EVALUATION OF INFORMATIONAL PROVISION QUALITY OF FOOD INDUSTRY ENTERPRISES FLEXIBILITY MANAGEMENT

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Abstract

In the conditions of the information society, processing and obtaining qualitative information for the adoption of a grounded management decision becomes of great importance. Today, one of the ways to improve the management system of food industry enterprises is to build an effective system of information provision and to evaluate its quality on a permanent basis in order to achieve enterprise flexibility.

An analysis of the hypothesis concerning the impact of the information provision quality on enterprise flexibility was carried out through the analysis and synthesis of scientific works, and the current trends in the information society development. Determination of the information support attributes set was carried out using the expert estimation method. At the heart of the proposed mathematical model for evaluation of the flexibility management information provision quality lies in the multi-attribute approach.

It has been established that the level of information provision quality of enterprise flexibility management depends on the formalized system of the following attributes set, namely, the "input", which contains certain parameters of the information receipt on the effective flexibility management, "converters", through which processing of this information and the "exit", which characterizes the results of flexibility management. Parametric evaluation of nuclear attributes (relevance and timeliness of information receipt, speed of information collection and processing, reliability of information and channels of its receipt, correctness and comparability of the result in the information processing) sample of food industry representatives showed that about 40% of them correspond to a high level of quality information support.

The proposed approach allows for a predictive evaluation of the information provision quality, comparative evaluation, quality control to maintain it at the required level, and also creates new opportunities for managers to make effective decisions in order to avoid the risk of lowering the profitability and overall efficiency of food business.

Key words: *Attribute, Information provision, Model, multi-attribute approach, Quality system, Food industry.*

1. Introduction

In the conditions of the information society, the process of elaboration and obtaining qualitative information for a well-grounded management decision is increasingly gaining significance. Today, one of the ways to improve the food business management system is to build an effective information support system, since the successful operation of an enterprise depends on the timely adoption of a professional managerial solution. The basis for deciding on the future vector for the development of enterprises in the food industry is the quality of the input stream of information, its relevance, reliability, timeliness. Therefore, in the conditions of constant instability of the economic and political situation in Ukraine, fluctuations of the world economy, special attention needs to be paid to the problem of forming a qualitative model of flexibility management information provision of business entities that carry out activities in the food industry. As flexibility management allows timely generation and implementation of innovations, focus on improving the efficiency of the enterprise.

The purpose of the paper is to develop a formalized model of the information provision system of food enterprises flexibility management, which will strengthen the potential and determine the direction of the enterprise current state improvement on the basis of improving the quality and effectiveness of information provision.

The object of research is the process of the enterprise information provision formation. The subject of the study is the theoretical and methodological principles information provision formation for flexibility management of food enterprises.

2. Materials and Methods

2.1. Sampling of enterprises

The basis for the study were 5 food producing enterprises, which specialize in the production of fresh, chilled or frozen pork. To determine the set of information security attributes (quality criteria), a commission of 37 executives and leading experts in the investigated enterprises, which directly serves both manufacturers and users of information on the level of flexibility, was created. Each respondent was asked to complete a questionnaire in which it was necessary to express their own opinion on the definition of the list of attributes of information provision for flexibility management. The degree of consistency of experts is calculated using the coefficient of concordance.

2.2. Analytical techniques

For proving and assessment of suggested model it has been used apparatus of technological networks of design by Khotyashov N. and Drogobytsky N. [3]. Tuple of indicators of information system of management of flexibility is formed on the basis of common functional mathematical dependence of quantitative and qualitative indicators (formulas 1 - 4). Calculating the quality of nuclear attributes is the weighted average of the importance of the attribute adjusted for peer review (formulas 5 - 7). Additionally, we used characteristics of information provision attributes groups for flexibility management of food enterprises, which are compiled on the basis of different authors [6, 7, and 8]).

3. Results and Discussion

3.1. Model of information management system for flexibility of food industry enterprises by the authors

The timely receipt of information is very important for the development of food industry enterprises in modern conditions, as it precedes the optimal implementation of the implementation process, becoming an important resource that determines the factors of effective enterprises development. The share of people employed in the field of creation and transfer of information on human potential is constantly increasing in comparison with traditional spheres. The information component represents the driving force behind the growth of food industry enterprises potential, a means of ensuring its competitive advantages.

