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DYNAMIC PROCESSES OF AN AIRPORT'S SYSTEM. A VALUE NETWORK ANALYSIS

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ABSTRACT

The performance of an airport and its efficiency has been measured generally from its operational and financial data, and on that basis, classified its relative position in the set of airports. But this methodology, by itself, is insufficient to determine relationships between a given position in the ranking of an airport and the generated value associated with that position, either within the entire business system of the airport or along the inter-relationships that it establishes with the surrounding community.

We argue that networks are fundamental instruments for the development of the business system of airport's landside areas. Applying the Value Network Analysis (VNA) to the Air Cargo we concluded that this approach provided a network ecosystem perspective into how processes and people create value within the Cargo Network.

Keywords: airport's landside areas, business systems, air cargo network, social network analysis, value network analysis

1. INTRODUCTION

Accordingly to the expected results of the one of the Airdev Project's tasks, related with the hinterland effects, **two main outcomes** will be delivered: 1) A system dynamics model; and

2) a model for the evolution of an airport into a city airport, which derives from the first outcome.

The first will make clear the mechanisms responsible for the generation of economic and social benefits. It must identify the key variables and their relationships that allow evaluating the impacts resultant from the existence of an airport. The second outcome will provide the framework for evolution from airport into city airport, being sufficient flexible to handle with different sizes of airports. The model will include all the relevant activities that may be located in an airport city and also the relevant vectors of development: economic, financial, strategic, marketing and processes.

Transversal to the both outcomes is the concept of system, which relies on networks and dynamic interrelations.

We propose the value network analysis (VNA) for a better understanding of how processes and people create value into the airports' network ecosystem. This methodology makes possible to understand and visualize the internal and external value networks, mapping the players and their interrelationships and thus capturing the dynamics of the entire airport's system.

Our study maps the players and their interrelationships in **four different scenarios**: the air traveler experience, the supply chain, the infrastructure development and the air cargo experience.

On the context of this paper only the air cargo scenario will be presented.

2. THEORETICAL FRAMEWORK

Much of the relevant literature refers to the huge economic impact of airports on local, national and international economies. Indeed some airports contribute to national and/or international economies, but the mechanisms by which the regions are benefited by the existence of an airport remain still fairly unknown.

A number of limitations in the practice of airport economic impact studies were identified (TRB, 2008), which raise the question if the metric of the impacts is the more adequate and even if this metric is more important than majoring the opportunities associated with airport.

The adequacy of any method (traditional or not) to measure net benefits, impacts or even to identify relevant vectors of development depends on the understanding of the complex roles and spatial interactions actually associated with a given system. The same is true when the goal is not the metric of the impacts but instead majoring the opportunities associated with that system. These facts call for refreshed conceptual frameworks for better understanding

the regional opportunities and constraints associated to airports and, at the same time, for integrative models that allow recognizing and understanding the nature and importance of international, national, regional and local airports' sustainable growth.

In this context, quantification alone is not enough for the understanding of such complex systems. Matters of pattern, structure and value conversion must be considered along with several levels of analysis.

Network approach is viewed as one strategy for cross-level analysis and has been used to understand the conversion of the value of financial and non-financial assets in other forms of value.

2.1 Networks and Social Network Analysis (SNA)

The concept of network is being used in scientific literature in two directions (Romeiro, 2007), particularly relevant in the context of this paper. As a 1) fundamental architecture for the economic, social and institutional organization: in this context a network represents an organizational structure comprised of independent elements that establish relations between them for medium-long term, based on the will of the elements to work together around common objectives, which could not be achieved in the same way through individual work (Vernon, 2005); and as an 2) explanatory principle of complex realities structure: in this sense the concept of network refers to a set of actors (individuals, institutions or organizations) bound by a set of social relations of a certain type (friendship, business or other), (Gulati, 1998). Therefore, the social network can be viewed as a series of links that are established between a defined set of social actors (Requena, 1989; Powell and Smith-Doer, 1994).

Both perspectives of analysis are important for this research. While organizational structure the concept of network is 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). The network is established under the premise that all organizations within a network are interdependent, meaning that the behaviour of one organization affects and is affected by the behaviour of the others organizations. This design points out explicitly the 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).

Applications of Social Network Analysis (SNA), have increasingly 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, 2009:2).

However some inherent limitations of SNA have been limited that progress (Allee, 2009):

- Although SNA provides a structural analysis of the network linkages does not directly address economic or social value creation and outputs;
- Remains to be demonstrated adequately the empirical link between organizational structure and performance of companies;
- The links defined in a social network are of the same nature and only one link is represented among actors. When there are multiple variables and unique features, it becomes necessary to build separate networks for each different type of social or economic exchanges between players, which turns the analysis very weighty;
- Due to the high level of technical expertise needed to analyze and interpret the patterns of the network, the use of SNA as a management tool is limited.

2.2 Value Network Analysis (VNA)

To overcome these limitations Allee (2008) proposed a network methodology that allows measuring the value creation of networks. According to this author (*op.cit.*, 2008:2) (...) *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..*

According to Allee (2008) **value network** is any set of roles and interactions in which people engage in both tangible and intangible exchanges to achieve economic or social value. This definition allows application of the value network perspective to the a) **internal** value networks focused on the sets of relationships between individuals, within and among work groups and between and among the various work groups that make up the organization; and to the b) **external**-facing value networks, which comprise those between the organization and its suppliers, its investors, its strategic business partners, and its customers.

