
The Integration of the Accounting System for Implementing World Class Manufacturing (WCM) Principles

O.I Averina¹, N.F. Kolesnik², L.M. Makarova³

Abstract:

This article covers relevant issues of the development of accounting information system using the principles of integrated information space under implementation of WCM management technology. High-class internationally acknowledged business affects the key approaches to implementing social, ecological and business-processes as well as information space of economic actors. Principles underlying WCM are constant improvement and elimination of waste.

In this situation, the studies oriented toward the development of theoretic and methodological projects and applications for integrating accounting systems of the economic actors into one system become especially relevant. Analysis of theoretical and methodological approaches to solving this problem demonstrated that currently the issues of formation and development of the accounting system remain open. Current model of accounting system in the Russian Federation faces contradictions between new requirements and limited possibilities of the methods of traditional accounting and, consequently, the existence of qualitative, quantitative and structural changes in the development of the accounting system. Today in Russian companies there is a great number of types of accounting with a well-defined functional segment: operational, financial, managerial, statistical, fiscal as well as accounting principles IFRS/GAAP. This separation causes obstacles in the management information system and in transition to the principles WCM, creation of several duplicative uncoordinated large data of internal reporting: in parent company and its subsidiaries, head office and structural divisions of the company etc. The aim of the study is to develop methodological and methodical approaches to forming an integrated accounting system using unproductive costs and loss as an example.

Key Words: *accounting, integration, losses, modelling, business-process*

¹ Full Doctor of Economics, Associate Professor, Department of Accounting, Analysis and Audit, Ogarev Mordovia State University, Saransk, Russian Federation, ch.analiz@econom.mrsu.ru

² Full Doctor of Economics, Associate Professor, Department of Accounting, Analysis and Audit, Ogarev Mordovia State University, Saransk, Russian Federation, kolesniknf@mail.ru

³ PhD (Economics), Associate Professor, Department of Accounting, Analysis and Audit, Ogarev Mordovia State University, Saransk, Russian Federation

1. Introduction

1.1. Problem Statement

High-class internationally acknowledged business affects the key approaches to implementing social, ecological and business-processes as well as information space of economic actors. Successful companies do their best to meet the requirements of the clients to the fullest potential and in the shortest possible time; they expand their competitive advantages due to new ways of management organization and changing their corporate culture for the sake of constant internal improvements, make maximum effect of the use of human capacity and solving ecological issues.

A priority development trend in management technologies today is the concept of World Class Manufacturing (WCM) which originated in Japan in 1970s and initially was known as a complex system of total providing maintenance (TPM).

The programs WCM in different companies apply various management models and their variations: Toyota Production System, KAIZEN, Just-in-Time, Lean Manufacturing, Total Quality Management, 6 Sigma, ISO 9000, 20 keys, Theory of Constraints etc.

The key points of the WCM:

- 1) Orientation towards internal and external customers;
- 2) Creation of efficient work environment;
- 3) Reduction of losses;
- 4) Increase of efficiency, reliability and equipment flexibility;
- 5) Quality improvement;
- 6) Reduced time for project, administrative, manufacturing, logistic and service processes;
- 7) Use of the best management practices.

Principles underlying WCM are constant improvement and elimination of waste. WCM suggests creation of production system in the manner of “zero logic”. For instance, “Just in time” (0 cases of delivery delays) and full control of the production quality (0 defects). WCM management methods are aimed to optimize the use of resources of a company. This method is a symbiosis of the Eastern and Western best principles of production management. Due to this concept the whole company works as a team.

A world-class company is distinguished by a high quality of its production, efficient work with the clients, stable and high return at a consistently low cost, strict attitude to occupational safety and health, systematic reduction of losses, competence in all the issues, visibility, and absolute reliability.

Under these conditions international professional community of accountants faces

the problem of developing the concept of integrated accounting system based on a unified information system within an integral complex of human, technical, informational, organizational and institutional resources.

1.2. Relevance of the Problem

Primary prerequisite is that this problem is widely discussed in an international community under growing demands to have accounting information by the increasing number of its users, and regarding the need in the information of new quality required by modern management systems.

Current model in the Russian Federation is characterized by contradictions between new requirements and limited possibilities of the methods of traditional accounting and, consequently, the existence of qualitative, quantitative and structural changes in the development of the accounting system. Today in Russian companies there is a great number of types of accounting with a well-defined functional segment: operational, financial, managerial, statistical, fiscal as well as accounting principles IFRS/GAAP. This separation causes obstacles in the management information system and in transition to the principles WCM, creation of several duplicative uncoordinated large data of internal reporting: in parent company and its subsidiaries, head office and structural divisions of the company etc.

This state of information processing contradicts the WCM concept because parallel management of different types of accounting and reports which differ by their formats leads to information disintegration, changes the form of presentation of one and the same initial information and makes it hard to implement coordinated actions by management services of the company.

Taking into consideration that one of the WCM principles is reduction of losses, the authors of the paper made an effort to develop methodological and organizational approaches by integrating accounting information about unproductive costs and loss.