The ability to quickly adaption to unforeseen changes in the environment has become a key factor not only in the efficiency of activities but also in the survival of food industry enterprises. The political and economic uncertainty that exists in Ukraine today largely affects economic development and the financial performance of business entities. Therefore, the overall level of the food industry enterprises flexibility management depends on how quickly the quality of information provision increases.

The organization of effective management of any enterprise requires systematic information on the economic processes carried out, their nature and scope, the availability of material, labor and financial resources, their use, the formation of costs and financial performance, etc. As Pushkar M. rightly points out: "... society requires objective information about all processes taking place in production, which means that a public institution is needed that would guarantee the impartial objective information on material production" [1].

Information sphere is becoming more and more a priority, necessary and indispensable in the process of any entrepreneurial subject activity. The emergence of new technologies, the construction of global, national, regional and local information networks and systems opens not only technical but also economic and financial opportunities for the integration of information resources. This, undoubtedly, causes changes in all areas and processes of the food industry. Information systems of flexibility management should not only be a tool that provides information processing for units and end users, but should provide the company with significant competitive advantages on the market, the achievement of which may be due to the maintenance of a high level of quality information management of economic flexibility, as under conditions of instability the market environment for competitiveness and enterprise sustainability is provided by flexibility management methods.

In his work Demkiv I., [2], determines that the flexibility of an enterprise should be understood as its ability to prevent and at least cost to respond to changes in external and internal environments, the main among which in conditions of fierce competition it is necessary to recognize changes in requests and requirements of consumers. In support of this view, it should be emphasized that modern food businesses should

be flexible to market requirements, and in order to meet the needs of consumers in a timely manner, timely and relevant information must be available.

At the same time, the most difficult task for the formation of high-quality information provision is to create the optimal route for information receipt and processing on the food industry enterprise. Therefore, before assessing the quality of information support at the enterprise and draw conclusions about the level of flexibility management, it is first necessary to develop or correct an existing model of the information system.

The most important task of formalizing the technology of designing information systems is the apparatus of technological networks of design, developed by Khotyashov N. and Drogobytsky N. [3]. The basis for formalizing the technology of designing an information system is a formal definition of a technological design operation (Figure 1).
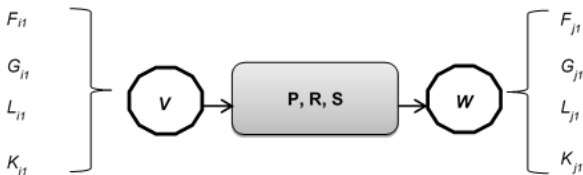

Figure 1. Information management system with a set of factors and the correlation between them [3]

Technological operations are presented graphically in the form of blocks within which names are given (P-converter, R-resources, S-means). Inputs (V) and outputs (W) are represented by identifiers inside the circles, from which and to which the arrows pointing to the input and output streams. As a component of input and output, many documents are used (F-descriptor of many interconnected facts), parameters (G-descriptor of one fact), programs (L-separate case of a document, which describes the description of the algorithm for solving the problem), universal sets (universes) (K is a finite and complete set of facts of the same type).

On the basis of technological networks apparatus using Khotyashov N. and Drogobytsky N., the system of flexibility management information supplying management of food industry enterprises can be represented as a set of such attributes, namely, the "input", which contains certain parameters of the information receipt on the effective management of economic flexibility, "converters", through which processing of this information and the "exit", which characterizes the results of economic flexibility management.

As formalized, the information system for flexibility management of food industry enterprises is proposed to be submitted by the following tuple:

$$IS^g = V + P + W \qquad (1)$$

$$V = \{I^P, I^Z, I^D, I^S, I^O\} \qquad (2)$$

$$P = \{I^L, I^E, I^R, I^H, I^C\} \qquad (3)$$

$$W = \{I^Q, I^V, I^{EZ}\} \qquad (4)$$

Legend: IS^g - information system for flexibility management of food industry enterprises; V, P, W - respectively, the input, data converters and output information system for flexibility management of food industry enterprises; I^P - the need for information; I^Z - information request; I^D - sources of information; I^S - information providers; I^O - opportunities and threats (risks) in obtaining the enterprise the necessary information; I^L - content of information; I^E - key indicators of the state and efficiency of flexibility management; I^R - resources; I^H - means of processing and transforming information (information technology, software, automated data collection and processing systems, human resources, etc.); I^V - required volume and cost of information; I^C - consumers (users) of information; I^Q - the level of quality information for management flexibility; I^{EZ} - the effectiveness of information management flexibility.

