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Express Audit of Logistics Processes for Data Integration Into Digital Ecosystem of the Enterprise

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***Abstract*—The article presents methodology for conducting logistics processes using digital tools based on marketing-logistics technologies. Organizational and management mechanism allows pre-project examination of logistics processes as part of enterprise strategy development and/or adjustment, as well as logistics systems audit at micro level. It allows identifying problem points in logistics processes. Two database components developed by the author represent data content. Functionality development of the applied methodology consists in automated collection, processing and subsequent data analysis for specific customer goals for logistic processes audit. The advantages of using substantive part of database components are the possibility of respondents' remote access to test and questionnaire surveys; demonstration of competency scores and typical errors in thematic areas; providing results while ensuring high validity of the tasks. The development of database application has potential to further parameters of the expected process condition development and assumptions for individual types of deviations in each logistics process. It may also serve as basis for further ranking of logistics key performance indicators in functional areas and specific processes in logistics system at micro level. In case of methodology extension, it will have practical application for partners in supply chain.**

Keywords—logistics process, logistics system audit, organizational and management mechanism, database, marketing research, survey

I. INTRODUCTION

In marketing logistics, a significant role is played by modern information technologies. They make it possible to efficiently serve informational and generated service logistics flows (Kraynova, 2019; Pham &Thanh-Thuy, 2020). To achieve this, experience of primary marketing research, data systematization for several functional modules of logistic system / operational logistic processes is demonstrated in pre-project (research) module. They are the following: module 1 "Storage organization", module 2 "Display arrangement", module 3 "Warehouse" , module 4 "Trading hall (logistics)", module 5 "Trading hall (sales departments)", module 6 "Safety", module 7 "Acceptance of goods", module 8 "Working with claims", module 9 "Certification", the module 10 "Delivery".

The presented algorithm for collecting and analyzing data from logistics system research is one of the components registered in the Federal Service for Intellectual Property (ROSPATENT) of the database "Express-Audit of Logistics Processes Using Strategic Management Tools". As a result, primary marketing research technology is presented in the form of online questionnaire and its content. It allows to gather necessary analytics of logistic operations within the processes and deal with a significant array of data automatically. Such approach will provide necessary basis for subsequent management decisions in logistics management (Korotkova et al., 2017; Gaidabrus, 2015; Sgarbossa et al., 2020; Torbacki & Kijewska, 2019).

The relevance of problems in logistic systems of different levels contributes to need of building a model of managing financial and related streams flowing. They are intended in the direction from producer to consumer, taking into account all elements of "marketing mix" enterprise. The optimization criterion in the context of marketing support is business processes development in logistics system with the ability to integrate them into supply chain (Dybskaya & Vinogradov, 2018). Besides, it is very relevant to build an effective customer relationship management system. To achieve this goal it is significant to process input logistic flow with suppliers and partners, and output flow with enterprises intermediaries of distribution system (Imane et al., 2020; Yasanur, 2018).

Scientific novelty and practical significance of the presented research results consist in organizational and managerial mechanism development for conducting logistics processes audit. It is vital to use modern forms of collecting, processing and subsequent interpretation of results for developing and / or adjusting enterprise's logistics strategy with substantiation of processes key performance indicators (Lukinskiy et al., 2013; Rudenko & Degtyar, 2017; Kraynova, 2018). The practical implementability of the methodology is also confirmed by its convenience and functionality. Such