1.3. Literature Review

Theoretical and methodological issues of accounting system integration have been the subject of many studies and discussions during the whole period of accounting development. Issues of this research were covered in a significant number of scientific publications demonstrating various approaches of recognized scientists to the range of issues containing theoretical and methodological and methodical aspects. Kondrakov (2009), Palij (2006), Sheremet (2005) and other contributed to creation of fundamental statements and concepts in a systematic approach to accounting process. Studies of development of integrative processes in accounting systems of economic entities in the context of possibilities of information technologies are presented in the publications of Russian specialists such as Abramov (2005), Shuremov (2005), Malyavko (2009), Solonenko (2011) and others.

Modern stage of differentiating accounting variety by the types of accounting is explored by Burlakova (2008), Vahrushina (2011), Gluschenko (2010), Kaverina (2014), Kerimov (2014), Kim (2014), Kolesnik (2006), Krohicheva (2004), Nikolaeva (2005) and others. Accommodation of interests of the users of accounting information is described in the works by Ageev (2000), Vasilieva (2012), Kolvakh (2000), Krass (2012), Osipov (2013) and others.

Foreign economic science pays much attention to the problems of accounting systems integration. Leading specialists in economically developed countries emphasize a special role of accounting systems integration based on a unified information system in the conditions of modern management technologies. This problem is covered in the works of such foreign researches as Brown S.(2007), Squire B.(2007), Eid R.(2009), Schonberger R.(2013), Muda S.(2002), Bowen J.(2014).

Among the most prominent works are publications of Brimson (2007), Kaplan (2003), Norton (2003), Fridag (2007), Schmidt (2007) etc.

1.4. Hypotheses and their Impact on the Structure of the Study

In order to solve the given problem we applied a complex system approach suggesting interconnected consideration of theoretical, methodological and organizational issued of building an accounting system regarding WCM on the base of accounting processes integration and modelling information flows.

The hypothesis of the study is a conceptual statement that in modern conditions development of an integrated accounting system as a complex of its types and its practical application is possible only under the condition of interaction between organizational, informational and institutional factors providing relevant information depending on the goals of users.

2. Method

2.1 Integration of accounting types

Formation of parameters of all types in a coherent manner when collecting, registering, processing and presenting information about business-processes in a company may be considered as an objective and relevant process of accounting system integration (Figure 1).

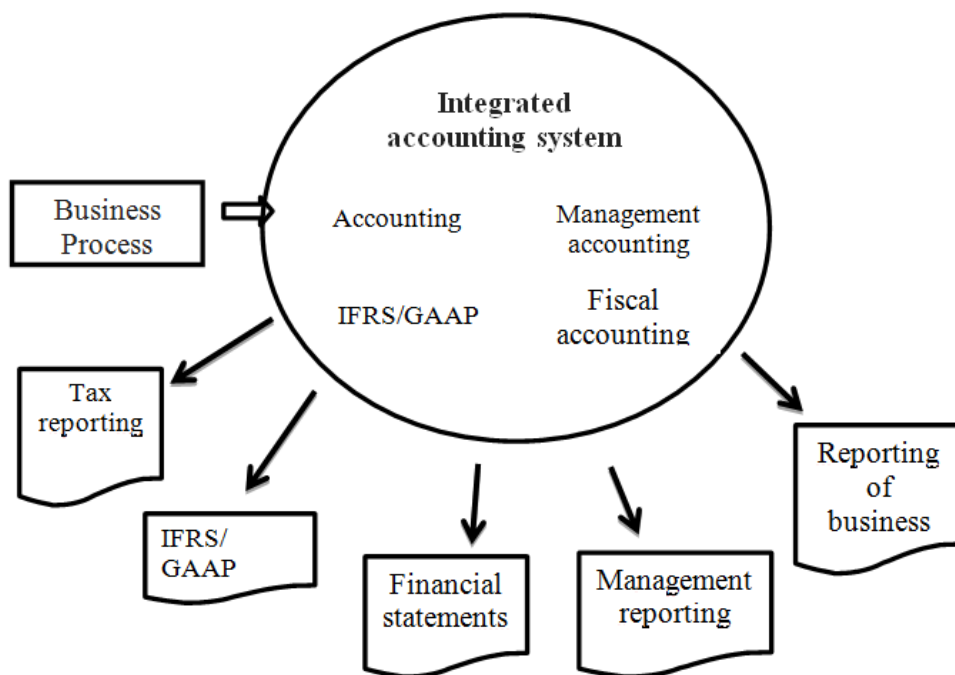


Figure 1. Presentation of business-processes in an integrated accounting system

Integrated accounting system in this understanding is a complex of interrelated target sub-systems which are able to reveal completely new characteristics of a studied object. However it is inappropriate to point out at critical importance of one of the aforementioned types of accounting, because a complex effect suggests combination of informational possibilities when solving interrelated task with the help of autonomous instruments of each of the accounting types.

