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AND SUPPLY CHAIN MANAGEMENT**

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## INTRODUCTION

We are happy to invite you to get acquainted with the first issue of the new scientific and practical publication "Intellectualization of Logistics and Supply Chain Management".

We strongly believe that the launch of this magazine indicates the objective need to rethink a wide range of issues related to the development of theory and practice in logistics and supply chain management, awareness of the need to unite the scientific community and logistics practitioners, dissemination of modern knowledge and best practices for innovative development of the logistics services market.

The first issue of the magazine is published at a difficult time. The global coronavirus pandemic and the deep economic crisis have significantly worsened business activity in the world. Currently, global supply chains are collapsing, international trade is declining, and competition between global and regional logistics operators is intensifying. The most common thesis is that the world will never be the same again. Industry experts predict the emergence of new, more flexible and adaptive supply chain management strategies and approaches to logistics business process management. The trend towards collaborations, cooperation and unification of services is emerging, comprehensive proposals for clients are being developed. There is increasing talk about the need to build bimodal supply chains, which involves the development of different decision-making scenarios: the traditional approach - cost-effective efficiency, low risk, high predictability; a new approach "second mode" - rapid recognition of opportunities, adaptability, willingness to solve unexpected problems and look for new opportunities.

Radical transformations of the global and national markets for logistics services require appropriate scientific support. Logistics science has a special role to play in this process. Initiating the emergence of a new journal, we decided to focus on its coverage of problematic aspects of the formation and development of logistics systems at the micro, mezo and macro levels, supply chain management, digitization of logistics, methods and tools for optimizing processes in logistics and supply chains, sociopsychology relations and network interaction of enterprises using cloud technologies, artificial intelligence, e-learning, neural business process management systems, etc.

Therefore, we invite scientists, researchers and business representatives, as well as our colleagues from abroad, to cooperate and present the results of scientific research, to discuss and debate on them, to work together to develop the scientific theory of logistics and promote mutual intellectual enrichment.

We hope that the new scientific publication will become a theoretical guide for young researchers and representatives of other fields.

**HRYPHORAK Mariia**  
*Chief Editor*



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## SIMPLE TO COMPLEX BUSINESS MODELS USING SYSTEM DYNAMICS LENS

**Ijaz Yusuf, Nadiia Reznik.** *"Simple to complex business models using system dynamics lens". System Dynamics is methodology that requires building the integrated system dynamics models using computer simulation to gain the insight of the social, economic, and business problems and keep on experimenting with the model to propose the alternative solutions to make the system better behaved.*

*This paper attempts to describes the business models form simple to complex using system dynamics modeling while identifying the different facets of factory dynamics. Single stock Banana Shop to Multi-stock Complex Model Labour Intensive 3PL Logistics firm share the modelling steps and keep on adding the factory structures to make the business complex gradually. Each model helps to explore the different mode of behaviours. Production, inventory, workforce, information systems, shipments and customer orders are the dynamic variables which change over the period of time and all are interacting in the multi-stock complex 3PL logistic firm model. Model structures and interactions among of different variables not only give the model understanding but also reveal the policies to make the system better behaved. Feedback notion is other significant property for system dynamics models.*

*Using the factory information, its dynamics is modelled step by step and its behavior is analyzed at each stage to gain the real-life wisdom. As we keep on adding the stocks and rates to improve the model of factory dynamics, each step highlights the model insight and understanding. Model validation is done after building the model while using different tests.*

*Plausible policies are suggested on the basis of parametric changes and structural changes of the model that set the guidelines for policy formulation.*

*This model development process indicates how a Systems Dynamics model addresses the corporate issues and designs the firm of its own choice.*

**Keywords:** Systems Thinking, Model Development, Factory Dynamics, Policy Design

**Іджаз Юсуф, Надія Резнік. «Прості та складні бізнес-моделі через призму системної динаміки».** Системна динаміка – це методологія, яка вимагає побудови інтегрованих моделей системної динаміки за допомогою комп'ютерної симуляції, щоб отримати уявлення про соціальні, економічні та бізнес-проблеми та продовжувати експериментувати з моделлю, щоб запропонувати альтернативні рішення для покращення поведінки системи.

У цій статті зроблено спробу описати бізнес-моделі від простого до складного за допомогою моделювання системної динаміки, визначивши при цьому різні аспекти заводської динаміки. Від однокладової бананової крамниці до багатоскладової складної моделі трудомісткої 3PL-логістичної фірми ділиться кроками моделювання та продовжує додавати заводські структури, щоб поступово зробити бізнес складнішим. Кожна модель допомагає дослідити різні моделі поведінки. Виробництво, запаси, робоча сила, інформаційні системи, відвантаження та замовлення клієнтів - це динамічні змінні, які змінюються з плином часу, і всі вони взаємодіють у моделі складної 3PL-логістичної фірми з декількома складами. Структура моделі та взаємодія між різними змінними не тільки дає розуміння моделі, але й розкриває політику для покращення поведінки системи. Поняття зворотного зв'язку є ще однією важливою властивістю моделей системної динаміки.

Використовуючи інформацію про фабрику, її динаміка моделюється крок за кроком, і її поведінка аналізується на кожному етапі, щоб отримати мудрість реального життя. Оскільки ми продовжуємо додавати запаси та ставки для покращення моделі динаміки заводу, кожен крок підкреслює глибину та розуміння моделі. Валідація моделі здійснюється після побудови моделі з використанням різних тестів.

На основі параметричних змін та структурних змін моделі пропонуються вірогідні політичні рішення, які встановлюють орієнтири для формулювання політики.

Цей процес розробки моделі показує, як модель системної динаміки вирішує корпоративні проблеми і проектує фірму за власним вибором.

**Ключові слова:** системне мислення, розробка моделей, динаміка виробництва, розробка політики.

**Introduction.** System Dynamics is a versatile methodology that has been used to integrate existing economic concepts into comprehensive models for providing new insights (Saeed, 2014). System Dynamics is a methodology that starts with important problems, comes to understand that structures that produce undesirable symptoms, and moves on to finding changes in structure and policy that will make a system better behaved (Forrester, 1980). System Dynamics being a blend of knowledge of

control engineering, cybernetics and organizational theory is a guiding philosophy to analyze the dynamic behavior of model in terms of its feedback mechanisms (R. Geoffreycel, 1985). System thinking, in practice, is a continuum of activities which range from the conceptual to the technical (Barry Richmond, 1987). There are many steps and different phases that describe the modeling protocol. Sajjad and Yusuf (2007) has discussed the model building process as under:

Conceptual	Problem Definition System Conceptualization Model Representation Model Behavior
Technical	Model Evaluation Policy Analysis



The modeling process uses two important schemes to highlight the dynamics of system i.e. thinking about how the quantities vary through time and thinking about whether a substantial feedback relationship exists.

#### Reinforcing and Balancing Loops

Model is the blend of balancing and reinforcing loops. Behavior of the system is the result of interaction of balancing and reinforcing loops.

A positive loop is often defined "... by the fact that an initial change in any factor eventually induces further self-change in the original direction (Levin, Roberts & Hirsch, 1975). Representative of the definitions of negative feedback loops are the followings: "When a feedback loop response to a variable opposes the original perturbation, the loop is negative or goal-seeking (Towill, 1996). The definition of a negative loop is usually interpreted to mean that" ... a change in one element is propagated around the circle until it comes back to change that element in a direction opposite to the initial change" (Meadows, 1972).

#### Stock and Flow Variables

Technical phase begins with level and rate variables. Feedback structure can be portrayed by equations or stock-and-flow diagrams (George P. Richardson, 1986). Stocks reflect the conditions within the system at a point in time. Stocks accumulate the flows and depending upon the rate of inflow and outflow the level of stock varies. Whereas flows represent the stream of activity associated with particular stocks. Decision rules govern the flow and stock and accordingly different modes of behaviors generate over period of time.

### **Presentation of the main results.**

**Model Development** To develop the model, we have to follow the steps mentioned above, but sometimes the feedback loops are so obvious that we directly move towards stock and flow equation. The below mention models are develop using computer simulation software STELL SOFTWARE version 1.1 (Barry et al, 1987). The objective is to learn the system dynamics modeling using factory dynamics comprising so many business scenarios from simple to complex and from single stock to multiple stocks.

**Single Stock Model: Banana Shop** To understand the dynamic of a factory we have to explore the different business scenarios from simple to complex, the simplest work pattern is the Banan shop where an owner gets the material and to deliver the material, the simplest form of a trading firm only deals with stock of materials and incoming supplies from suppliers as a result of order placed and process of delivery the material procured against the confirmed orders from customers. If inflow and out flow is same there is no change in the stock of materials stacked if incoming supplies are more than the customer orders to deliver the product then stock of materials piled up and if the inflow of supplies is less than the customer orders then there will be more shipment and stock of materials stacked has a decreasing trend. That is quite obvious with the simple stock and flow diagram.

#### **Inflow is equal to Outflow**

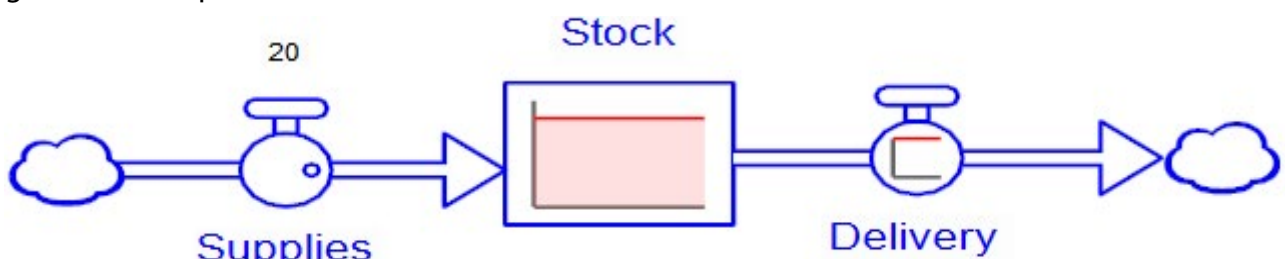


Figure 1 – Stock and Flow Diagram

Top-Level Model:

$$\text{Stock}(t) = \text{Stock}(t - dt) + (\text{Supplies} - \text{Delivery}) * dt$$

INIT Stock = 250

INFLOWS:

Supplies = 20

OUTFLOWS:

Delivery = 20

{ The model has 3 (3) variables (array expansion in parens).

In 1 Modules with 0 Sectors.

Stocks: 1 (1) Flows: 2 (2) Converters: 0 (0)

Constants: 2 (2) Equations: 0 (0) Graphicals: 0 (0)}

**Inflow is greater than Outflow (from  
20 units/hr to 30 units/hr)**

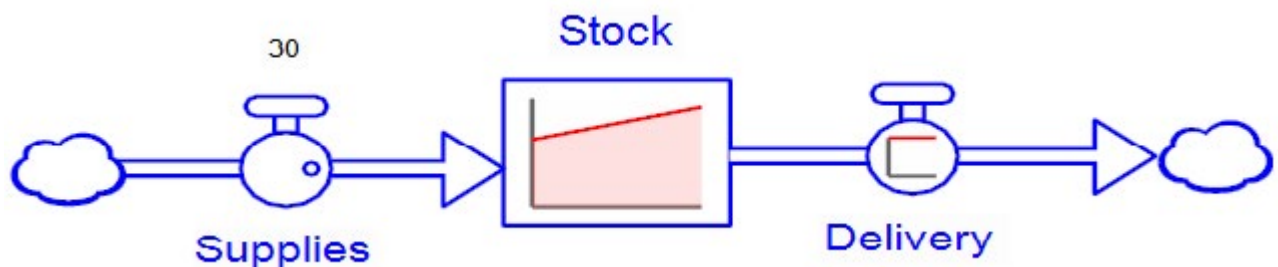


Figure 2 – Stock and Flow Diagram (Supplies greater than delivery)

Top-Level Model:

$$\text{Stock}(t) = \text{Stock}(t - dt) + (\text{Supplies} - \text{Delivery}) * dt$$

INIT Stock = 250

INFLOWS:

Supplies = 30

OUTFLOWS:

Delivery = 20

{ The model has 3 (3) variables (array expansion in parens).

In 1 Modules with 0 Sectors.

Stocks: 1 (1) Flows: 2 (2) Converters: 0 (0)

Constants: 2 (2) Equations: 0 (0) Graphicals: 0 (0)}

**Inflow is lesser than Outflow (from  
20 units/hr to 15 units/hr)**

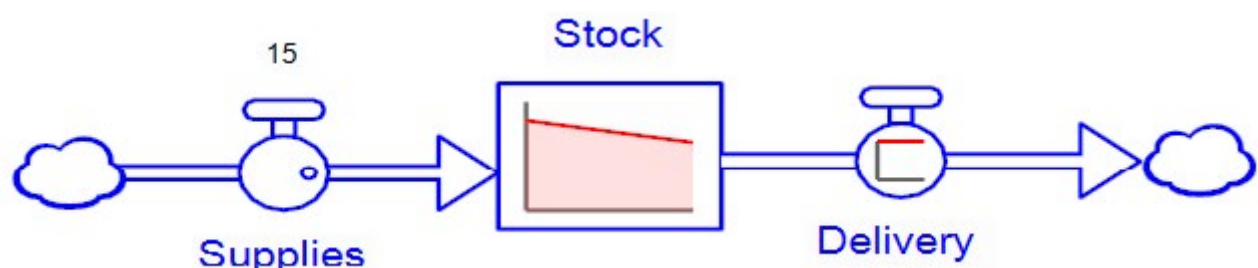


Figure 3 – Stock and Flow Diagram (Supplies lesser than delivery)

Top-Level Model:  
 $Stock(t) = Stock(t - dt) + (Supplies - Delivery) * dt$   
 INIT Stock = 250  
 INFLOWS:  
 Supplies = 15  
 OUTFLOWS:  
 Delivery = 20  
 { The model has 3 (3) variables (array expansion in parens).  
 In 1 Modules with 0 Sectors.  
 Stocks: 1 (1) Flows: 2 (2) Converters: 0 (0)  
 Constants: 2 (2) Equations: 0 (0) Graphicals: 0 (0)}

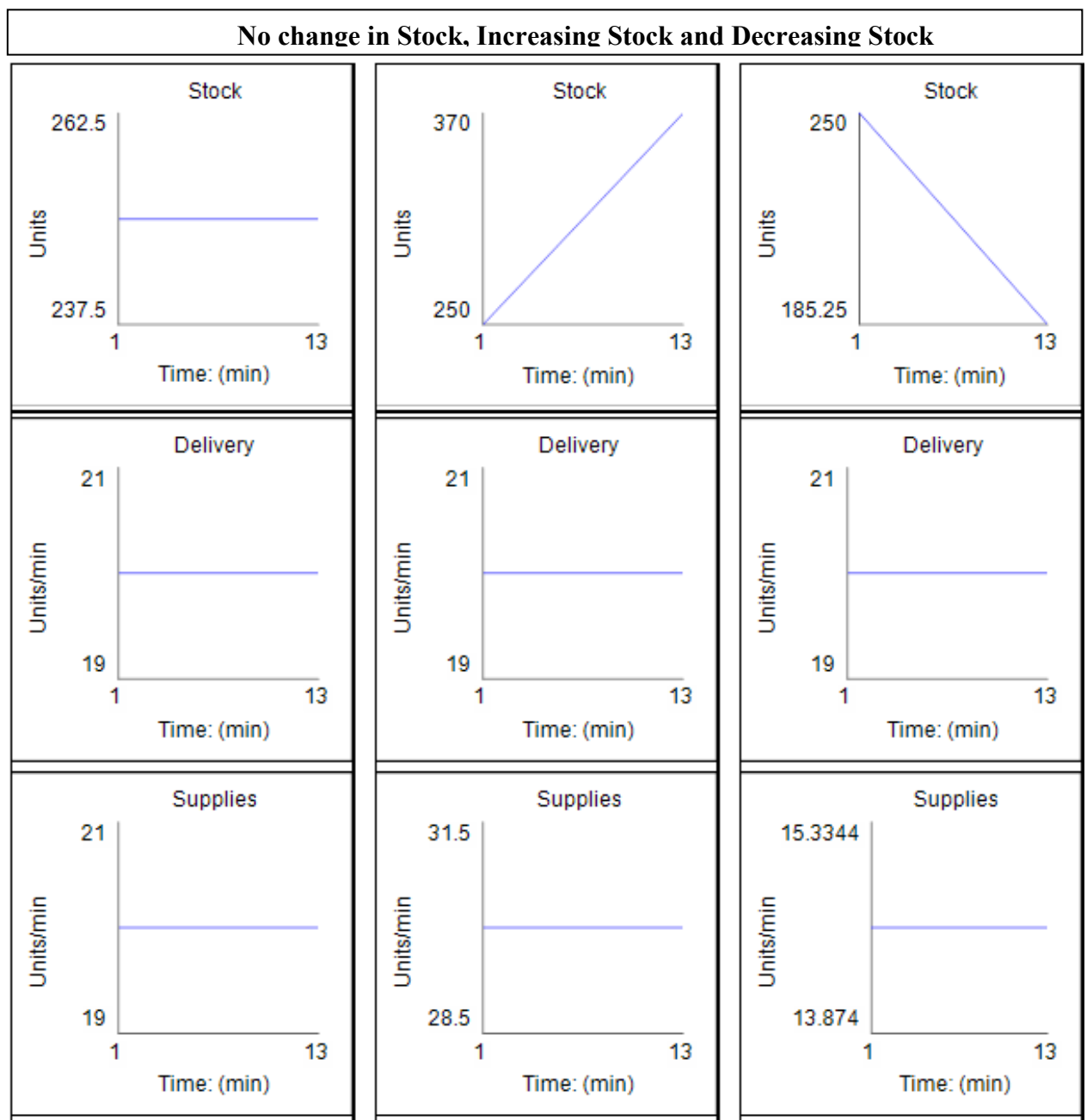


Figure 4 – Behavioural modes of Stock and Flow Model

$$\begin{aligned}
 \text{Loop Gain} &= d\text{flow}/d\text{stock} \\
 &= d(\text{producing})/d(\text{INV}) \\
 &= \text{producing} * d(1)/d(\text{INV}) \\
 &= \text{producing} * d(\text{INV}^0)/d(\text{INV}) \\
 &= \text{producing} * (0 * \text{INV}^{-1}) \\
 &= \text{producing} * 0 = 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Loop Gain} &= 0 \\
 \text{Eigen Value} &= 0
 \end{aligned}$$

**Labour based production Model: LED Bulb Manufacturing**

External resource production process depicts the higher level of the firm from trading to production. Now workforce is hired to produce the saleable units (LED Bulbs) and productivity of the workers is assumed that is fixed, product of workforce and labour

productivity appears in the form of production rate that fills the stock of sellable units (LED Bulbs), when the production rate and shipment rate both are same, inventory of sellable units' remains constant. If the productivity of the workers is enhanced using production incentive from 100 % to 130 % then the stock has gone up if it is declined then stock has gone down.