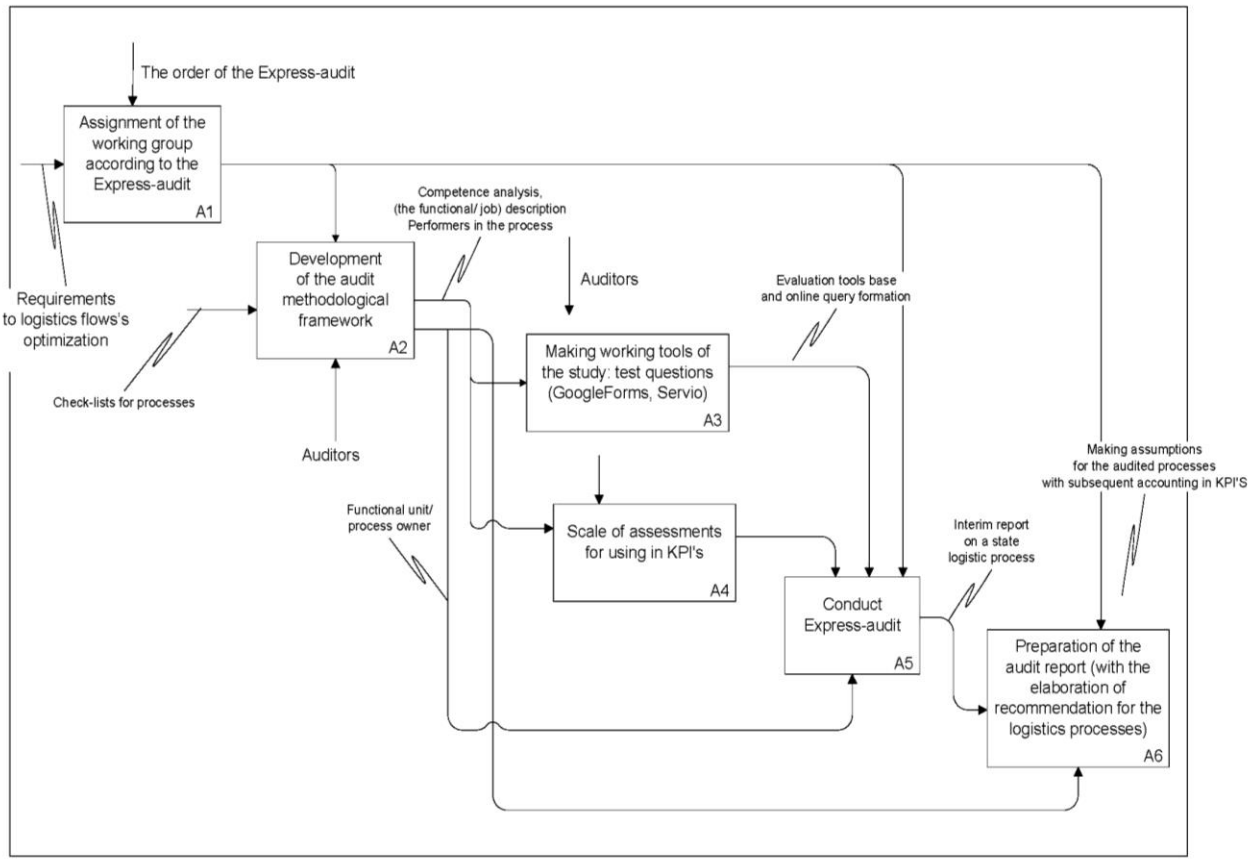

Fig. 1. Managerial mechanism by means of express audit system (Source: compiled by the author on the basis of internal information of the object of study)

approach will help to foster "make or buy" management decisions in the classical concept of logistics (Dybskaya et al., 2019) considering options for interaction through process outsourcing.

II. Materials and Methods

Methods of primary marketing research are used in the research. In particular, we applied to interactive questionnaire survey, developed in Goolge Cloud SQL (application Google Forms, Survio); system analysis method; ranking method; statistical grouping method.

III. Results

Managerial mechanism by means of express audit system in the research is represented in fig. 1.

Developed for the purpose of auditing logistic processes, organizational mechanism for database creation includes a system of components presented in the first part of the test assessment tasks for three thematic modules using Google Forms service. Each module includes 45 test tasks. Respectively, component 1 of the database includes 135 test tasks.

Service "Google Forms" for the represented Database is free and run in the browser. Apart from that, it is included into cloud storage Google Drive. Respondents are demanded to have only Gmail account (Kharlamova & Zobnin, 2018).

We developed multiple choice test questions for respondents with the help of "Google Forms". The opportunity for respondents to perform tasks via remote access when clicking on links sent to them is represented. The service itself provides answer assessment and demonstrates the results.

Question types, created in database with the use of "Google Forms":

1) a question that suggests answer in the form of a detailed text, including solving case situations;

2) a question implying one answer;

3) a question implying multiple answers;

4) a grid to select multiple answers.

The technology of database creation when passing a test implies access to its passage through a link. All changes made to the test are instantly saved and automatically changed in the current link.

The developer of the test tasks assigned a certain number of points for each question. They are summarized in the test results. The number of points scored and mistakes made are available to the respondent upon completion of the test with a

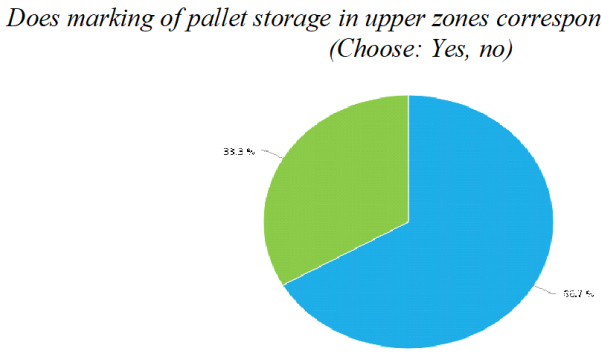

Fig. 2. Chart with responses unloaded from the site "Survio.com" (module 2 in Database) (Source: compiled by the author on the basis of internal information of the object of study)