Development of accounting integrated system suggests standardization of collections, processing, storing and presenting the information about target requirements. The main aim is also common, namely to meet informational request of the users. The similarity of accounting, fiscal, management and statistical accounting is in the unity of operative informational base on the base of which the transformation of data into certain registers of different users occur.

When creating information data set about the studied object, the need for unification and integration of all accounting types, both technically (document level) and organizationally, is considered urgent. The ultimate goal of developing different accounting types is to create an integrated document meeting the informational needs of the users for making justified administrative decisions when deviations in business-processes occur. Integrated approach enables to create and regulate information flows covering different types of accounting which leads to stable and

well-controlled connection (Figure 2).

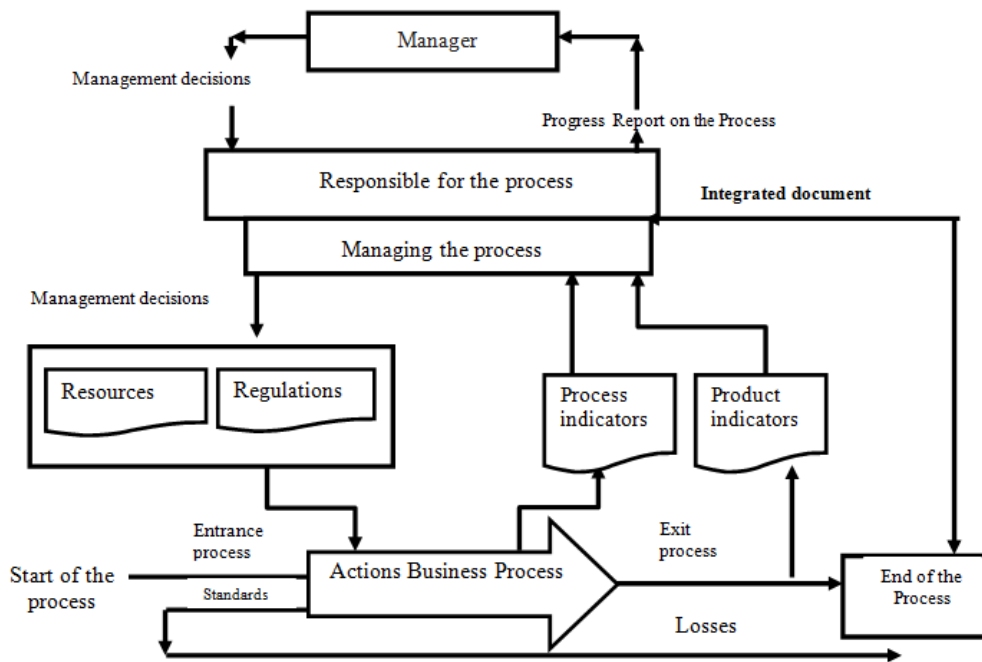


Figure 2. Integration of accounting types on the same informational base

An information system with implemented mechanism of integrated documents will be able to meet the requests of concerned users in various aspects of business-processes using strategies and methods of different accounting types emphasizing benefits and disadvantages of business-processes. An integrated approach to information accounting system enhances connection and interrelation between the accounting sub-systems, but it means neither complete merging, nor independent existence of accounting types.

2.2. Accounting System Modelling

Accounting system integration should be started with creation of a unified information database to increase the quality of accounting information, eliminate duplication of operations during data collection, registration, storage and transfer, minimize the amount of superfluous information which may have a negative impact on making administrative decisions. An important method of economic studies as modelling will help to solve this task.

For modelling it is necessary to solve the following objectives:

- to create a simplified description of accounting system with highlighting its significant parameters, i.e. building of the accounting model;
- to develop methods of practical use of accounting model, i.e. implementing

- of the model;
- to carry out the experiment.

In an integrated accounting system we may single out the following sub-systems defining the quality of its functioning: methodology, methods, organization and technology. All these elements are separate objects of modelling, namely:

- in methodology the structure of technological data entries by business-processes is modelled;
- in methods the forms of registration, transformation and accumulation of both initial information and information of a certain level of aggregation is modelled;
- in organization among the objects of modelling are constitutive elements of integrated accounting process, the order of distribution of functions and privileges between the users;
- in technology the processes of information processing are modelled.

The building of models of integrated accounting system of a company should be performed with generalization and systematization of best practices in information exchange as well as modelling of business-processes development. The objects of modelling in this case are information flows and their processing as any model is a way of transformation of input information into output. The information model is understood as a scheme of information flows used in the process of management and reflecting various procedures of performing functions of management and demonstrating on each task connection between input and output documents and indicators.

3. Results and discussion

3.1 Unproductive Costs and Losses as an Object of Accounting System Integration

We consider implementation of integrated accounting system on the example of such accounting object as unproductive costs and losses under which we understand any a resource and time consumption activity that do not create values.

There are two forms of losses:

- Evident;
- Concealed.

Evident losses are easy to identify with the help of traditional management functions: planning, control, accounting, analysis and regulation.

