International Conference
"Digital Technologies in Logistics and Infrastructure", October 10-11
Peter the Great St. Petersburg Polytechnic University

Crossborder Integration of Supply Chains: Problems and Digital Solution Concept

Graduate School of Management
St. Petersburg University

Peter the Great St. Petersburg Polytechnic University

Dr. Nicolay Didenko, head of "System Dynamics" R&D Lab.

Dr. Djamilia Skripnuk, professor of "System Dynamics" R&D Lab.

Dr. Vitally Cherenkov, professor of Marketing Department

1. **MINIMIZING LOGISTICAL RISKS AND TRANSACTION COSTS - THE MOST IMPORTANT TASK**
2. CONCEPTUALIZING INTERNATIONAL LOGISTICS
3. TASK OF CROSSBORDER INTEGRATING SUPPLY CHAINS – graphically represented and formalized
4. PROSPECTIVE MODEL OF ARCTIC DIGITAL REAL-VIRTUAL CYBERSPACE
5. QUO VADIS?

Competitiveness = F(Logistics)

average costs for international logistics - 25–35% of the sale price of goods

total annual world logistics costs – up to $5–6,5 trln. approximately

Russian logistics costs in prices of final products could be 20-70%.

Non distance related reasons for large logistics costs in Russia --- 1

(1) difficult general economic situation;

(2) long-term underestimation of the meaning of the sphere of product circulation in the economy;

(3) obsolete infrastructure (first of all, digital communications, roads and vehicles themselves) and its slow development;

(4) substantial lag in applications of modern technologies (digital ones included) for movement, transportation, storage and packaging of goods;

(5) low level of development of production and technical and technological base of warehousing;

Non distance related reasons for large logistics costs in Russia --- 2

(6) poor development of the industry for the production of modern packaging;

(7) high degree of operational logistics risks (both due to the human factor, and due to IT soft/hard errors);

(8) relatively low level of conceptualization of logistics

(9) lack of formalized (digitalized), clear, and detailed descriptions of logistic functions/operations, coordinated with other business processes of organization.

AGENDA

2

1. THE MOST IMPORTANT TASK - MINIMIZING LOGISTICAL RISKS AND TRANSACTION COSTS
2. **CONCEPTUALIZING INTERNATIONAL LOGISTICS**
3. TASK OF CROSSBORDER INTEGRATING SUPPLY CHAINS – graphically represented and formalized
4. PROSPECTIVE MODEL OF ARCTIC DIGITAL REAL-VIRTUAL CYBERSPACE
5. QUO VADIS?

CONCEPTUALIZING INTERNATIONAL LOGISTICS

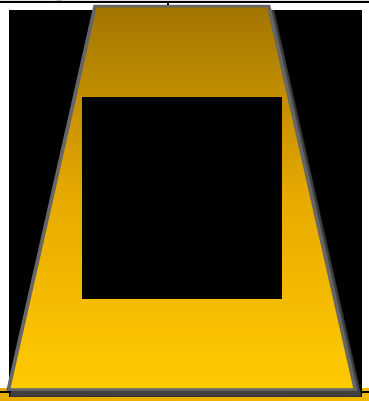
LOGISTICS MIX --- a set of logistics functions/operations (managed or controllable variables) that provides cross-border product movement in accordance with essential terms and conditions of sale contract (supported by transportation contract and corresponding payments) that should be adjusted to specifics of corresponding dimensions of logistics environment in the host (destination) country/region.

CODIFIED LOGISTICS MIX --- a contract package and supporting documents/procedures that are necessary to realize legal, reliable and effective cross-border movements of complex logistics flows (product, financial, and information ones) to provide the integrity of corresponding cross-border supply chain.