On the basis of the considered components of the information system for the flexibility management of food industry enterprises and their formalized representation, the following model is proposed (Figure 2).

The elaboration and introduction into the activity of the food industry enterprises of the information system for flexibility management will allow to combine
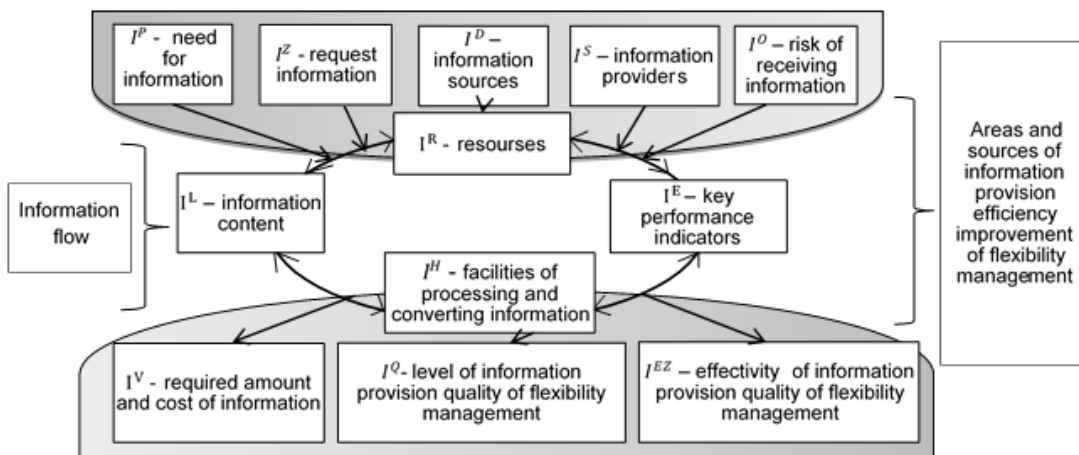

Figure 2. Model of information management system for flexibility of food industry enterprises (Author's development)

information flows; provide collection, storage and analysis of managerial information; provide the possibility of one-time development and multiple use of algorithms for calculating all indicators of the enterprise; to provide support for business relationships between performers; Ensure the adoption of sound and informed management decisions, and ensure the dynamism, manageability and responsiveness of the flexibility management process.

In the course of the research, it was established that one of the main factors in improving the management efficiency of food industry enterprises is the level of information provision quality.

The high quality of information provision indicates full, reliable and timely information on the level of flexibility that comes from reliable sources and the company's ability to process it for future use. With such information, the leadership of food industry companies increases the likelihood of more rational management decisions in optimizing the level of economic flexibility in certain areas, thereby ensuring a stable profitability of their activities and competitive advantages. The results of such decisions in themselves increase satisfaction of food industry enterprises management [4].

Therefore, the evaluation methodology and quality indicators are of particular importance for the quality information of the food industry enterprises flexibility management. In special scientific literature on the issues of the products quality research, goods and services, various models and quality management systems are presented, within which the appropriate methods and indicators of evaluation are selected.

For quality information provision of the flexibility management of food industry enterprises requires, first and foremost, an efficient system for collecting and storing information. In order to build such a system, the analytical service of the enterprise should constantly and in advance make suggestions on necessary changes in its accounting system in order to make it convenient for use not only for the services that offer it but also for economic analysis.

It should be noted that the assessment of the information provision quality is significantly different from the quality of goods, since its main difference from the product is the indeterminacy, and the objective assessment of the intangible object quality is quite problematic. Determination of information provision quality level of flexibility management of food industry enterprises proposed to implement on the basis of the concept of multicultural goods Fishbein.

In accordance with this concept, all properties of information provision quality are a set of certain attributes (significant characteristics) that can be nuclear and peripheral. Peripheral attributes are divided, in turn, into necessary and additional ones. This procedure for attributing attributes can be performed both analytically and through a survey of leading expert experts [5].

Taking into account our interest in the importance of defining a list of attributes (quality criteria) and assessing the quality level of information flexibility management of food industry enterprises, the characteristics of various groups of information security attributes (Table 1) are summarized. Since the transformation of qualitative information into quantitative indicators is not a difficult task, summarizing the quality of information by users according to the above criteria will give an opportunity to explain to what extent the information used by managers in making a decision depends on the perception of the available information.