It is difficult to identify concealed losses by traditional methods of observation and control. They show themselves through financing the operations which are performed in established technological and management conditions. However due to internal changes it is possible to avoid them.

Concealed losses may be classified by the following indicators:

1. Losses caused by overproduction of materials or information;

2. Time losses caused by delay;
3. Losses caused by unnecessary movement of materials or information;
4. Losses caused by unnecessary stages of procession;
5. Losses caused by any, except minimum essential, resources;
6. Losses caused by unnecessary movements during the work;
7. Losses caused by defective production;
8. Losses of creative capacities of the staff.

Identification and elimination of losses should be regarded as a cyclic technology of self-improvement in a company including the following stages: monitoring, detection, assessment and implementation (Figure 3):

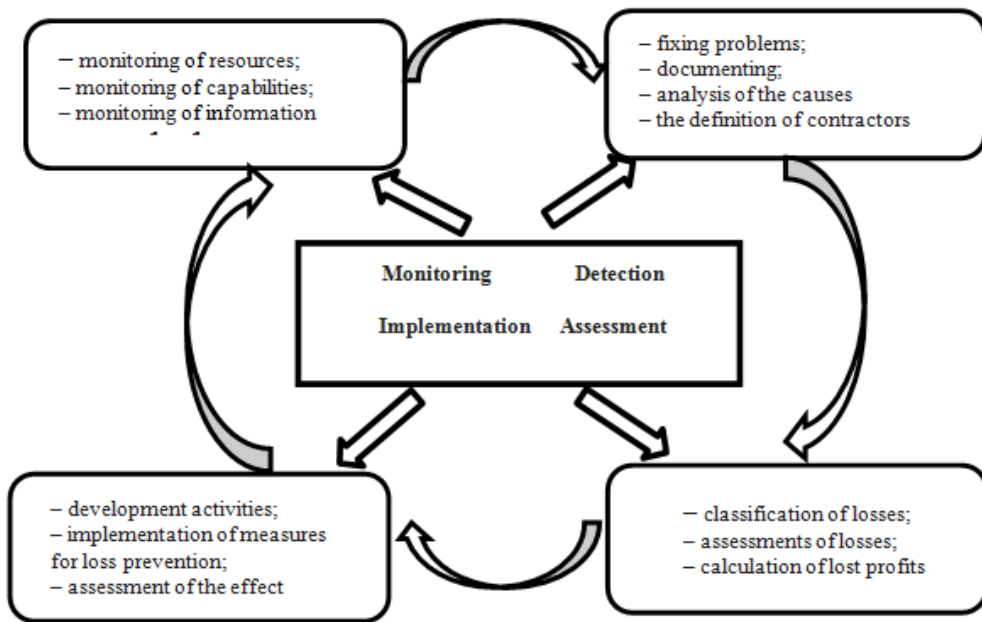


Figure 3. Cyclical technology of self-improvement in managing losses in a company

The first stage is preparation of expertise and instrumentation base for monitoring of used and unused resources and analysis of everything that does not contribute to progressive development of a company whether it involves people, information or processing technology.

On the second stage we detect parameters used for business-processes, resources and unnecessary processes for obtaining add-on value as well as implementation of data collection procedure.

On the stage of assessment we classify and assess the losses by their types depending on implemented business-processes. We also detect resource losses in the

total amount of deviations, calculate the amount of losses and identify the who or what is in fault.

On the fourth stage we develop and implement measures to prevent losses and evaluate accomplished effect.

Then all the stages are repeated only with a new information base and under changes conditions of functioning and management, i.e. new goals are set to detect used and unused resources delaying progressive development of a company.

Modelling of information flows characterizing unproductive costs and losses in terms of requests by internal users is presented through the description if its model. In this case, the access to this model is information about standards of business-processes development. Then we review the technology of actions in business-processes which detect unproductive costs and losses on different levels of their formation. The result of functioning of this model is information flows by the levels of internal users providing feedback with the objects of management by business-processes and products. The exit is the information for making administrative decisions by those who are responsible for the processes as well as better use of available resources (Figure 4).