OBJECT FUNCTION OF LOGISTICS MANAGEMENT – integrating cross-border parts of supply chains provided decreasing logistics risks and transaction costs

Cross-border Disruptions of Logistics Mix

HOME COUNTRY		FRONTIER 		HOST COUNTRY

Components of Home Logistics Mix	Impact of Logistically Significant Dissimilarities between Home and Host Marketing Environments	Logistics Mix Mismatching / Disruptions
IL1 - Cultural, physical infrastructure		IL1
IL2 - Transportation system		IL2
IL3 - Middlemen characteristics		IL3
IL4 - Risks, tools of risk management		IL4
IL5 - International insurance		IL5
IL6 - Terms and means of payment		IL6
IL7 - Terms of trade/delivery		IL7
IL8 - Customs clearance		IL8
IL9 - Security clearance		IL9
IL10 - Paper work, communications		IL10

Cross-Border Effects of Logistics Mix Mismatching / Disruption

Eliminating and Smoothing Crossborder Logistics Disruptions

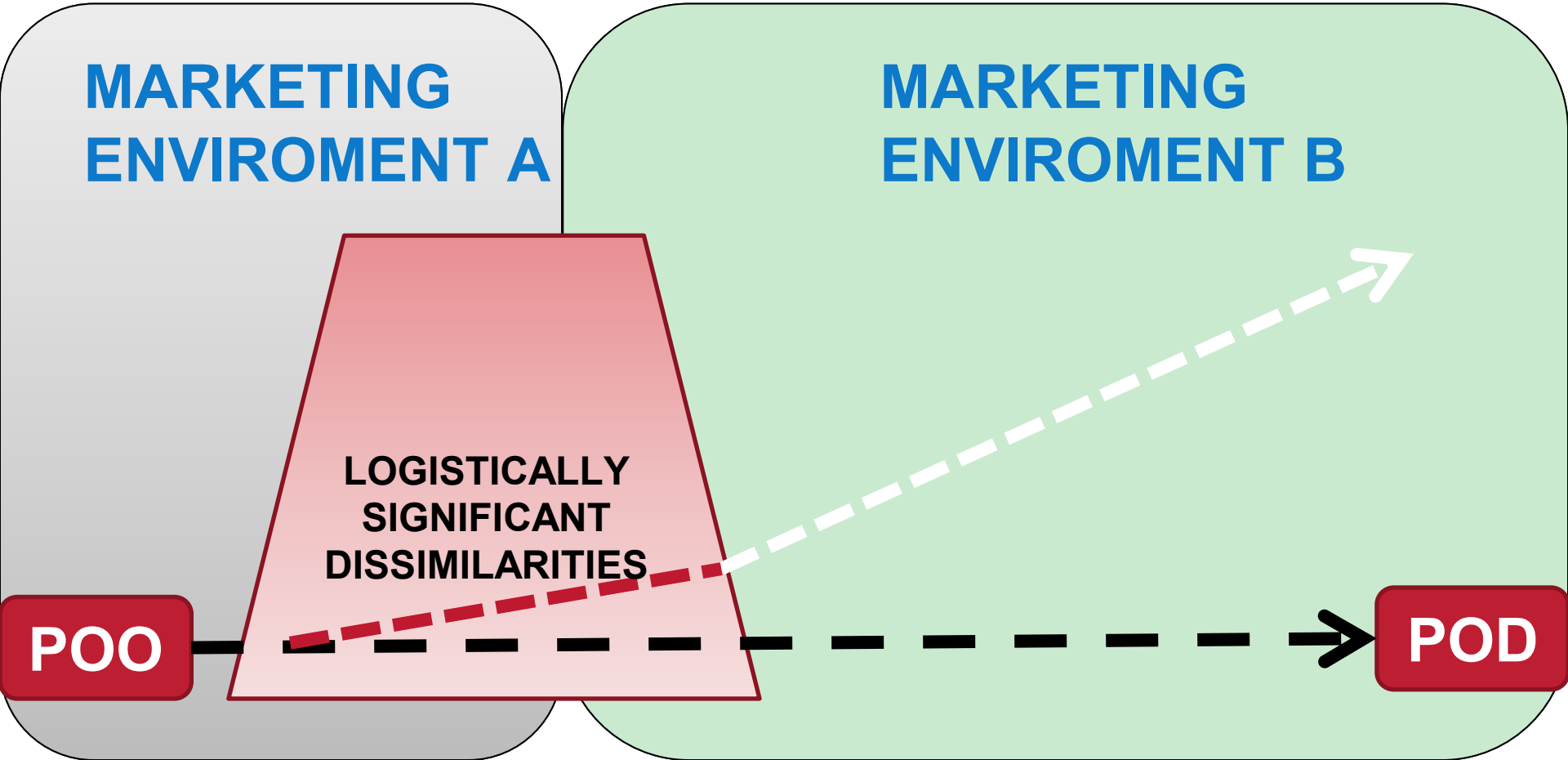
HOME COUNTRY		FRONTIER 		HOST COUNTRY

Components of Home Logistics Mix	Impact of Marketing Environment	Actions of International Logistics	Adjusted Logistics Mix	Degree of Matching Actions
IL1 - Cultural, physical infrastructure			IL1	IL1
IL2 - Transportation system			IL2	IL2
IL3 - Middlemen characteristics			IL3	IL3
IL4 - Risks, tools of risk management			IL4	IL4
IL5 - International insurance			IL5	IL5
IL6 - Terms and means of payment			IL6	IL6
IL7 - Terms of trade/delivery			IL7	IL7
IL8 - Customs clearance			IL8	IL8
IL9 - Security clearance			IL9	IL9
IL10 - Paper work, communications			IL10	IL10

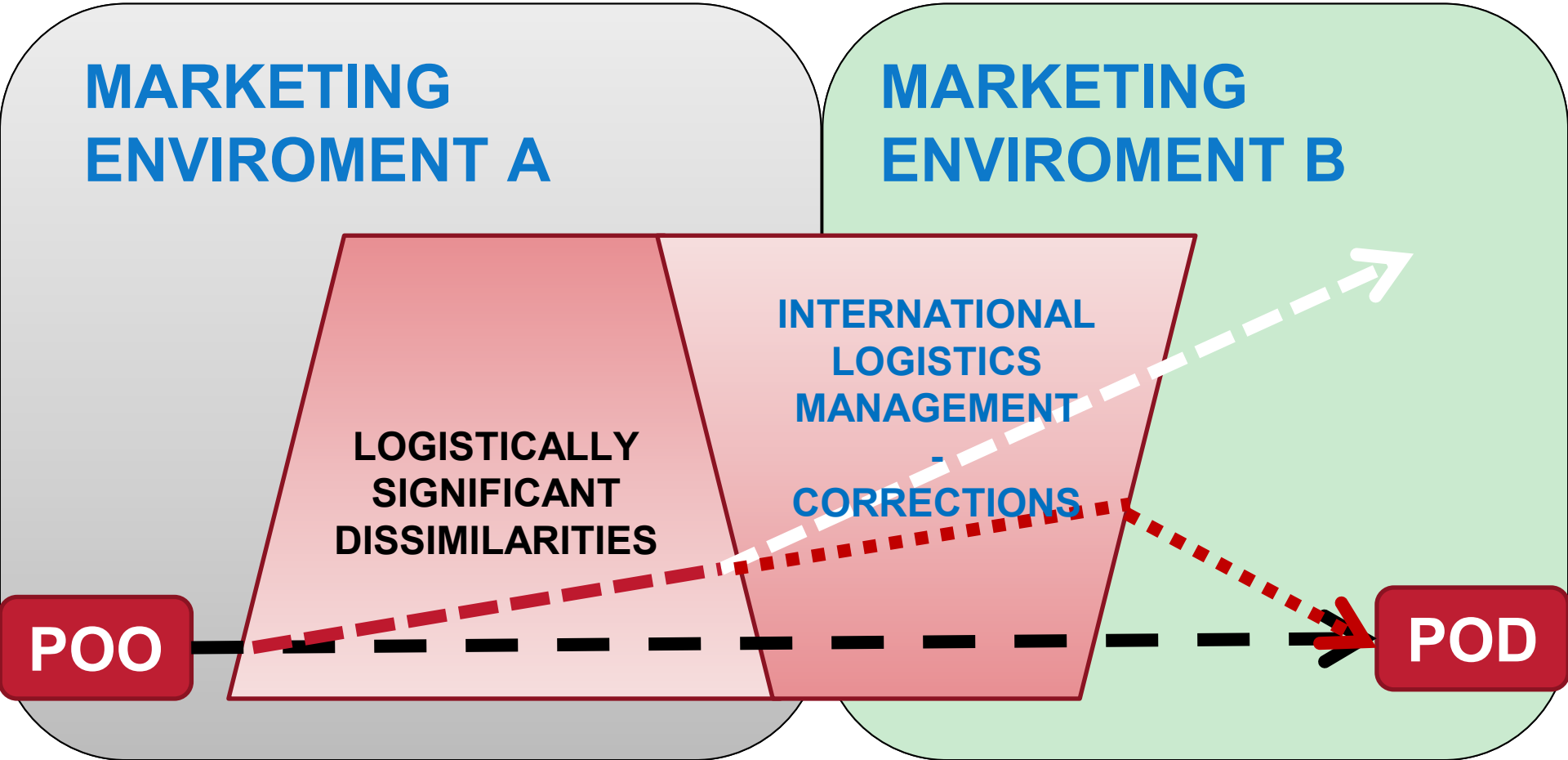
Matching Actions of International Logistics Management

