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Koulik V.A. PhD (Economics), Professor, Professor of Logistics Department National Aviation University (Ukraine), Honored Worker of National Education of Ukraine, Honorary employee of aviation transport of Ukraine

ORCID – 0000-0002-3975-9036

Researcher ID – S-7356-2018

Scopus author id: –

Zamiar Zenon Dr. hab. Inż, Professor, Vice-Rector the International University of Logistics and Transport in Wroclaw (Poland)

ORCID – 0000-0001-9887-0183

Researcher ID –

Scopus author id: 56419979900

SUPPLY CHAIN SPIRAL DYNAMICS

Volodymyr Koulik, ZAMIAR Zenon. «Supply chain spiral dynamics». The article is devoted to the research of modern tendencies of defining the essence of supply chain management as an innovative philosophy of spiral business dynamics. The research is based on the generalization and application of the basic principles of wave theory of development, classical theory of marketing, modern provisions of the theory of TQM and conceptual provisions of the theory of spiral dynamics. A new look at supply chain architecture, from identifying growing needs for specific products and ending with utilization, namely the emergence of new links in the chain of transformation of resources such as the stage of intelligent innovation processes to create modifications and upgrades or design a new product to meet growing needs. A multicomponent process of change is considered in view of current trends. The application of the theory of the spiral dynamics of the supply chains is a logical and predictable extrapolation of the general tendencies of the development of the life support system and the growing needs of society, starting from the "subsistence economy" and to the creation of modern global economic associations such as transnational corporations and international transport corridors. economic associations of countries and international programs of scientific search in the field of artificial intelligence and development of the cosmos.

Keywords: strategy, integrated logistics, social psychology, supply chain, spiral dynamics of development, logistics.

Володимир Кулик, ZAMIAR Zenon. «Спиральна динаміка ланцюгів постачань». Стаття присвячена дослідженню сучасних тенденцій визначення сутності управління ланцюгами постачань як інноваційної філософії спіральної динаміки бізнесу. Дослідження базуються на узагальненні та використанні основних положень хвильової теорії розвитку, класичної теорії маркетингу, сучасних положень теорії TQM та концептуальних положень теорії спіральної динаміки. Новий погляд на архітектуру ланцюга постачань, починаючи з виявлення зростаючих потреб в конкретних видах продукції і завершуючи утилізацією, а саме появи в структурі ланцюзі нових ланок трансформації ресурсів таких як етапу інтелектуальних інноваційних процесів створення варіантів модифікації та модернізації або розробки проекту нового продукту для задоволення зростаючих потреб. Розглянуто мультикомпонентний процес змін з огляду на тенденції сучасності. Застосування теорії спіральної динаміки ланцюгів постачань є логічною і передбачуваною екстраполяцією узагальнених



тенденцій розвитку системи забезпечення життєдіяльності та зростаючих потреб суспільства починаючи від «натурального господарства» і до створення сучасних глобальних господарських об'єднань, таких як транснаціональні корпорації та міжнародні транспортні коридори й трансконтинентальні ланцюги постачань, економічні об'єднання держав та міжнародні програми наукового пошуку в галузі штучного інтелекту та освоєння можливостей космосу.

Ключові слова: стратегія, інтегрована логістика, соціальна психологія, ланцюг постачань, спіральна динаміка розвитку, логістика.

Владимир Кулик, ZAMIAR Zenon. «Спиральная динамика цепей поставок». Статья посвящена исследованию современных тенденций определения сущности управления цепями поставок как инновационной философии спиральной динамики бизнеса. Исследования базируются на обобщении и использовании основных положений волновой теории развития, классической теории маркетинга, современных положений теории TQM и концептуальных положений теории спиральной динамики. Новый взгляд на архитектуру цепи поставок, начиная с выявления растущих потребностей в конкретных видах продукции и заканчивая утилизацией, а именно появление в структуре цепи новых звеньев трансформации ресурсов как этапа интеллектуальных инновационных процессов создания вариантов модификации и модернизации или разработки проекта нового продукта для удовлетворения растущих потребностей. Рассмотрены мультикомпонентный процесс изменений учитывая тенденции современности. Применение теории спиральной динамики цепей поставок является логичной и предсказуемой экстраполяцией обобщенных тенденций развития системы обеспечения жизнедеятельности и растущих потребностей общества начиная от «натурального хозяйства» и к созданию современных глобальных хозяйственных объединений, таких как транснациональные корпорации и международные транспортные коридоры и трансконтинентальные цепи поставок, экономические объединения государств и международные программы научного поиска в области искусственного интеллекта и освоения возможностей космоса.