Another related concept is **value conversion**, which refers to the act of converting or transforming financial to non-financial value or transforming an intangible input or asset into a financial value or asset. When considering value conversion, it is necessary to assess the inputs and outputs for each role in the network to determine whether value conversion opportunities are being overlooked. Also the network is a value conversion mechanism that achieves not only positive goods and outcomes, but nefarious and negatives ones as well, according to the values and intent of those who serve the network.

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.

Based on these concepts, Allee (2008) proposed a methodology called Value Network Analysis (VNA) which provides a network ecosystem perspective into how processes and people create value.

This methodology presents several advantages in comparison with the traditional SNA (Allee, 2008):

- It shows both structured relationships and the informal yet essential flow paths of knowledge sharing and support;
- Provides a perspective for understanding value creating roles and relationships, both internal and external, upon which an organization depends;
- Offers dynamic views of how both financial and non-financial assets can be converted into negotiable forms of value that have a positive impact on those relationships;
- Explains how to more effectively realize value for each role and how to utilize tangible and intangible assets for value creation;
- Provides a systematic analysis of how one type of value is converted into another.

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).

It is the case, for example, of the Cisco's Global Call Center. Value networks and VNA were fundamental and highly instrumental in achieving advancements in Cisco's Global Call Center strategy. Following LaVeta Gibbs, former director of Global Contact Center Strategies for Cisco "Value Network Mapping of an organization, or even better, multiple organizations is the most unbiased and necessary view into what really goes on in business interactions. If done successfully, it changes the way job roles and the value of interactions is perceived and measured."

Mayo Clinic, one of the largest medical clinics in the U.S, adopted VNA to solve problems related to the time that patients had to wait (six months) to get a confirmed appointment for a critical medical procedure. ValueNet Works analysts identified a key bottleneck that other management tools, including Lean analysis, could not identify and reduced the wait time to four weeks .

AgResearch, the New Zealand's largest crown research institute, identified through VNA method how a twelve-year innovation process was being disadvantaged by differences between scientific research and commercialization networks. Time to market was reduced and employee morale improved by creating new roles, enabling the scientists to focus on

research . Also the value network evaluation was performed in the region Skåne of Sweden in order to explore the regional innovation system.

The Boeing Company is another example of successful implementation of VNA. They launched a complex new product which significantly expanded daily product testing without a corresponding increase in resources. The flight test team completely changed the business unit model and increased the number of tests that could be performed through the use of VNA in combination with process engineering. VNA is now being used to achieve similar gains in productivity for other business units within the company.

3. DYNAMIC PROCESSES OF AN AIRPORT'S SYSTEM. AN EMPIRICAL STUDY

Several studies applied value network analysis to different business and organizational areas but none concerning the application of this methodology to the business system of airport's landside areas as far as we know. Since we argue that networks are fundamental instruments for the development of this domain of activity, in this section we explore how this methodology can be adopted in order to achieve (...) *a more economically efficient, aesthetically pleasing, and socially and environmentally sustainable* (...) development (Kasarda, 2010). Considering that business systems for airport landside areas have to be considered in a global base, we agree with Stevens *et al.* (2007) that the list of system impacts further than the system boundaries has grown through time, but treatments have remained highly specialized and contained within disciplinary paradigms. Even the empirical analysis has been generally limited to the evaluation of the isolated components of a complex system.

These facts call for refreshed conceptual frameworks for better understanding the business opportunities and constrains related with the airport landside and at the same time for integrative models that allow recognizing and understanding the nature and importance of international, national, regional and local airport industry growth and the need for sustainable balanced development.

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, 2002, 2008; Allee and Taug 2006; Venezia et al., 2007; Allee and Schwabe, 2009), has been used for this research.

3.1 Methodology

The analysis begins with 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 **nodes** represent individuals or groups of individuals, as a business unit, or aggregate groups as a type of business in a network of industry and each node is analyzed from a perspective of the **role** it plays within the system.

People generate **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.

Furthermore the critical **intangible** exchanges (informal knowledge exchanges and benefits or supports that build relationships) are also made visible with a value network analysis. These intangible exchanges, traditionally ignored by the business practices, are a fundamental key for creating trust and opening ways for innovation.

The several visualizations and diagrams link to a variety of **assessments** (usually using Excel spreadsheets) allowing to increase value outputs, to leverage knowledge and intangibles for improving financial and organizational performance, and to detect new value opportunities. Through this analysis it is possible to gain insights into what is happening into the ecosystem, where more value can be realized, and what is required to achieve maximum value benefit across the entire business activity or ecosystem that is the focus of the analysis.

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 Scenario;
- 2 - Cargo experience Scenario;
- 3 - Supply chain Scenario;
- 4 - Infrastructure development Scenario.

The first scenario results from the existence of the air transport services for the use of individuals. The second is related with those companies that 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.

For the validation of each scenario, several interviews were done with several experts.

The Cargo experience scenario is the only subject of analysis in the context of this paper.

3.2 A Value Network Analysis of Air Cargo Experience. Research Approach and Main Findings

3.2.1 Research Approach

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.

1st Step: Contact between businesses

The *sine qua non* condition for 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.

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 insurance company, 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.

2nd 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, is 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.

3rd 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.

3.2.2 Main Findings of Cargo Scenario

Following the steps mentioned above, it was possible to identify the **main tangible and intangible transactions** between the **key roles** related with the Cargo Scenario: Freight Forwarder; Ground Handling; Local business; Insurance; Air carrier; Airport management; and Customs. The following figure (Figure 1) allows visualizing the mentioned roles and transactions.