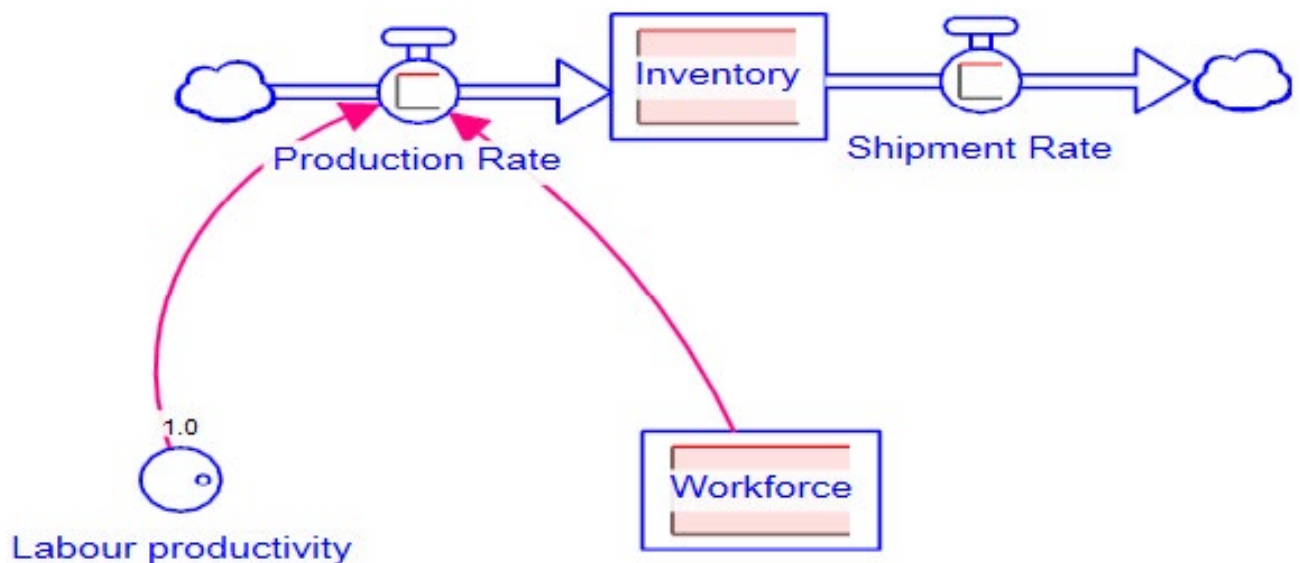


Figure 5 – External Resource Production Model

Top-Level Model:

$$\text{Inventory}(t) = \text{Inventory}(t - dt) + (\text{Production\_Rate} - \text{Shipment\_Rate}) * dt$$

$$\text{INIT Inventory} = 1000$$

INFLOWS:

$$\text{Production\_Rate} = \text{Labour\_productivity} * \text{Workforce}$$

OUTFLOWS:

$$\text{Shipment\_Rate} = 100$$

$$\text{Workforce}(t) = \text{Workforce}(t - dt) + * dt$$

$$\text{INIT Workforce} = 100$$

$$\text{Labour\_productivity} = 1$$

{ The model has 5 (5) variables (array expansion in parens).

In 1 Modules with 0 Sectors.

Stocks: 2 (2) Flows: 2 (2) Converters: 1 (1)  
 Constants: 2 (2) Equations: 1 (1) Graphicals: 0 (0) }

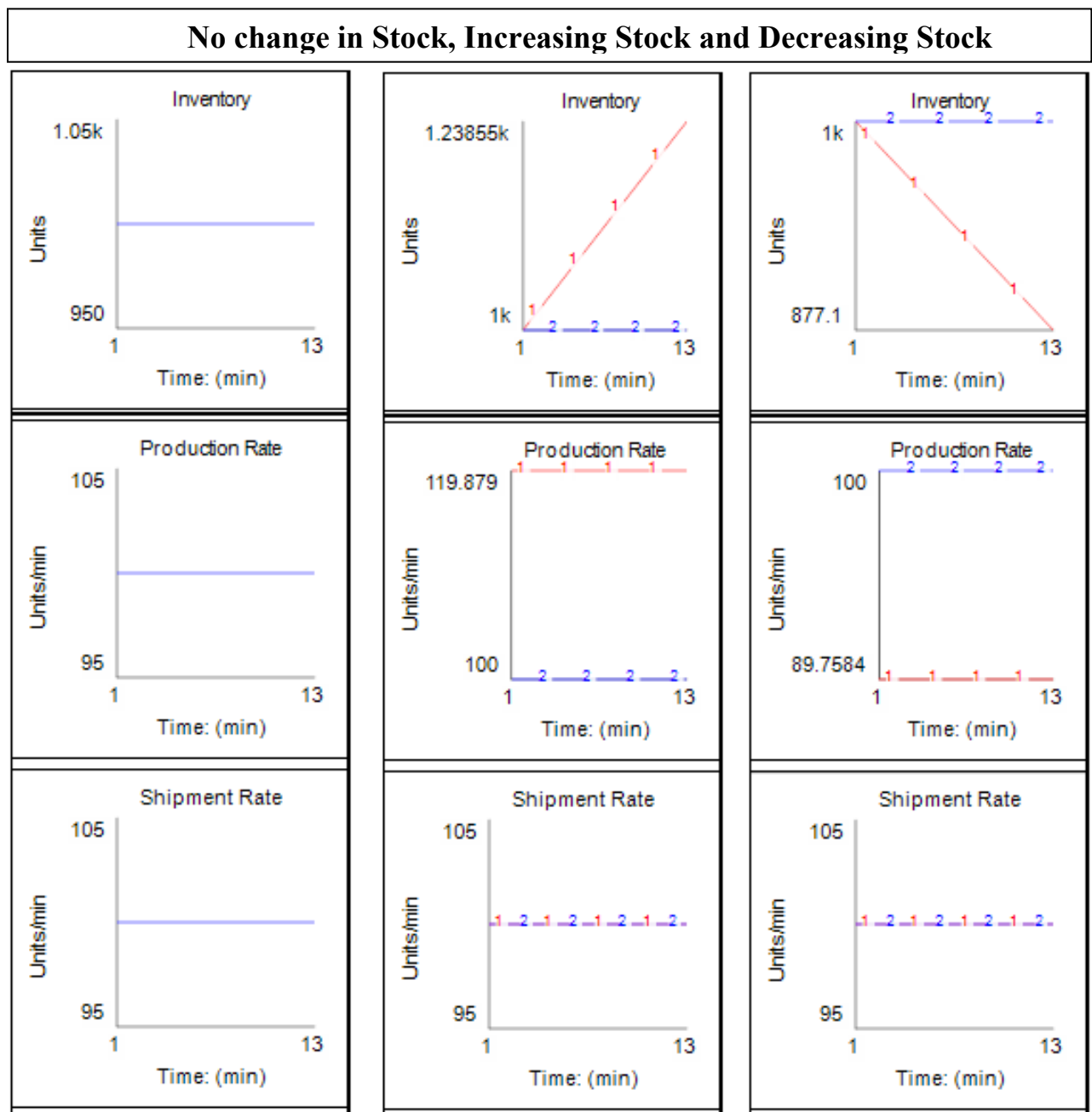


Figure 6 – Behavioural Modes of External Resource Production Model

$$\begin{aligned}
 \text{Loop Gain} &= d\text{flow}/d\text{stock} \\
 &= d(\text{production rate})/d(\text{INV}) \\
 &= d(\text{labour productivity} * \text{workforce})/d(\text{INV}) \\
 &= \text{labour productivity} * \text{workforce} (d 1)/d(\text{INV}) \\
 &= \text{labour productivity} * \text{workforce} * d(\text{INV}^0) / (0 * \text{INV}^{-1}) \\
 &= \text{labour productivity} * \text{workforce} * (0 * \text{INV}^{-1}) \\
 &= \text{labour productivity} * \text{workforce} * 0 = 0
 \end{aligned}$$

Loop Gain = 0  
 Eigen Value = 0

**Labour Intensive Firm (Labour Contractor for Packing candies) Model**

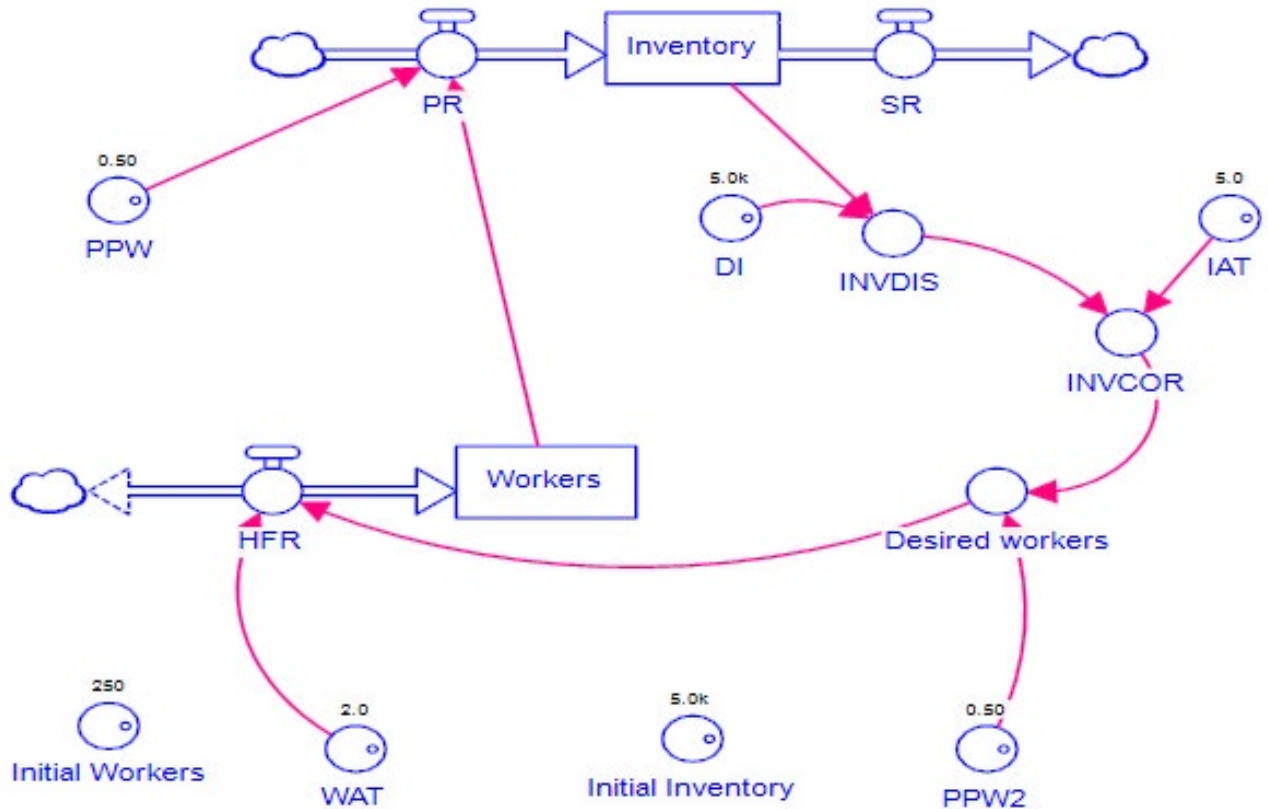


Figure 7 – Factory Dynamics of Labour based firm

Abbreviations	Descriptions	Unit of Measure
PR	Production Rate (Manual Packing the candies)	Items per day
SR	Shipment Rate (Dispatching the product to market)	Items per day
DI	Desired inventory	Number of Items
INVDIS	Inventory Discrepancy	Number of Items
INVCOR	Inventory Correction	Number of Items
IAT	Inventory Adjustment Time	Days
WAT	Workers Adjustment/Training Time	Days
HFR	Workers Hire and Fire Rate	Workers per day
EC	Equilibrium constant	Number of Items
PPW/PPW2	Labour Productivity	Items produced per worker per day

Top-Level Model:

$$\text{Inventory}(t) = \text{Inventory}(t - dt) + (\text{PR} - \text{SR}) * dt$$

$$\text{INIT Inventory} = \text{Initial\_Inventory}$$

INFLOWS:

$$\text{PR} = \text{Workers} * \text{PPW}$$

OUTFLOWS:

$$\text{SR} = 125 * (1 + \text{STEP}(0.1, 5))$$

Workers(t) = Workers(t - dt) + (HFR) \* dt  
 INIT Workers = Initial\_Workers  
 INFLOWS:  
 HFR = Desired\_workers/WAT  
 Desired\_workers = INVCOR/PPW2  
 DI = 5000  
 IAT = 5  
 Initial\_Inventory = 5000  
 Initial\_Workers = 250  
 INVCOR = INVDIS/IAT  
 INVDIS = DI-Inventory  
 PPW = 0.5  
 PPW2 = 0.5  
 WAT = 2  
 { The model has 15 (15) variables (array expansion in parens).  
 In 1 Modules with 0 Sectors.  
 Stocks: 2 (2) Flows: 3 (3) Converters: 10 (10)  
 Constants: 7 (7) Equations: 6 (6) Graphicals: 0 (0)}

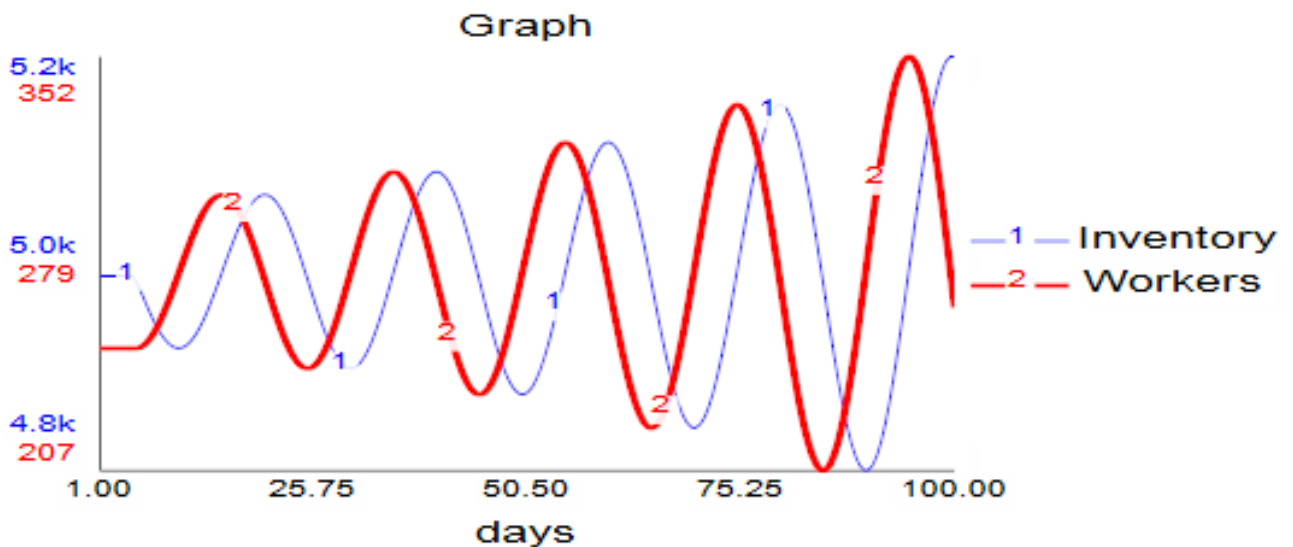


Figure 8 – Oscillatory waveform of workforce and units to be produced in a labour based firm

Loop Gain = dflow/dstock  
 = d (production rate)/d(INV)  
 =d(labour productivity \* workforce)/d(INV)  
 = labour productivity \* workforce (d 1)//d(INV)  
 =labour productivity \* workforce \* d (INV<sup>0</sup>)/ (0\*INV<sup>-1</sup>)  
 =labour productivity \* workforce \* (0\*INV<sup>-1</sup>)  
 =labour productivity \* workforce \* 0 = 0  
 Loop Gain = 0  
 Eigen Value =0