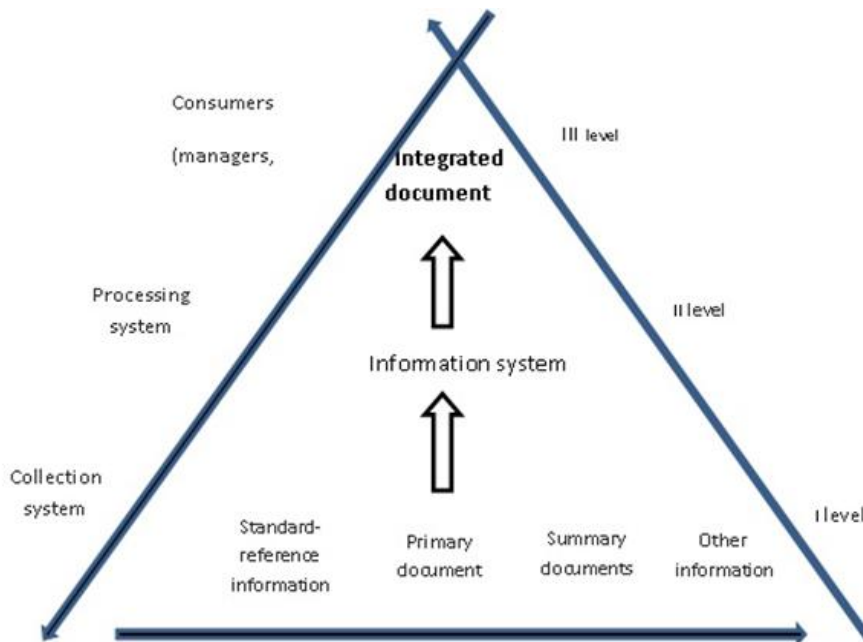


Figure 4. The model of information support for managing unproductive costs and losses

The modelling of accounting organization of unproductive costs should be preceded by a thorough exploration of structure of the exploration, characteristics of information flows and connections, their compliance to criteria of optimality, structure of the current system of accounts, consistency in forming indicators of accounting and reporting. The quality of this form of modelling and its information capacity depends largely on the chosen indicators, system of accounts and forms of accounting records.

As experience shows, the experiment with the model is always more cost-effective than the further results of undertaken activities. The model accurately represents the object and allows evaluate efficiency of the experiment.

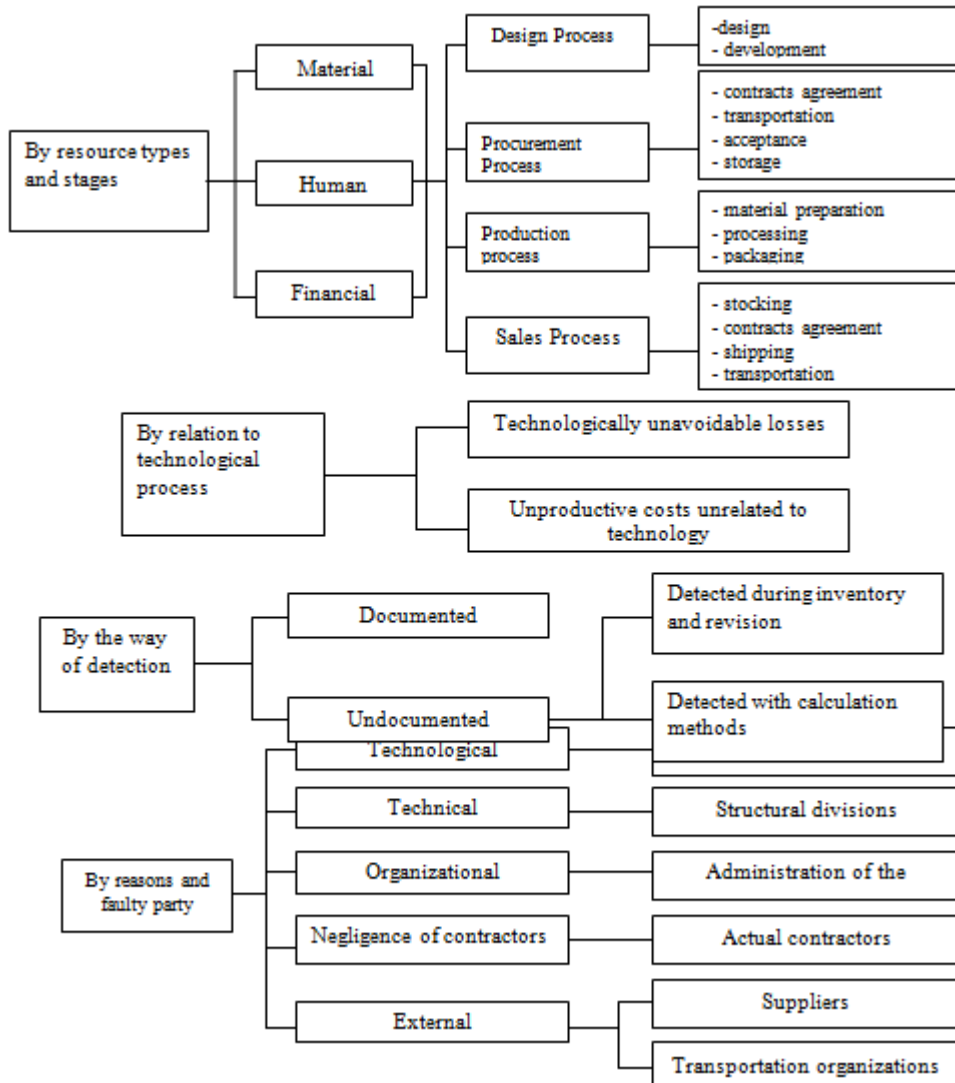
The results of information flows studies can be presented as a matrix containing data about initial documents, their movement routes and indications during implementation of business-processes.