**Value Network:
All
Transactions**

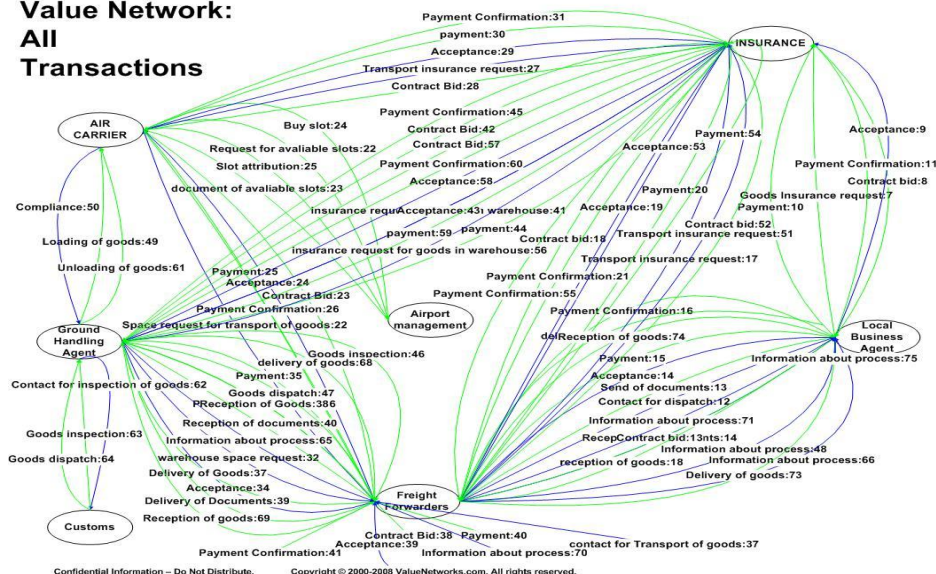


Figure 1 – Value Network Modeling of Cargo Scenario. Own elaboration

Resilience of the network

The Resilience of the network is critical for the network to respond to changing conditions. It requires the right balance of formal structure to informal knowledge sharing. The ratio of Tangible/Intangible Transactions is helpful as an indicator of the Resilience of the network.

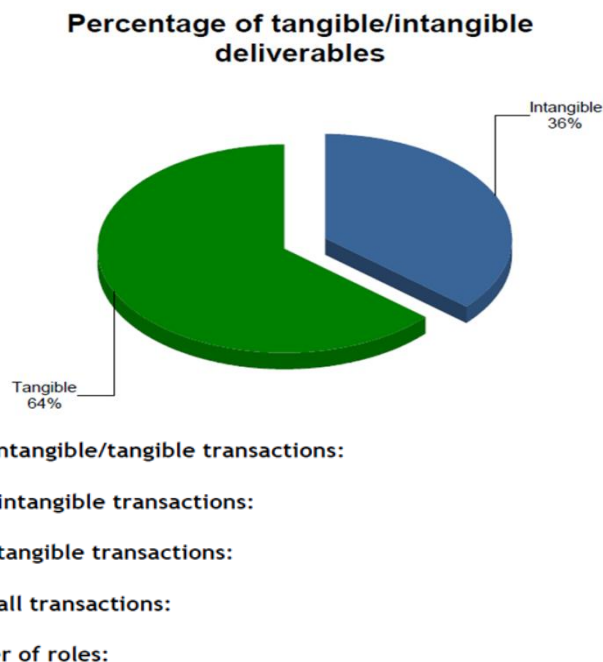


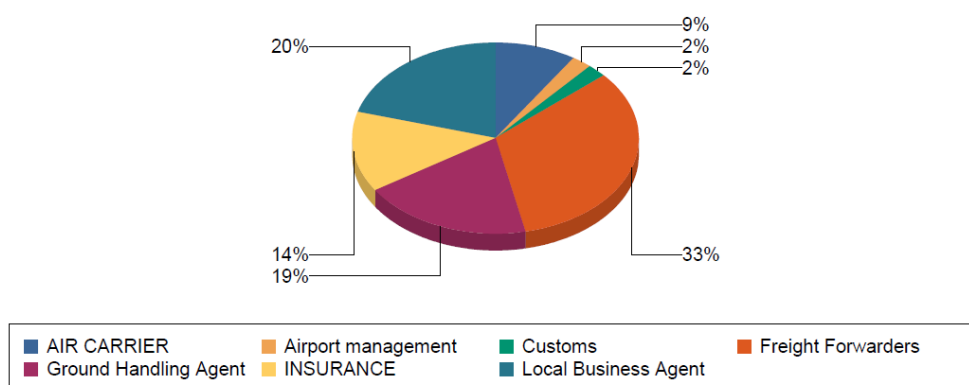
Figure 2 – Resilience of the Cargo Network. Own elaboration

According to VNA, is normal to have a higher level of tangible transactions than intangible in process-focused operational networks. In this context we can state that **Cargo Network is a formal structure with systematized processes and established routines** (see Figure 2).

