

## Dynamic Processes of an Airport's System. A Value Network Analysis

*Margarida Vaz, Jorge Silva, Emília Baltazar, Tiago Marques, Tiago Reis*

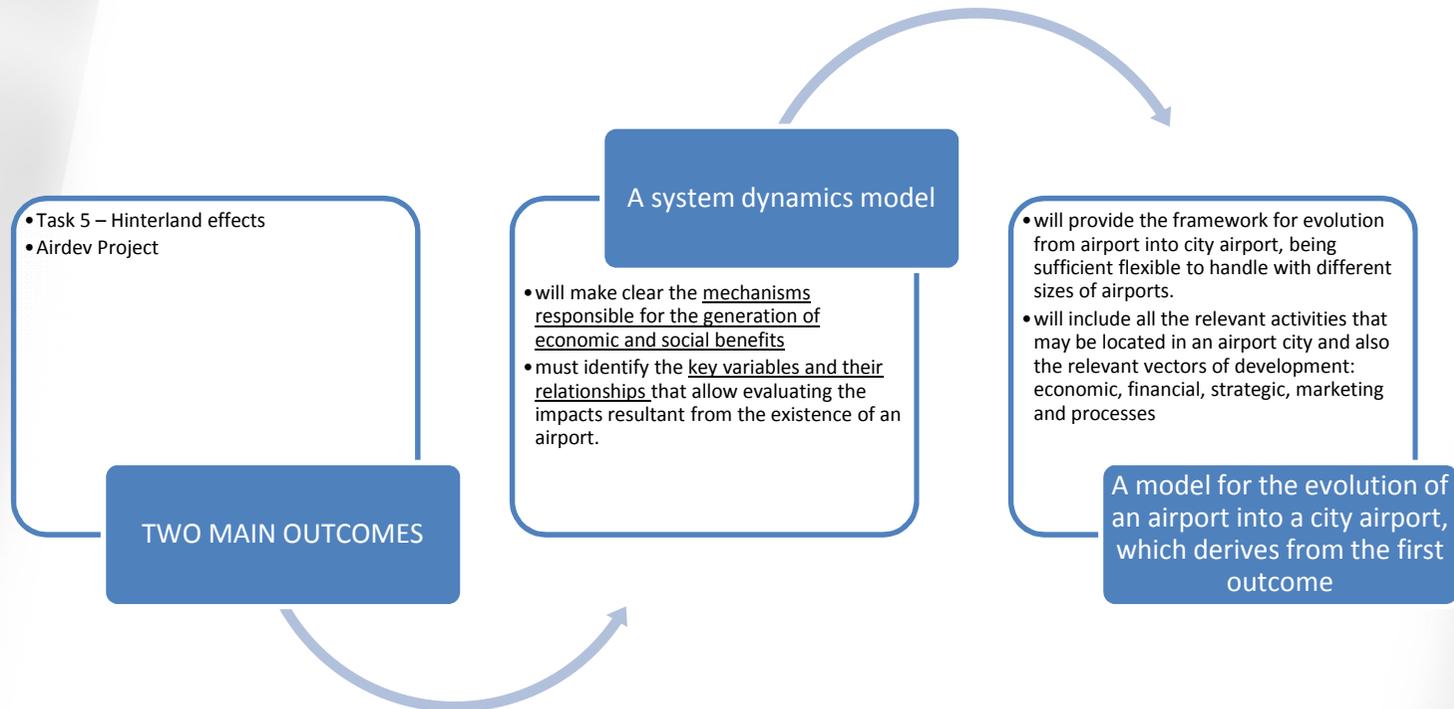
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## ***STRUCTURE OF PRESENTATION***

- 1. Introduction**
- 2. Theoretical Framework: from Social Network to Value Network**
- 3. Empirical Study**
  - **Research Approach and Methodology**
  - **Main Empirical Findings of Cargo Scenario**
- 4. Conclusions**

# Introduction



**Transversal to the both outcomes is the concept of system, which relies on NETWORK CONCEPT and DYNAMIC INTERRELATIONS**

# Theoretical Framework: from Social Network ...

- Concept of **network** understood as a structure between:
  - The market and the hierarchy
  - Formed by more than two organizations (corporate, public organization, association, university, airports among others)
  - Who decide, formally or informally, initiate cooperation in the medium term
  - Involving the exchange of resources (material or immaterial).
  
- Premise: all organizations within a network are interdependent (the behaviour of one organization affects and is affected by the behaviour of the others organizations).
  
- **Components** of a network - a set of actors and a set of relations, whose structure can be systematized and analyzed through the **Social Networks Analysis (SNA)**,
  - which has been expanding to the business world, whether at the level of organizational performance and/or strategic alliances (Cross and Parker, 2003; Dawson 2003; Iansiti and Levien, 2004; Anklam 2007; Basol and Rouse 2008; all cited by Allee (2009)).

## Theoretical Framework: ...to Value Network

*Traditional approaches to business activity analysis have “hit the wall” and are declining in value...*

- Process Management – misses *human interactions*
- Asset Management – doesn't account for *intangibles*
- Org Charts / ERP (Enterprise Resource Planning) – do not reflect *roles in the network*
- Performance Management – misses *value contributions*
- Social Networks – can't address *business processes*

## Why Value Networks?

## Theoretical Framework: ... to Value Network

*Because the **network** is the **primary economic mechanism for value conversion**, network analysis can be used to describe the **value creation dynamics** of work groups, organizations, business webs, and purposeful networks engaging in both tangible and intangible value exchanges to support the achievement of specific outcomes and to generate economic and social good (MacCauley, 1963; Granovetter and Swedberg, 2001; Allee, 2002, 2003).*

- Organizational networks, consequently, can be considered value conversion networks, or value networks (Allee, 2009)
- Any purposeful organization or activity can then be understood as a value network.

# Theoretical Framework: ... to Value Network

**Value Networks are sets of roles, interactions, resources and relationships that generate economic or social value.**

This definition allows application of the value network perspective to:

- a) **internal value networks:** sets of relationships between individuals, within and among work groups and between and among the various work groups that make up the organization;
- b) **external-facing value networks:** comprise relationships between the organization and its suppliers, its investors, its strategic business partners and its customers.