Ключевые слова: стратегия, интегрированная логистика, социальная психология, цепь поставок, спиральная динамика развития, логистика.

Logistics' rapid development in the modern world economy is a critical factor in the cost and products value building that meet the growing needs of society and consumers. Management of the business processes in cross-cutting integration through the supply chain and the transformation of primary resources into final products creates the necessary conditions for the continual development and improvement of logistics activities. According to Donald Bowersox and David Closs, the main paradigm of modern logistics is the creation of a logistic system in the form of a unified holistic association, the integration of which provides a much more prominent performance than a separate management of individual logistic functions [2]. After all, when every business process and operation is integrated into interrelated flows, chains, and networks, they create the key area of logistical

competence in the economy, being the source of the competitive advantages formation for certain types of products and their producers [1].

The theory of integrated logistics was formed in the end of the last century. Integrated logistics involves the creation of a holistic cross-flow control system that passes through all integrated chain's links, which goes through the stages of product's life cycle starting with design, supply of resources, then production and straight to the end user and after-sales service. The integrated logistics concept relies on the enterprises personnel' efforts unification - logistic partners and their concerted action based on the common goals and the entire supply chain efficiency criteria [12].

The integrated logistics concept has been transformed into business-concept Supply Chain Management (SCM). Douglas M.



Lambert and Stoke J.R. define supply chain management as the integration of key business processes that begin with the end-user and cover all suppliers and goods, services and information manufacturers, add value to consumers and other stakeholders [10]. This business concept develops on the basis of inter-functional and inter-organizational coordination of interconnected and consistently ordered elements of a complex logistics system - the supply chain.

Supply chains' functioning is associated with considerable uncertainty. Uncertainty is a general indication of various kinds of random events that violate the normal operation of the system and create the risk of not receiving the expected results. The reasons for the uncertainty may be: changing needs, changing requirements for a product that is designed to meet the need, science and technology innovations, as well as demand fluctuations, forecast errors, loss of resources, data inaccuracy, managers' miscalculations, inaccurate transmission of information and the interpretation of various events, delayed receipt of an order from the client, unexpected production failure, damage to the goods at delivery to the consumer or delivery outside the place of destination, targeted actions on the destruction of the supply chain (terrorism, goods' thefts), and such contingencies as political or natural conditions changes.

Uncertainty is one of the main problems that could arise in supply chain management. All supply chain links and all functional cycles of logistics exposed to it, that's why the uncertainty factors and risks should be taken into account both when planning the supply chain, and when implementing the plan. This significantly complicates planning in the supply chain, reinforces the requirements for the plans' flexibility and the development of mechanisms for supply chain participants coordinated actions in both regular and extraordinary situations. As uncertainty is eliminating (minimizing), the efficiency of supply chain management is raising.

Thus, minimizing uncertainty and timely adjusting actions through operational changes in the flow of the supply chain and the activities of its business entities are key tasks of SCM.

Logistics Strategic Management Specialists (Stoke and Lambert) argue that managing partner engagement will only succeed if it is perceived as a "multicomponent process of change" that takes into account simultaneously and in the full range all components of the supply chain and on all the links [10].

The implementation of such approach is proposed to be reached using the author's scheme of cascade-integrative method of change management in the supply chain system.