The benefit of presenting information model as a matrix is a uniform connection between divisions of the company and the process of creating account data circulating between them.

Possibility and the need to build a matrix model of accounting information system of unproductive costs is justified by the fact that there is classification and generalization of information in relevant elements of an integrated database concerning unproductive costs for all types of resources. Each document used in the integrative information system is justification of the value of certain costs and their reasonability. Matrix model enables us to imagine the degree and the character of transformation of information about unproductive costs during its use for making administrative decisions; at the same time eliminating duplicates when forming necessary indicators.

3.2 Classification of Unproductive Costs and Losses

Modelling of each aspect of accounting information system should be performed on the base of a separate classification of accounting objects because distinctive features of certain business-processes, for example, production have a significant impact on organization of loss records. Thus, the model of accounting organization for a certain object is build with separate areas on the base of available classification models. Among the classification models are developed classification criteria for allocating unproductive costs and losses in an integrated accounting system (Figure 5).



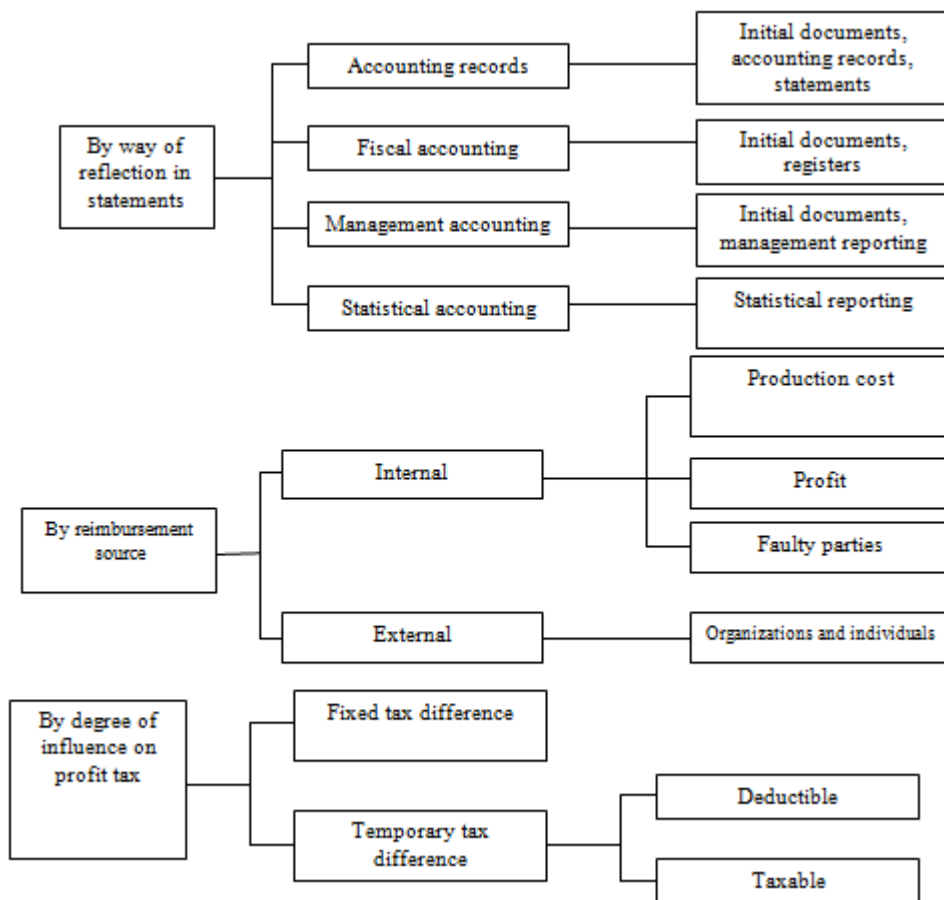


Figure 5. Classification criteria for allocating unproductive costs and losses in an integrated accounting system

Matrix model for information building about unproductive costs by the levels of management may be presented as a matrix AB (Table 1).

Table 1. Matrix model for information building about unproductive costs by the levels of management

Business-process	Indicators of initial documents in B1	Indicators of information system in B2	Indicators of integrated document in B3
Acceptance A1	A1B1	A1B2	A1B3
Processing A2	A2B1	A2B2	A2B3
Production A3	A3B1	A3B2	A3B3

Packaging A4	A4B1	A4B2	A4B3
Storage A5	A5B1	A5B2	A5B3
Distribution A6	A6B1	A6B2	A6B3

In the first case, the entire accounting system is modelled with all its elements in relation. In the second case, a separate element of the accounting system is modelled, and a certain problem is being solved, for example, improvement of report indicators at all the levels on management.

AB matrix determines dependence of forming the indicators about unproductive costs both of material, human resources and financial resources on all the stages of their occurrence: acceptance, processing, production, packaging, storage and distribution.