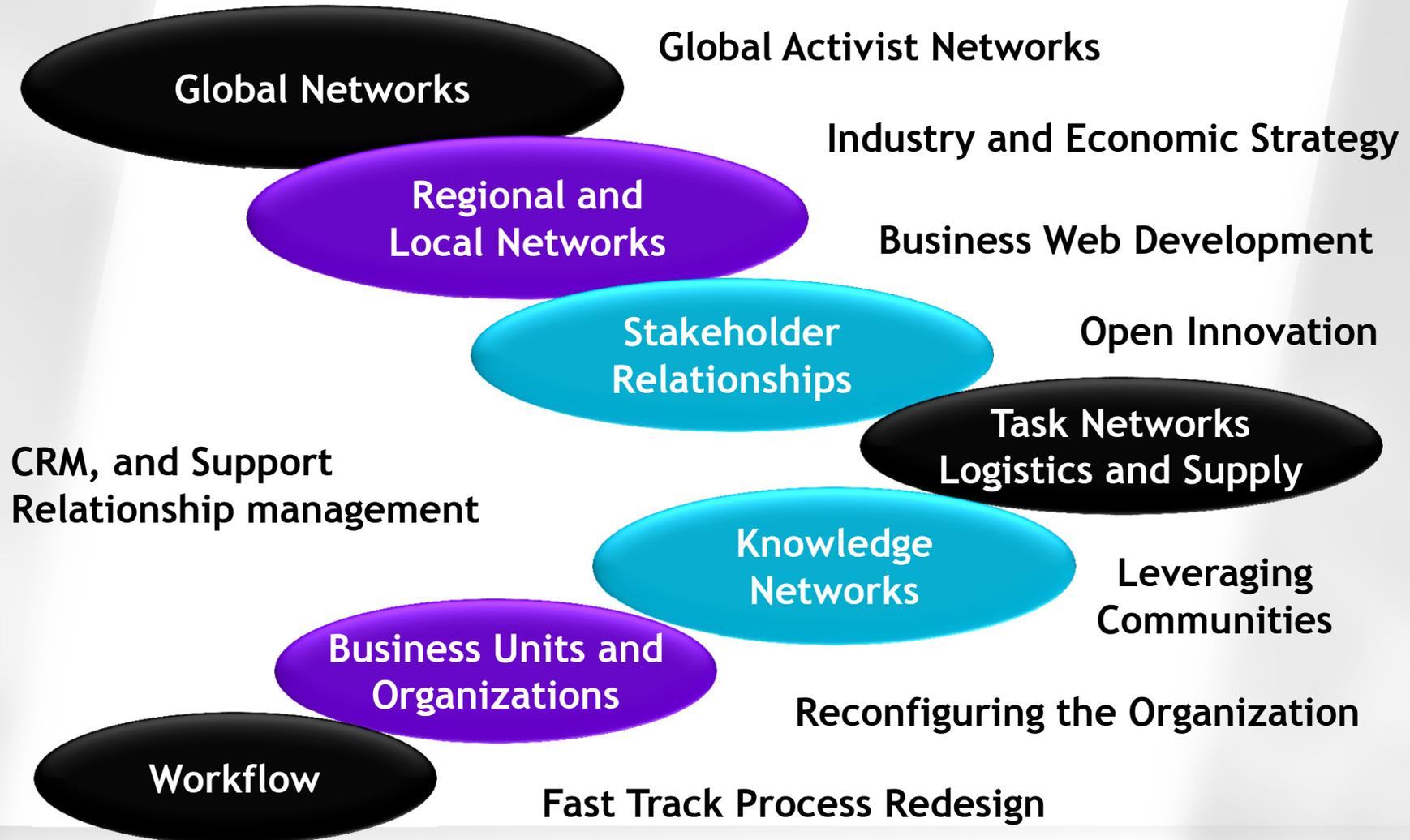
The emergent purpose **and value dynamics of the network** are revealed through the particular pattern of **roles** (contributing individuals or organizations) and their unique negotiated **value exchanges** in service fulfilling an economic or social goal or output. Shared purpose and values may be *either tacit or explicit but can be deduced from the network patterns and the nature of the exchanges*. Value is continually being negotiated in this context of both individual and overall purpose and values.

## Empirical Study

For a better understanding of how processes and people create value in an airport network ecosystem, the Value Network Analysis (VNA), a methodology proposed by Allee and colleagues (Allee ,1998, 2000, 2003, 2008; Allee and Taug 2006; Venezia et al., 2007; Allee and Schwabe, 2009), has been used for this research.

The ability of VNA to better describe effective work networks has been demonstrated at many organizations addressing a wide range of business issues. The number of published case studies and academic articles referencing and applying Value Network Analysis is multiplying rapidly with more than 50 relevant academic articles published in 2007, more than double those published in 2006. Company adoption of VNA, especially the Allee method, has been growing rapidly in global companies, government agencies, and civil society organizations and networks (Verna, 2009)