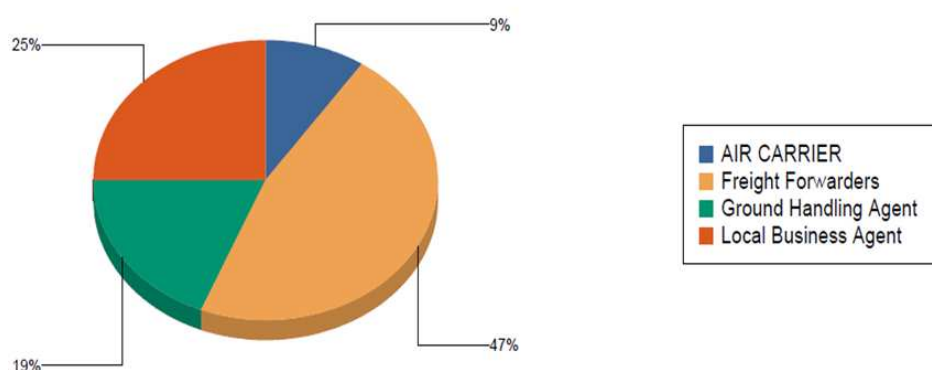
Value Creation

The active agents for Value Creation are the Roles in the network. The value creation depends on the 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.

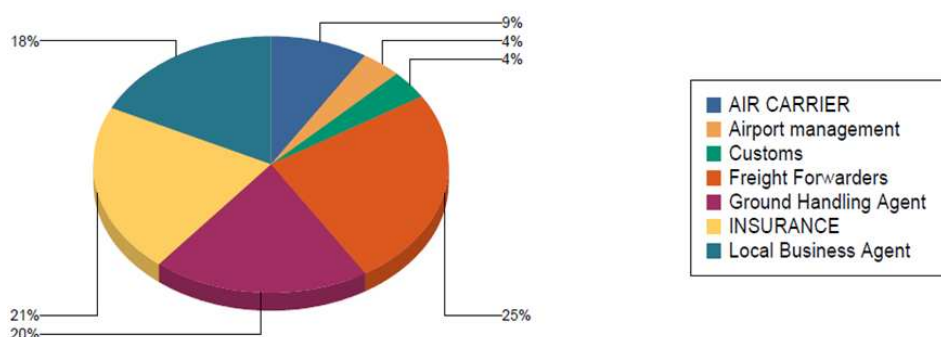
Percentage of all Deliverables Generated by each Role



Percentage of Intangible Deliverables Generated by each Role



Percentage of Tangible Deliverables generated by each Role



Average Number of Deliverables per role: 11.00

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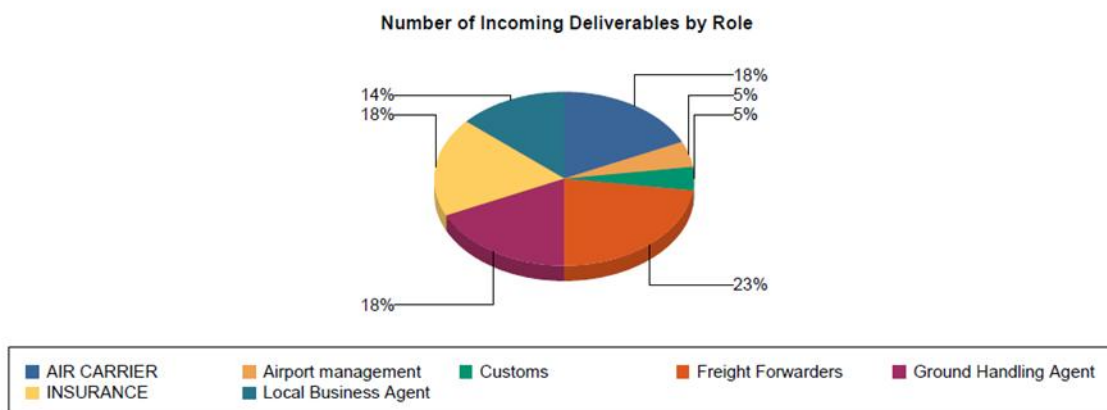
Figure 3 – Value Creation By Cargo Network's Roles. Own elaboration

As the above figure illustrates (Figure 3), the **Freight Forward's Role** is the one that **generates more value** (tangible and intangible) in the Cargo Network, followed by the Local Business Agent (intangible) and the Insurance and Ground Handling roles (tangible).

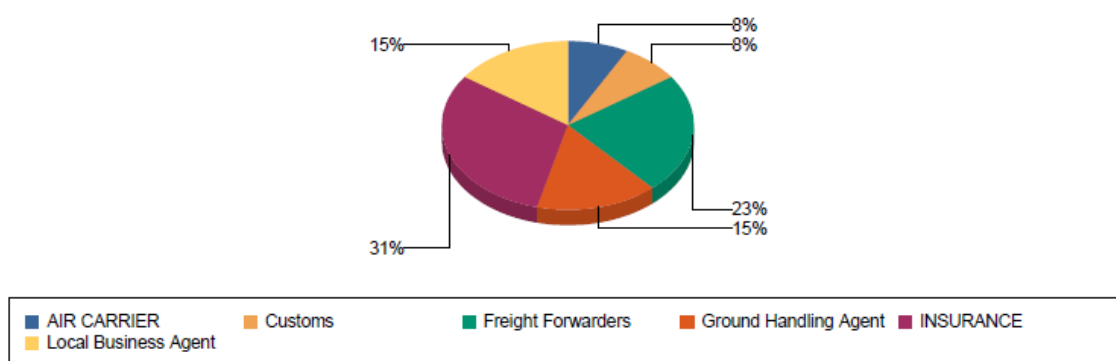
Structure and Value

Centrality Indicators help to see value from a structural standpoint and explains how do roles gain or contribute value.