This table allows you to analyze the information that is available at the enterprise and evaluate its quality: the higher the assessment of the quality criteria, the more important it is assigned.

The evaluation of the quality of the attributes of the information management software for managing the flexibility of food industry enterprises is carried out in several stages, initially calculating the aggregate quality of the nuclear attributes inductively (formula 5), then a general (deductive) estimation of the quality of all attributes is made (formula 7).

Table 1. Characteristics of information provision attributes groups for flexibility management of food enterprises (compiled on the basis of [6, 7, and 8])

Comparison criteria	Information provision attribute groups		
	Nuclear	Peripherals needed	Peripheral auxiliaries
Expectations of information consumers	High quality	Required level of quality	Attribute is a "pleasant" surprise
Stability of quality	Low	high	Low
Direction of control	Strict, frequency high	Strict, frequency low	Unstrict, frequency high
Influence on consumer information	Cause satisfaction and dissatisfaction	Cause just dissatisfaction	Cause just satisfaction
Methods of quality control	Inductive assessment of attributes	Survey of users using open questions	Deductive evaluation of information provision

$$IS_\varepsilon^g = \sum_{i=1}^{n} \varepsilon_i \times \mu_i \qquad (5)$$

Legend:
IS_ε^g - Aggregate nuclear attributes quality of information flexibility management information provision.
ε_i - Importance of i-th attribute of flexibility management information provision, which is determined by an interval scale. This indicator is calculated by formula 6.

$$\varepsilon_i = \frac{\vartheta^i}{\sum_{i=1}^{n} \vartheta^i} \qquad (6)$$

Legend: n - The number of nuclear attributes of flexibility management information provision.
ϑ^i - Importance of i-th attribute, which is determined by a continuous rating scale of 1 to 10 points.
μ_i - Expert quality evaluation of i-th attribute of flexibility management information provision.

$$IS_\theta^g = IS_\tau^g - IS_\varepsilon^g \qquad (7)$$

Legend:
IS_θ^g - The quality of flexibility management information provision, due to the influence of peripheral attributes.
IS_τ^g - Aggregate perception of the quality of flexibility management information provision.

It should be noted that if the quality of nuclear attributes below the aggregate quality information provision of flexibility management, then in the peripheral attributes prevails the effect of additional, which increases the overall level of aggregate quality information provision of food industry enterprises flexibility management.

3.2. Findings about investigated enterprises

Summarized results of the expert evaluation of determining the set of information security attributes, which determine the level of its quality, is shown in Figure 3.

In order to substantiate the reliability and trustworthiness of the proposed set of information provision attributes that determine the quality level of food industry enterprises flexibility management, the coefficient of concordance W [9] was calculated. Its value is 0.89. That indicates a high level of consensus among experts.

The results of approbation of this methodology allowed to reveal certain quality trends in information management of the flexibility of food industry enterprises and to develop a linguistic scale for assessing its level (Table 2).

Table 2. Scale for the quality information provision evaluation of food industry enterprises flexibility management (author's development)

Value interval	Quality score
0 - 3	Low (L)
3.1 - 5	Moderate (M)
5.1 - 8	High (H)
8.1 - 10	Very high (V)