1. THE MOST IMPORTANT TASK - MINIMIZING LOGISTICAL RISKS AND TRANSACTION COSTS
2. CONCEPTUALIZING INTERNATIONAL LOGISTICS
3. **TASK OF CROSSBORDER INTEGRATING SUPPLY CHAINS – graphically represented and formalized**
4. PROSPECTIVE MODEL OF ARCTIC DIGITAL REAL-VIRTUAL CYBERSPACE
5. QUO VADIS?

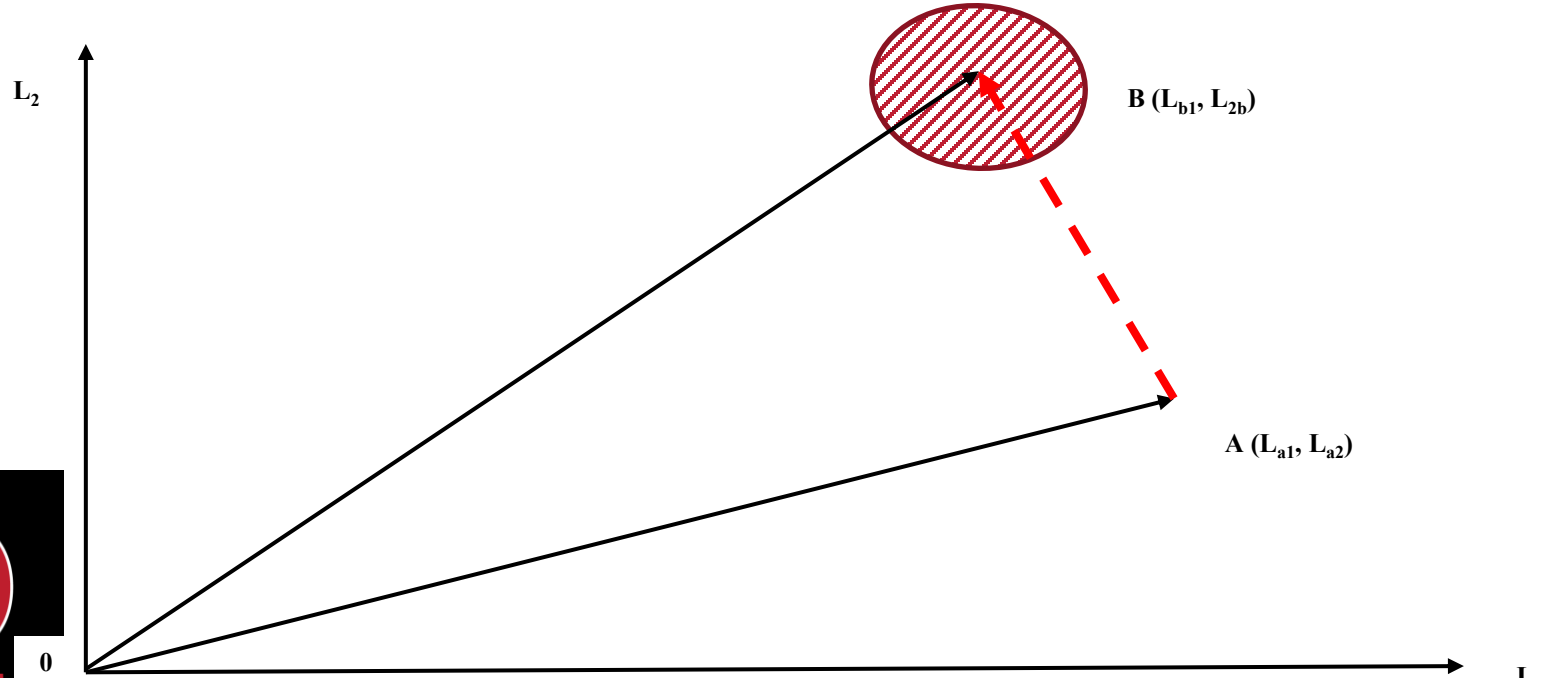
Prismatic Model of ILM Disruptions



Prismatic Model of IL Management



Adaptation of Logistics Mix: Vector Representation



ВШМ СПбГУ

Adaptation of Logistics Mix: Matrix Representation

$$\begin{bmatrix} OA_{11} & OA_{12} & OA_{13} & \cdots & OA_{1n} \\ OA_{21} & OA_{22} & OA_{23} & \cdots & OA_{2n} \\ OA_{31} & OA_{32} & OA_{33} & \cdots & OA_{3n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ OA_{m1} & OA_{m2} & OA_{m3} & \cdots & OA_{mn} \end{bmatrix}$$

$$\begin{bmatrix} OB_{11} & OB_{12} & OB_{13} & \cdots & OB_{1n} \\ OB_{21} & OB_{22} & OB_{23} & \cdots & OB_{2n} \\ OB_{31} & OB_{32} & OB_{33} & \cdots & OB_{3n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ OB_{m1} & OB_{m2} & OB_{m3} & \cdots & OB_{mn} \end{bmatrix}$$

$$\begin{bmatrix} AB_{11} & AB_{12} & AB_{13} & \cdots & AB_{1n} \\ AB_{21} & AB_{22} & AB_{23} & \cdots & AB_{2n} \\ AB_{31} & AB_{32} & AB_{33} & \cdots & AB_{3n} \\ \cdots & \cdots & \cdots & \cdots & \cdots \\ AB_{m1} & AB_{m2} & AB_{m3} & \cdots & AB_{mn} \end{bmatrix}$$

ВШМ СПбГУ

SOME MEASURES FOR ADJUSTING LOGISTICS MIX - 1

Dissimilarities could be revealed in logistics environment B	**Possible changes/measures necessary to do, concerning logistics mix A**
Sociocultural variables relevant to logistic functions (including cultural / language infrastructure variables)	Studying new business culture and modifying managers' behavior.