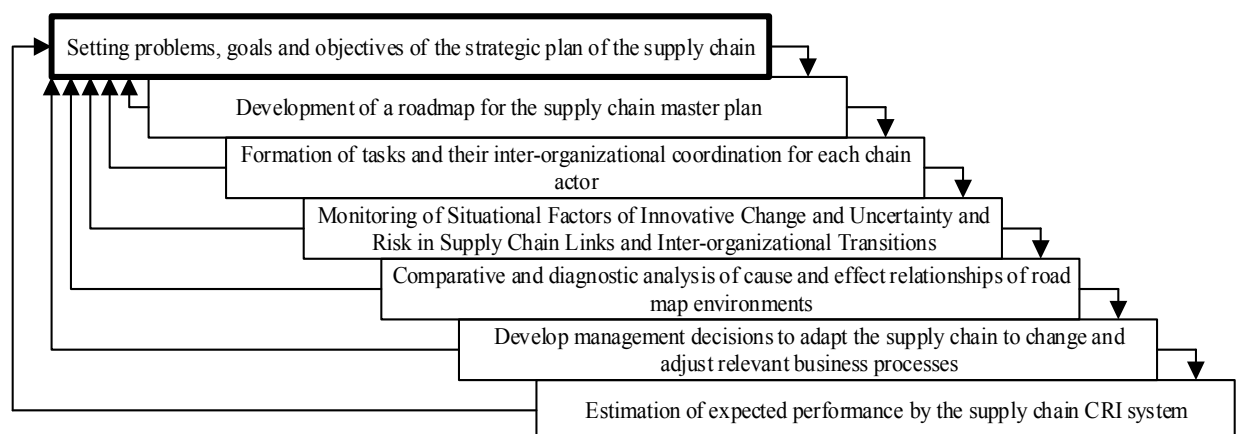


Fig. 1. Cascade-integrative change management in supply chain

Taking into account the accelerating pace of innovation in the development of equipment and machinery, technology and their consumer market, as well as the expedited change in the consumers' needs and preferences, according to many researchers, the business concept of SCM requires a wider interpretation of the concepts and components of integrated logistics in general and the nature and structure of the supply chain before all as a single business complex - systems of resource support for the design, production and consumption of products which are needed to meet the growing demands and new needs of society.

This paper is aimed to study and elaborate separate discussion positions and ideas about changing the paradigm of supply chain formation and its performance management. The research is based on the synthesis and use of the basic provisions:

- the wave theory of development and changes in technological methods (by M. Kondratiev and J. Schumpeter) in the formation of strategic views on the changes dynamics in logistics systems of each layout and the continuous improvement and modernization of subsystems and business processes of functional logistics [11];

- the classic Philip Kotler's Marketing Theory and the Maslow's hierarchy of needs [8]. After all, with a certain stability and persistence of representations about the generalized term "necessity", the complex (spectrum) of "localized needs" is growing constantly for its satisfaction, which in turn are disaggregated into the specified "needs in certain products or services", which individual life cycle continually shrinks while the growth rate of their innovative update increases all the time. Consumption products, in line with the consumer response and the achievements of science and technology, have to constantly improve their functional characteristics, economic parameters by modifying, modernizing or transitioning to a

fundamentally new level of needs' satisfaction [9];

- modern provisions of the TQM theory - the total quality management by W. Edwards. Deming and Joseph Juran, according to which the quality of the product is provided by a closed system - "quality loop" - interconnected processes of managing the technological complexity and quality of all successive stages of the design, production and use of a product or service with their constant changes, improvements and refinements during the life cycle [5, 7];

- the theoretic provisions of the concept of spiral dynamics by Beck and Cowan as an instrument for the formation of the global outlook and system values of individuals and society, as well as changes in priorities in their interrelations for different levels of human development and socio-economic systems [3, 4]. The transfer of these problems from pure sociopsychology into the most pragmatic level of organizational-technological and socio-economic tasks of supply chain management allows us to scientifically substantiate the necessity to change the focus from managerial egocentrism to the integration sociocentrism, which is typical for such virtual associations with the partner heterarchy system in the management of their functioning.

The principles of system integration and globalization can extend the concept of the supply chain, not as a system of successive "door-to-door" movement of supply objects, but as a system of ordered business processes meeting the needs of "0 to 0", that is, from the moment when a need occurs and up its full satisfying by means of the necessary complex of products and services for this purpose - objects of supply. This approach radically changes the architecture of the supply chain due to the emergence of new resources transformation elements in the chain structure:

- separate parts of business processes of resource - material, energy, financial, cognitive - ensuring the state of effective and



competent consumption (use, exploitation) of the product, its recycling and, then, utilization;

— consumers' final assessment stage of the used product conformity level based not only the international standards ISO, but also with the individualized needs and requirements of the client;

— the stage of intellectual innovation processes creating options for modification and modernization or design of a new product to meet the growing needs and requirements of both society and individual consumers [6].

Determining the need for a single common point, " $0 \rightarrow 0^*$ " of the supply chain origin and finalization, fully complies with the SCM concept to begin the supply chain key business processes formation from the end user and its needs.