The Centrality is a 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. Nevertheless a Role with a strong structural position does not mean it is providing the most value to the network. It is possible to examine incoming and outgoing ties separately, using another Centrality Indicators as the Centrality In Degree (related with the value a Role gains from the network) and the Centrality Out Degree (related with the value a Role provides to the network).



Number of Incoming Deliverables by Role For Intangible Deliverables



Number of Incoming Deliverables by Role For Tangible Deliverables

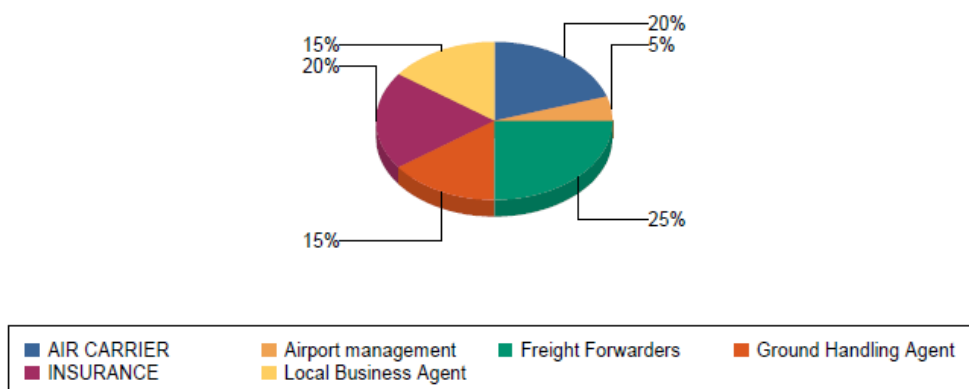
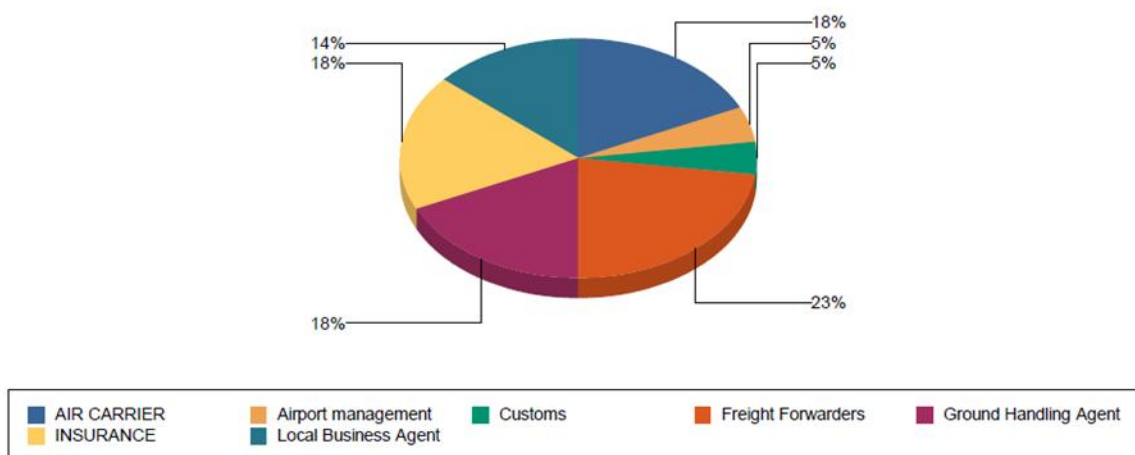


Figure 4 – Centrality In Degree of Cargo Network. Own elaboration

Within the Cargo Network, the Freight **Forwarder's Role** has the **strong structural position** (presents more ties), **receiving and sending more value** (see Figures 4 and 5).