# Where it can be used

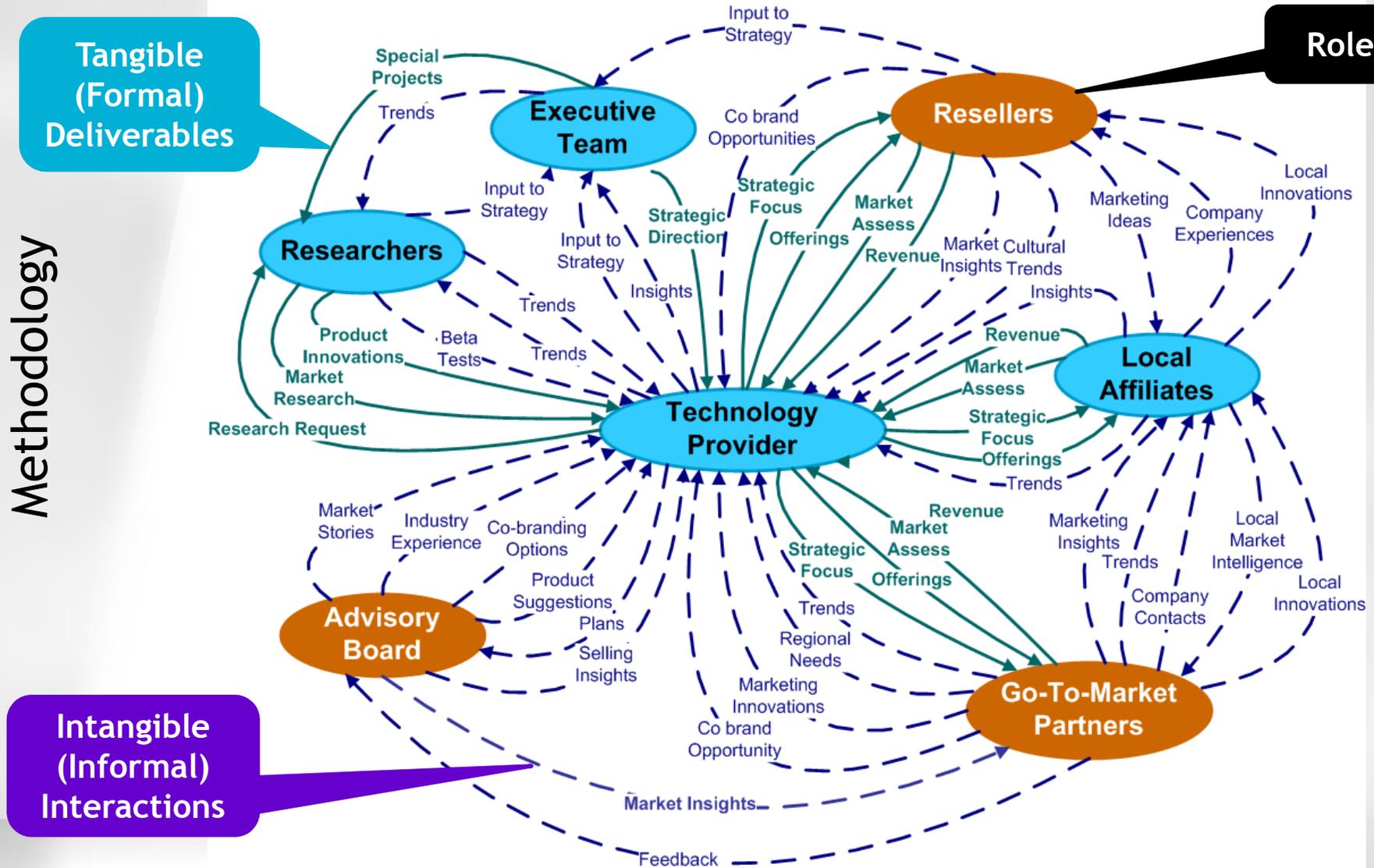


## Empirical Study

The methodology includes the following characteristics:

- Addresses **financial** and **non financial value**;
- All business relationships include contractual or statutory activities (**tangibles**) among participants and **also** informal exchanges (knowledge, favours and benefits) (**intangibles**);
- A **visual map** or diagram that shows the essential contractual, tangible revenue or business funding-related transactions and exchanges that occur between **each node** of the network; the critical intangible exchanges (informal knowledge exchanges and benefits or supports that build relationships) are also made visible.
  - Intangible exchanges, traditionally ignored by the business practices, are a fundamental key for creating trust and opening ways for innovation
- The **nodes** represent individuals or groups of individuals (eg. business unit, aggregate groups, type of business in a network of industry) and each node is analyzed from a perspective of the **role** it plays within the system.

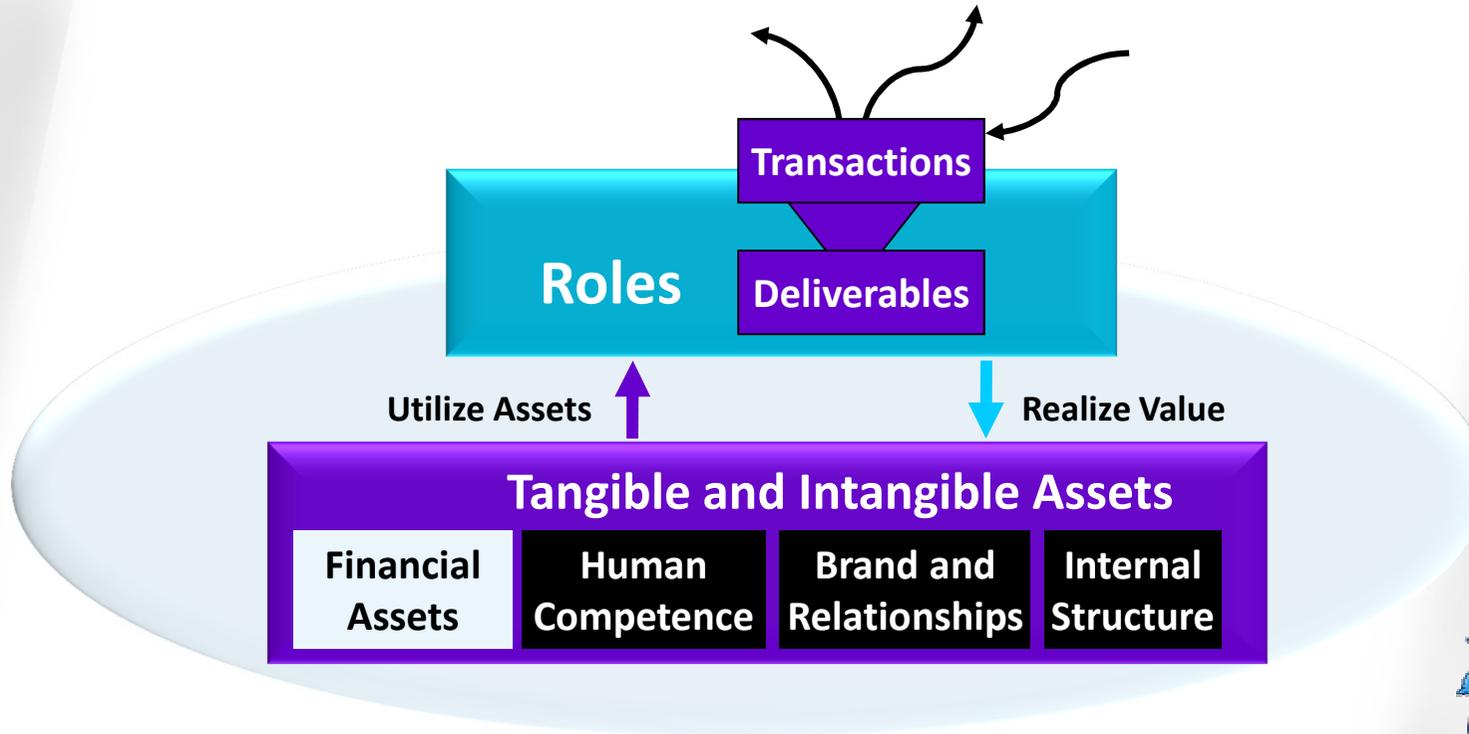
# Value Network Modeling



# How People Create Value

By assuming or creating *roles* ...  
to *convert* tangible and intangible assets into *deliverables* ...  
that can be conveyed to other roles through the execution of a *transaction*.  
In turn, value is *realized* by companies when they convert inputs into gains.