Since in our case the supply chain end point is its return to its starting " 0 ", but already at the estimated level " 0^* ", as a result of needs'

satisfaction or their change, the supply chain graphic representation might be expedient not as a linearly ordered set of stages and logistics business –processes, but as "loop-spiral" of the full cycle of supply management. This chain form provides implementation of one of the basic requirements for a modern management system - the system's closed contour presence with feedback in conditions of high uncertainty and risk at the business process docking stages and the transition of transformed supply objects in the logistics chain from one economic entity to another.

The global supply chain, focused on the full satisfaction of the generalized need- "necessity", takes into account its differentiation to local needs and, correspondingly, forms a local logistics supply chains system of a specific set of tangible and intangible products for the comprehensive provision of specific needs of consumers.

Fig. 2. Loop-spiral of global supply chain



Thus, the loop-spiral of the supply chain is a complete set of logistic chains and flows of homogeneous supply objects - resources, parts, semi-finished goods, goods, etc., as well as the stages (links) of their gradual technological transformation into final products to meet the needs of consumers (Fig. 2).

The main stages of the objects transformation in the global supply chain are the following:

0 — identifying specific needs through awareness of its importance for the consumer;

1 — product concept generating to satisfy the need by transforming intellectual search into the product idea;

2 — project development concerning the needed product for consumers through the use of intellectual resources to create the main project components: constructional, technological, resource, investment, informational;

3 — resource source search and order placement by transforming the need in the resources into supply contracts;

4 — product manufacture of the required quality and functionality as a result of the

resources transformation into specific products;

5 — product transformation into the good as a result of its commercialization;

6 — good distribution and its delivery to the consumer through order transformation into the object of ownership or leasing;

7 — product effective consumption (use, exploitation);

8 — logistic service and product of consumption recycling through the restoration of lost properties;

9 — product utilization and formation of secondary resources as a result of their processing;

10 — determining the level of customer satisfaction and the need for new products to meet the needs through the formation of new product requirements;

0* — formation of an updated need in a new or upgraded product.

— local logistics flows of displacements of homogeneous objects of supply between the points of their transformation.