ε_β - nuclear attributes; ε_γ - requared peripheral attributes; ε_φ - auxiliary peripheral attributes; $\varepsilon_{\beta1}$ - volume (sufficiency) and cost of information; $\varepsilon_{\beta2}$ - relevance and timeliness of receipt of information; $\varepsilon_{\beta3}$ - the speed of information collection and processing; $\varepsilon_{\beta4}$ - reliability and reliability of information and channels of its receipt; $\varepsilon_{\beta5}$ - correctness and comparability of the result in the processing of information; $\varepsilon_{\gamma1}$ - standardized design and transfer of information; $\varepsilon_{\gamma2}$ - the availability of systematic methods and channels for obtaining information; $\varepsilon_{\gamma3}$ - confidentiality when transmitting and processing information; $\varepsilon_{\gamma4}$ - professionalism of management and staff; $\varepsilon_{\varphi1}$ - levelof integration of automation systems of various business processes; $\varepsilon_{\varphi2}$ - level of automation of business processes; $\varepsilon_{\varphi3}$ - availability of automated information management systems and modern software
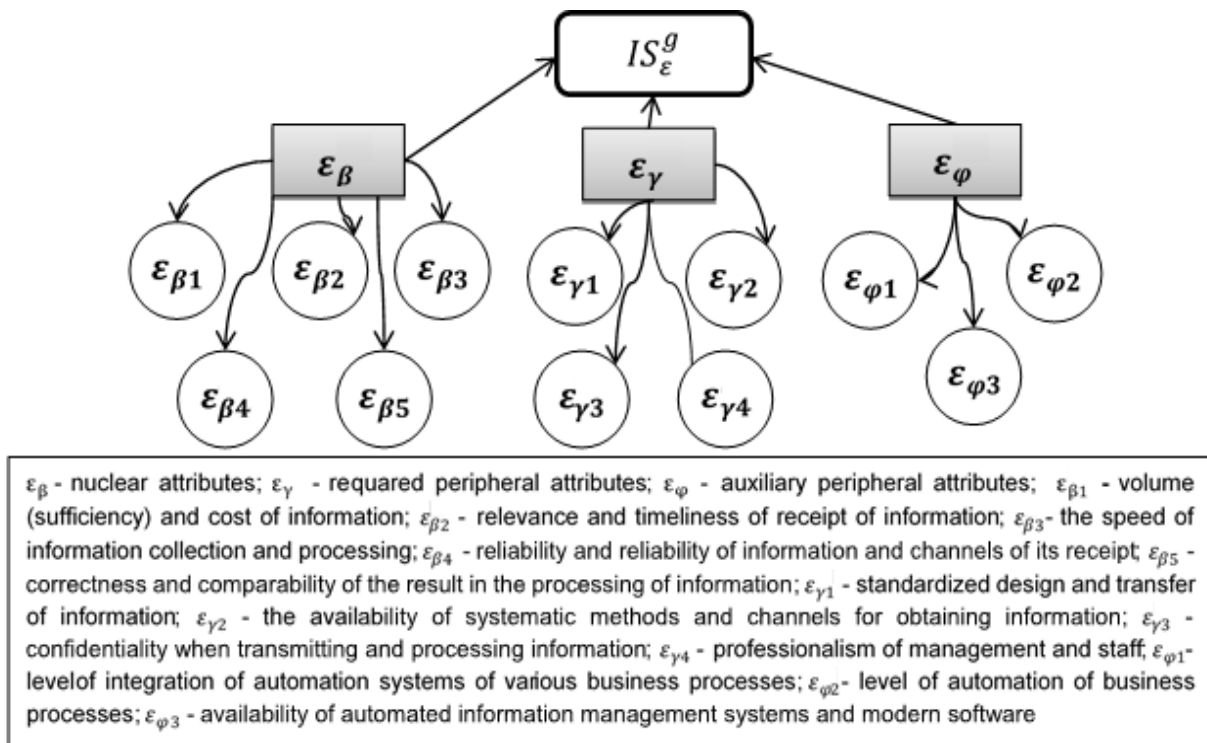
Figure 3. A set of information security attributes that determine the level of quality information provision evaluation of food industry enterprises flexibility management (author's development)

An evaluation of the quality information provision evaluation of flexibility management for each investigated company with all the attributes defined was carried out separately. The summarized results of the estimation are given in Table 3, while graphic interpretation of the quality information provision level of food industry enterprises flexibility management is shown in Figure 4.

Analysis of the data shown in Figure 4 allows us to conclude that the food industry enterprises of Ukraine are very acute in the issue of improving the information provision quality of flexibility management processes. As, according to the results of the calculations, it was determined that the very high and high levels of information provision quality of the flexibility management, which is characteristic for PRAT "APK-Invest" PJSC and "Trade House "Myasna Vesna" LLC, respectively.

The level information provision quality of flexibility management of the overwhelming majority of food industry enterprises ("Exim Food" LLC, "MMK" OJSC and "Kremenchukmeat" PJSC) is evaluated as moderate. Achieving the desired level of competitiveness and ensuring high technical and economic indicators at the given enterprises in the food industry is possible by solving the spectrum of the main problems of information provision of the flexibility management process at all stages of the product life cycle and production management, updating the information fund of management processes, improving the information support system in general, systems of information search, application of new types of sources of information and methods of its analysis.