Methodology



## Value Conversion

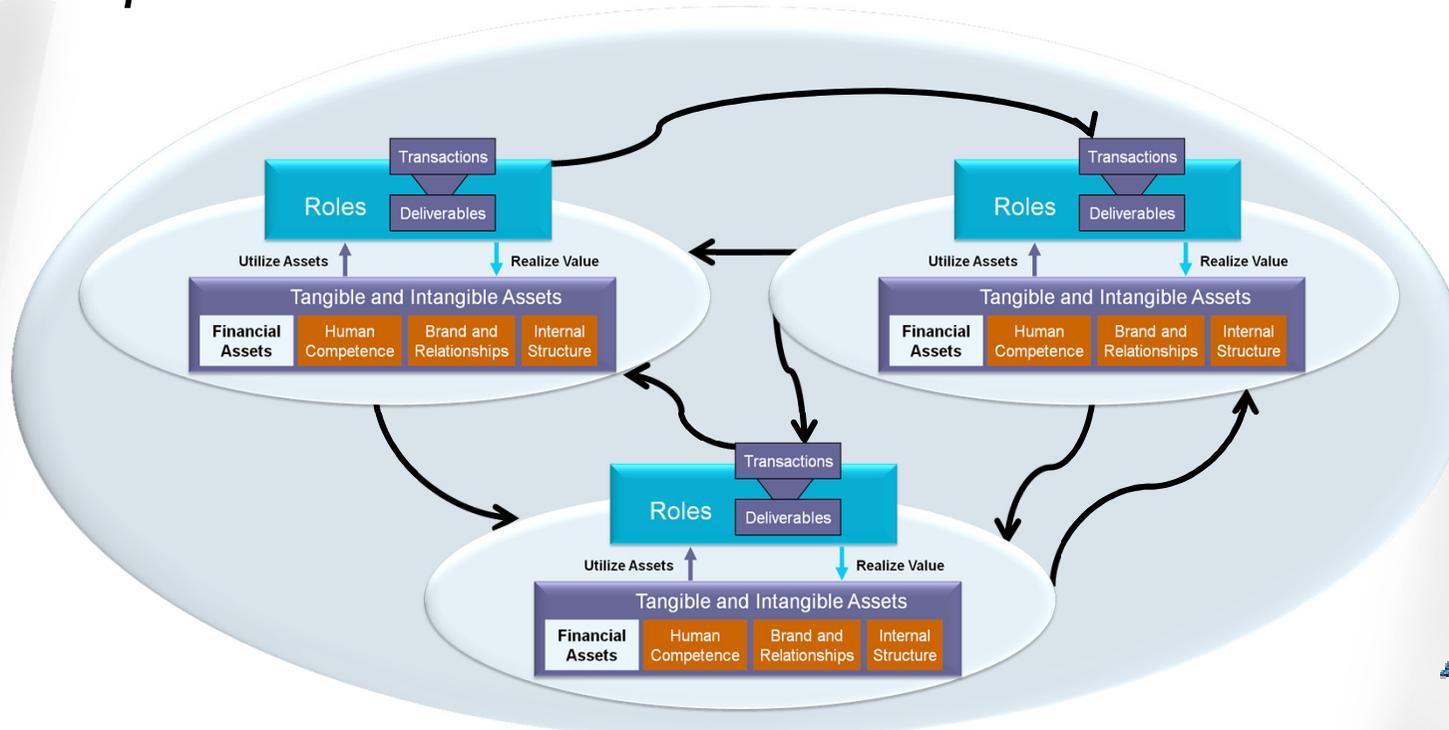


Theory

## How Networks Create Value

The emergent purpose of the value network is revealed through the pattern of *roles* and *value exchanges* that support an economic or social output. Sustainability depends on a consistent high level of *both* transactional and network *perceived value*.

Methodology



## Value Creating Network



Theory

# Empirical Study

With a variety of assessments (using Excel spreadsheets), this analysis allows to gain insights into what is happening into the airport ecosystem, where more value can be realized, and what is required to achieve maximum value benefit across the entire business activity or ecosystem.

Our study maps the interrelationships between the airport's players and the hinterland's players in four different scenarios, considering the related impacts in the form of the tertiary effects and perpetual effects:

- 1-Air traveler experience;
- 2- Cargo experience;
- 3- Supply chain scenario;
- 4-Infrastructure development

# Empirical Study

## Methodology

- The first scenario results from the existence of the air transport services for the use of individuals;
- The second for when companies need a high speed and quality transport service.
- The third scenario considers the supply of goods and services that contribute to the operations of an airport
- The fourth scenario considers perpetual effects associated with the regional economy considering that an infrastructure investment will raise the level of activity and stimulates productivity, setting in progress a bigger and longer lasting cross regional economic development leading to profitable scale economies.

The validation of each scenario requires two steps:

- 1- Interviews with several experts (ongoing)
- 2- Realization of workshops with focus groups, to identify the perceived value of transactions for “senders” and “receivers” (next path)

**Cargo experience:** subject of analysis in this presentation

## Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

### Main Findings of Cargo Scenario

For this Scenario, we consider some conditionals related with the contractual nature of the relationships among roles.

Considering export firms or imports firms as local business, there is a symmetry when we draw a simplified sequence of the cargo transport, as we can take the inverse path. The Air Carrier role is considered the point of symmetry of this sequence.

Export Firm → Freight Forwarder A → Ground Handling A → Air Carrier → Ground Handling B → Freight Forwarder B → Import Firm

Import Firm → Freight Forwarder B → Ground Handling B → Air Carrier → Ground Handling A → Freight Forwarder A → Export Firm

Thus, there is no need to separate roles involved in the process, as we consider both agents assume the same responsibilities in both lands, being only separated by the distance and the flight itself.

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

1<sup>st</sup> Step: Contact between businesses

The sine qua none condition of the realization of the whole cargo scenario is the existence of a contract deal between a local business and a foreign business. Several informal contacts (intangibles) normally occur before the closure of the deal.

According to the contract, the cost of the merchandise transport can be shared in several ways, involving more or less participants in the process. For example, if the first firm only supports the cost of the transport until the ground handling unloads a cargo aircraft, the second firm will have contractual relationships with the Freight Forwarder present in the second country, or eventually will go directly to the airport to get the goods. Outnumbering scenarios could be made, depending on how the firms try to minimize their costs.