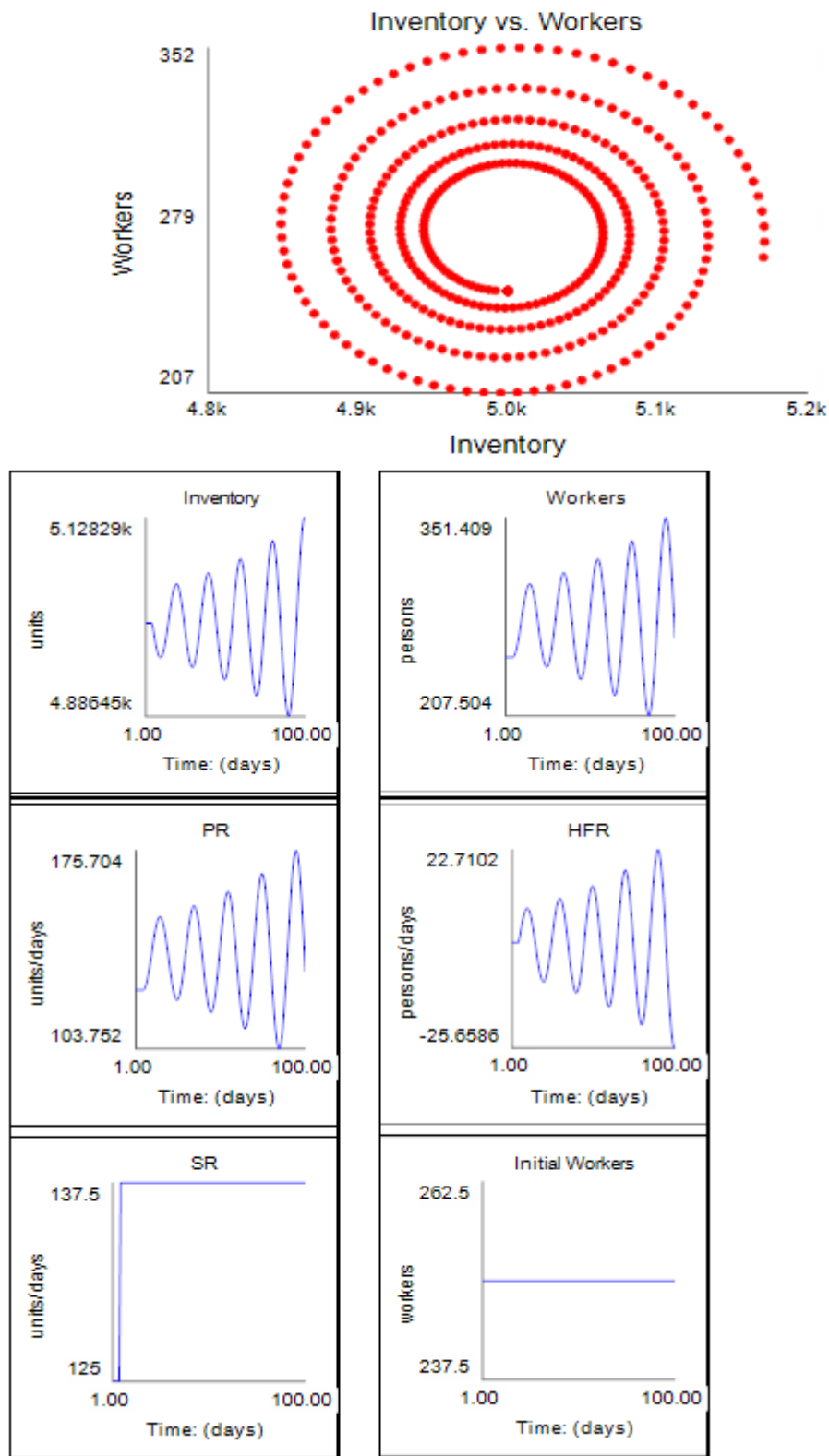
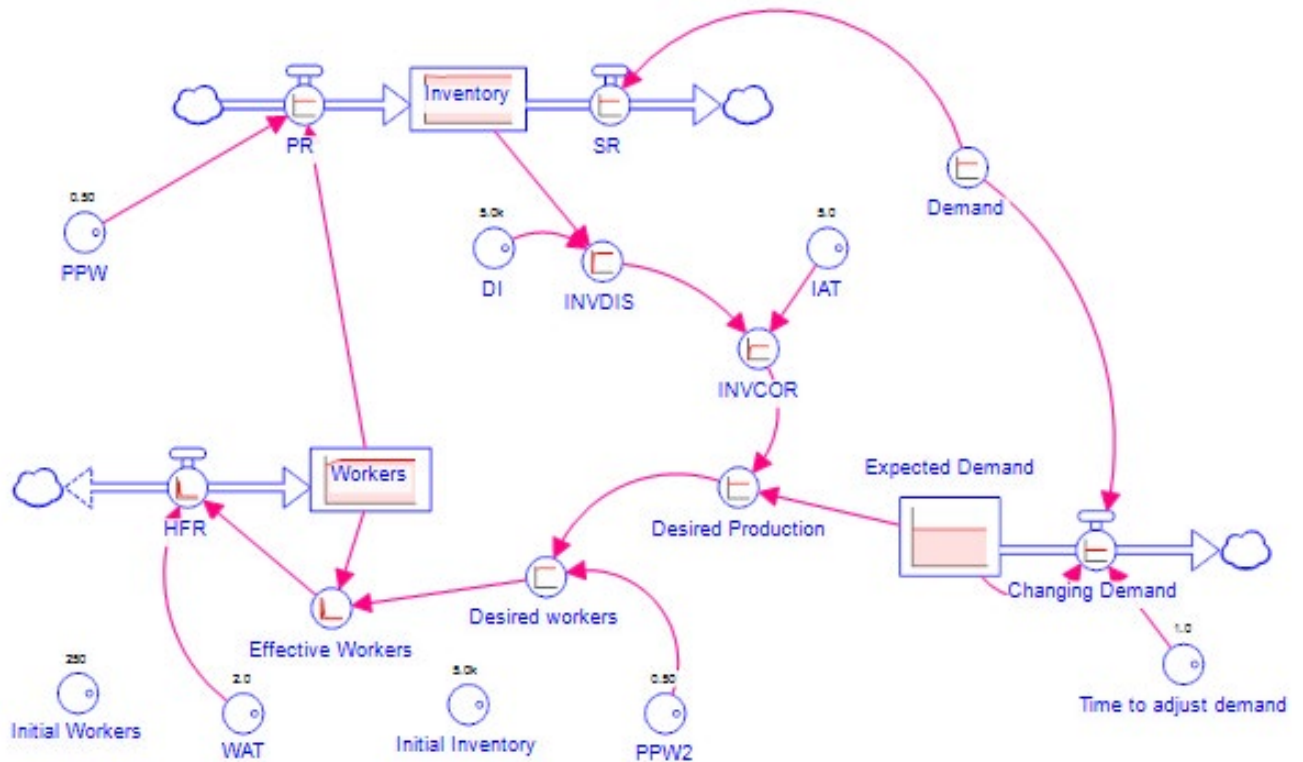


Figure 9 – Behavioural Waveform of Stock and Flow Diagram (Supplies greater than delivery)



**3PL Logistics Firm with Multiple Stocks:**  
**Factory Dynamics Model with Expected**  
**Demand**



Top-Level Model:

$$\text{Expected\_Demand}(t) = \text{Expected\_Demand}(t - dt) + (- \text{Changing\_Demand}) * dt$$

$$\text{INIT Expected\_Demand} = \text{Demand}$$

OUTFLOWS:

$$\text{Changing\_Demand} = (\text{Expected\_Demand} - \text{Demand}) / \text{Time\_to\_adjust\_demand}$$

$$\text{Inventory}(t) = \text{Inventory}(t - dt) + (\text{PR} - \text{SR}) * dt$$

$$\text{INIT Inventory} = \text{Initial\_Inventory}$$

INFLOWS:

$$\text{PR} = \text{Workers} * \text{PPW}$$

OUTFLOWS:

$$\text{SR} = \text{Demand}$$

$$\text{Workers}(t) = \text{Workers}(t - dt) + (\text{HFR}) * dt$$

$$\text{INIT Workers} = \text{Initial\_Workers}$$

INFLOWS:

$$\text{HFR} = \text{Effective\_Workers} / \text{WAT}$$

$$\text{Demand} = 125 * (1 + \text{STEP}(0.1, 5))$$

$$\text{Desired\_Production} = \text{INVCOR} + \text{Expected\_Demand}$$

$$\text{Desired\_workers} = \text{Desired\_Production} / \text{PPW2}$$

$$\text{DI} = 5000$$

$$\text{Effective\_Workers} = \text{Desired\_workers} - \text{Workers}$$

$$\text{IAT} = 5$$

$$\text{Initial\_Inventory} = 5000$$

$$\text{Initial\_Workers} = 250$$

$$\text{INVCOR} = \text{INVDIS} / \text{IAT}$$

INVDIS = DI-Inventory

PPW = 0.5

PPW2 = 0.5

Time\_to\_adjust\_demand = 1

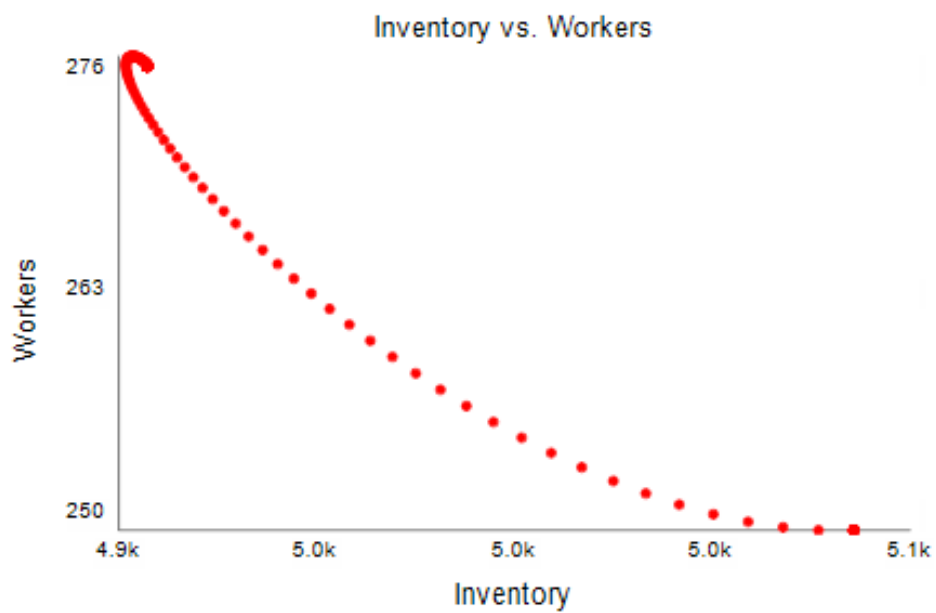
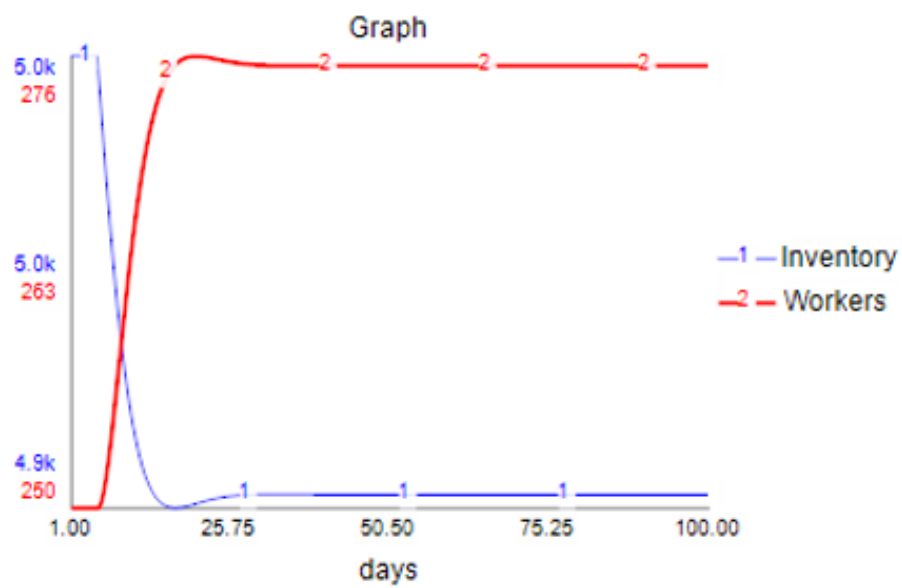
WAT = 2

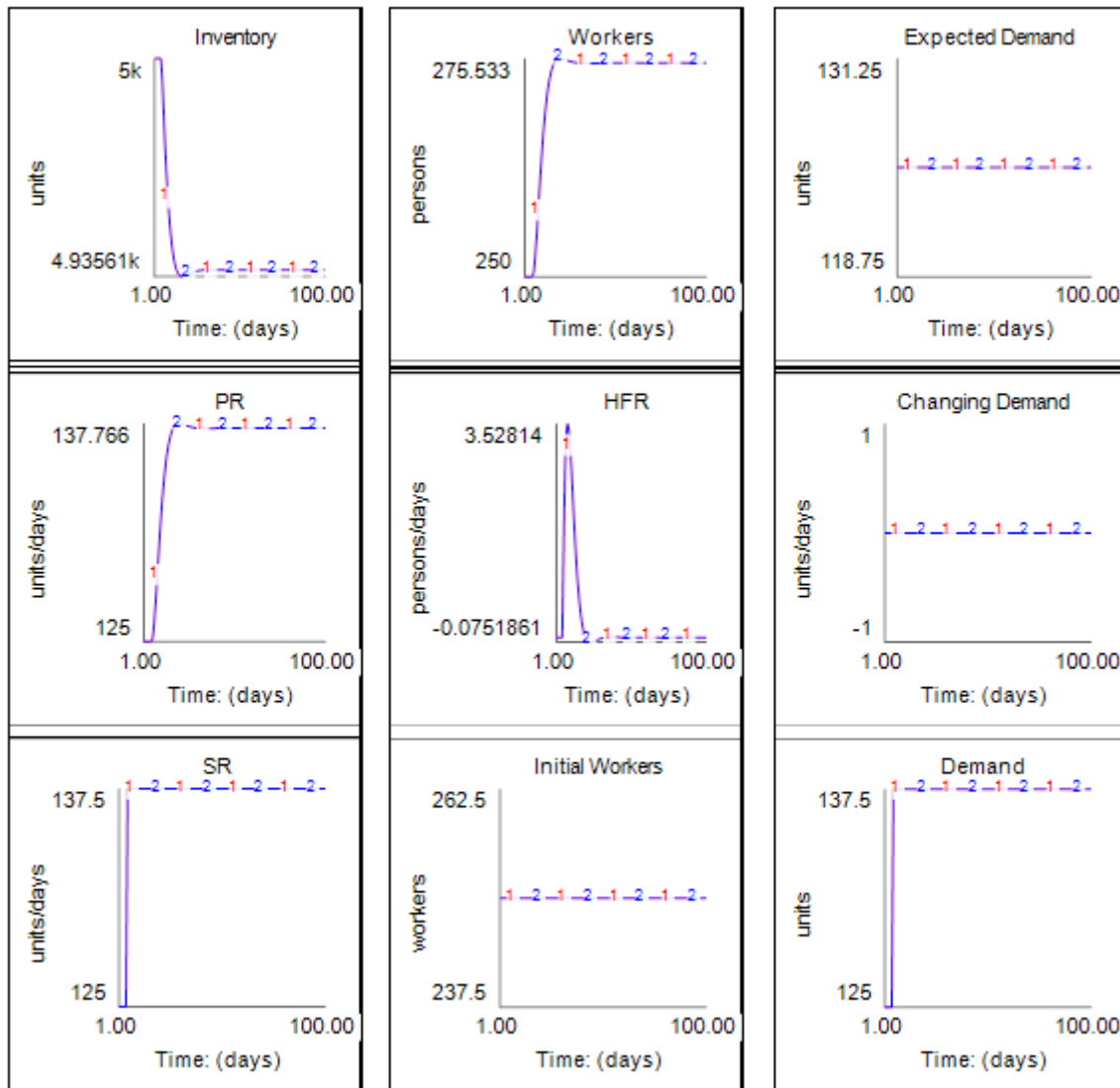
{ The model has 21 (21) variables (array expansion in parens).

In 1 Modules with 0 Sectors.

Stocks: 3 (3) Flows: 4 (4) Converters: 14 (14)

Constants: 8 (8) Equations: 10 (10) Graphicals: 0 (0)}





### **Model Validation and Testing**

Validation is the process of establishing confidence in the soundness and usefulness of a model. There is no single test which serves to validate a system dynamics model rather confidence on model accumulates gradually as the model passes more tests.

Model validation is important aspect in model building process. In system dynamics there are some tests which are associated with model structures, some tests are with model behaviour and some tests are associated with policy implications.

### **Dimensional Consistency Test**

Dimension consistency test deals with the structure of the model. The model

variables must have some unit of measure and both sides of the equations must be balanced dimensionally. For example the unit of measure of the production rate must be equal to unit of measure of shipment rate and so on so forth. This test also checks whether dimensions of variables in the model correspond to the unit in which they can meaningfully express the real variables which exist in the company. In Stella Software Version 1.1 it checks automatically and where there is discrepancy it highlights for correction.

### **Extreme Conditions Test**

Extreme condition tests also deals with the structure of the model. Whether the structure of the model is so robust or not how

the model behaves under extreme condition. For example there is a labour strike and no production as a result there is no increase in the inventory. If the model behaviour depicts the real world behaviour in the same situation as model did in extreme conditions it means model satisfies the test.