Number of outgoing connections for all transactions



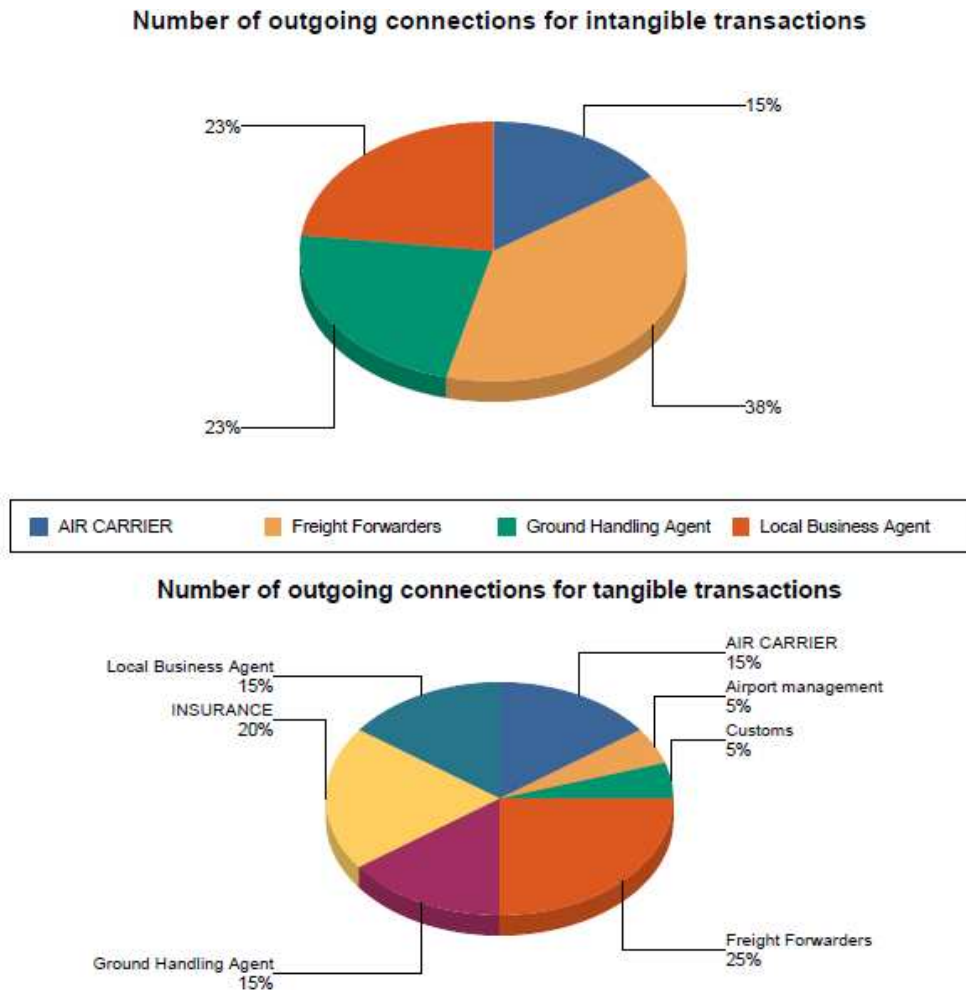


Figure 5 - Centrality Out Degree of Cargo Network. Own elaboration

Risk

One kind of risk to the network shows up in Role dependency. The risk is that the Role could be a bottleneck. If the Role is not adequately resourced then flow paths can be negatively impacted with time delays. If a Role cannot keep the value flow paths moving then it affects the speed of value creation and conversion in the network. A good cross check for whether the Role is a bottleneck is to look at the speed indicators to see if a potential bottleneck Role slows down the value flow paths.

The second risk factor is that 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

Unless two roles (customs and airport management) the other roles of the Cargo Network have many ties, which means that it is **not a very centralized network**.

Asset Impact

Asset Impact measures the impact of a transaction to the network as a whole. Therefore, it is necessary to identify which assets are impacted by the transaction activity in the network and also which assets are most affected by the network behaviour as a whole and by the actions of specific Roles. On this network were identified three main assets: financial, competence and business relationships.

The following charts show which assets are impacted by the transaction activity in the network. These figures are compiled from how individual transactions impact assets. These indicators can be used to consider which assets are most affected by the network behavior as a whole and by the actions of specific Roles.