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

1<sup>st</sup> Step: Contact between businesses (cont.)

Since there is so much flexibility in the contracts, we consider that the local business will endorse the costs of the transport, and the import firm will receive the goods in its warehouse. **This allows us to consider the most roles that can be involved in this scenario.** The local business will then make a contract with an insurer, which will provide insurance for the goods during the transport.

At this time, the Freight Forwarder (local and foreign) and Ground Handling Operator would need to have an insurance contract as well. That contract would provide safety for their activities.

The freight forwarder contacts the air carrier to proceed to the flight booking and space reservation inside the aircraft. The air carrier establishes contracts with the airport managers to buy slots, normally for a reasonable period of time.

## Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

2<sup>nd</sup> Step: transporting the goods from the local business to the origin airport

For this procedure and after the whole path for the goods have been traced, the local freight forwarder goes to the local business to pick up the merchandise. Next, a first verification of the needed documents ensues, and the freight forwarder checks if the packages are correctly packed and correspond to the initial description.

The freight forwarder transports the goods to the ground handling operator, where the good will be stored at the warehouse.

The ground handling agent will, at his turn, verify the whole package, seal it and treat it according with its content, and emit carry documentation. This document, along with the transaction bill, are necessary to pass the frontier when the transaction is made inside the EU.

Informal contacts are made along the path of the merchandise, in order to ensure both business agents are kept informed about the process. Those contacts are critical, as they permit to contour several abnormalities, such as delays and possible shortcuts, damage of the goods, and so on.

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

3<sup>rd</sup> Step: Flight and reception of goods

After the loading of the airplane, the flight goes to its destination. The foreign ground handling operator unloads the aircraft and proceeds to the storage of the good in a warehouse.

The customs are contacted to supervise the merchandise, label it, and emit a bill note to the ground handling operator. The merchandise will only be dispatched after the payment and conformity of the package.

The Foreign Freight Forwarder goes to the airport and takes the merchandise from the warehouse to the foreign business.

Informal contacts are kept along the way



# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

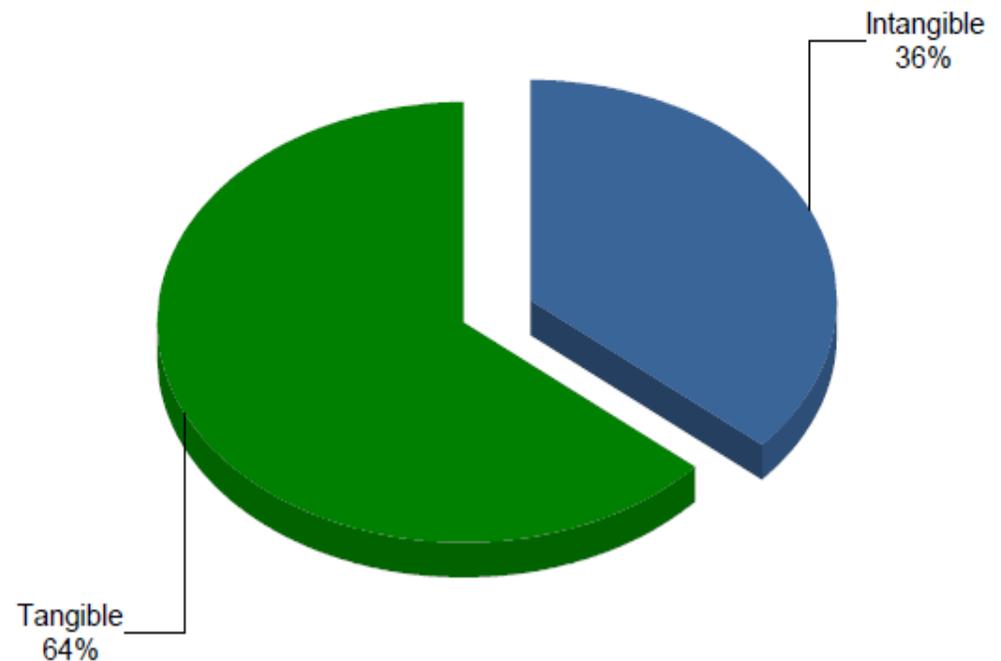
## Main Findings of Cargo Scenario

**Resilience of the network** : critical for the network to respond to changing conditions.

- requires the right balance of formal structure to informal knowledge sharing
- In process-focused operational networks a higher level of tangible transactions than intangible is normal.
- the Ratio of Tangible/Intangible Transactions is helpful as an indicator of the Resilience of the network.

Cargo Network: Formal structure with systematized processes and established routines

Percentage of tangible/intangible deliverables



Ratio intangible/tangible transactions:	0.57
Count intangible transactions:	32
Count tangible transactions:	56
Count all transactions:	88
Number of roles:	8

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

**Value Creation:** The active agents for Value Creation are the Roles in the network.

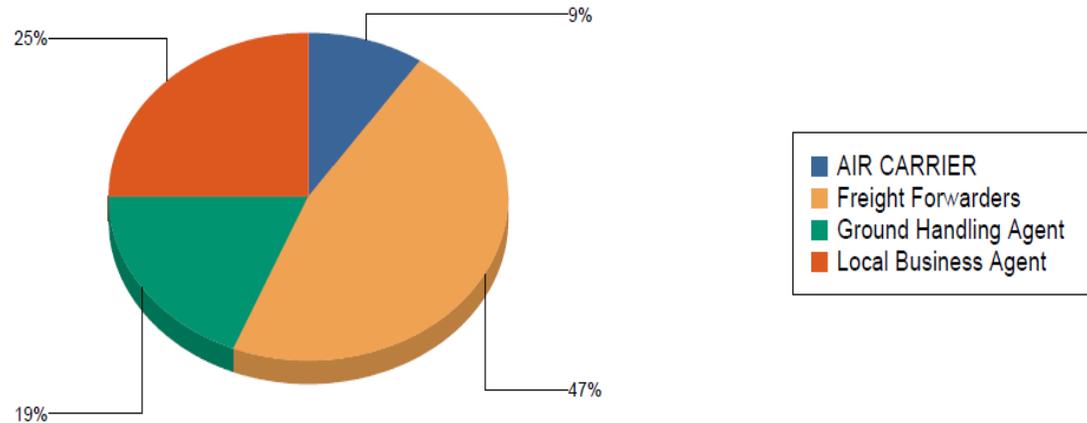
- Capacity for each Role to generate both tangible and intangible value.