### **Structure Verification Test**

This test as well checks the structure of the model. The variables and the way the equations using variables in the model are formulated have a logical rational behind and represent the real system structure. That further enhances the confidence of the model that model is a valid model.

### **Behavior sensibility test**

This test is focused on detecting the parameters whose small changes cause significant change in the model behavior. The fewer such parameters, the higher the credibility of the model is. However, the model behavior sensibility is acceptable if in the real system small change of the parameter values also causes significant change of the system behavior. The objective of the systems dynamics is to find the system structures that have most effect on the model behaviour. So policies can be designed either on the basis of the parametric sensitivity or on the basis of systems structures.

### **Policy Experiments**

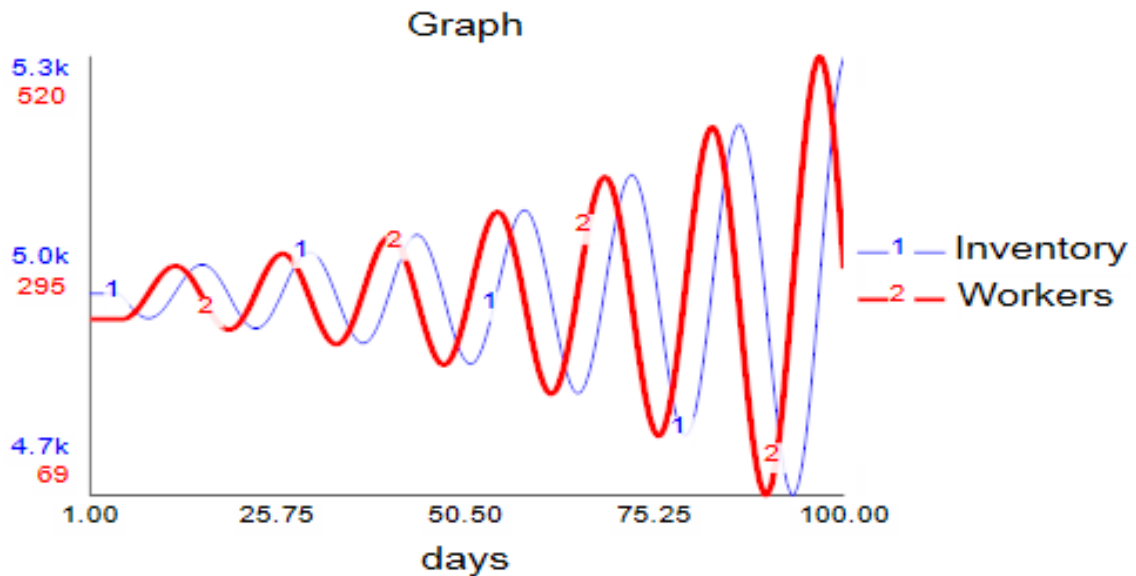
Playing with the model always helps to gain the insight about the model. Stock and flow structures are governed by the decision rules that reflect the various modes of behaviors of the model. Decision rules control the behavioural pattern and provide a baseline how policies can be proposed to

make the system better behaved. Computer simulations depict the fate of the problem under study. Practitioners and experts can choose the policies that design the future of organization as per their expectations

### **Model Response to Policies Parametric Base**

#### Policy Run 1 VALUING EMPLOYEES AS AN ASSET

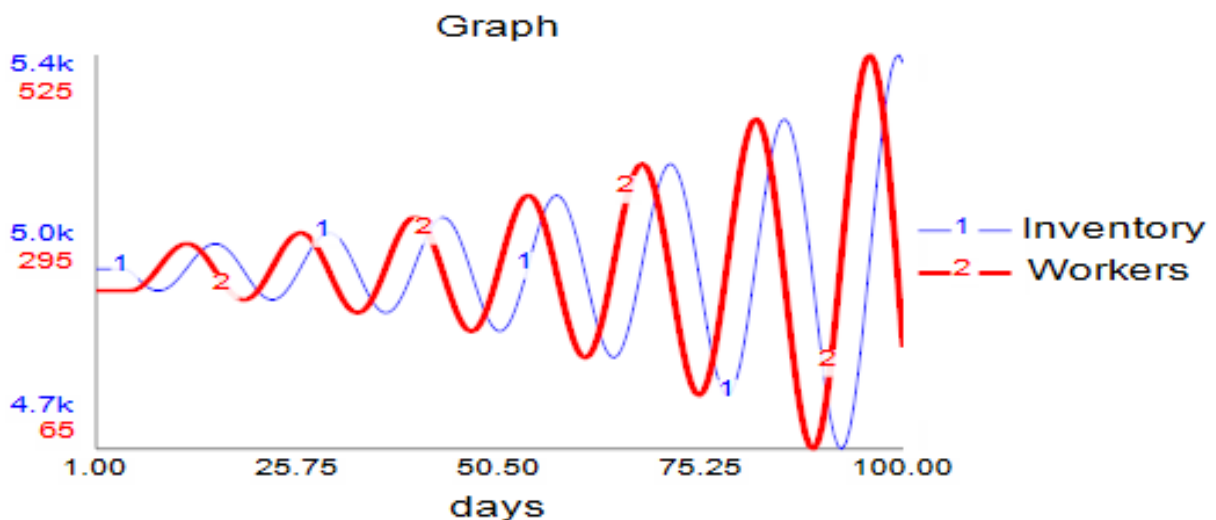
In a labour-intensive firm, employees are the important dimension, many human based practices can be in placed to enhance the labour productivity and to improve the skill set of workers so that they become effective workers in a shortest possible time to make the products which are saleable in nature. Training whether it is soft skills or hard skills can be provided to workers that appear in the form of worker adjustment time or worker training time. The less time means workers are not properly trained and due to lacking skills can not produce more units. The impact of Worker Training Time (WAT) is a measure sensitive parameter. Our pre-simulation prediction was that if we reduce the worker training time using Worker training programme. The workers will be in position to contribute more raising the production level; consequently inventory discrepancy decrease and stock of inventory will build up. But the results are contrary to the pre-simulation prediction. Stock still has declining trend. No doubt, value of WAT = 1 days as compared to WAT = 2 days eliminates the information delay and brings the stability in system earlier. This policy is based on parametric change.



Policy Run 2 TECHNOLOGY DEPLOYMENT

It was another suggestion that we should introduce Information Technology (IT) based practices a either the management information system (MIS) or the enterprise resource planning (ERP) or technology deployment initiative in order to reduce inventory adjustment time (IAT). As soon as the discrepancy in inventory is observed, with

the fastest means of communication real time information is immediately sent to administration team to hire the workers. The objective is to adjust the inventory discrepancy in the least time frame through faster information flow system. But simulation results tell the different story; value of IAT = 1 days as compared to 5 days increases oscillations and vanishes system's stability. This policy is based on parametric change.



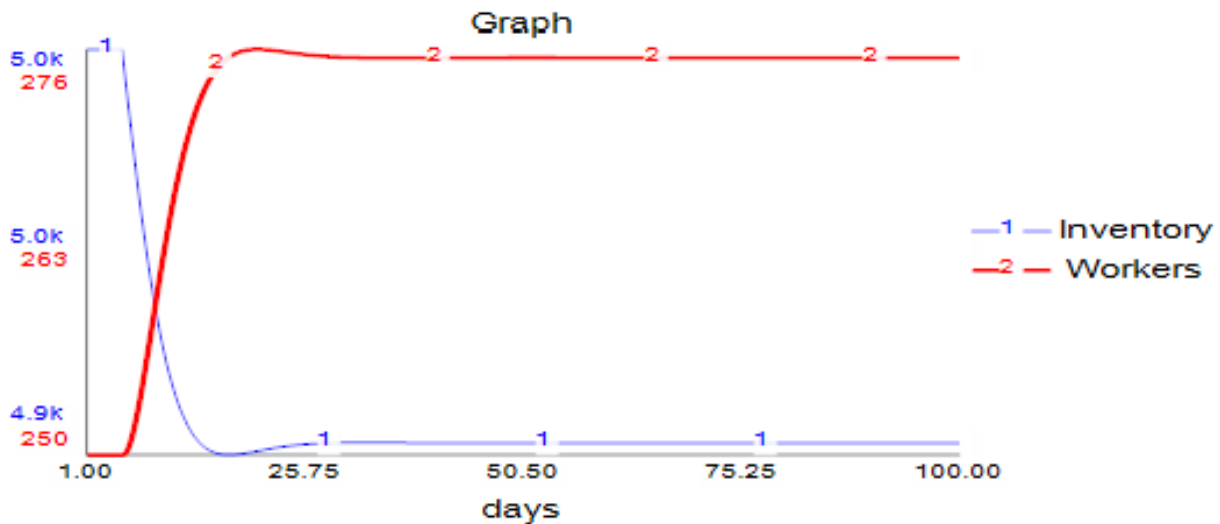
Policy Run 3 CHANGING IN HIRING PROCESS

There is a need to change the hiring process of the workers. Desired workers were initially calculated on the basis of the

inventory discrepancy but the true requirement of labour force must be calculated while comparing the new labour requirement with existing stock of workers. The net workers are the true workers who can

enhance the marginal production increase which has a match with inventory

discrepancy. This policy is based on structural change.



**Conclusions.** Policy experiments indicate that interactions among expected demand, workers and inventory are complex and dynamic in nature. It is hard to understand the factory dynamics intuitively. Here few assumptions like there is no shortage of raw material, expected demand is stepped up to disturb the steady state simplified the model. Even then pre-simulation expectations in parametric based

policies are not generating the behaviour of the model that brings stability in workforce level and inventory. Structural based policy helps to achieve the desired results. This paper encourages top-line managers to implement system dynamics approach in decision-making process and design plausible policies to make the system better behaved, mere judgment and intuition may mislead the top line executives..

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## INCREASING THE LEVEL OF ENVIRONMENTAL FRIENDLINESS OF COMPANIES THROUGH DECARBONISATION

**Vladyslav Marchenko, Dmytro Bugayko.** *«Increasing the level of environmental friendliness of companies through decarbonisation».* In our time, the question of environmental friendliness of companies is regularly on the agenda of the world community. Today, it is highly relevant and concerns both ordinary citizens and all possible business representatives. With each new year, more and more people are beginning to pay attention to the problems related to environmental pollution and climate change. They are global, existential challenges for humanity, and therefore require high-quality ideas, fast, effective and truly complex counteractions that can improve the current state of affairs. The gradual deterioration of the ecological situation in the world is leading to a rise in interest to these problems and the search of possible variants that can minimise the negative anthropogenic impact on the environment. One of the most effective solutions today is the decarbonisation of companies' activity, and therefore, scientists and researchers need to continue to study and analyse this complex question, to look for possible prospects for their development in the direction of «green» initiatives.

**Keywords:** ecology, decarbonisation, optimisation, development, efficiency, prospects, logistics, business, technologies, companies

**Владислав Марченко, Дмитро Бугайко.** *«Підвищення рівня екологічності компаній за рахунок проведення декарбонізації».* В наш час, питання екологічності компаній регулярно стоїть на порядку денному світової спільноти. Сьогодні, воно є високоактуальним і турбує, як звичайних громадян, так і всеможливих представників бізнесу. З кожним новим роком, все більше і більше людей починають звертати увагу на проблеми, що пов'язані з забрудненням навколишнього середовища та зміною клімату. Вони є глобальними, екзистенційними викликами для людства, а тому потребують високоякісних ідей, швидких, ефективних та по-справжньому комплексних контрдій, що здатні покращити поточний стан справ. Поступове загострення екологічної ситуації в світі



*призводить до зростання інтересу до даних проблем та пошуку можливих варіантів, що здатні мінімізувати негативний антропогенний вплив на навколишнє середовище. Одним з таких найбільш ефективних рішень сьогодні є декарбонізація діяльності компаній, а тому, науковцям та дослідникам необхідно продовжувати вивчати та аналізувати це комплексне питання, шукати можливі перспективи для їх розвитку в напрямку «зелених» ініціатив.*

**Ключові слова:** екологія, декарбонізація, оптимізація, розвиток, ефективність, перспективи, логістика, бізнес, технології, компанії.

**Introduction.** In our time, the idea of environmental protection is more relevant than ever before, both among ordinary people and business. The situation has become so serious that in the nearest future, ignoring the problems connected with environmental pollution and climate change may become not just difficult, but even shameful. Today, they are real challenges for humanity, the negative consequences of which can already be clearly seen in many countries around the world. Realising the global nature of this problem has led to the search for solutions that can correct the situation. One of such variants was the decarbonisation of companies' activity. Nowadays, this idea has gained a great popularity. It represents a modern, prospective measure aimed at effective counteraction to the above-mentioned processes. Its high-quality realisation today is closely linked to the spheres of logistics and management, and the level of success of its completion depends on many factors: used innovations, scientific achievements, implemented «green» technologies, comprehensive reforms, the level of environmental awareness of citizens, etc. The issue of decarbonisation of companies' activity has gained a critical value and that is why it is so important to continue to research, study and analyse it.

**The purpose of the article** is to explain the idea of decarbonisation, provide a definition of this term, and reveal its global significance. This article will explain not only why it is so important to develop a decarbonisation plan and monitor the progress of its implementation, but also outline the key variants that can be used to achieve this successful decarbonisation.

Based on the results of the conducted research, a conclusion will be formulated.

**Presentation of the main results.** Nowadays, decarbonisation is truly important. Rapid and focused decarbonization is essential to the future of our planet [1]. It should be emphasised that this term has different definitions. Its interpretation usually depends on the scientific approach and research direction. Some scientists concentrate attention when describing decarbonisation on the process of reducing greenhouse gas emissions into the atmosphere, while others trying to focus on a set of various measures aimed at reducing anthropogenic greenhouse gas emissions into the atmosphere. Greenhouse gases in our atmosphere act like the glass in a greenhouse, letting light through but stopping heat from escaping [2].

It is necessary to consider this question with all possible seriousness and responsibility. Closing eyes and sometimes even banal indifference to it in the past has led to a dramatic worsening of this issue. Now the resolution of this situation depends on us, and we cannot postpone it any longer. Greenhouse gases from human activities are the most significant driver of observed climate change since the mid-20th century [3].

The long-term policy of ignoring this moment was a huge mistake. Therefore, it is not surprising that so much attention today is paid to the role of business in these processes. Businesses are major contributors to global emissions and play a crucial role in decarbonizing the economy [4].

For this reason, in this context, the key goal facing humanity is to reduce greenhouse gas emissions into the atmosphere that arise

from the operational activity of modern companies. An example of greenhouse gases

that occur during the company's operational activity can be clearly seen in Fig. 1.



Figure 1 – Greenhouse gases that occur during the company's operational activity  
Source: <https://www.power-technology.com/news/us-greenhouse-gas-emissions-rose-by-1-3-in-2022-report/>

At present, among the possible variants of improving companies' environmental friendliness, the idea of decarbonisation is very popular and remains a top priority. Of course, this task is undoubtedly not easy and actually requires significant efforts from these companies, but at the same time, it opens up an extremely wide range of opportunities for efficient development, increase of competitiveness and further growth.

Decarbonisation requires a thoughtful approach to all aspects of companies' activities, their key processes, and especially their logistics. By improving the logistics aspect, companies are able to achieve significant positive results in this regard.

Everything starts with a very detailed analysis of all the company's operations, which is primarily aimed at identifying the

main sources of greenhouse gas emissions and finding potential solutions that can minimise them. Afterwards, taking into account the company's available resources and capabilities, the results of the analysis are used to formulate a clear action plan in the time perspective, which will take into account future adjustments in its activities, step-by-step implementation of various ecological projects, introduction of innovative ideas, and changes in relevant norms and standards.

Besides, it is important not only to set the desired objectives, but also to create a full-fledged control system that will monitor the company's progress in achieving them. Fortunately, nowadays, the use of various digital technologies can not only significantly simplify this process, but also provide an accurate and detailed check of the execution

of the scheduled stages. There is no doubt that the rapid development of artificial intelligence will allow to automate this system and maximise its efficiency. Knowing what to expect helps us adapt and prepare for a more resilient future [5].

There are many solutions that can ensure progress in terms of decarbonisation. Today, a particularly popular option for companies is to switch to renewable energy sources. Solar, wind and hydropower have very serious prospects for development and are already allowing companies to significantly reduce greenhouse gas emissions.

An additional advantage is that businesses now have a choice of investing in

their own equipment and renewable energy plants or purchasing already generated green energy from specialised companies.

The successful experience of such a policy can be seen in a huge number of countries around the world, both among small business players and global market leaders. Apple, Google, Microsoft, Amazon, Samsung, Tesla are just the beginning of the list of all those companies that already have successful experience in using them in their activities. A modern example of the use of solar panels is excellently demonstrated in Fig. 2.



Figure 2 – The use of solar panels

Source: <https://abcnews.go.com/Technology/apples-headquarters-facilities-now-powered-100-percent-renewable/story?id=54362901>

No less important solution today can be the development of companies' infrastructure and the improvement of the energy efficiency of their operational processes. This includes not only the general use of energy-saving technologies or the modernization of

outdated equipment, but also the qualitative optimisation of logistics. A change in the approach to transportation and resource distribution, alteration of delivery routes and minimization of downtimes can significantly improve the current situation.

It is impossible not to mention the use of electric vehicles, which are becoming increasingly widespread in business. Today, this solution is able to provide a long list of

significant advantages compared to vehicles with a regular internal combustion engine. A modern example of the use of electric transport can be seen in Fig. 3.



