of a list of emerging technologies»
(experts-entrepreneurs)

**Priority area** _____

Sphere of activity _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

(choose from the offered list)

1. Surname, name, patronymic _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. The Enterprise _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Position, scientific degree _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

4. What are the most important problems of your enterprise will require the introduction of new technologies and how you plan to resolve the specified problemu?

| # p/n | Problem | Latest technology | The ways of-solution problems | | | |
|---|---|---|---|---|---|---|
| | | | Purchase a license | | Stacking dogovo-py with a research organization to develop technologies | Hard to say |
| | | | Patriotic | Foreign | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

5. Name the new science-intensive products (service), created on the basis of the technologies listed in paragraph 4, which might produce at your company. Specify terms of implementation and the necessary resource.

| # p/n | Latest technology | New science-intensive products (service) | The main technical and operational characteristics | The term (years) | Required resources | |
|---|---|---|---|---|---|---|
| | | | | | Experts (specialty) | Funds (ths.) |
| | | | | | | |
| | | | | | | |
| | | | | | | |

6. Specify domestic scientific organizations collaborating your enterprise.

| # p/n | Organization | Directions of research | Embedded innovation for research results |
|---|---|---|---|

|  |  |  |
|---|---|---|
|  |  |  |
|  |  |  |

## Appendix B

### THE SECOND SURVEY

QUESTIONNAIRE
"The forming of new technologies»
(experts-scientists)

**Priority direction**_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _

Sphere of activity _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _ _ _ _
(choose from the offered list)

1. Surname, name, patronymic _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _

2. Post _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Scientific degree  _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _
_ _ _ _ _ _ _ _ _ _ _ _ _

4. With all the passports of new technologies from the above list, formed according to the results of the first survey of expert scientists. If you do not agree with any other information, click the "fix" and make another option.

| #<br>p/n | Name of the technology |
|---|---|
| 1 | Technology 1 |
| 2 | Technology 2 |
| 3 | Technology 3 |

4.1. The main purpose

4.2. Scientific research aimed at the development of modern technology

4.3. Research Organization developer

4.4. The organization leaders in carrying out scientific research (country)

4.5. The term scientific study to implement the newest technologies (years)

4.6. The Scheduled year of creating new technologies

4.7. The total funding of research to implement the newest technologies (ths)

4.8. The enterprise/sector implementation of the newest technologies

4.9. The field of consumption of new naukoêmnoï products (services)

5. Estimate the functionally interesting characteristics of domestic new science-intensive products (services), which can be obtained by this latest technology, in comparison with the existing domestic and foreign analogues.

| # p/n | New science-intensive products (Service) | Domestic analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new science-intensive products (services) in points (1 to 4) | |
|---|---|---|---|---|---|
| | | | | Functional | Pricing |
| | | | | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |
| # p/n | New science-intensive products (Service) | Foreign analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new science-intensive products (services) in points (1 to 4) | |
| | | | | Functional | Pricing |
| | | | | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |

| | | | | 1) | | |
|---|---|---|---|---|---|---|
| | | | | 2) | | |
| | | | | 3) | | |
| | | | | 4) | | |
| | | | | 5) | | |

## QUESTIONNAIRE
## "The forming of new technologies»
### (experts-managers)

**Priority direction** _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Sphere of activity _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

(choose from the offered list)

1. Surname, name, patronymic _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. Organization _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Position, scientific degree_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

4. With all the passports of new technologies from the above list, formed according to the results of the first survey of experts-managers. If you do not agree with any other information, click the "fix" and make another option.

| # p/n | Name of the technology |
|---|---|
| 1 | Technology 1 |
| 2 | Technology 2 |
| 3 | Technology 3 |

4.1. Research Organization developer

4.2. Organization leaders in carrying out scientific research

4.3. Enterprise/sector implementation of the newest technologies

4.4. the Area of consumption of new naukoêmnoï products (services)