- A decrease over time in value outputs can be an indicator that resource availability or productivity has declined.

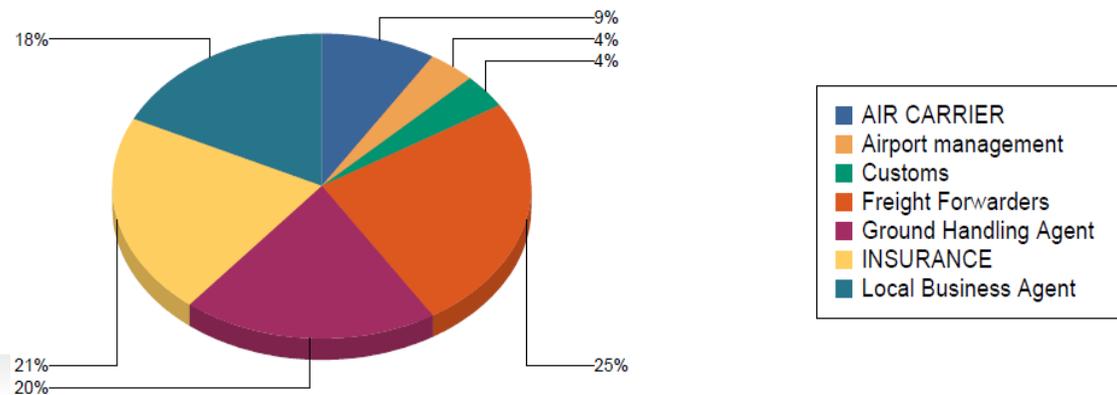
- An increase in value outputs with minimal additional resource demands is an indicator that value productivity is improving. The capacity of a network to generate value depends on good asset utilization - in both financial and non-financial terms.

Cargo Network: Freight Forward's Role generating more value (tangible and intangible)

Percentage of Intangible Deliverables Generated by each Role



Percentage of Tangible Deliverables generated by each Role



Average Number of Deliverables per role: 11.00

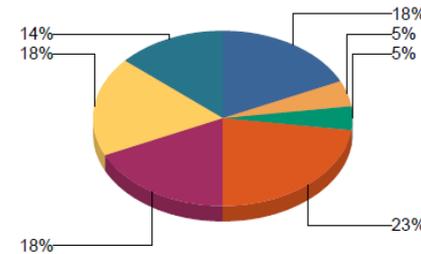
# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

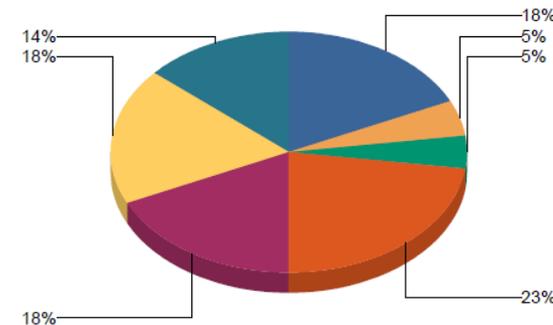
**Structure and Value:** How do Roles gain or contribute value?

- Centrality Indicators: help to see value from a structural standpoint.
- Centrality: classic network indicator that shows which Roles have the most ties. Roles with more ties hold important structural positions; may have access to more of the resources of the network as a whole
- A Role with a strong position structurally does not mean it is providing the most value to the network.
- examining incoming and outgoing ties separately, using Centrality indicators
- Centrality In Degree = the value a Role *gains from the network*
- Centrality Out Degree = the value a Role *provides to the network*

Number of Incoming Deliverables by Role



Number of outgoing connections for all transactions



Cargo Network: Freight Forward's Role with more ties (strong structural position), receiving and sending more value

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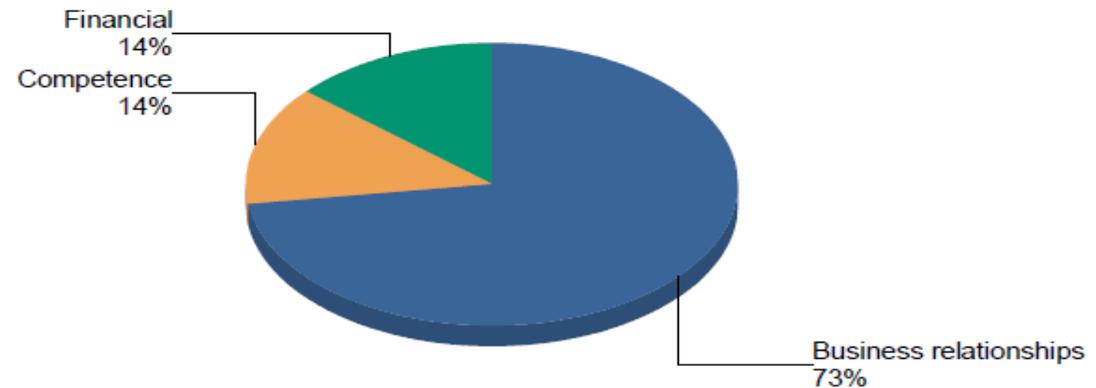
## Main Findings of Cargo Scenario

**Asset Impact:** assess the impact of a transaction to the network as a whole

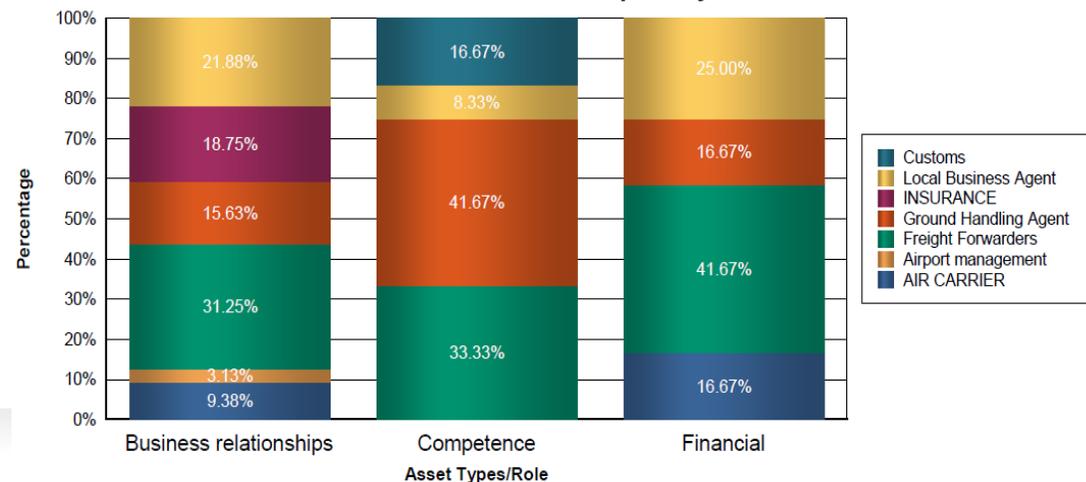
- which assets are impacted by the transaction activity in the network
- which assets are most affected by the network behavior as a whole and by the actions of specific Roles.