Figure 3 – The use of electric transport by FedEx company

Source: <https://newsroom.fedex.com/newsroom/global/fedex-continues-advancing-fleet-electrification-goals-with-latest-150-electric-vehicle-delivery-from-brightdrop>

One of the most modern options currently being considered by business companies is the implementation of a wide range of reverse logistics practices and the development of a circular economy. This model can create a closed production cycle and increase the efficiency of business

processes, when waste from one operation can not only become a resource for others, but also be reused or safely utilised. In this context, a good example would be «Dell Reconnect». This is a modern residential computer recycling program. A scheme of its functioning can be seen in Fig. 4.



Figure 4 – Scheme of the «Dell Reconnect» program functioning

Source: <https://www.goodwillsouthernaz.org/recycle/recycling-computers-with-dell-reconnect/>

Despite the fact that it is not easy to implement such a system, it can greatly improve resource efficiency, reduce greenhouse gas emissions and improve the overall environmental friendliness of the particular business.

When a company organises a plan for successful decarbonisation, it is crucial to not neglect the importance of involving the working staff, its own suppliers, business partners and other institutions in these processes, as they play a key role in them. Decarbonisation has become a global imperative and a priority for governments,

companies and society at large, because it plays a very important role in limiting global warming [6].

It is necessary to form and support a new, unified corporate culture that gives a clear understanding of why it is essential to move in the direction of environmental initiatives. This can be achieved through informational and educational activities, various courses, environmental events, conferences, trainings, audits, forums, etc. A very good modern example can be ADIPEC 2023, which is shown in Figure 5.



Figure 5 – ADIPEC 2023

Source: <https://www.khaleejtimes.com/business/adipec-2023-a-success-showing-global-energy-industrys-commitment-to-decarbonization>

It was another suggestion that we should introduce Information Technology (IT) based practices a either the management information system (MIS) or the enterprise resource planning (ERP) or technology deployment initiative in order to reduce inventory adjustment time (IAT). As soon as the discrepancy in inventory is observed, with the fastest means of communication real time information is immediately sent to administration team to hire the workers. The objective is to adjust the inventory discrepancy in the least time frame through faster information flow system. But simulation results tell the different story; value of IAT = 1 days as compared to 5 days increases oscillations and vanishes system's stability. This policy is based on parametric change.

It is also worth mentioning the current significance of participation in various partnerships and international initiatives. Collaborative projects with other market players and organisations provide companies with the opportunity to exchange precious

experience, statistics, information and knowledge, share impressions of new technologies, adjust ideas, create global plans, develop new approaches, standards and practices. The importance of climate change, which is largely due to rising CO2 emissions, has been recognized not only internationally but globally, by all countries committing themselves to sustainable development [7].

Everyone is now well aware of the benefits of such co-operations, especially financial ones. The possibility of gaining significant funds to finance various environmental initiatives motivates more and more people every year. That is why decarbonisation is so important in our time. The article is a logical continuation of a number of publications by the authors devoted to the greening of logistics activities [7-11].

**Conclusions.** The result of this article was the achievement of all the previously set goals. In this work, we have clearly indicated

that today such problems as environmental pollution and climate change are global in scale. We have not only focused attention on their seriousness, but also pointed out that in order to overcome these problems, or at least slow down their pace, humanity needs to make a truly comprehensive effort. We not only explained that in our time, the issue of ecological preservation is extremely relevant, but also emphasised that the problems connected with environmental pollution and climate change are long-term challenges for humanity. Their gradual worsening has led to the search for new ideas and decisions that can correct the situation, one of which was the decarbonisation of companies' activities. We explained the idea of decarbonisation, revealed possible definitions of this term and highlighted its modern importance. Attention was paid to the necessity of creating a decarbonisation plan and monitoring its execution. We pointed out that the implementation of this idea is realistic but very complex. This paper qualitatively outlined the key ways that can be used to achieve success in decarbonisation and

indicated the key advantages that can be gained from it. Summing up all the information above, the conclusion becomes quite obvious. Today, decarbonisation has an enormous importance for modern companies. It demands comprehensive and well thought out actions from them. Of course, such measures are not easy, but they are undoubtedly necessary to improve the environmental friendliness of the business segment. Decarbonisation needs a comprehensive approach, as it can be effectively achieved in many ways. All solutions presented in this paper are only a small part of the huge list of possible options for achieving decarbonisation.

Proper implementation of these ideas will not only help companies reduce their greenhouse gas emissions, but will also open up new opportunities for them, improve their image and market competitiveness. The issue of decarbonisation of companies' activities is crucial, and that is why it is so important to continue to research, study and analyse it in a high-quality manner.

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## **MECHANIZM OF ORGANIZATION OF LOGISTICS ENTERPRISES ACTIVITY**

**Dmytro Bugayko, Volodymyr Reznik, Svitlana Smerichevska.** «*Mechanizm of organization of logistics enterprises activity*». Globalization of the market and conditions for the development of information technologies create a promising situation. Opportunities for the development of logistics in the business sector. It is important to support logistics companies. The general well-being and stability of the economy for various reasons. First, a logistics company. Ensuring efficient transportation and distribution of goods important for the functioning of the industry in various branches of industry. Second, logistics companies create jobs and contribute. Economic growth due to product distribution, inventory management, warehouse management, operation and other logistics services. In addition, efficient operation of logistics. Companies contribute to foreign economic relations in the context of international services and globalization. There is support for trade and export, cross-border cooperation and expansion of the activities of Ukrainian companies.

**Keywords:** logistics, transportation, multimodal transportation, supply chain, WMS, freight-forwarding, means of transport

**Дмитро Бугайко, Володимир Резнік, Світлана Смерічевська «Механізм організації діяльності логістичних підприємств».** Глобалізація ринку та умови для розвитку інформаційних технологій створюють перспективну ситуацію. Можливості розвитку логістики в бізнес-секторі. Важливо підтримувати логістичні компанії. Загальне благополуччя і стабільність економіки з різних причин. По-перше, логістична компанія. Забезпечення ефективного транспортування та розподілу важливих для функціонування промисловості вантажів у різних галузях промисловості. По-друге, логістичні компанії створюють робочі місця та роблять внесок. Економічне зростання завдяки розподілу продукції, управлінню запасами, управлінню складом, експлуатації та іншим логістичним послугам. Крім того, ефективна робота логістики. Компанії сприяють зовнішньоекономічним відносинам у контексті міжнародних послуг та глобалізації. Існує підтримка торгівлі та експорту, транскордонного співробітництва та розширення діяльності українських компаній

**Ключові слова:** логістика, транспортування, мультимодальні перевезення, ланцюг поставок, WMS, експедирування, транспортні засоби.

**Introduction.** The modern globalized economy requires new conditions for the adaptation of intermodal transport. The role of intermodal transportation is becoming increasingly important. This is because this type of transportation allows production processes in different geographical locations to continue without interruption. When considering intermodal transportation, it is first necessary to consider the nature of this concept. Intermodal transport is the transportation of goods by two or more means of transport organized by a single logistics company. Moreover, the main transport company has the possibility to contract with subcontractors who provide other means of transport, but the main transport company is responsible for delivery. The different types of transport include rail, sea, car and air.

**The purpose of the article.** The main aim of the article is to provide the research of the main challenges and problems of activity of Logistics enterprise (in our case freight forwarding in case of "Freight Transport Partner Company". This article will explain not only why it is so important to pay attention on risks and challenges develop and to develop the plan how to avoid them or to reduce up to the minimum values the conducted research, a conclusion will be formulated.

**Presentation of the main results.** Logistics companies are responsible for the

delivery of goods from point A to point B within a given time frame. They manage all processes related to the movement, storage and transportation of goods, ensuring reliable delivery and reducing the risk of loss or damage to goods. [1].

A number of Ukrainian researchers such as Kharazishvili Y. [2, 4], Bugayko D. [2 - 10], Savchenko L., Smerichevska S. [9], Hryhorak., Ovdienko O., Marchuk V. [3] are devoted to the study of the problems of further development of logistics and multimodal transportation. The company's goal is to optimize the schedule of product delivery to this sector. During the work, work tasks are divided into individual problems that are systematically solved. For Ukraine, this problem is extraordinary relevant questions related to the study of strategies for the development of transport enterprises engaged in Ivashkevich V.S., Evdokimov A.V., Ustenko M.O., Konishcheva N.Y., Trushkina N.V. [11], Oklander M. A [12]., Reznik N., Rudenko S., Pylypchuk K. [13], Skrynkovskyy R.M. [14], Khvyshchun N.V. [15] and others.

Among foreign scientists, it is appropriate to single out Ya. Witkovsky, J. Koil, H.K. Paul, J. Waters, M. Cheshelski, and others.

During transportation, logistician calculations are taken into account, ensuring economic expediency and profitability. The main principles are to fully meet deadlines and avoid delays and haste. The methods

used ensure orderly and uninterrupted execution of the work. Otherwise delays and warehouse overflows may occur. The following principles ensure efficient use of resources and vehicles: minimizing downtime and loading/unloading times. Traffic flow must be continuous and movement with empty bodies or idling must be avoided. This principle is applied through the delivery of raw materials to the plant and the removal of finished products in the opposite direction. Supporting circularity ensures continuity in the execution of the business plan. Traffic is profit. Mechanization is a group of elements that is a win-win for all sides. If returns are made on empty vehicle bodies, this can lead to increased delivery costs [6].

Traffic conflicts and optimal route strategy selection.

All important factors are considered before a scheduled flight. The main concerns are given to the main tasks and features. The basis is the minimization of the following factors:

- Distance travelled;
- Time required;
- Consumption of resources;
- Risks.

Routes are planned taking these factors into account. However, real conditions often do not allow all points to be taken into account and fully implemented. Therefore, the main focus is on the main tasks.

Partial fulfilment of these can also be useful. Final decisions are made wherever possible. The aim of logistics is to unify delivery phases into a single payment mechanism, reduce costs and ensure domestic delivery. By managing the flow of goods, transportation can be optimized and efficiency increased. As each flight is unique and has its own characteristics, it can be tracked individually, resulting in further security improvements and cargo savings.

There are many logistics strategies in business but only some of them are basic. It is mostly used to create logistics system. For business D. Waters gives the following interpretation of his logistics strategy,

including the entire long-term one. Decisions in conjunction with logistics activities make all strategic decisions and the Chain Management Plan " creates a link between strategies and is more abstract. High-level strategies and detailed problem-solving operations in the supply chain

*Successful logistics missions* require the assessment of cargo characteristics such as dimensions, value, composition, consistency and weight. The distance and availability of connected delivery routes are also taken into account. It is necessary to note the importance of a systematic approach to the development of logistics strategies, which must be connected with other strategies, and cover all areas of the company's activity to optimally implement a competitive strategy. For the successful implementation of logistics strategies the following conditions must be observed: have a corporate strategy and a support strategy; the possibility of designing the dimensions and structure of production in accordance with the requirements of logistics; the presence of vertical integration of the logistics areas of the company; resource-oriented supply, production and sales structure; compliance of management and information systems; take appropriate measures to improve efficiency; comply with the degree of automation of the movement of goods and information. The main goal of the logistics strategy is to build an organization that can work successfully, cope with unforeseen circumstances, competition and internal problems, and to win new positions in the market. The logistics strategy of the company consists of the following stages: analysis of logistics systems of the enterprise; development of a logistics strategy model's acceptable for the company; strategy implementation control.

*When planning logistics strategies*, the following factors must be taken into account external and internal:

- Existence of a competitive environment;
- Development of international cooperation;

- Development of modern information technologies;
- Development of transport and warehouse infrastructure;
- Environmental standards;
- Close cooperation with partners;
- Use of modern information technologies;
- Delivery of own transport and warehouse infrastructure;
- Effective inventory management;
- Expansion of the logistics network;
- Improving the quality of logistics services;
- Application of modern management concepts;
- Focus on achieving the company's strategic goals;
- Participation of management in the modelling of logistics strategies;
- Assessment of development opportunities.

*Improved simulation model of the typical function Transport company "FTP", which offers a wide range of products, transport and logistics services, i.e.:*

- Organization of cargo transportation;
- Freight transportation; -
- The work of a shipping agent;
- -process of bulk at the warehouses and sea harbors
- Sea container transportation;
- Delivery and customs clearance of cargo (including vehicles);
- Cargo insurance (with the assistance of partnership insurance company "Ingo" LLC..

Before March 2022 such partnership sea ports were engaged in maritime company's operations. Each group has an integrated supply chain. Acceptance of orders, reception of goods, delivery on the territory of Ukraine

(depending on the selected mode of transport) to the harbor warehouse and sea transportation to the destination point. The company's jurisdiction ceases from the moment of delivery of the cargo. Goal. The shipping company is hired by the company. After the completion of the sea transportation, it will issue an invoice for the payment of the service. In turn, the Transport Company will pay for the road or rail service. The final indicators will be created: Number of completed orders, revenue and profit. In addition to the real number of the formation of the main financial indicators the number of completed orders and the saved cost of order fulfilment, for some lawsuits that were affected by the possibility of imposing a fine on the company. More likely types of fines are severe punishment and arrest. In general, with a fine's on exceeds the penalty for using container equipment. The terms agreed in advance with the Maritime Carrier. Demolishing additional fees for exceeding the free time spent by the container in the port of unloading. Fee for storing the container outside the terminal for longer than the set time for returning the container to the line. The difference between calculations and reimbursement is only in the amount and the amount of fees from the free period. Each marine line has its own size and amount of bet. The fine is reproduced in the model as an effect random variables according to the law of probability distribution are determined based on the available statistical observations of the function of real system.

The most-common used ferries of the transport company (Example of Freight Transport Partner LLC).

The table formulated by the author is represented bellow.

Table 1.1. The main ports used by logistic company's and their characteristics

No	Port name	Port location
1	2	3
1	Belgorod - Dniester seaport	The port is located on the shores of the Dniester estuary northwest of the Dniester-Constantinople estuary (southern bucket of the Dniester estuary)

End of table 1.1

1	2	3
2	Berdyansk seaport*	Sea of Azov, Berdyansk Bay, Tonka Strait
3	Izmail seaport	Port in the Odessa region, located at the mouth of the Kili River Danube.
4	Chernomorsk seaport	Black Sea
5	Mariupol seaport *	North-western part of the Taganrog Bay of the Sea of Azov
6	Mykolaiv seaport	The Mykolaiv seaport is located in the city of Mykolaiv near the left bank of a bend of the river the Southern Bug for 19 miles to the north from its mouth. The port also includes the port of Ochakiv and a raid near the city of Ochakiv near the banks of Trutayev
7	Odessa seaport	Black Sea, Odessa Bay
8	Specialized seaport Olbia	The left bank of the Bug-Dnieper estuary
9	Reni seaport	Coastline on the left bank of the Danube
10	Skadovsk seaport*	Black Sea. Dzharilgatskaya Bay
11	Ust-Dunaisk seaport	Odessa region, Kiliya district, Vilkove city
12	Kherson seaport*	right and left banks of the Dnieper River in the city of Kherson
13	Southern seaport	Black sea, Adzhalik estuary

*Developed by: Volodymyr Reznik, Bugayko Dmytro*

Also railway operations were commonly used. The railway map is also represented bellow.



Figure 1.1 – Railway road map of Ukraine [6]

Source: <http://www.gps-info.com.ua/31924>

As to the railway transportation, for accurate understanding the dynamics, the Table is provided bellow.

Table 1.2 - Freight shipped, by rail of general use, million tons (% of total volume) (it is dedicated to all the transportation in Ukraine)

№	Freight type	Years					
		2016	2017	2018	2019	2020	2021
1	Total freight	343	339	322	313	306	314
2	oil and oil products	15 (4)	14 (4)	12 (4)	12 (4)	11 (4)	12 (4)
3	coal	73 (21)	67 (20)	65 (20)	59 (19)	49 (16)	50 (16)
4	coke	8 (3)	6 (2)	6 (2)	5 (1)	5 (2)	5 (2)
5	ore	77 (23)	70 (21)	71 (22)	75 (24)	80 (26)	78 (25)
6	cement	6 (2)	6 (2)	6 (2)	6 (2)	6 (2)	6 (2)
7	chemical and mineral fertilizers	11 (3)	12 (4)	9 (3)	9 (3)	9 (3)	11 (4)
8	timber	4 (1)	4 (1)	3 (1)	1 (0)	1 (0)	1 (0)
9	ferrous metals (including scrap)	29 (8)	26 (7)	25 (8)	24 (8)	22 (7)	24 (8)
10	grains, cereals and flour	32 (9)	37 (11)	34 (10)	40 (13)	35 (11)	34 (11)
11	other freight	88 (26)	97 (28)	91 (28)	82 (26)	88 (29)	93 (30)

*Developed by: Volodymyr Reznik, Bugayko Dmytro, Svitlana Smerichevska*

The main principles of Freight-Forwarding company's operation's strategy. Especially during the complex period's at the market of Logistics service provider's. There are such principle's, that are observed bellow:

1. Optimization of the supply chain, including research and improvement for each stage of the logistics chain from the supplier to the final consumer; realization Automation technology will reduce and increase the cost of inventory tracking and management systems Increase efficiency and improve service.

2. The use of information technologies, especially the implementation of such modern IT solutions Logistics management system (WMS), electronic document management system, online Tracking facilitates and ensures the automation and optimization of the logistics process Quick exchange of information, reduction of errors and improvement of cooperation with partners.

3. Development of infrastructure, including attracting additional investments for its development of transport infrastructure, primarily ports, railways and highways. This helps to reduce the time and costs of transporting goods, modernization of

the distribution center and communications. Attract global and new investors.