	Translating contract documents.
Different vehicles, carriers, forms of transport documents, unexpected changing distances and transit time	Prior study of these features and making adjustments

SOME MEASURES FOR ADJUSTING LOGISTICS MIX - 2

Dissimilarities could be revealed in logistics environment B	**Possible changes/measures necessary to do, concerning logistics mix A**
Legal status and business practice of intermediaries included in the next part of supply chain.	Prior study of previous experiences (if any) and making adjustments (personal contacts included)
Unknown logistics risks and dangers.	Prior identifying logistics risks and dangers and preparing tools of the relevant risk management.

SOME MEASURES FOR ADJUSTING LOGISTICS MIX - 3

Dissimilarities could be revealed in logistics environment B	**Possible changes/measures necessary to do, concerning logistics mix A**
Reliable and valid insurers and insurance terms	Prior control and buyer's (consignee's) acceptance in writing.
Different vehicles, carriers, forms of transport documents, unexpected changing distances and transit time	Prior control and buyer's (consignee's) acceptance in writing

SOME MEASURES FOR ADJUSTING LOGISTICS MIX - 4

Dissimilarities could be revealed in logistics environment B	**Possible changes/measures necessary to do, concerning logistics mix A**
Validity and accept of selected conditions and means of international payments	Prior control and buyer's (consignee's) acceptance in writing.
Terms of delivery (currently Incoterms® 2010);	Careful selection and buyer's (consignee's) acceptance in writing