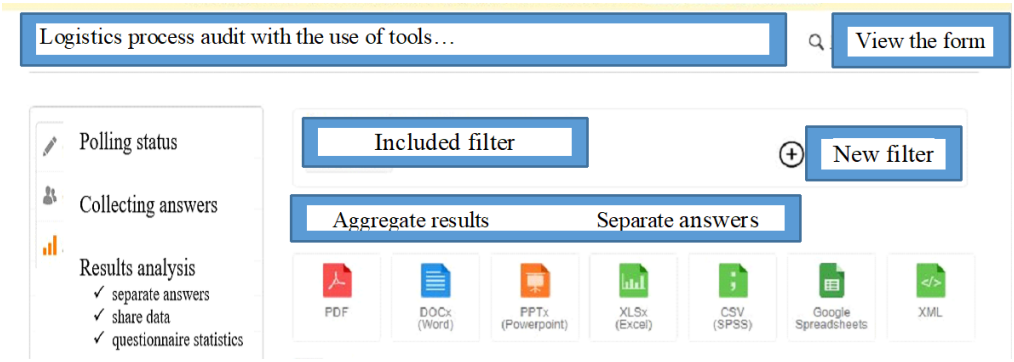

Fig. 3. The page with answer result, which is selected using installed filter (module 2 in Database) (Source: compiled by the author on the basis of internal information of the object of study)

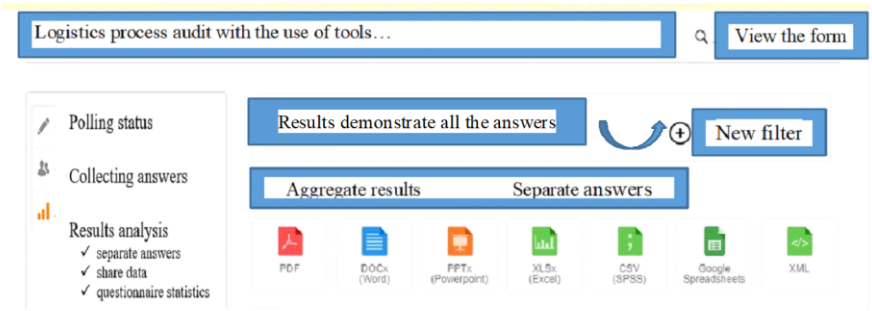

Fig. 4. The page with the result of all surveyed respondents' answers (module 2 in Database) (Source: compiled by the author on the basis of internal information of the object of study)

report sent by e-mail provided during registration on the Google Forms platform.

Collecting and processing responses, depending on the goals, can be done in general summary in diagrams. It makes it possible to view all the answers for each specific question, and for each individual respondent. The number of respondents who have passed the test from the presented database is unlimited.

The second component of the database is a questionnaire method for surveying logistic processes in the amount of ten thematic modules systematized in the Survio.com system. The breakdown of questions by process involves different number of questionnaire questions modules (from 5 to 18), respectively, component 2 of database includes total of 85 questions.

"Survio.com" system for the submitted database is free and runs in a browser. It is online system for creating surveys and questionnaires. It only requires electronic mailbox.

Questionnaire shown in Survio.com system are questions that imply one answer.

A multiple choice questionnaire was created for database with the help of "Survio.com". The respondent has the opportunity to take a survey by the links sent to him through remote access. Moreover, the system allows processing the result of the questionnaire with demonstration of received answers in the form of:

TABLE I. CRITERIA FOR ASSESSING STATUS AND ASSUMPTIONS IN TORAGE OF GOODS ARRANGEMENT (COMPONENT 1) (SOURCE: COMPILED BY THE AUTHOR ON THE BASIS OF INTERNAL INFORMATION OF THE OBJECT OF STUDY)