Studying the dependence of factors influencing the changes in information and documentation also plays a critical role in the modelling. There are three groups of factors: production, management and accounting. The production factors include the type of production, production technology and the structure of the company. Among the management factors are the organizational structure, planning, norms setting, control and others. Accounting factors include documentation, document management, the way of accounting information processing, accounting principles, cost planning methods on manufacture, list of expenses, and organization of accounting department. Each of these factors is influenced by a number of the other ones.

The impact of these factors should be taken into consideration when forming new information flows about unproductive costs by the levels of management.

The formation of information flows makes it possible to clearly define and allocate the functions of each department and division of a company in terms of accounting and control of unproductive costs and losses of material, human and financial resources on each stage of business activity. In accordance with objectives on each stage of business-process, the functions of departments and services are defined in terms of detection, accounting, control and analysis of unproductive costs and losses. This enables coherence and links between the functions and eliminates their duplicates. On the stage of resource acceptance timeliness of delivery in required amount and of required quality is under control. The next divisions in the technological process control the quality and quantity of materials, detect defects, deficiencies and their record, analysis of the reasons and identifying those who is responsible for this situation. The legal affairs service executes the claim and justifies it etc.

3.3 The Use of Corporate Software Products

As it was already mentioned, modelling enables us to carry out the experiment with lower costs and identify the best mode of functioning of a modelled object. For instance, when developing and implementing the model of information flows, it is

reasonable to carry out the experiment detecting many different quantitative parameters. For this reason, the experiment may be carried out with the help of various software programs, such as ERP-system Microsoft Dynamics AX. The system has complex and universal functions and allows creating a comprehensive system of management with regard to individual demands due to flexible and safe operation environment (Table 2).

Table 2. Microsoft Dynamics AX functionality

Functional profile	Modules			
Business-analysis	Balanced Indicators System	Management of business-processes	Multivariate analysis (OLAP)	Polls
CRM	Relationships with customers	Sales management	Marketing	Call-center management
Financial management	Russian accounting, fiscal, management and others standards	Management of holding's finances	Assets accounting	Wages accounting
Distribution		Trade agreements	Inventory management	Warehouse management
Production	Master planning	Production	Product configurator	Shop floor control
Project management	Project management	Planning and analysis of results	Financial monitoring of projects	Service management
Human resource management	Organizational structure	Staff recruitment	Personnel development	Personnel record keeping
Technological capabilities	Application server	Development tools	Access Control System	Integration Framework

Microsoft Dynamics AX covers all the aspects of organization management: production and distribution, supply chains and projects, finances and business-analysis tools, relationships with customers and personnel, i.e. all the aspects which require business-processes control, detection of deviations, analysis of the reasons, detection of party in fault. All this helps to build mechanisms oriented towards prevention of losses.

In this software system to calculate balanced indicators guidelines of the company activity are set, the delivery of works is monitored both at the level of divisions and certain employees. During this process a global data set of principal plan Indicators Company's activity of formed. During actual implementation of elements of business-processes this set reflects the achieved level of indicators due to automatic collection and analytical processing and actual values of the data. As a result of

assessment of current indicators of business activity, the company detects the correspondence between strategic aims and efficiency criteria of business and achieved level. This enables the company to increase the speed and accuracy of business-analysis, reach a new level in business-processes management and quickly react on arising problems and deviations from the target values. This makes Balanced Indicators System not just a unique tool of top-managers but routine mechanism of evaluation of current situation.

Orientation towards strategic approaches of development requires formalization of a strategic aim and development of action plan to reach this aim in each of the business-processes, accumulation and expanding of best practices scope for better business management and monitoring all the events and correctness of their implementation. A critical element in eliminating losses is setting indicators by the projects oriented towards particular aim and having well-defined start and completion dates, structured subordinate plans and, what is even more important, containing a set of specific activities into which management of any business-processes may be divided. With the help of checkpoints intermediate results are identified and potential problems are detected.

In the course of company's activities all the employees are involved in solving planned and unexpected tasks on the base of a daily schedule of forthcoming work. It allows recording the results and analyzes efficiency of work.

Multivariate analysis (OLAP) of a huge amount of information enables to carry out timely analytical data processing. Directors General and Chief Financial Officers, accountants, specialists of sales and marketing departments have an opportunity to create, review and save all the necessary reports in real-time. The necessary information becomes available beforehand when there is time to think about the actions, to detect effective and ineffective aspects of functional activity currently and in a long-term prospective with detailed specification of management data categories and established data hierarchy.

Regardless the complexity of a request, the result of multivariate data analysis are always accurate and relevant because they take into account all the current updates both in general and detailed view. Managers may use OLAP-analysis to evaluate various indicators of company's activity, to compare their actual values with budget indicators or with previous data. This makes it possible to evaluate work efficiency in each division and the company in whole. Accountants and financial analysts apply OLAP for analyzing cash flows, actual and budgeted expenditures as well as for making analytical reports etc.