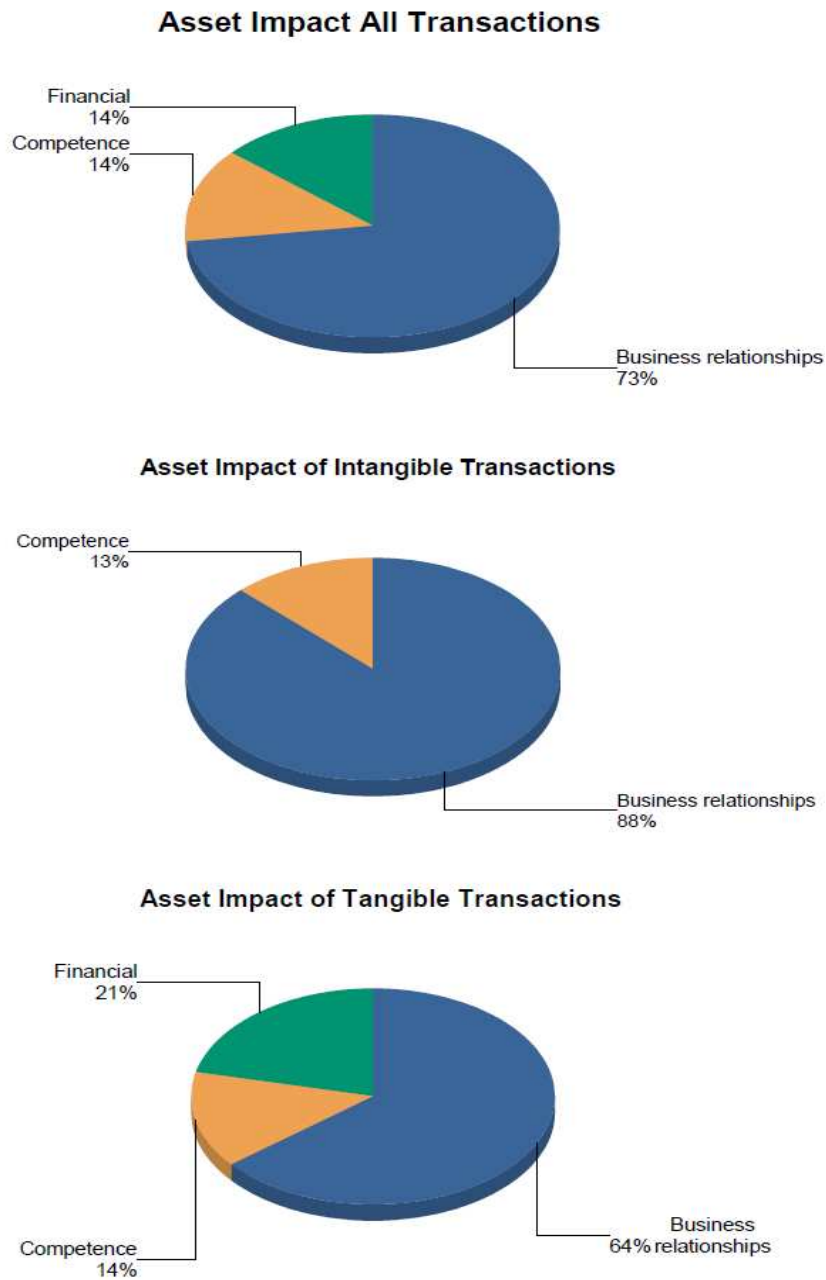


Figure 6 – Asset Impacts of Cargo Network. Own elaboration

On the Cargo Network the “business relationship” asset is the most impacted by the transaction activity of the network as a whole either for intangible or tangible transactions (see Figure 6).

The following charts (Figure 7) show Role distributions for Asset Impact. We can conclude that the **role of “Freight Forwarder” has great impact over “business relationship”, “competence” and “financial” assets**. The role Ground Handling impacts essentially over the asset “competence”.

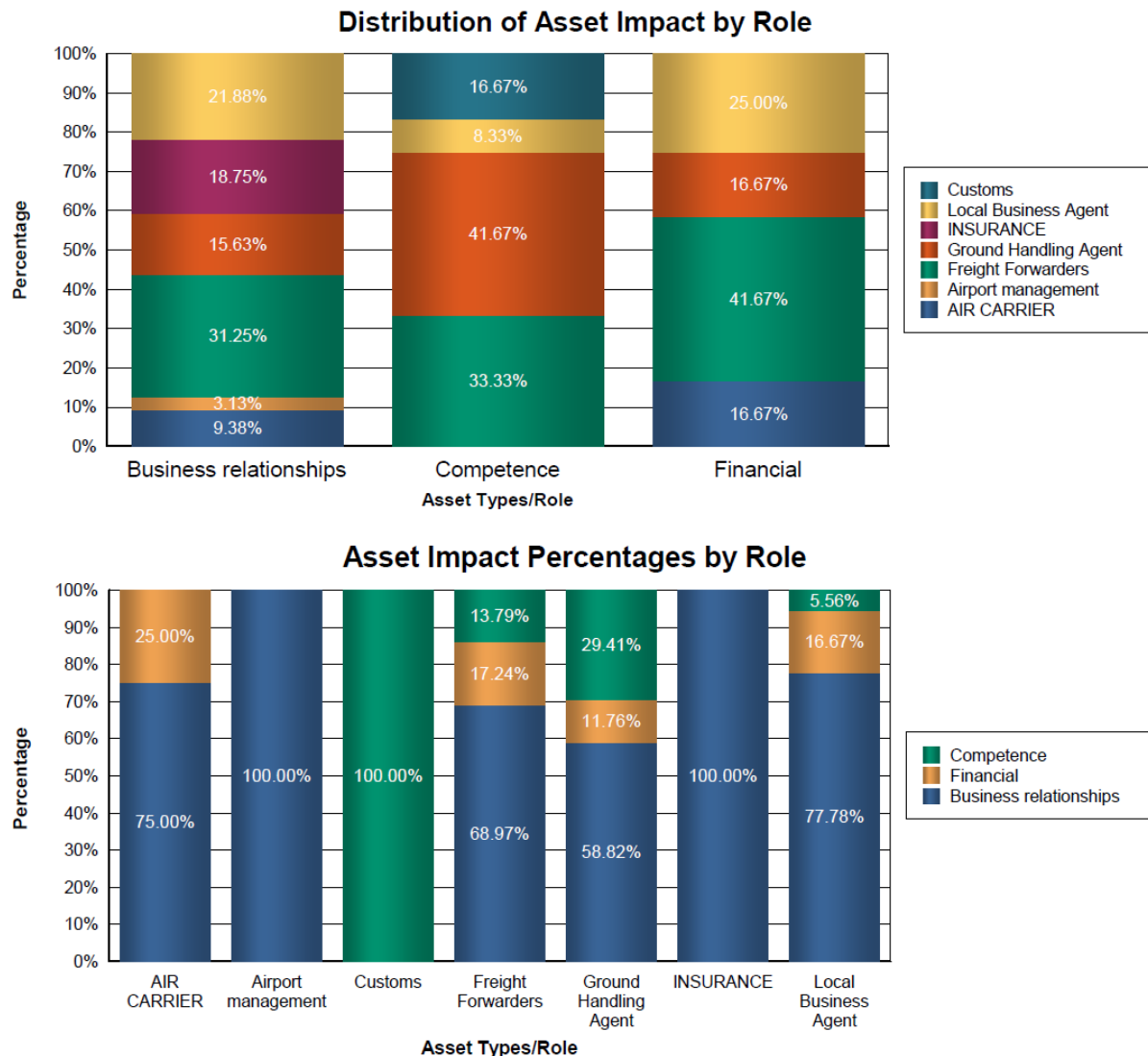


Figure 7 - Role distributions for Asset Impact. Own elaboration

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?” For instance, 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*.

The next figure (Figure 8) shows the Cost/Benefit Ratio from All Transactions, then from Intangible Transactions only and finally from Tangible Transactions.