Planned (expected) state	Assumptions
1.1. Is actual warehouse plan posted in a prominent warehouse location? The actual topological plan of the logistics zone is posted in a prominent place in the warehouse.	Posted topological warehouse plan is not relevant in no more than 3 cells
1.2. Does marking of warehousing correspond to the logistics concept? A distinguished information sheet is attached to the pallets of warehouse from the front side: 1) when placed in storage directly after acceptance - the receipt list with indication of the supplier and the date of delivery of the goods; 2) when putting into storage after laying out in the sales area - backflow info sheet indicating the supplier (type of goods), the date of displacement from the sales area and the reason for moving out of the sales area (Ivanov et al., 2017)	The absence of a standard information sheet of no more than 15 pallets (but no more than 1% of the volume of warehouse pallet storage)
1.3. Does the marking of pallet storage in the upper zones correspond to the logistic concept? Information sheet is attached to the storage pallets in the upper areas of the sales area in the front side: 1) when placed in storage directly after acceptance - the receipt list with indication of the supplier and the date of delivery of the goods; 2) when putting into storage after laying out in the sales area - a backflow info sheet with an indication of the supplier (type of goods), the date of putting into storage and the reasons for putting it into storage	The absence of a standard information sheet of no more than 15 pallets (but no more than 1% of the volume of pallet storage of the upper zones)
1.4. Are the racks labeled with the storage area? Each racking rack has a label that corresponds to the current topological plan.	Label missing (or not relevant) in no more than 1 place
1.5. Do goods in stock correspond to the storage area? All storage in stock correspond to topological zones.	The discrepancy storage topological zone no more than 3 pallets
1.6. Are damaged goods not stored in the warehouse? There is no damaged item in stock	Temporary storage of no more than 5 pallets of damaged goods at the order of the store director, for subsequent sale with a markdown
1.7. Are markup buffer storage areas present? All floor storage areas have actual floor markings.	-
1.8. Are the loads in the internal warehouse located in approved areas? All cargoes in the internal warehouse are located within the zones specified in the topological plan.	A maximum of 5 pallets outside the topological zones (but no more than 1% of the storage volume of the internal warehouse)
1.9. Are the loads in the street area of the warehouse located in the approved areas? All cargoes on the territory of the warehouse's street zone are located within the zones indicated in the topological plan.	A maximum of 5 pallets outside the topological zones (but not more than 1% of the storage volume of the outdoor storage area)
1.10. Are goods and items of administrative use not stored on the floor? All cargoes are located on pallets / equipment with wheels / in stationary structures / suspended and not attached to vertical surfaces	-
1.11. Does the number of free operating storage bins correspond to the calculated? The number of free operational storage bins corresponds to the estimated day of inspection.	-
1.12. Are reserve capacities used as intended? Imported goods are in reserve zones, the shelf life does not exceed 7 days	1) the storage period for imported goods in the reserve zones does not exceed 14 days; 2) the reserve zone is used as a transit zone (with short-term storage up to 2 days) for local goods
1.13. Is the principle of "stringency" storage respected? Each stocking item can be obtained "in one movement" (without moving another product)	It is impossible to get "in one movement" (without moving another product) with no more than 2 articles of monoplet or 2 assorted pallets

1) general summary in the diagrams;

It is also possible to separately download each summary diagram for each question directly from Survio.com website (fig. 2).

2) a report with a review of the responses set by the filter (fig. 3);

In this case, a list of all respondents who chose answer NO in question № 5 is indicated.

3) a report with a review of answers to questions from each individual respondent (Fig. 4).

The presented table allows you to track the exact date and time when a particular respondent is interviewed. It also displays contact details and email addresses of respondents.

The technology of the survey questionnaire is a link click with all changes made to the questionnaires saved manually and changed in the current link after the page is updated. Questions may be optional (which can be skipped) and mandatory (which cannot be skipped).

The number of respondents who have completed the survey from the database is limited. Only 100 people are surveyed per month.

IV. DISCUSSION

In the pre-project module, the author presents specific issues of conducting express audit of logistic process by function which allows formulating the expected state of the process and assumptions for individual types of deviations in the project unit. Thus, a pre-formed database automatically demonstrates the state of logistic process allowing you to identify the problem field (Reveyac, 2015; Kovtunenko et al., 2019; Werner-Lewandowska & Kosacka-Olejnik, 2019; Lang et al., 2017).

In this section of the study, we will present data of the planned (expected) states, summarizing information in a tabular form under each audited area (see Table 1).

V. CONCLUSION

In the logic of the research, the author presents specific cases of express audit of the logistic process by functions. It allowed formulating the expected state of the process and assumptions for individual types of deviations. Due to this, there is a clear connection between the use of marketing tools at the stages of research and organization of projects. A pre-formed database automatically demonstrates the state of the logistic process (Pokrovskaa & Titova, 2019; Stank, et al., 2017; Yasanur, 2018). It allowed identifying the "problem field", and then planned states of logistic system for the audited areas were formulated (expectations from implementation) (Potapov & Potapov, 2017). Criteria for assessing status and assumptions for storage organization, display, address storage, organization of logistics in sales area (Kuzmenko et al., 2017), sales departments, occupational safety (Mishenin et al., 2018), acceptance of goods, handling claims, certification, delivery of goods arrangement are systematized (Kydyrova et al., 2018).

Research methodology development, according to the author, will allow further research to disclose and organizationally prescribe issues of post-project support for logistics optimization. In particular, it is important to develop algorithm for evaluating customer-oriented logistics system, including a system of criteria and their optimal indicators (Kostromina, 2018), recorded in the operational checklist for logistics (Kraynova, 2018).

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