4. Continuous improvement and training, including the implementation of a continuous system. Training and professional development of personnel to promote the improvement of knowledge and skills of industry workers. Logistics, especially in the direction of understanding new trends, technologies and methods.

5. The development of logistics and strategic partnership consists in cooperation and partnership organization, suppliers, carriers and other market participants and it may be applied forms of joint planning, coordination and sharing of resources will be expanded to reduce costs and to increase delivery speed and customer service.

The article is a logical continuation of a number of publications by the authors devoted to the development of mechanism of logistics enterprises activity organization [2-10].

**Conclusions.** Logistics companies are the main participants in the global supply chain. It ensures efficient transportation of goods, optimizes routes, manages stocks, ensures customs clearance and implements innovations. Through their activities, logistics companies contribute to increasing the

competitiveness of business and the stability of the world economy. The role of logistics companies is becoming increasingly important in a world where speed and efficiency are key success factors. At the role that logistics companies play in the global supply chain and why logistics companies are necessary.

1. Ensuring uninterrupted flow of goods. Logistics companies are responsible for organizing and coordinating the transportation of goods around the world. It ensures a smooth flow of goods, minimizes delays and prevents supply disruptions. This is especially important for industries that depend on on-time delivery, such as manufacturing and retail.

2. Optimization of transport routes. One of the main functions of logistics companies is the optimization of transport routes. Using the latest technologies and analytical tools, they develop the most efficient routes for transporting goods, reduce fuel consumption and shorten delivery times. This helps to increase the competitiveness of companies and reduce the impact on the environment.

3. Inventory and warehouse management. The logistics company is also engaged in inventory and warehouse management. They ensure that products are stored in optimal conditions and help

maintain quality and safety. In addition, logistics companies help customers optimize inventory levels, preventing excessive storage costs.

4. Provision of customs clearance. International transportation is usually associated with the need for customs clearance. The logistics company has experience in this field and ensures timely and accurate processing of customs documents. This will help avoid delays at the border and minimize the risks associated with violating customs rules.

5. Innovations and technologies. Modern logistics companies are actively innovating and using advanced technologies to improve their services. From automation to using big data for demand forecasting, logistics companies are constantly improving their operations for greater efficiency and accuracy. Logistics strategy plays an important role in achieving the company's strategic goals. They are related to other functions: supply, production, etc. It covers all areas of strategy and activity, including: the implementation of logistics strategies leads to a decrease and an increase in total costs, increasing the efficiency of customer service activities and achieving business goals, ensuring business development and growth prospects.

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## THE ESSENCE OF THE ENTERPRISE MANAGEMENT SYSTEM AND FEATURES OF ITS STRUCTURE

**Serhii Dolynskiy, Tetiana Kostina, Volodymyr Voskolupov.** *"The essence of the enterprise management system and features of its structure".* The studied topic is extremely relevant, as it is aimed at solving the key problems of modern business and contributes to the development of scientifically based approaches to the management of enterprises in the conditions of a changing economic environment.

*This article is devoted to problematic issues related to the enterprise management system and the study of its features. It was determined that management is a purposeful and constant process of influence of the subject of management on the object of management, this process is aimed at changing the state of the object and/or subjects according to pre-thought-out and developed plans. Control functions and system functions are also considered.*

*The main problems of management during the implementation of the process of adjusting the functioning of the enterprise, which are caused by objective and subjective reasons, are characterized. These*

*include constant changes in the economic situation and the obvious aggravation of competition between business entities in the market of resources, the market of finished products and sales markets.*

*The enterprise management system was studied. It is considered as a set of principles, techniques and mechanisms for processing and passing information, making management decisions, organizing planning, motivating, stimulating and controlling activities. It was determined that the enterprise management system is a management structure, as well as all possible external and internal relationships between its structural elements and their dynamic interaction, which enables the system to adapt to the changing conditions of the external environment and be flexible.*

*It is considered that the purpose of the management system is the formation of the managed work of the enterprise through the creation and implementation of a set of management influences for the successful functioning of the management object in the changing conditions of the external environment.*

*It was determined that the important characteristics of the management system are its structure, size and complexity. The management structure is an ordered set of permanently interconnected elements that ensure the functioning and development of the organization as a whole.*

*It is noted that the management process is implemented through the main functions: planning, organization, motivation and control.*

**Keywords:** management, enterprise management, enterprise management system, management structure, organizational structure

**Сергій Долинський, Тетяна Костіна, Володимир Восколупов. «Сутність системи управління підприємством та особливості її структури».** Досліджена тематика є надзвичайно актуальною, оскільки вона спрямована на вирішення ключових проблем сучасного бізнесу та сприяє розвитку науково обґрунтованих підходів до управління підприємствами в умовах мінливого економічного середовища.

Ця стаття присвячена проблемним питанням що стосуються системи управління підприємством та дослідження її особливостей. Визначено, що управління є цілеспрямованим і постійним процесом впливу суб'єкта управління на об'єкт управління, цей процес спрямований на зміну стану об'єкта та / або суб'єктів по наперед продуманим і розробленим планам. Також розглянуто функції управління та функції системи.

Охарактеризовано основні проблеми менеджменту при здійсненні процесу налагодження функціонування підприємства, що викликані об'єктивними та суб'єктивними причинами. До них належать постійні зміни економічної ситуації та очевидне загострення конкуренції між суб'єктами господарювання на ринку ресурсів, ринку готової продукції та збутових ринках.

Досліджено систему управління підприємством. Її розглядають як сукупність принципів, прийомів та механізмів обробки та проходження інформації, прийняття управлінських рішень, організації планування, мотивування, стимулювання та контролю діяльності. Визначено, що система управління підприємством це структура управління, а також усі можливі зовнішні і внутрішні взаємозв'язки між її структурними елементами та їх динамічна взаємодія, що надає можливість системі адаптуватися до змінних умов зовнішнього середовища і бути гнучкою.

Розглянуто, що метою системи управління є формування керованої роботи підприємства шляхом створення і реалізації сукупності управлінських впливів для успішного функціонування об'єкта управління в мінливих умовах зовнішнього середовища.

Визначено, що важливими характеристиками системи управління є її структура, розмір і складність. Структура управління це упорядкована сукупність стійко взаємопов'язаних елементів, що забезпечують функціонування і розвиток організації як єдиного цілого.

*Зазначено, що процес управління реалізується через основні функції: планування, організації, мотивації і контролю.*

**Ключові слова:** управління, управління підприємством, система управління підприємством, структура управління, організаційна структура.

**Introduction.** In today's business environment, competition is becoming increasingly fierce. Enterprises with effective management systems can respond more quickly to market changes, make more informed decisions, and achieve their strategic goals. A well-organized management system ensures the optimal use of all types of human resources, financial, and material. This is particularly important in conditions of limited resources and the need for their rational allocation. Technological advancements require businesses to continuously update and adapt their management systems. Understanding the structure and functioning of management systems allows for the integration of cutting-edge technologies that enhance domestic efficiency and competitiveness.

**Analysis of recent research and publications.** During the study of current aspects of the enterprise management system and its structure, the works of famous domestic scientists in this field were analyzed, such as: D. Babich, O. Boltak, V. Danylko, Yu. Kabakov, Yu. Lysetsky, G. Seleznyova, I. Simenko, Ya. Velichko, and others.

**The objective of this article** is to thoroughly explore the concept of enterprise management systems and the distinct features of their structure.

**Presentation of the main results.** The operation of modern enterprises in conditions of intense competition requires the optimization of management decisions regarding principles and mechanisms of planning and forecasting, as well as providing businesses with various forms of incentives for the effective use of all resources. The effectiveness of any business structure depends on an optimized enterprise structure and the creation of a resource management system.

Management is a purposeful, ongoing process where the management subject influences the management object, aiming to change the state of the object and/or subjects (including themselves) according to pre-conceived and developed plans. This concept is also viewed as the activity of directing an objective process towards a subjectively chosen goal. The foundation of any management always includes expediency [7].

When studying and analyzing any system, including a management system, it is essential to clearly distinguish its two main characteristics function and goal.

The function of a system is a characteristic that defines the change of system states, the set of all possible system states, determined by the number of its elements, their diversity, and interconnections.

The management function is a specific type of management activity, concrete forms of managerial influence on the system's activities, which determine and define the content of business relationships.

The goal of a system is a specific (desired, externally set, or internally established) state of its outputs (results), that is, a certain value or set of values of the system's function.

The goal of the production process (or service provision process) at an enterprise is the optimal production of a specified range of products (or services) with the most rational use of limited technological resources and progressive methods of production organization [4].

The main management issues in establishing the enterprise's operations are caused by objective and subjective reasons. These include constant changes in the economic situation and the evident intensification of competition among economic entities in the resource market, finished goods market, and sales markets. Fundamental knowledge about the

enterprise management system enables timely and appropriate management decisions that help achieve the company's primary goals.

In a market economy, management includes a set of management mechanisms aimed at formulating and implementing a complex of measures that ensure the necessary conditions for the effective operation, viability, and continuous functioning of the enterprise.

Technical, organizational, and economic measures are designed to synchronize and coordinate the work of all structural elements of a business organization at all levels to achieve the goal.

The enterprise management system is viewed as a set of principles, techniques, and mechanisms for processing and passing information, making management decisions, organizing planning, motivating, stimulating, and controlling activities.

In modern conditions, the enterprise management system is a management structure that includes all possible external and internal connections between its structural elements and their dynamic interaction, enabling the system to adapt to changing external conditions and remain flexible.

The basis of the enterprise management system includes:

- description of business processes and activities carried out in the implementation of the enterprise's policy;
- definition of the sequence, interrelationship, and interaction between business processes;
- creation of methods for implementing processes within the enterprise;
- selection of necessary resources and their description;
- determination of criteria for evaluating and monitoring process efficiency [3].

At the same time, it is worth noting the social aspect of the enterprise management system. This system can be seen as an

organized set of interactions between individuals and groups that form a cohesive whole. Since management is primarily focused on personnel, the professional, socio-psychological, and spiritual aspects of people's activities shape the social orientation of the enterprise management system.

The goal of the management system is to establish controlled operations of the enterprise by creating and implementing a set of management influences for the successful functioning of the managed object in changing external conditions. The management subject consists of structurally defined associations of people and leaders at the personal level who carry out management activities and have the authority to do so. The management object comprises individuals or groups of people targeted by the organized, systematic, and planned actions of the management subject.

The management system can be viewed as a combination of two subsystems: the managed and the managing. An effective management system is built on the following principles:

- hierarchy distribution of management functions vertically;
- complexity consideration of all interactions, influences, and connections between system elements;
- economy the principle that the system should expend the least resources while achieving maximum efficiency;
- timeliness making management decisions promptly and in accordance with changes and trends in the external environment;
- optimality – the balance of management functions within the system should be harmonious, coordinated, and without duplication;
- scientific basis – measures should be developed based on scientifically substantiated facts, utilizing modern scientific achievements;
- autonomy – each element of the management system should be ensured rational autonomy in its work;

- transparency and clarity – adherence to the conceptual unity of system elements;
- flexibility (adaptability) – the system's ability to adapt to changing operating conditions;
- continuity – focusing the enterprise's operations on long-term and uninterrupted functioning [7].

The principles of building an enterprise management system must be applied in interaction with each other and depending on the operating conditions. Important characteristics of the management system include its structure, size, and complexity.

The management structure is an organized set of stable, interconnected elements that ensure the functioning and development of the organization as a whole. The organizational structure of the management apparatus is a form of labor division in managing the organization.

Each division and staffing unit in the enterprise is created to perform a specific set of management functions or tasks, endowed with certain rights to distribute resources, and responsible for the execution of the functions assigned to the division.

The organizational structure regulates the distribution of tasks among divisions, depending on their competence in solving specific problems, and coordinates the overall interaction of these elements.

Within organizational structures, the entire management process takes place, along with the flow of information involving managers at all levels [8].

The size of the system is characterized by the number of its elements and the connections between them, while complexity is defined by the diversity, heterogeneity of the properties of the elements, and the peculiarities of the connections between them.

Any management process has the following distinctive features:

- the necessity to create and operate a complete (self-sufficient) system;
- a targeted influence on the system, resulting in achieving orderliness of

relationships and connections capable of performing the assigned tasks;

- the presence of a subject and object of management as direct participants in the management process;
- information as the main link between management participants;
- the presence of a hierarchy in the management structure (elements, subsystems, systems, regions, etc.);
- the use of various forms of subordination of the management object to the management subject, within which different techniques, forms, methods, and means of management are employed [1].

The management process is implemented through the main functions: planning, organizing, motivating, and controlling.

1. Planning. This function involves defining the goals of the enterprise (organization), the means, and the most effective methods for achieving them. An important element of this function is the forecasts of possible development directions and strategic plans. At this stage, the enterprise must determine what real results it can achieve, assess its strengths and weaknesses, as well as the state of the external environment (economic conditions in the country, legal conditions, positions of trade unions, actions of competing organizations, consumer preferences, public opinions, technological developments, etc.).

2. Organization. This management function forms the structure of the organization and provides it with everything necessary (personnel, means of production, financial resources, materials, etc.). At this stage, conditions are created for achieving the organization's goals. Proper organization of the work of personnel allows for more effective results.

3. Motivation. This is the process of encouraging people to engage in activities to achieve the organization's goals. In fulfilling this function, a manager provides material and moral incentives for employees and creates the most favorable conditions for their

abilities and professional growth. With good motivation, the staff performs their duties in accordance with the organization's goals and plans. The motivation process involves creating opportunities for employees to satisfy their needs while performing their duties properly. Before motivating staff for more efficient work, a manager must identify the real needs of their employees.

4. Control. This management function involves evaluating and analyzing the effectiveness of the organization's performance. Through control, the level of goal achievement by the enterprise is assessed, and necessary adjustments to planned actions are made. The control process includes setting standards, measuring achieved results, comparing these results with planned ones, and, if necessary, revising initial goals. Control unites all management functions, allowing the organization to maintain proper operational settings and timely correct incorrect decisions.

The enterprise management system can be broadly presented as a set of principles and mechanisms for decision-making, information processing, planning, and a system of motivation and material incentives, representing the real implementation of managerial relationships. The enterprise

management system is based on three main components:

- information support for decision-making and implementation processes;
- a set of typical business procedures for solving assigned tasks;
- a personnel motivation system [2].

The enterprise management system is a complex aggregation of processes and phenomena, which can be improved with varying degrees of detail.

Its real economic, organizational, and psychological effectiveness depends on the methodology and timing of implementation, as well as the intuition and professional training of the manager.

Considering a broader set of elements within the enterprise management system, four subsystems can be identified: methodology, structure, process, and management techniques (Fig. 1.) [5].

Management methodology includes goals, tasks, principles, laws and regularities, functions, and management methods.

The management process involves the communication system, management technology (development and implementation of management decisions), and information support [5].

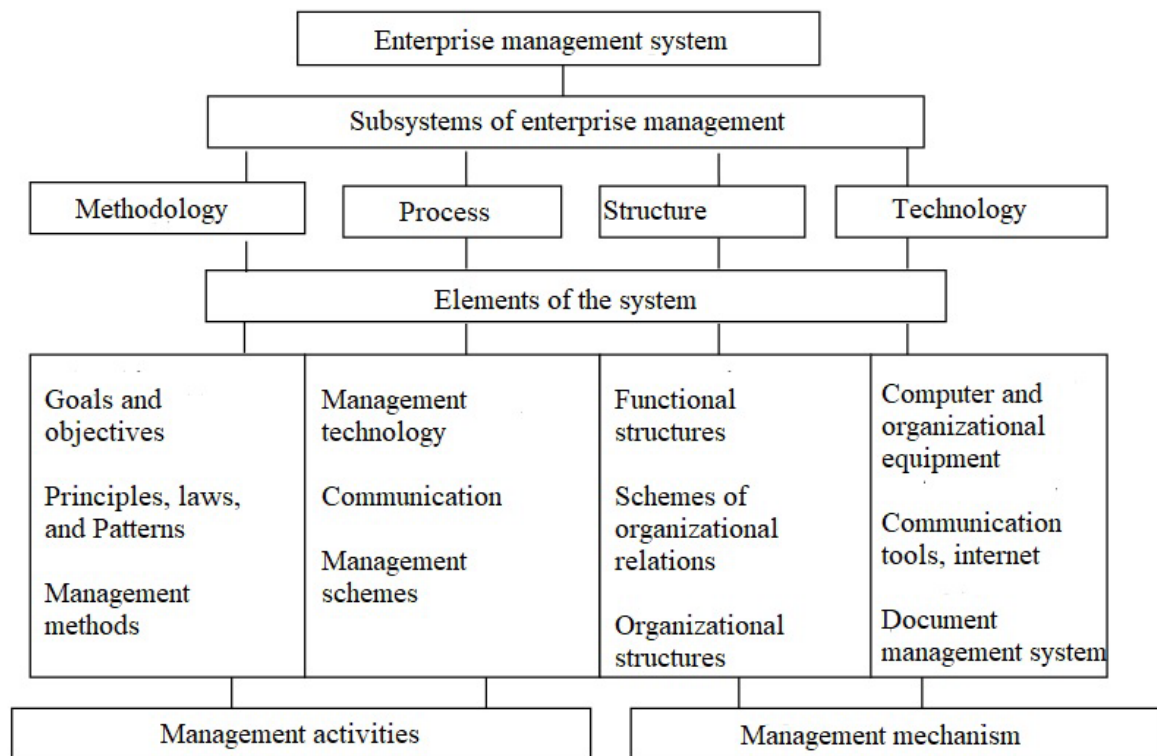


Figure 1 – Components of the enterprise management system

The management structure includes the functional and organizational structures, the scheme of organizational relationships, specific interaction schemes of higher management bodies, and the personnel structure.