Cargo Network: The asset "business relationship" most affected by the network behavior as a whole. The role of " Freight Forward" has great impact over business relations, competence and financial assets. The role Ground Handling impacts essentially over the asset "competence"

**Asset Impact All Transactions**



**Distribution of Asset Impact by Role**



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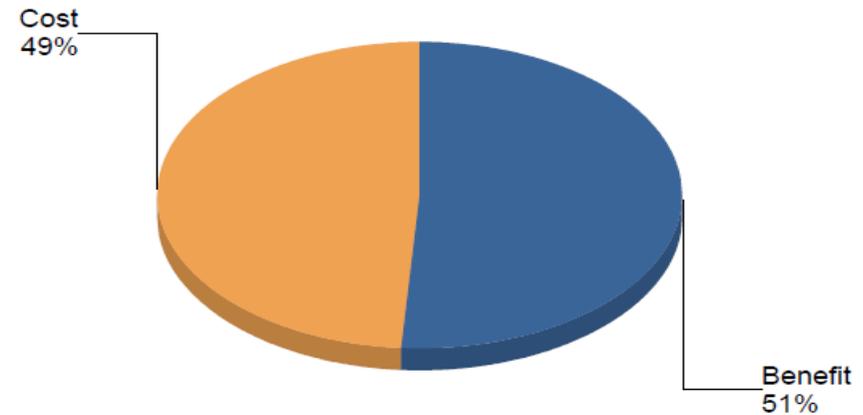
## Main Findings of Cargo Scenario

**Asset Impact - Cost/Benefit :** Once the impacted Asset has been identified the next question is, "Does the transaction have a positive or negative impact on the asset? When the Deliverable is received how is it going to impact the overall asset picture?"

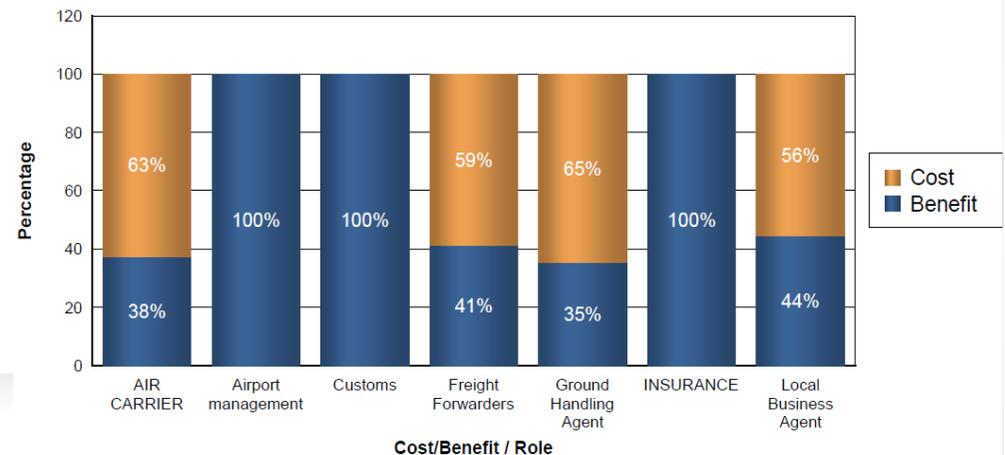
- completion of a financial transaction would provide a positive *Benefit for Financial Assets*. Completion of a *knowledge deliverable* might have a positive *Benefit on Human Competence*. Completion of a *regulatory compliance transaction* might have a negative *Cost financially*

Cargo Network: All transactions have more positive impacts (benefits) than negative impacts (costs) on the assets, mostly for the roles of Airport Management, Customs and Insurance

Cost/Benefit Ratio - All Transactions



Cost/Benefit Percentage by Role



# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

**Transaction speed indicator:** refer to how slow or fast the Deliverable is executed and released by the Role. Used this way it would more represent “wait time” for a Role to complete and send the Deliverable. This approach is useful to identify where there may be Roles that could be better supported with resources or improved processes for faster execution

- The average speed is calculated by giving the rating of: Fast = 1, Medium = 2 and Slow = 3

Cargo Network: All transactions (tangible and intangible) are fast executed and released by the roles

### Average Speed of All Transactions:

Total Number of Transactions: 88

Average Speed: 1.00

### Average Speed of Intangible Transactions:

Total Number of Transactions: 32

Average Speed: 1.00

### Average Speed of Tangible Transactions:

Total Number of Transactions: 56

Average Speed: 1.00

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

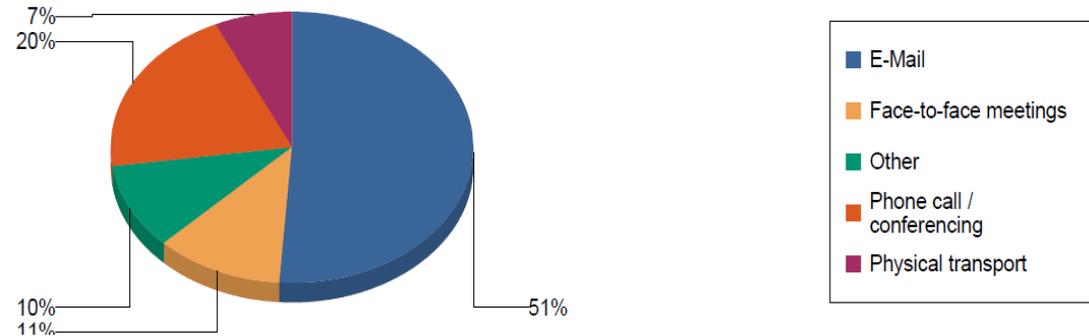
## Main Findings of Cargo Scenario

**Channel profile:** provides a way to consider the effectiveness of different delivery mechanisms for specific Deliverables