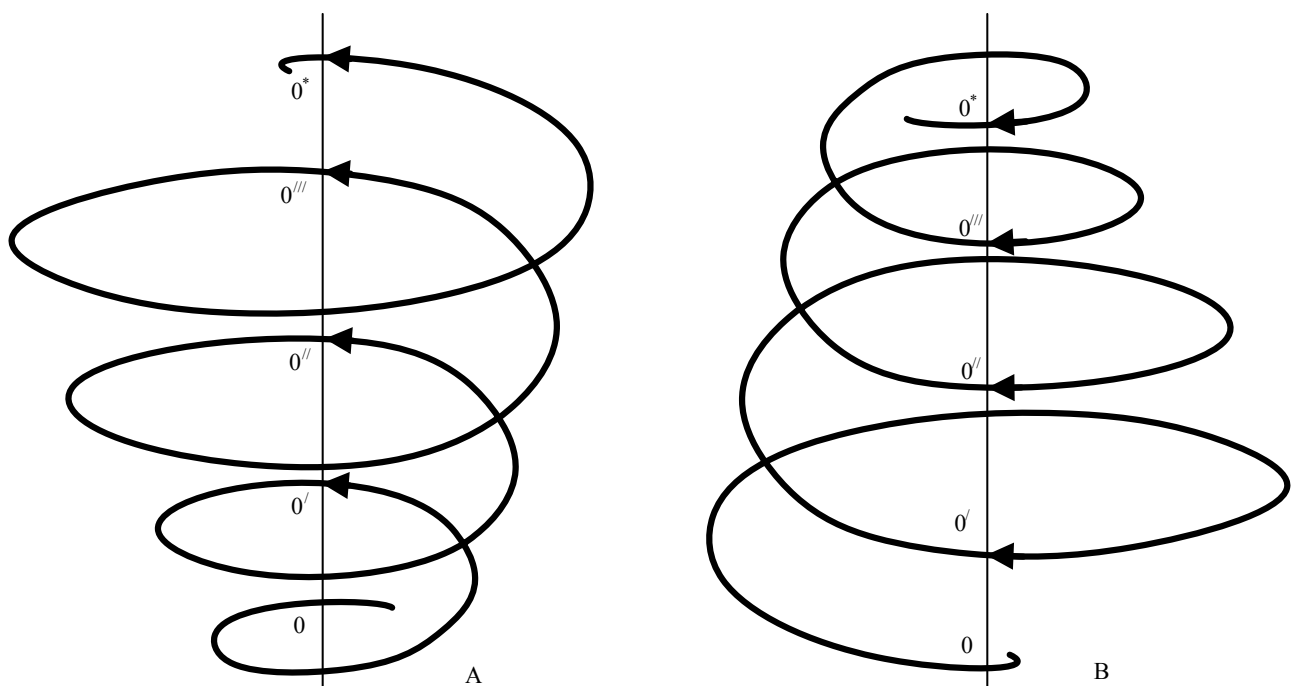


Fig. 3. Spiral funnels for increasing (A) and degrading (B) supply chains



The spiral dynamics concept of development assumes the formation of the next turn of the spiral in accordance with the most currently relevant values for society and individuals, which consistently develop on the basis of the previous values system and become dominant, then to give way to a more progressive stage of development. This means that at each stage of development, a specific system of production relations that corresponds to the level of intellectual, technological, informational state of the technological structure and society as a whole is created.

Clare Graves came to the conclusion that our society has reached the period of the world centered development stage, which has a global systemic vision of the unity of all processes, the flexibility and pluralism of human and inter-organizational relations, the tendency to integration and team work.

Main provisions of the supply chain formation and management concept are consistent with all of these principles. Practice empirically proves the unconditionality of the spiral nature of the movement and the scale changes of the supply chains loops. These changes, on the one hand, are oriented towards innovative developments of future products and forms and methods of their supply to consumers, and on the other hand, on previous trends in supply chain functioning. Therefore, graphically, the spiral of the chain development has a non-cylindrical, but a cone shape of the "spiral funnel" type of global supply chains. "Spiral funnels" can have different directions and forms of development:

- for degrading chains of fading needs that do not meet the present requirements to products - supply objects, "funnel" is narrowing, and individual links of supply chains are simplified;

- for increasing supply chains of innovative products and meeting new consumer needs, the "funnel" is expanding due to increased demand, the development

of effective logistics infrastructure, globalization and the integration of logistics functions.

The needs category inclusion as a source of efficient supply chain management and as a whole spiral dynamics of integrated logistics concept is based on the voluntary uniting of the all enterprises concerted efforts - supply chain participants to achieve a common final result - meeting the consumers' needs. Harmonization of changes in the functional business processes and actions of the chain participants in space and time in response to updated consumer requests is carried out through logistic coordination based on:

- organizational unity of flow processes in all links and at all stages of local logistics chains and flows;

- the target strategy of the global supply chain spiral dynamics development, fixed in the agreements between its participants;

- technological unity of unified business processes and international standards and logistics requirements;

- diversified activities and conscious responsibility of the supply chain participants;

- economic unity of the entities' efforts in forming the value chain of integrated logistics services;

- information unity of flow processes as a result of business entities participation in the formation and use of a common information platform for global supply chains at all levels of management.

Conclusions The idea of the spiral dynamics of supply chains is a logical and predictable extrapolation of the generalized tendencies in the development of the system of providing vital functions and growing needs of society from the "natural economy" to the modern global economic associations, such as transnational corporations and international transport corridors and transcontinental supply chains, economic state unification and international research

programs in the field of artificial intelligence and development of space capabilities.

All of these trends in the world and regional economies development are directly related to the formation of new perspectives on the current and future needs of society and their satisfaction logistics. Consequently, the concept of spiral dynamics of supply chain development on the principles of globalization, integration and partner interaction could contribute to the search for

new forms, methods and tools for supply chain management as a business concept of the economic system of modern logistics.

Certain provisions of this research are only fragmented and sketchy, so they can be controversial and need further development. Interested scholars and practitioners of the logistics community are invited to discussions and debates.