Management techniques include computer and organizational technology, communication networks (internal or external, Internet), and the document circulation system.

In turn, the methodology and management process form managerial activities, while the structure and management techniques form the management mechanism. The state of the elements of the enterprise management system directly impacts its overall efficiency.

The components of the enterprise management system manifest through certain characteristics (Table 1.) [6].

Table 1 - Components of the enterprise management system and their characteristics

Components of the management system	Characteristics of the management system components
1	2
Management personnel	<ul style="list-style-type: none"> <li>— required number of managers;</li> <li>— relevant qualification levels of managers;</li> <li>— alignment of professional training with the positions held;</li> <li>— rapid adaptation of staff to changes;</li> <li>— creative approach to task execution;</li> <li>— willingness to take calculated risks.</li> </ul>
Management methods	<ul style="list-style-type: none"> <li>— level of influence managers have on employee interests;</li> <li>— alignment with the goals and objectives of the organization;</li> <li>— impact on final outcomes of activities.</li> </ul>

End of table 1

1	2
Structural and functional support	<ul style="list-style-type: none"> <li>— composition of management functions and their optimal distribution;</li> <li>— separation of management functions within each department;</li> <li>— degree of rigidity and flexibility in function distribution;</li> <li>— effectiveness of interfunctional connections.</li> </ul>
Information support	<ul style="list-style-type: none"> <li>— availability, accuracy, and completeness of necessary information;</li> <li>— timeliness of information receipt;</li> <li>— relevance of information to the issues at hand.</li> </ul>
Management technology and techniques	<ul style="list-style-type: none"> <li>— degree of provision with organizational and computer equipment;</li> <li>— availability of technical documentation for management;</li> <li>— level of computerization in management activities.</li> </ul>

Source: base on [6].

The comprehensive interaction of all the defined components ensures the efficient and productive functioning of the enterprise management system.

**Conclusions.** Thus, the study of the enterprise management system and its structure allows for the development of effective management solutions that contribute to the sustainable development of enterprises in the conditions of the modern economy. This research has practical value for managers and management professionals in helping them adapt to change and ensure the long-term success of their enterprises.

The enterprise management system is a management structure, as well as all possible external and internal relationships between its structural elements and their dynamic interaction, which enables the system to adapt to the changing conditions of the external environment and be flexible.

Summarizing the structure of the enterprise management system, its main four

subsystems can be distinguished. It includes methodology, structure, process and management techniques.

The management system of the enterprise and the features of its structure are key factors in the successful functioning and development of the enterprise in the conditions of the modern economy. In the conditions of fierce competition, rapid technological changes and globalization, an effective management system allows enterprises to remain competitive, adaptive and flexible. It is important to ensure the integration of all management functions planning, organization, motivation and control, as well as the use of modern management methods and technologies. The human factor, information support, structure and technical support play an important role in achieving the company's goals. Thus, the optimization of management processes and structures is a necessary condition for ensuring sustainable and effective development of the enterprise.

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## LOGISTICS BUSINESS PROCESSES IN THE CONTEXT OF ANTI-CRISIS MANAGEMENT OF THE ENTERPRISE

**Nadiia Reznik.** «*Logistics business processes in the context of anti-crisis management of the enterprise*» This article is devoted to understanding of global business experience indicates that the concept of logistic management is a popular practice for enhancing the competitiveness of large, medium, and small enterprises. This concept becomes particularly relevant during periods of crisis when businesses need to organize their activities to minimize costs associated with the movement and storage of goods from the initial source to the final consumer [1].

The article establishes that logistics is one of the key components of successful business operations in modern conditions, and its significance cannot be overstated as it encompasses all processes related to the management of material, information, and financial flows from the supplier to the final consumer. It is proven that logistics gains special importance during crises such as economic recessions, natural disasters, wars, or global pandemics. Under such conditions, effective management of logistic business processes becomes not just a potential development strategy but a necessity for every enterprise, as logistics is a key element ensuring the efficiency and competitiveness of companies. Therefore, crisis management in business holds one of the priority positions in the enterprise development strategy.

The purpose of this article is to study the theoretical and practical aspects of optimizing business processes in logistics under conditions of crisis management. The main focus is on determining the impact of key factors in the development of logistic activities on the financial and economic state of the enterprise during crises. Moreover, the article demonstrates how the optimization of business processes affects the efficiency of enterprise operations using examples from large companies. In this context, several negative factors affecting the economic state of the enterprise in crisis conditions are identified, and ways to improve such processes are proposed, which will not only help to overcome the negative manifestations of crises but also improve the financial state of the enterprise as a whole.

**Keywords:** logistics, business processes, crisis management, crisis phenomena, optimization of logistic processes.

**Надія Резнік «Логістичні бізнес-процеси у контексті антикризового управління підприємством».** Ця стаття присвячена розумінню світового досвіду бізнесу, який свідчить про те, що концепція логістичного менеджменту є популярною практикою для підвищення конкурентоспроможності великих, середніх і малих підприємств. Ця концепція стає особливо актуальною в кризові періоди, коли підприємствам необхідно організувати свою діяльність так, щоб мінімізувати витрати, пов'язані з переміщенням і зберіганням товарів від початкового джерела до кінцевого споживача [1].

У статті встановлено, що логістика є однією з ключових складових успішного ведення бізнесу в сучасних умовах, і її значення неможливо переоцінити, оскільки охоплює всі процеси, пов'язані з управлінням матеріальними, інформаційними та фінансовими потоками від постачальника до кінцевого споживача. Доведено, що логістика набуває особливого значення під час криз, таких як економічні спади, стихійні лиха, війни чи глобальні пандемії. За таких умов ефективне управління логістичними бізнес-процесами стає не просто потенційною стратегією розвитку, а необхідністю кожного підприємства, оскільки логістика є ключовим елементом забезпечення ефективності та конкурентоспроможності компаній. Тому антикризове управління в бізнесі займає одне з пріоритетних місць у стратегії розвитку підприємства.

Метою даної статті є дослідження теоретичних та практичних аспектів оптимізації бізнес-процесів у логістиці в умовах антикризового управління. Основну увагу зосереджено на визначенні впливу ключових факторів розвитку логістичної діяльності на фінансово-економічний стан підприємства під час криз. Крім того, у статті на прикладах великих компаній показано, як оптимізація бізнес-процесів впливає на ефективність роботи підприємства. У цьому контексті визначено ряд негативних факторів, що впливають на економічний стан підприємства в умовах кризи, та запропоновано шляхи вдосконалення таких процесів, що сприятиме не лише подоланню негативних проявів криз, а й покращить фінансовий стан підприємства в цілому.

**Ключові слова:** логістика, бізнес-процеси, антикризове управління, кризові явища, оптимізація логістичних процесів.

**Introduction.** Logistics plays a critically important role during a crisis for several key reasons. Firstly, during a crisis, enterprises typically face declining revenues and the need to reduce costs. Logistics helps optimize storage and transportation processes, which allows for a reduction in operational expenses. Effective management of logistic processes can ensure cost savings through route optimization, inventory reduction, and improved inventory management.

Secondly, crises such as natural disasters, economic recessions, or pandemics can disrupt supply chains and jeopardize the continuity of business processes. Logistics provides flexibility and resilience to supply chains, allowing them to quickly adapt to changing conditions and minimize supply disruptions.

Thirdly, enterprises that can effectively manage logistic processes have competitive

advantages in the market and can respond more quickly to customer needs, ensure timely product delivery, and provide high-quality services. This is especially important during a crisis when consumers become more demanding and cautious.

Fourthly, crises always come with increased risks such as supply disruptions, fluctuations in raw material and transportation costs, and financial market instability. Logistics helps enterprises identify and minimize these risks through careful planning, supplier diversification, the use of alternative routes, and strategic stockpiling.

Fifthly, despite the crisis conditions, customers expect a high level of service. Effective logistics allows for timely delivery of goods, maintaining appropriate inventory levels, and promptly responding to changes in demand, which helps meet customer needs and retain their loyalty.

Thus, it can be confidently stated that logistics during a crisis becomes a key element of the survival and development strategy of enterprises. It ensures cost reduction, business continuity, increased competitiveness, risk minimization, and improved customer service. This collectively allows enterprises not only to overcome crisis phenomena but also to emerge stronger and better prepared for future challenges.

**Analysis of recent research and publications.** Recently, scientific publications by domestic and foreign researchers have highlighted the problems of organizing logistic processes in the context of global crises.

O. Y. Bavyko [2] describes the organizational optimization of crisis management of enterprise business processes during the Covid-19 pandemic. Vatchenko B.S. and Sharanov R.S. [3] investigated crisis management of enterprises during wartime, identifying the main differences between traditional crises and wartime crises, and revealing key methods of crisis management in wartime conditions. Renowned Ukrainian scholars such as Bezuhla L.S., Vatchenko B.S., Gudz O.Ye., Ilchenko N.B., Krykavskiy Ye.V., and Moskvina B., among others, have also devoted their work to the problems of finding effective tools for optimizing enterprise logistic processes.

According to the research of M. Christopher [4] (Christopher, M., 2016), the optimization of logistic processes should be based on three main principles: cycle time reduction, cost reduction, and improved customer service quality. The author emphasizes the importance of integrating all elements of the logistic chain to achieve these goals. Meanwhile, in the research by Carrington and Perry [5] (Carrington, D., & Perry, J., 2017), the importance of crisis management for the stable operation of logistic systems is examined. The authors propose several strategies, including the creation of reserve stocks and supplier

diversification, which help reduce risks during a crisis.

Wang [6] and his co-authors (Wang, X., Zhang, Y., & Li, Z., 2019) believe that the use of information technologies, such as warehouse management systems (WMS) and transportation management systems (TMS), significantly enhances the efficiency of logistic processes during a crisis. The authors emphasize the importance of integrating these systems to ensure continuous monitoring and optimization of the supply chain.

In the work of Johnson and Sparks [7] (Johnson, R., & Sparks, L., 2020), the impact of economic and natural crises on enterprise logistic processes is examined. The authors analyze the consequences of various types of crises on logistics and propose adaptation methods, including the implementation of flexible management systems and the use of alternative delivery routes.

Thus, the analysis of existing studies shows that the optimization of logistic business processes in the context of enterprise crisis management is a multifaceted task. It involves the use of modern technologies, flexible resource management, and effective planning. Key aspects include the integration of all elements of the logistic chain and continuous process monitoring to respond promptly to changes in the external environment, such as global economic instability, political changes, wars, natural disasters, and others.

**The formulation of the goals of the article** is to study the theoretical and practical aspects of optimizing business processes in logistics under conditions of crisis management. The main focus is on determining the impact of key factors in the development of logistic activities on the financial and economic state of the enterprise during crises.

**Presentation of the main results.** Crisis management is crucial for ensuring the resilience and survival of an enterprise during periods of instability. This process comprises a set of measures aimed at identifying,

analyzing, preventing, and overcoming crisis situations that may arise during the enterprise's activities. Crisis management involves the development of strategies, action plans, and measures designed to minimize risks and mitigate the adverse effects of crises on the financial state, operational activities, reputation, and long-term development prospects of the enterprise. Through effective crisis management, enterprises can not only survive crises but also discover new opportunities for growth and development,

adapt to changes, and enhance their competitiveness in the market.

Crisis management also includes a range of measures aimed at detecting, preventing, and overcoming crisis situations that may threaten the stability and efficiency of an organization's functioning. The main stages of crisis management can be defined as: analysis and diagnosis, strategy development, implementation of crisis measures, control and monitoring, and communication (Table 1).

Figure 1 – Key Aspects of Enterprise Crisis Management. Source: Table compiled by the authors according to sources [15-20].

Stage	Measures	Description
<b>Analysis and Diagnosis</b>	Financial State Assessment	Analysis of financial indicators (profit, loss, liquidity, solvency)
	Market Position Assessment	Studying the competitive environment, market trends, and the enterprise's market position
	Internal process assessment	Analyzing the efficiency of production and management processes
<b>Strategy Development</b>	Goal Setting	Clear formulation of short-term and long-term enterprise goals
	Strategy Selection	Identifying ways to achieve goals, such as restructuring, diversification, cost optimization
<b>Implementation of Crisis Measures</b>	Financial Measures	Attracting additional capital, refinancing debts, reducing expenses
	Organizational Measures	Restructuring the enterprise, changing the organizational structure, optimizing personnel numbers
	Operational Measures	Improving production efficiency, optimizing supply chains, implementing new technologies
<b>Control and Monitoring</b>	Continuous Monitoring	Monitoring the implementation of measures, controlling the achievement of set goals
	Results Analysis	Evaluation of the effectiveness of implemented measures and adjustment of plans if necessary
<b>Communication</b>	Internal Communication	Informing employees about planned measures and their role in the process
	External Communication	Interaction with investors, partners, clients, and other stakeholders

Given that the implementation of anti-crisis measures is based on the effective application of financial, organizational, and operational tasks faced by the enterprise, it is

essential to pay particular attention to improving production efficiency, optimizing supply chains, and introducing new technologies. Logistics ensures the continuity

of business processes, flexibility in responding to changes, and risk minimization, allowing companies to adapt to new conditions and maintain competitiveness. **Considering this, the main aspects highlighting the importance of logistics in maintaining business efficiency during a crisis are:**

1. *Establishing Reliable Supply Channels:* During a crisis, the supply of raw materials and finished products can be disrupted due to various factors such as production or transportation failures. Establishing reliable supply channels, including diversifying suppliers, helps avoid shortages and ensure the stability of production processes.

2. *Strategic Inventory Planning:* Effective inventory management is crucial for maintaining production and meeting product demand. Strategic inventory planning allows companies to have sufficient reserves for uninterrupted operations even in case of supply disruptions.

3. *Data Analysis and Forecasting:* Crisis situations can significantly change product demand. Therefore, the use of data analytics and forecasting helps companies quickly respond to these changes by adjusting production plans and logistics processes according to current market needs.

4. *Flexibility in Logistics Processes:* Flexibility in logistics processes allows for the quick redirection of goods and resources, which is especially important during a crisis. This also includes the ability to rapidly shift production capacities and make changes in supply chains.

5. *Implementing Effective Inventory Management Methods:* Inventory management methods such as Just-in-Time (JIT) help reduce storage costs and avoid excess inventory. This is particularly important during a crisis when companies' financial resources may be limited.

6. *Optimizing Transport Routes:* Optimizing delivery routes helps reduce transportation costs, which is a crucial factor in lowering overall logistics costs. Using

modern technologies for route planning allows for greater efficiency.

7. *Fast and Reliable Delivery:* Maintaining a high level of customer service quality is critical even during a crisis. Fast and reliable delivery of products contributes to customer satisfaction and loyalty retention.

8. *Feedback System:* An established feedback system quickly identifies and resolves issues arising in the logistics process. This ensures prompt response to customer needs and enhances the overall efficiency of logistics processes.

9. *Developing Emergency Action Plans:* These plans ensure the company's readiness for various development scenarios and include identifying potential risks and developing strategies to minimize them. Supporting this theory are joint studies by Kerrington D. and Perry J. [9], stating: «Anti-crisis plans should include clearly defined actions for various development scenarios, such as supply disruptions, increased demand, or changes in legislation. Implementing such plans ensures the enterprise's readiness for rapid strategy changes and minimizes the negative impact of the crisis.»

10. *Diversifying Suppliers and Transport Routes:* Diversifying supply sources and delivery routes reduces dependency on a single supplier or transport route, increasing the supply chain's resilience to disruptions.

11. *Utilizing Modern Technologies:* Anderson T. and Smith J. wrote about their prospects in 2017 [10]: «Investing in innovative technologies and solutions provides enterprises with a competitive advantage. Companies that actively implement new technologies such as artificial intelligence, blockchain, and the Internet of Things (IoT) can significantly improve their logistics processes and increase the efficiency of supply chain management.»

Modern technologies such as the Internet of Things (IoT), blockchain, and artificial intelligence (AI) enhance transparency and control over logistics processes. They enable

companies to respond promptly to changes and improve operational efficiency.

12. *Automation and the Use of Artificial Intelligence*: Automation of processes and the use of AI help reduce costs, increase accuracy, and improve the efficiency of logistics operations. This is especially important during a crisis when resources may be limited, and the demands for speed and accuracy are high. Johnson M. and Smith P. discussed this issue in their work «Strategic Crisis Management»: «Automation of logistics processes, including the use of robotics in warehouses and automated order processing systems, allows for increased accuracy and speed of operations, reduces labor costs, and minimizes the human factor. This is particularly important in a crisis when the need for quick and efficient order processing increases.»

It is important to understand that during a crisis, when business conditions can change abruptly, effective logistics becomes a critical factor for the survival and successful

functioning of an enterprise. Optimizing logistics processes, implementing innovative solutions, and effectively managing risks enable companies not only to overcome crisis situations but also to lay the foundation for sustainable development in the future.

The current crisis, triggered by the war in Ukraine, has affected enterprises of all types, especially those involved in logistics support. According to a Dive&Discovery Research survey, as of the end of July 2022, the capacity of the vast majority of enterprises (72%) did not exceed 50-70% of the pre-war level. Sixteen percent of the surveyed enterprises were forced to stop their activities or were almost stopped (their capacity does not exceed 20% of the pre-war level) [8]. Today, in the road transport market, the main problems are related to the decrease in enterprise profits due to the rising cost of fuel and lubricants, the reduction in the number and volume of orders, low service prices, etc. At the same time, most of them cannot increase the cost of these services (Figure 1).