It should be noted that the assessment of nuclear attributes is the main influence on the conclusion about

Table 3. General results of the quality information provision evaluation of food industry enterprises flexibility management

| Food industry enterprise	Nuclear attributes		Required peripheral attributes		Auxiliary peripheral attributes		Comprehensive evaluation of attributes	
	Cumulat. score, ε_β	Quality improve. reserve, %	Cumulat. score, ε_γ	Quality improve. reserve, %	Cumulat. score, ε_β	Quality improve. reserve, %	Cumulat. score,	Quality improve. reserve,%
"Kremenchukmeat" PJSC	2,43	75,7	3,71	62,9	3,55	64,5	3,53	64,7
"MMK" OJSC	4,73	52,7	3,96	60,4	2,56	74,4	3,99	60,1
"Exim Food" LLC	4,14	58,6	4,74	52,6	3,07	69,3	4,11	58,9
"Trade House "Myasna Vesna" LLC	7,11	28,9	7,79	22,1	7,31	26,9	7,73	22,7
"APK-Invest" PJSC	8,44	15,6	8,38	16,2	7,11	28,9	8,79	12,1
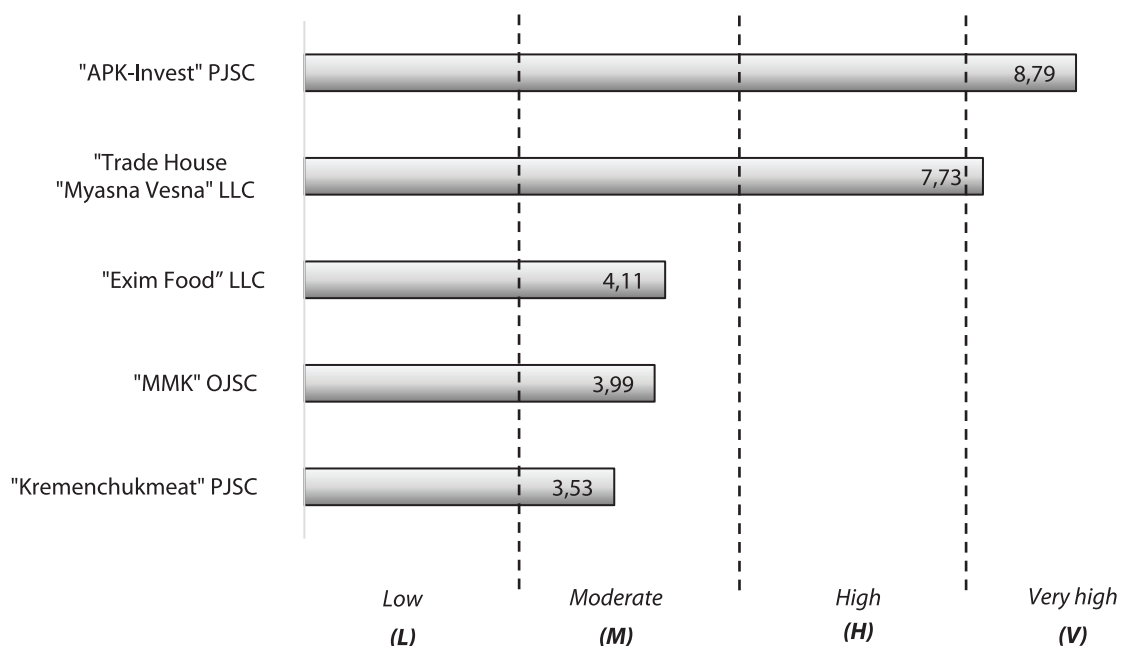
Figure 4. Estimates of the quality information provision level of food industry enterprises flexibility management

the overall quality of information management flexibility, as they are of the highest importance. It should be noted that only a set of peripheral additional attributes is open and can be formed based on the goals of the food industry. The rest of the information attribute set is mostly fixed and requires detailed analysis, based on an assessment of their importance to users and their level of satisfaction.

4. Conclusions

- Summing up the conducted research, we emphasize that one of the factors of increasing the information provision effectiveness of food industry enterprises flexibility management of is the level of its quality, which directly depends on the system of collection and accumulation of information, as well as from the process of its processing.

- The effectiveness of information processing, in turn, is determined by quality performance indicators based on the multi-attribute approach, according to which all the criteria for the quality of information support represent a set of attributes.

- Prospects for further research are to substantiate a scientific approach that will provide an opportunity to identify issues of low-quality information management flexibility and on the basis of which it will be possible to provide optimal recommendations to management of enterprises for their solution.

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