SOME MEASURES FOR ADJUSTING LOGISTICS MIX - 5

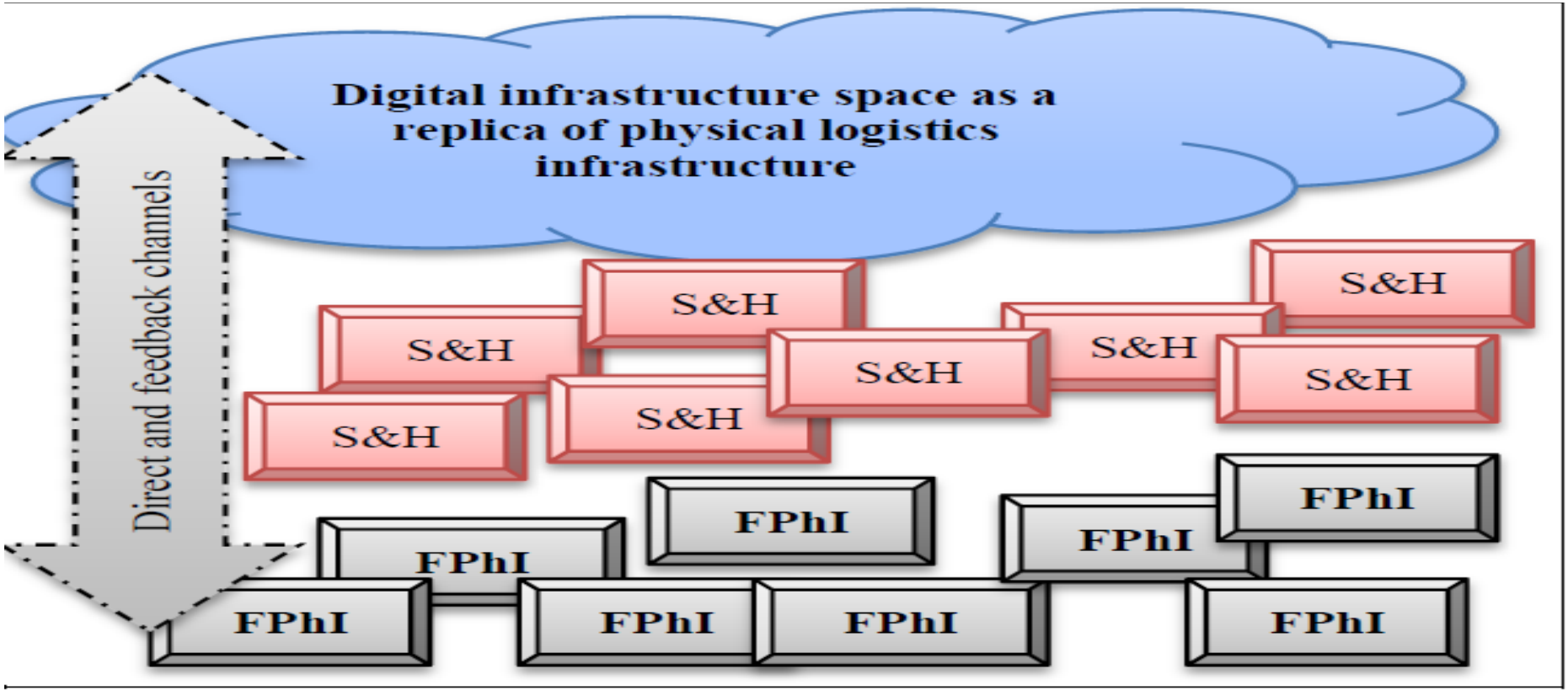
Dissimilarities could be revealed in logistics environment B	**Possible changes/measures necessary to do, concerning logistics mix A**
Specific customs clearance and related procedures (if any)	Prior control and buyer's (consignee's) acceptance in writing.
Terms of delivery (currently Incoterms® 2010);	Applying to customs broker (obligatory for the first experience)

SOME MEASURES FOR ADJUSTING LOGISTICS MIX - 6

Dissimilarities could be revealed in logistics environment B	**Possible changes/measures necessary to do, concerning logistics mix A**
Logistics Security for danger cargoes	Following relevant instructions (special marking and signaling included)
Specifics concerning assortment and forms of accompanying documentation	Careful “paperwork” (e-form) and/or applying to corresponding consulting organization or buyer (consignee)

1. THE MOST IMPORTANT TASK - MINIMIZING LOGISTICAL RISKS AND TRANSACTION COSTS
2. CONCEPTUALIZING INTERNATIONAL LOGISTICS
3. TASK OF CROSSBORDER INTEGRATING SUPPLY CHAINS – graphically represented and formalized
4. **PROSPECTIVE MODEL OF ARCTIC DIGITAL REAL-VIRTUAL CYBERSPACE**
5. QUO VADIS?