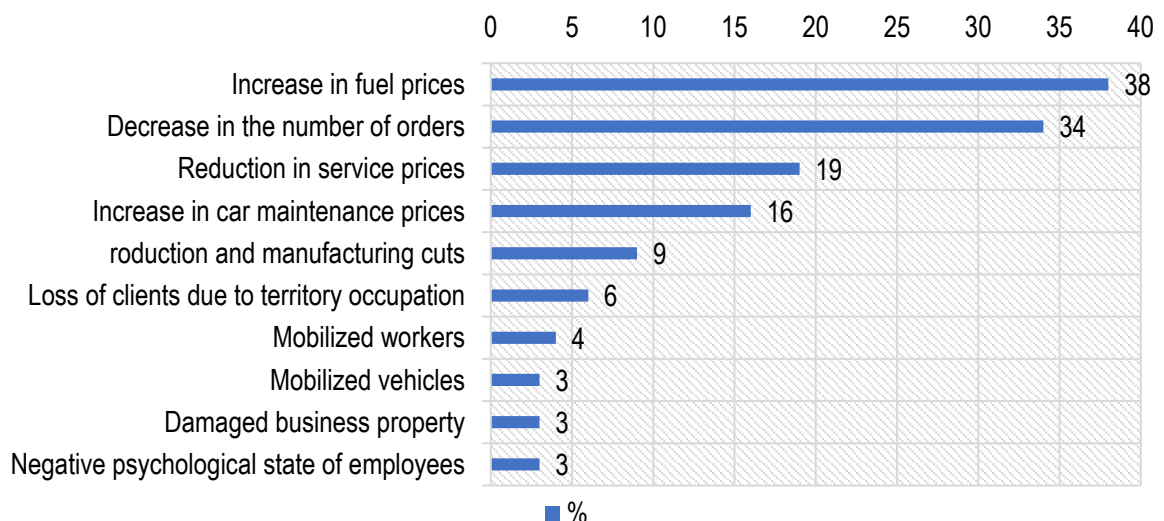


Figure 1 – Factors Affecting the Reduction of Enterprise Income in the Road Transport Market in 2022.

Sources: Graph based on data [8]

***In the context of logistics optimization of road transport during the crisis caused by the war in Ukraine, there are several key issues hindering effective logistics management:***

1. *Underdeveloped Infrastructure*: Poor road quality leading to delays, increased delivery times, and higher vehicle maintenance costs, along with the lack of modern logistics centers and warehouses,

complicating storage and redistribution of goods.

2. *Insufficient Digitalization and Automation of Processes*: Lack or low level of implementation of Transportation Management Systems (TMS) that allow automating planning and control processes of transportation, and insufficient use of real-time cargo monitoring and tracking systems complicating route control and delivery status.

3. *Complexity of Route Planning*: Inadequate use of modern technologies for route optimization leading to inefficient resource use and increased fuel costs, along with coordination problems between different types of transportation (multimodal transport).

4. *High Operational Costs*: Fluctuations in fuel prices affecting cost predictability and expenses for vehicle maintenance and repair.

5. *Data Processing Issues*: Lack of integrated systems for collecting, analyzing, and processing logistics data complicating decision-making; insufficient use of analytics and Big Data for demand forecasting and logistics process optimization.

6. *Qualification of Personnel*: Lack of staff and low qualification of workers in logistics and supply chain management.

7. *Legal and Regulatory Restrictions*: Complex and non-transparent regulatory requirements complicating licensing and certification processes; bureaucratic hurdles delaying customs clearance and border crossing processes.

The above-mentioned issues generate a number of tasks for the modern domestic logistics system and urgently require a comprehensive approach to solving problems caused by the crisis in the economy. To optimize logistics business processes, it is worth identifying key strategic solutions and effectively implementing them in the practical activities of companies.

An example of a logistics company that managed to maintain profits by implementing optimization solutions during the war in Ukraine is Nova Poshta. With the

onset of hostilities, the logistics sector faced significant disruptions. Many routes became dangerous or were completely blocked, causing serious problems with the delivery of goods and mail. **To maintain its reputation, jobs, profits, and customers, the company quickly implemented logistics optimizations in wartime conditions. Specifically:**

1. *Route Reconfiguration*: Nova Poshta quickly reconfigured its logistics routes, creating alternative paths for delivery, bypassing dangerous areas, and using route planning considering current safety information and road conditions.

2. *Real-Time Tracking Systems*: Implemented real-time tracking systems for monitoring cargo and vehicles, allowing prompt responses to any changes in the situation. Additionally, they began using automated warehouse systems for faster cargo processing and reducing storage time.

3. *Network Expansion*: Continued expanding their network by quickly opening new pickup points and branches in relatively safe regions, allowing customers to receive their parcels with minimal delays, and using partner pickup points to extend their geographical presence.

4. *Humanitarian Cooperation*: Actively collaborated with volunteer organizations and humanitarian funds to deliver aid to the most dangerous regions, supporting the company's image and providing an additional stream of orders.

5. *Mobile Applications and Online Services*: Actively used mobile applications and online services for customers to reduce the load on physical branches and ensure uninterrupted communication. Implemented contactless payment and parcel receipt methods to enhance the safety of customers and employees.

6. *Data Analytics*: Utilized data analytics to optimize vehicle load and routes, reducing fuel costs and increasing transport efficiency, and implemented inventory management systems to minimize downtime and increase cargo turnover, enhancing overall company efficiency.



By implementing such optimization solutions, Nova Poshta not only maintained its profits but also strengthened its position in the logistics services market (Table 2). Quick adaptation to new conditions and the use of modern technologies allowed the company

to efficiently manage logistics processes, ensure continuous delivery, and maintain a high level of customer service even in challenging wartime conditions.

Table 2. Economic Performance Indicators of Nova Poshta Before Optimization, During the Crisis, and After Optimization.

Indicator	Before optimization (2021)	During crisis (2022)	After optimization (2023)
Transport volume (million parcels)	245	180	210
Revenue (million UAH)	15,000	12,000	14,000
Expenses (million UAH)	10,000	9,500	9,000
Profit (million UAH)	5,000	2,500	5,000
Number of employees	30,000	25,000	26,000
Number of branches/offices	7,000	6,000	6,700
Logistics expenses (million UAH)	2,500	2,800	2,500
Number of logistics centers	50	45	48
Investments in technology (million UAH)	1,200	1,000	1,300

Source: Compiled by the authors based on data from sources [21-22]

During a wartime crisis, the main task of each business entity is to establish the uninterrupted operation of the enterprise and ensure its sustainable economic development. An effective means of achieving this result is the implementation of an anti-crisis management mechanism within the enterprise. Given that a wartime crisis has certain differences from a traditional one, the main elements of the anti-crisis management mechanism also acquire specific features in their functioning during the wartime period. Tactical methods aimed at quickly improving the financial and economic performance of the enterprise play a significant role, with the most popular being downsizing, outsourcing, optimization, and regularization.

A notable example of using these methods and optimization logistics solutions in the agricultural sector during the crisis is the Agroholding «Myronivsky Hliboproduct» (MHP). With the start of the war in Ukraine, the agricultural sector, including MHP, faced numerous challenges such as infrastructure destruction, supply disruptions, loss of access

to markets, and increased safety risks for employees.

**To optimize logistics business processes, «Myronivsky Hliboproduct» (MHP) employed the following strategic steps:**

1. *Logistics and Routing Optimization:* MHP quickly reconfigured its logistics routes, finding safer alternative paths for transporting products. The use of modern technologies for real-time cargo monitoring and tracking allowed for prompt responses to situational changes and ensured timely delivery of products.

2. *Expansion of Warehouses and Distribution Centers:* The company invested in the development and modernization of warehouse facilities in safe regions, enabling the storage of larger volumes of products and ensuring uninterrupted supply. The use of decentralized warehouses reduced the risks of product loss due to military actions.

3. *Adaptation of Production Processes:* MHP optimized its production processes by implementing automation and modernizing equipment, reducing dependence on manual

labor and increasing efficiency. Reducing production costs was primarily the result of implementing energy-efficient technologies.

4. *Digitization and Implementation of Analytical Systems:* The agroholding used digital platforms and data analytics for optimizing inventory management, demand forecasting, and production planning. The implementation of supply chain management (SCM) systems improved coordination and efficient logistics management.

5. *Support for Employees:* Ensuring the safety and proper working conditions for employees, including evacuating personnel from dangerous zones and providing psychological support, and engaging temporary workers in safe regions to maintain production.

6. *Cooperation with International Partners:* MHP actively cooperated with international organizations and partners to ensure product export and attract investments, and participated in humanitarian initiatives, which not only supported the company's reputation but also contributed to expanding market reach.

Thanks to the implementation of these optimization measures, «Myronivsky Hliboproduct» managed to maintain its profits and even expand its activities in some areas during the war. Rapid adaptation to new conditions, the use of modern technologies, and effective resource management allowed the company to maintain high production and customer service levels, ensuring stability and development even in difficult times (Figure 2).

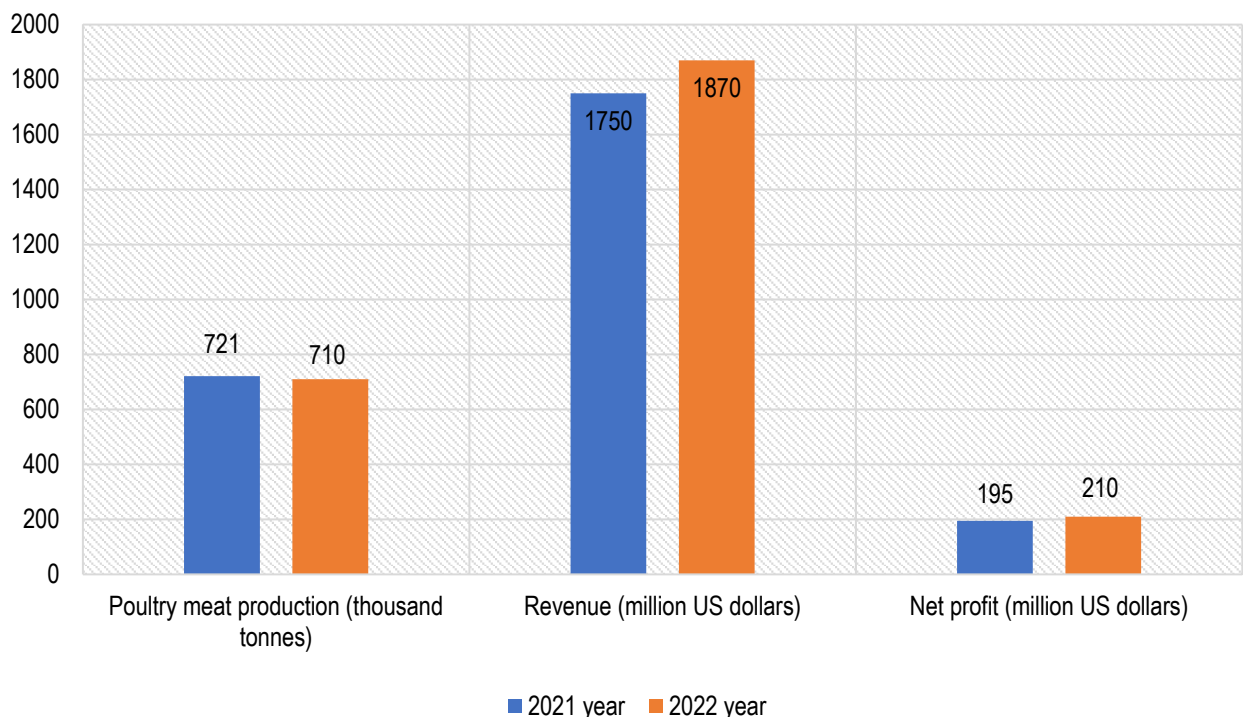


Figure 2 – Economic performance of «Myronivsky Hliboproduct» agroholding due to the implementation of optimization measures in 2021-2022.

Sources: Graph created by the authors based on sources.

Unlike large companies that successfully apply optimization measures during a crisis, small businesses do not have such opportunities. During a crisis, they are more

vulnerable to external factors and less capable of implementing optimization measures, leading to increased costs and risks. Without support and resources, small

businesses often cannot withstand the pressure and are forced to shut down.

According to a survey conducted by the marketing research agency Dive&Discovery Research in August 2022, it was found that the decrease in business margin leads to weaker players leaving the market. Twenty-one percent of individual entrepreneurs and business owners consider closing their business, and 6% are ready to do so in the near future. Meanwhile, 51% plan to expand

their business (13% in the near future, 21% immediately after the end of the war, and 17% at the planning level without a specific timeframe) [8].

Analyzing the reports of large international companies [12] and small businesses in Ukraine [13; 14], it becomes clear why the process of optimizing logistics business processes is overly complex for small businesses (Figure 3).

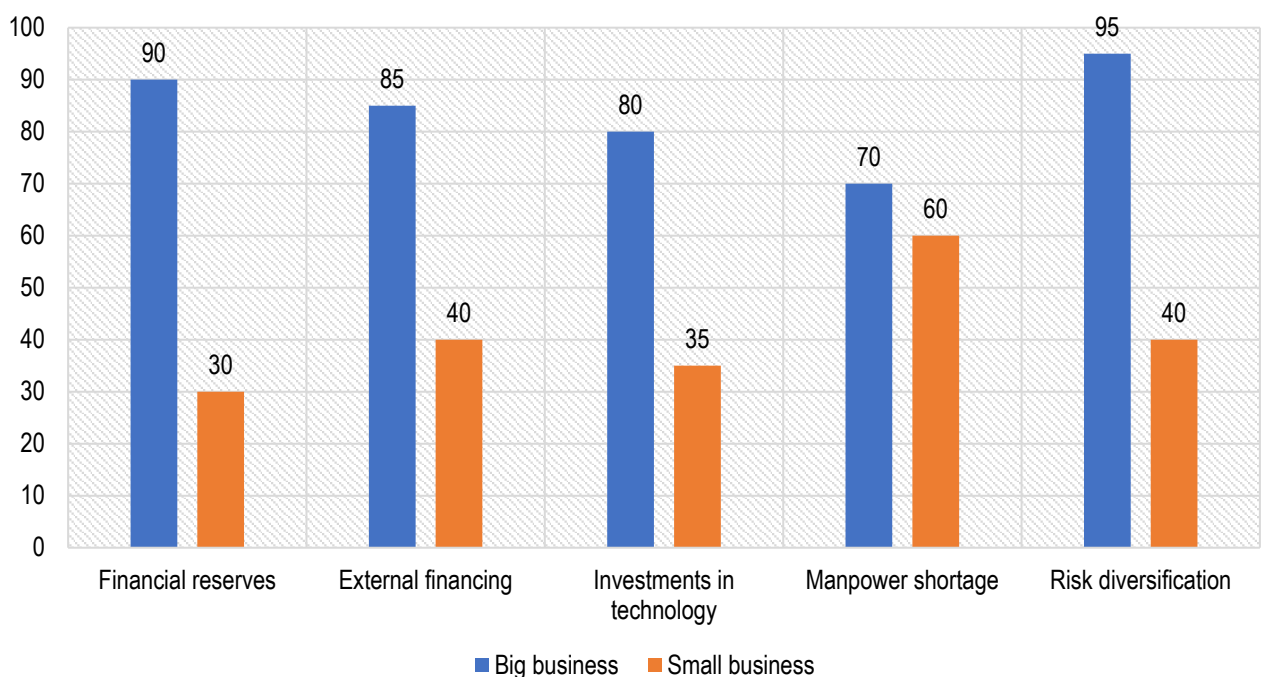


Figure 3 – Comparison of the Ability to Apply Business Process Optimization During Crisis and Wartime by Large and Small Companies, %.

Source: Graph created by the authors based on sources [12-14].

In the context of crisis management, optimizing logistics business processes becomes extremely important to ensure the stability and efficiency of companies. Large enterprises have significantly more opportunities to implement optimization measures during a crisis compared to small businesses. This is due to several key reasons. Firstly, they have access to substantial financial reserves, enabling them to invest in the latest technologies and automated logistics management systems. This includes investments in modern supply chain management (SCM) systems, route optimization software, and warehouse

process automation. Secondly, such companies can utilize advanced technologies to enhance the efficiency of their logistics processes, such as using Big Data and artificial intelligence (AI) for demand forecasting and inventory optimization. Thirdly, they have greater access to external financing through the issuance of bonds and shares, allowing them to attract significant financial resources for the development and modernization of their production and organizational capacities.

**Conclusions.** In modern conditions, where businesses are particularly vulnerable to external and internal crisis factors such as

war, unstable political situations, natural disasters, and economic instability, the question arises not so much about increasing business capitalization but about its very existence. Our research has shown that optimizing logistics business processes is accompanied by effective crisis management. Thus, enterprises can not only remain competitive in times of crisis but also successfully develop.

Based on the experience of companies such as Nova Poshta and the agroholding Myronivsky Hliboproduct», it can be concluded that the implementation of optimization solutions and quick adaptation to changes in the external environment have increased the profitability of companies and contributed to the growth of production capacities and service provision. Therefore,

further research into the activities of such companies can significantly deepen the understanding of logistics business process optimization in crisis conditions and contribute to the development of new, more effective management strategies.

The research also revealed the negative aspects of the impact of crisis phenomena on small business activities. Data from a survey conducted by Dive&Discovery Research showed the current state of their activities and indicated significant problems they face during a crisis. In our opinion, special attention should be paid by such enterprises to selecting a strategy for optimizing logistics business processes and determining the optimal solutions that will reduce costs and improve their operational efficiency..

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