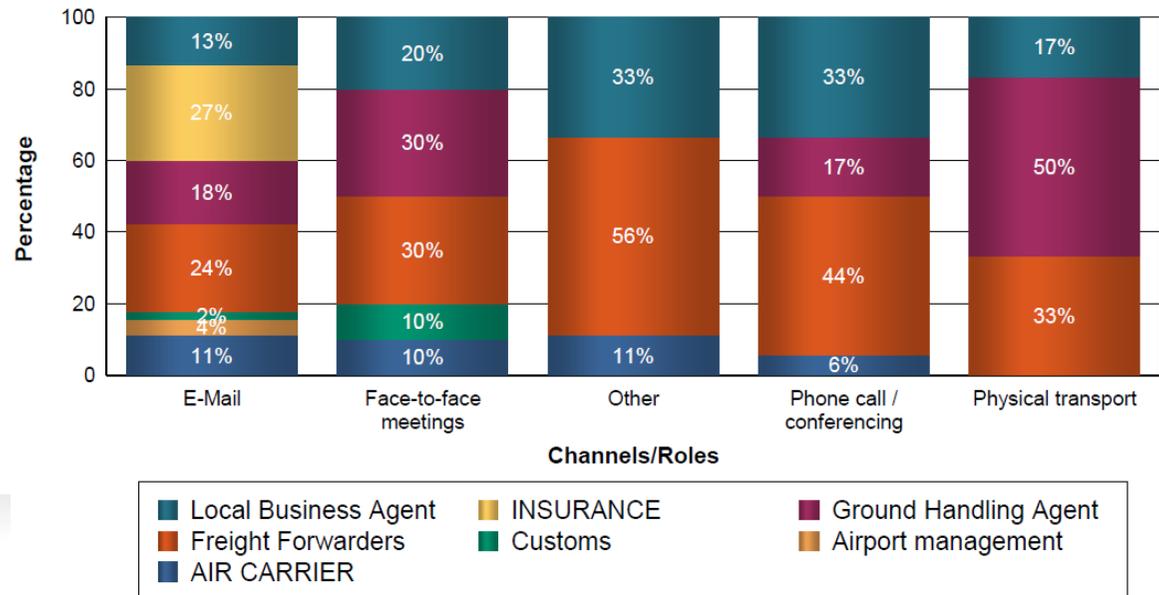
- Some companies rely heavily on face-to-face meetings, where video conferencing might be a more effective way to work. Other companies rely on technology and systems for delivering information or automating provisioning

Cargo Network: email the most present channel in all transactions.  
The preferred type of channel varies depending on the role

Percentage Channel Usage All Transactions



Role contribution per Channel



# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

**Risk:** if there is too much Structural Dependency on a Role then it can affect the entire network if something goes wrong.

-Structural Dependency is based on *centrality*, one of the most common structural indicators in network analysis.

-Centrality is about which Roles or Participants have the most ties or connections. In classic network analysis, high centrality is generally viewed positively as an indicator of prominence or high prestige. However, in value network analysis, extremely high centrality for any one Role or Participant may actually be a risk factor for the network

- Structural Dependency correlates to variance between the connections of all the Roles. We can assume that the higher the variance the more we are likely to find some Roles with many connections and others that have almost none. This means that power in the network is not well distributed. The wider the variance the higher the risk to the network. The network might be unduly influenced or controlled by one or two Roles. In such cases the network might break down or disintegrate if those Roles for some reason disappear or are unable to perform

Structural Dependency	All	Intangible	Tangible
a) Highest Number of connections per Role for Transactions	55	21	34
b) Lowest Number of connections per Role for Transactions	2	1	2
c) Variance Transactions	315.50	39.75	110.75
d) Average number of connections per Role for Transactions	22.00	8.00	14.00

Cargo Network: Unless two roles (customs and airport management) the other roles have many ties. Is not a very centralized network

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

**Agility:** how quickly information can move around the network.

- Degrees of separation, technically referred to as “distance” in a network is a measure of how quickly information can spread out across the network to reach all members.
- An important indicator of a network's agility in being able to make sense of and adapt to internal and external changes.
- Also an indicator of how easy it is for any individual to reach the person who might be able to solve a specific problem.
- A high average distance between Roles can be an indication that there are not enough hubs or connectors in the network

Average Degrees of Separation for all Transactions	:	1.86
Average Degrees of Separation for all Intangible Transactions	:	0.86
Average Degrees of Separation for all Tangible Transactions	:	1.86

Cargo Network: intangible transactions with more agility

# Dynamic Processes of an Airport's System. A Value Network Analysis of Cargo Experience

## Main Findings of Cargo Scenario

**Stability:** revealed by measures of network Density.

- Weak Tie Stability: the most significant Density indicator
- helps us understand the extent that the loss of connections in the network will impact performance of the network as a whole.
- Weak Tie Stability: ratio between intangible and tangible transaction density.
- The higher the ratio, the more dominant the density of intangible connections. The lower the ratio, the more dominant the density of tangible connections.

**Weak Tie Stability:**  
(intangible / tangible)

**0.57**

Cargo Network: density of tangible connections are dominant

## Conclusions

- Value Networks are sets of roles, interactions, resources and relationships that generate economic or social value
- Any purposeful organization or activity can then be understood as a value network
- The ability of VNA to better describe effective network of the Airport System justified the option for this methodology
- Applying the VNA methodology to the Cargo Scenario we concluded that:
  - The most important Roles for the Cargo Network are the Freight Forwarder , Ground Handling, Local business, Insurance, Air carrier, Airport management and Customs
  - The Cargo Network presents a formal structure with systematized processes and established routines
  - Density of tangible connections are dominant
  - Freight Forward's Role is generating more value (tangible and intangible) (the active agents for Value Creation are the Roles in the network)
  - Freight Forward's Role with strong structural position (more ties),receiving and sending more value
  - Unless two roles (customs and airport management) the other roles have many ties. Is not a very centralized network

## Conclusions

- The asset “business relationship” most affected by the network behavior as a whole
- The role of “ Freight Forward” has great impact over business relations, competence and financial assets. The role Ground Handling impacts essentially over the asset “competence”
- All transactions have more positive impacts (benefits) than negative impacts (costs) on the assets , mostly for the roles of Airport Management, Customs and Insurance
- Different delivery mechanisms for specific Deliverables depending on the role, but email is the most present in all transactions
- Intangible transactions with more agility (how quickly information can spread out across the network to reach all members)
- The next research step - workshops with focus group - will allow to extend the analysis using more indicators

## **Dynamic Processes of an Airport's System. A Value Network Analysis**

*Margarida Vaz*  
*mvaz@ubi.pt*