4.5. the Annual sales volume of new naukoêmnoï products (natural indicators)

| # p/n | New science-intensive products (service) | Consumers | Annual sales (natural indicators) | |
|---|---|---|---|---|
| | | | the internal market | foreign market |
| | | | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

5. Estimate the functionally interesting characteristics of domestic new science-intensive products (services), which can be obtained by this latest technology, in comparison with the existing domestic and foreign analogues.

| # p/n | New science-intensive products (Service) | Domestic analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new naukoêmnoї products (services) in points (1 to 4) | |
|---|---|---|---|---|---|
| | | | | Functional | Pricing |
| | | | | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |
| # p/n | New science-intensive products (Service) | Foreign analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new science-intensive products (services) in points (1 to 4) | |
| | | | | Functional | Pricing |
| | | | | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |

| | | | 5) | | |
|---|---|---|---|---|---|
| | | | 1) | | |
| | | | 2) | | |
| | | | 3) | | |
| | | | 4) | | |
| | | | 5) | | |

## QUESTIONNAIRE
### "The introduction of a list of emerging technologies»
### (experts-entrepreneurs)

Priority direction _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

Sphere of activity_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

(choose from the offered list)

1. Surname, name, patronymic _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

2. The Enterprise _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

3. Position, scientific degree _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

4. With all the passports of new technologies from the above list, formed according to the results of the first survey of expert entrepreneurs. If you do not agree with any other information, click the "fix" and make another option.

| #<br>p/n | Name of the technology |
|---|---|
| 1 | Technology 1 |
| 2 | Technology 2 |
| 3 | Technology 3 |

4.1. Enterprise/sector implementation technology

4.2. Research Organization developer

4.3. Minimum, medium, maximum terms of introduction of technologies (years)
4.4. The minimum, average, and maximum amounts of the costs to implement the newest technologies (ths.)
5. Specify the start of production of new science-intensive products (services) for the latest technology.

| #<br>p/n | New science-intensive products<br>(service) | Start of production of new science-intensive products<br>(services) | | | | |
|---|---|---|---|---|---|---|
| | | during the year, | After 1-2 years | through 3-5 years | 6 – 10 years | more than 10 years |

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

6. Specify the annual sales volume of new naukoêmnoï products (services) for this latest tehnology.

| # p/n | New science-intensive products (service) | The annual sales volume of new science-intensive products (services) | | | | |
|-------|------|------|------|------|------|------|
|  |  | up to 1 million. USD. | 1-10 million. USD. | 11-50 million. USD. | 51-100 million. USD. | more than 100 million. USD. |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

7. Rate of functional-cost characteristics of domestic new naukoêmnoï products (services), which can be obtained by this latest technology, in comparison with the existing domestic and foreign analogues.

| # p/n | New science-intensive products (Service) | Domestic analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new science-intensive products (services) in points (1 to 4) | |
|-------|------|------|------|------|------|
|  |  |  |  | Functional | Pricing |
|  |  |  |  | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are no analogues | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |
|  |  |  | 1) |  |  |
|  |  |  | 2) |  |  |
|  |  |  | 3) |  |  |
|  |  |  | 4) |  |  |
|  |  |  | 5) |  |  |
| # p/n | New science-intensive products (Service) | Foreign analogue | Functional characteristics (up to 5 most important parameters that reflect consumer price) | Evaluation of characteristics of new science-intensive products (services) in points (1 to 4) | |
|  |  |  |  | Functional | Pricing |
|  |  |  |  | 1 – worse than analogue 2 – on the level of counterpart 3 – dominated by analog 4 – there are | 1-higher counterpart 2 – on the level of counterpart 3 – lower analogue 4 – there are no analogues |

| | | | | | no analogues | |
|---|---|---|---|---|---|---|
| | | | 1) | | | |
| | | | 2) | | | |
| | | | 3) | | | |
| | | | 4) | | | |
| | | | 5) | | | |

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