Conceptual model of the three-part digitized logistics infrastructure



Some expected features of the three-part digitized logistics infrastructure

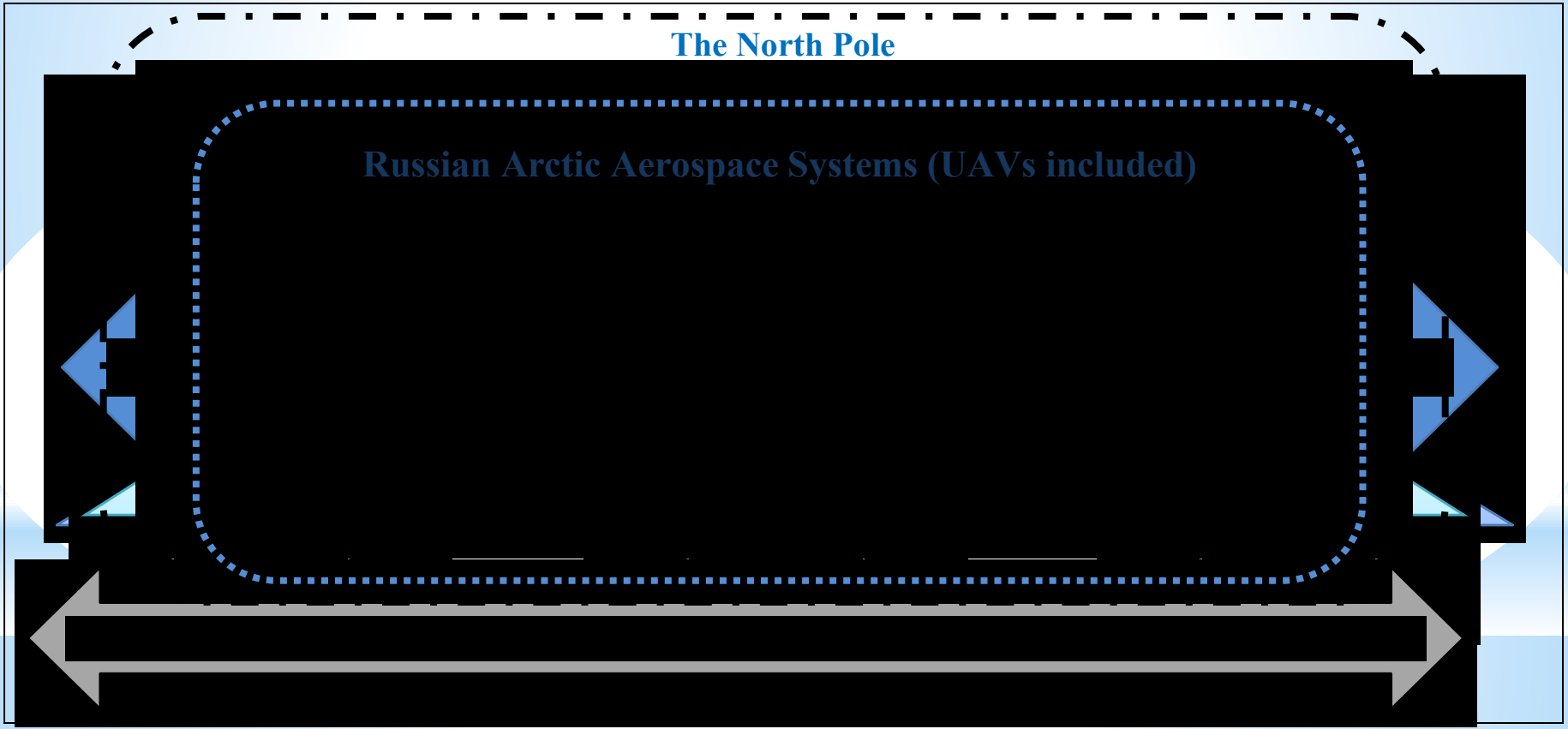
DIGITAL ECONOMY – from the viewpoint of digitized logistics – a complex IT platform providing innovative, balanced and effective development and using a digitized logistical infrastructure of the said (regional) economy