References

1. Aref'Eva O.V. Strategiya i taktika rozvitku Integrovanih blznes-struktur: monografiya / O.V. Aref'Eva, I.M. Myagkih. – K.: Lazurit-Pollgraf, 2012. – 217 s.
2. Bauersoks D.D. Logistika: integrirovannaya tsep postavok / D.D. Bauersoks, D.D. Kloss. 2-e izd. / per s angl. – M.: ZAO «Olimp-biznes», 2005. – 640 s.
3. Don Bek. Spiralnaya dinamika: Upravlyaya tsennostyami, liderstvom i izmeneniyami v XXI veke / Don Bek, Kristofer Kovan. – M.: Alpina-Publisher, 2011. – 450 s.
4. Don Bek. Spiralnaya dinamika na praktike. Model razvitiya lichnosti, organizatsii i chelovechestva / Don Bek. – M.: Alpina-Publisher, 2019. – 382 s.
5. Gludkin O.P. Vseobschee upravlenie kachestvom: uchebnik dlya vuzov / O.P. Gludkin, N.M. Gorbunok, A.I. Gurov, Yu.V. Zorin. – M.: Goryachaya liniya – Telekom, 2001. – 600 s.
6. Grigorak M.Yu. Intelktuallzatsiya rinku logistichnih poslug: kontseptslya, metodologiya, kompetentnst: monografiya / M.Yu. Grigorak. – K.: Slk Grup UkraYina, 2017. – 513 s.
7. Edvards Deming. Menedzhment novogo vremeni. Prostyie mehanizmyi, veduschie k rostu, innovatsiyam i dominirovaniyu na rynke / Deming Edvards. – M.: Alpina Publisher, 2019. – 182 s.
8. Filip Kotler. Marketing ot A do Ya. 80 kontseptsiy, kotoryie dolzhen znat kazhdyiy menedzher / Kotler Ffilip. – M.: Alpina Publisher, 2019. – 211 s.
9. Filip Kotler. Marketing menedzhment. Ekspress-kurs / Kotler Filip. – SpB.: Piter Press, 2003. – 496 s.
10. Stok Dzh. Strategicheskoe upravlenie logistikoy / Dzh. Stok, D. Lambert; per. s 4-go izd. – M.: INFRA-M, 2005. – 830 c.
11. Shumpeter Y.A. Teoriya ekonomicheskogo razvitiya / Y.A. Shumpeter. – M.: Progress, 1982. – 456 s.
12. Scherbakov V.V. Logistika i upravlenie tsepyami postavok: uchebnik dlya akademicheskogo bakalavriata / V.V.Scherbakov. – M.: Izdatelstvo Yurayt, 2015. – 582 s.

Список використаної літератури

1. Ареф'єва О.В. Стратегія і тактика розвитку інтегрованих бізнес-структур: монографія / О.В. Ареф'єва, І.М. Мяких. – К.: Лазурит-Поліграф, 2012. – 217 с.



2. Бауэрсокс Д.Д. Логистика: интегрированная цепь поставок / Д.Д. Бауэрсокс, Д.Д. Клосс. 2-е изд. / пер с англ. – М.: ЗАО «Олимп-бизнес», 2005. – 640 с.
3. Дон Бэк. Спиральная динамика: Управляя ценностями, лидерством и изменениями в XXI веке / Дон Бэк, Кристофер Кован. – М.: Альпина-Пабlishер, 2011. – 450 с.
4. Дон Бэк. Спиральная динамика на практике. Модель развития личности, организации и человечества / Дон Бэк. – М.: Альпина-Пабlishер, 2019. – 382 с.
5. Глудкин О.П. Всеобщее управление качеством: учебник для вузов / О.П. Глудкин, Н.М. Горбунок, А.И. Гуров, Ю.В. Зорин. – М.: Горячая линия – Телеком, 2001. – 600 с.
6. Григорак М.Ю. Інтелектуалізація ринку логістичних послуг: концепція, методологія, компетентність: монографія / М.Ю. Григорак. – К.: Сік Груп Україна, 2017. – 513 с.
7. Эдвардс Деминг. Менеджмент нового времени. Простые механизмы, ведущие к росту, инновациям и доминированию на рынке / Деминг Эдвардс. – М.: Альпина Пабlishер, 2019. – 182 с.
8. Филип Котлер. Маркетинг от А до Я. 80 концепций, которые должен знать каждый менеджер / Котлер Филип. – М.: Альпина Пабlishер, 2019. – 211 с.
9. Филип Котлер. Маркетинг менеджмент. Экспресс-курс / Котлер Филип. – СПб.: Питер Пресс, 2003. – 496 с.
10. Сток Дж. Стратегическое управление логистикой / Дж. Сток, Д. Ламберт; пер. с 4-го изд. – М.: ИНФРА-М, 2005. – 830 с.
11. Шумпетер Й.А. Теория экономического развития / Й.А. Шумпетер. – М.: Прогресс, 1982. – 456 с.
12. Щербаков В.В. Логистика и управление цепями поставок: учебник для академического бакалавриата / В.В. Щербаков. – М.: Издательство Юрайт, 2015. – 582 с.