Consequently, development and active use for reducing unproductive losses in information environment is possible due to the use of integrated accounting systems and active use of functions of ERP software programs. As WCM dictates the necessity of a complex approach to production organization for the best effect in

terms of income and company's capitalization, the requirements for detecting profits and expenses are also increasing. This process should be more analytical and it should be related to the current processes and management objects.

Thus, the results of the studies devoted to the development of integration processes in accounting system of economic agents on a new methodological and organizational base will provide all the users with necessary and adequate information and will promote grounded decisions in implementing WCM principles.

References

- Brown, S., & Squire, B., & Blackmon, K. (2007), "The contribution of manufacturing strategy involvement and alignment to world-class manufacturing performance", *International Journal of Operation & Production Management*, 27(30), p 282-302.
- Eid, R. (2009), "Factors affecting the success of world class manufacturing implementation in less developed countries", *Journal of Manufacturing Technology Management*, 20(7), p 989-1008.
- Bowen J.J., Brunswick P., Powell J.J. (2014), "Breaking Through, Second Edition: Building a World-Class Wealth Management Business", San Martin, TKO Management Associates, p 190.
- Muda, S. & Hendry, L. (2002), "Proposing a world class manufacturing concept of the make to order sector", *International Journal of Production Research*, 40(2), p 353-373.
- Schonberger, Richard J. (2013), "World Class Manufacturing: The Next Decade: Building Power, Strength, and Value", New York, Free Press, p 256.
- Robinson, P. (2005), "Business Excellence: The integrated solution to planning and control", Sussex, BPIC, p 312.
- Robinson, P. (2012), "World Class Manufacturing including lean, six sigma, kanban and checklist", Sussex, BPIC, p 99.
- Abramov A.A., Shuremov E.L., Afanasiev S.B. (2005), "Models and methods of computer accounting and analysis of production and commercial activity", N. Novgorod, Publishing House N.I. Lobachevsky NNSU, p 195.
- Ageev I.M. (2000), "Modelling, Financial and Management Accounting of a Back-up System under Conditions of Risk and Uncertainty", Rostov na Donu, North-Caucasian Scientific Center of the Highest School, p 131.
- Brimson D. (2007), "Budgeting Oriented on the Process, Implementation of a New Cost Management Tool", Moscow, Vershina, p 336.
- Burlakova O.V. (2008), "Modern Methodological Issues of Consolidated Accounting", Moscow, Accounting records, p366.
- Vasilieva L.N, Krass M.S. (2012), "Modelling of microeconomic processes and systems", Moscow, KNORUS, p 392.
- Vakhrushina V.A. (2011), "Management accounting Textbook for university students of economic specialties", Moscow, Omega-L, p 570.
- Gluschenko V.V. 2010, "The paradigm of post-industrial prognostics: forecasting in management", Moscow, IE Gluschenko Valeriy Vladimirovitch, p 84.
- Kaverina O.D. (2014), "Management accounting: theory and practice: textbook for bachelors", Moscow, Urait, p 489.

-
- Kaplan, Robert S., Norton, David P. (2003), "Balanced Indicators System. From strategy to action", Moscow, ZAO «Olymp-business», p 304.
- Krimov V.E. (2014), "Management accounting", Moscow, Dashkov and K, p 483.
- Kim L.I. (2014), "Strategic management accounting", Moscow, INFRA-M, p 202.
- Kolesnik N.F. (2004), "Information support in the system of unproductive costs management", Saransk, Publishing house of Mordovia University, p 116.
- Kolesnik N.F. (2006), "Accounting and control of unproductive costs and losses on processing enterprises", Saransk, Publishing house of Mordovia University, p 224.
- Kolvakh O.I. (2000), "Situational matrix accounting: models and conceptual solutions", Rostov na Donu, North-Caucasian Scientific Center of the Highest School, p 243.
- Kondrakov N.P. Ivanova M.A. (2009), "Management accounting: study guide", Moscow, INFRA-M, p 368.
- Krokhicheva G.E. (2004), "Virtual accounting: concepts, modelling and organization" (311 p.). Rostov na Donu, Rostov State University of Civil Engineering.
- Malyavko A.B. (2009), "Integration of accounting types in information accounting system in a commercial organization", PhD thesis, Sciences in Economics: 08.00.12, Volgograd, p 171.
- Nikolaeva O.V. Sheremet A.D., Polyakova S.I. (2005), "Management Accounting", Moscow FBK-Press, p 426.
- Osipov V.I. (2013), "Management accounting and control of resource consumption. Theoretical and practical issues, the ways of their solving", Saarbrücken: Palmarium Academic Publishing, p 256.
- Palij V.F (2006), "Management accounting of expenses and profits with elements of financial accounting", Moscow, INFRA-M, p 279.
- Solonenko A.A. (2011), "Methodology of forming an integrated accounting system in commercial organizations and translation capacities: monograph", Astrakhan, Sorokin R.V., p 176.
- Fridag Kh. R., Shmidt V. (2007), "Balanced Indicators System: implementation guide", Moscow, Finances and Statistics, p 160.