DIGITAL LOGISTICS manages not only information collection, storage and processing in the systems ensuring the "right" movement of material items carried on various types of transportation means, but also systems of trade exchange, production, and all other key business processes in supply chains

VIEWPOINT OF SUSTAINABLE DEVELOPMENT: The implementation of a for-the-firm new, or significantly improved, service, process, or organization in a logistics activity, that contributes to a more environmentally and/or socially sustainable development

Conceptual model of a prospective digitized logistics infrastructure of the AZRF supported by Arctic Aerospace Systems

(*land and sea facilities are not shown*)



SWOT-analysis matrix, concerning state of the Art and prospective of development of logistics infrastructure of the AZRF - STRENGTHS

- Assignment a variety of projects commonly known as “Digital Arctic”
- High achievements of domestic IT specialists
- High quality human capital involved
- Favorable geographical position as a West-East-West logistics bridge
- Positive consequences of climate changes
- Positive administrative, institutional, and financial factors for implementing RF state Arctic politics
- Rather high investment attractiveness for private / foreign investors
- Development of Arctic-focused hard and soft
- The presence of the NSR considered as a backbone of AZRF’s logistics infrastructure
- Participation of Ministry of Emergency (ME) and Army forces
- Theoretical and practical heritage of Russian Arctic studies

SWOT-analysis matrix, concerning state of the Art and prospective of development of logistics infrastructure of the AZRF - WEAKNESSES

- Uneven distribution of resources and production and difficult logistics
- Weakened and not-fully restored state Arctic politics
- Raw material exporting model of development
- High vulnerability to severe weather changes and natural disasters
- Law level of coordination between different Arctic actors and regulators
- Substantial risk for private / foreign investors
- Weak development of existing fragmented extremely logistics infrastructure
- Lack of holistic computerized information network for the AZRF as a whole
- Insufficient scientific analysis and forecasting
- Slow implementing Arctic-oriented innovations
- Dissociation of research organizations

SWOT-analysis matrix, concerning state of the Art and prospective of development of logistics infrastructure of the AZRF - OPPORTUNITIES

- Expected program of digitizing the AZRF
- Increasing world demand for natural resources
- Expected formation an institutionalization of “supporting zones”
- Targeted and selective labor migration
- Significant improvement in business and investment climate
- Innovative Arctic technologies
- Digitalizing monitoring and management
- Developing Arctic UAV fleet system in the frame of AeroNet (Action Plan of National Technological Initiative)

SWOT-analysis matrix, concerning state of the Art and prospective of development of logistics infrastructure of the AZRF - THREATS

- Outflow of IT specialist well-informed in Arctic peculiarities
- Negative consequences of climate changes
- Problems of regional institutionalization and overall regional governance
- Unfair domestic competition for budget money and administrative contradictions
- Outflow of highly qualified personnel as a result of weakening state politics
- Adverse volatility of hydrocarbon prices*
- State budget restrictions due to an arms race
- Further anti-Russia sanctions

1. THE MOST IMPORTANT TASK - MINIMIZING LOGISTICAL RISKS AND TRANSACTION COSTS
2. CONCEPTUALIZING INTERNATIONAL LOGISTICS
3. TASK OF CROSSBORDER INTEGRATING SUPPLY CHAINS – graphically represented and formalized
4. PROSPECTIVE MODEL OF ARCTIC DIGITAL REAL-VIRTUAL CYBERSPACE
5. **QUO VADIS?**

RESEARCH MODEL FOR AUDITING/DESIGNING A HOLISTIC ARCTIC LOGISTICS INFRASTRUCTURE

Digitizing the AZRF

Drone-oriented operation logistics

Unmanned production technologies

Digitized governance

Maximizing locally added value

Shortening supply chains

Creating mental sustainability constructs

Last but not least

Quo Vadis?