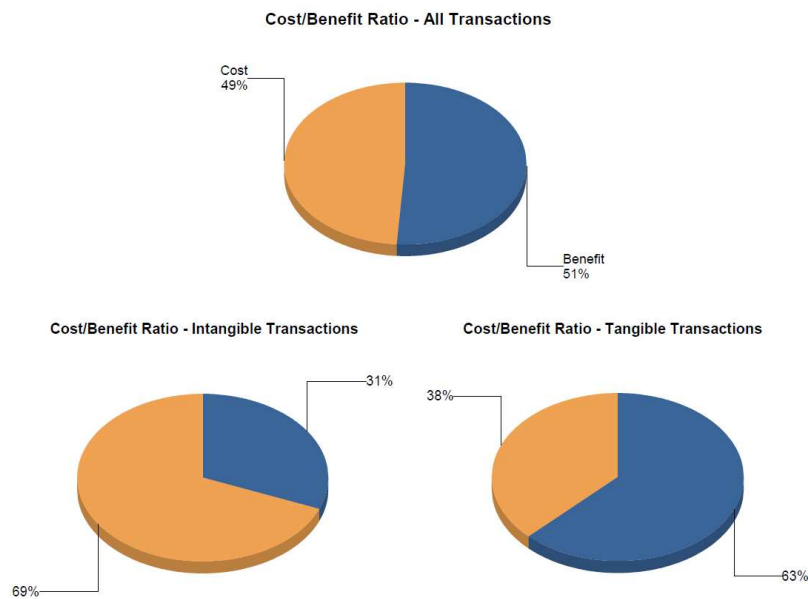


Figure 8 - Cost/Benefit Ratio from Transactions (tangible, intangible and all) of Cargo Network. Own elaboration

The following figure (Figure 9) examines the Cost/Benefit Distribution and Percentage by Role.

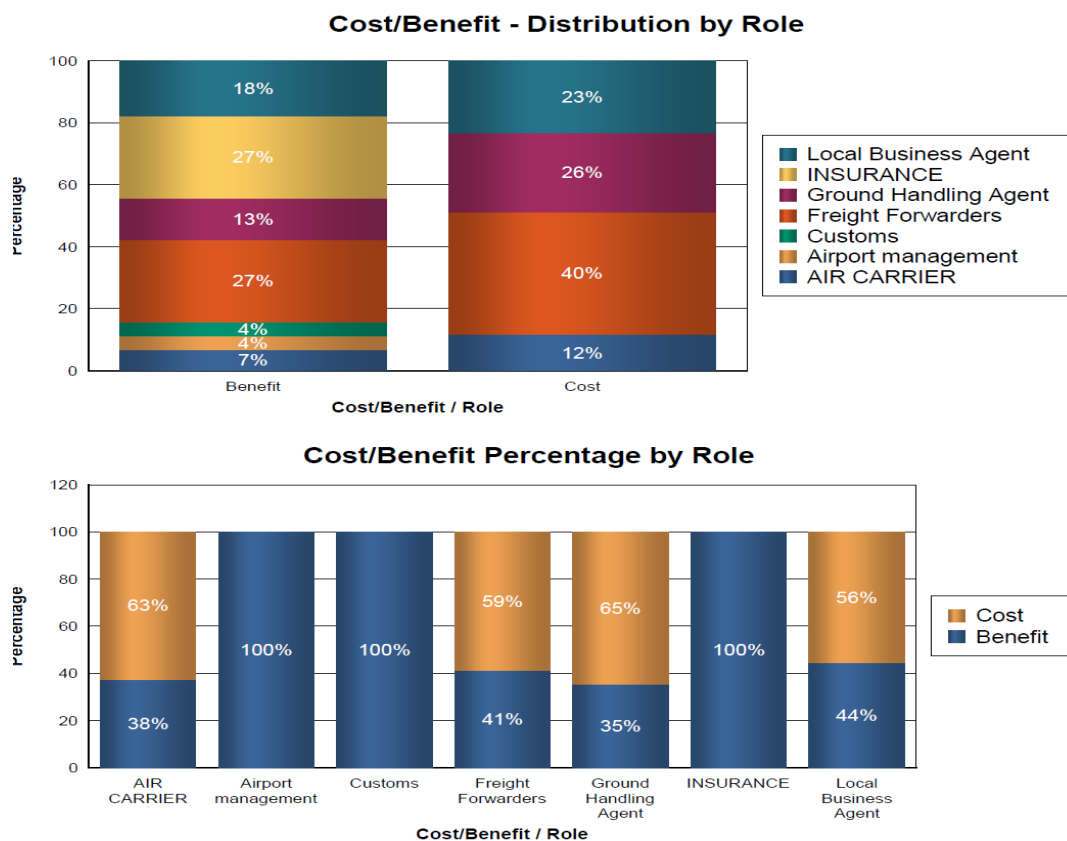


Figure 9 - Cost/Benefit Distribution and Percentage by Role of Cargo Network. Own elaboration

For the **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.

Transaction speed

The Transaction speed indicator is helpful in spotting network bottlenecks. Transaction speed can refer to the actual transit time of the Deliverable. Used this way it is useful compare speed with the transport Channel profile.

Transaction speed can also 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.

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

The obtained result allow us to state **that within the Cargo Network all transactions (tangible and intangible) are fast executed and released by the roles.**

Channel

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

For example, 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.

The next figure (Figure 10) shows the distribution of different channels used by All Transactions, Intangible Transactions only, and finally Tangible Transactions.

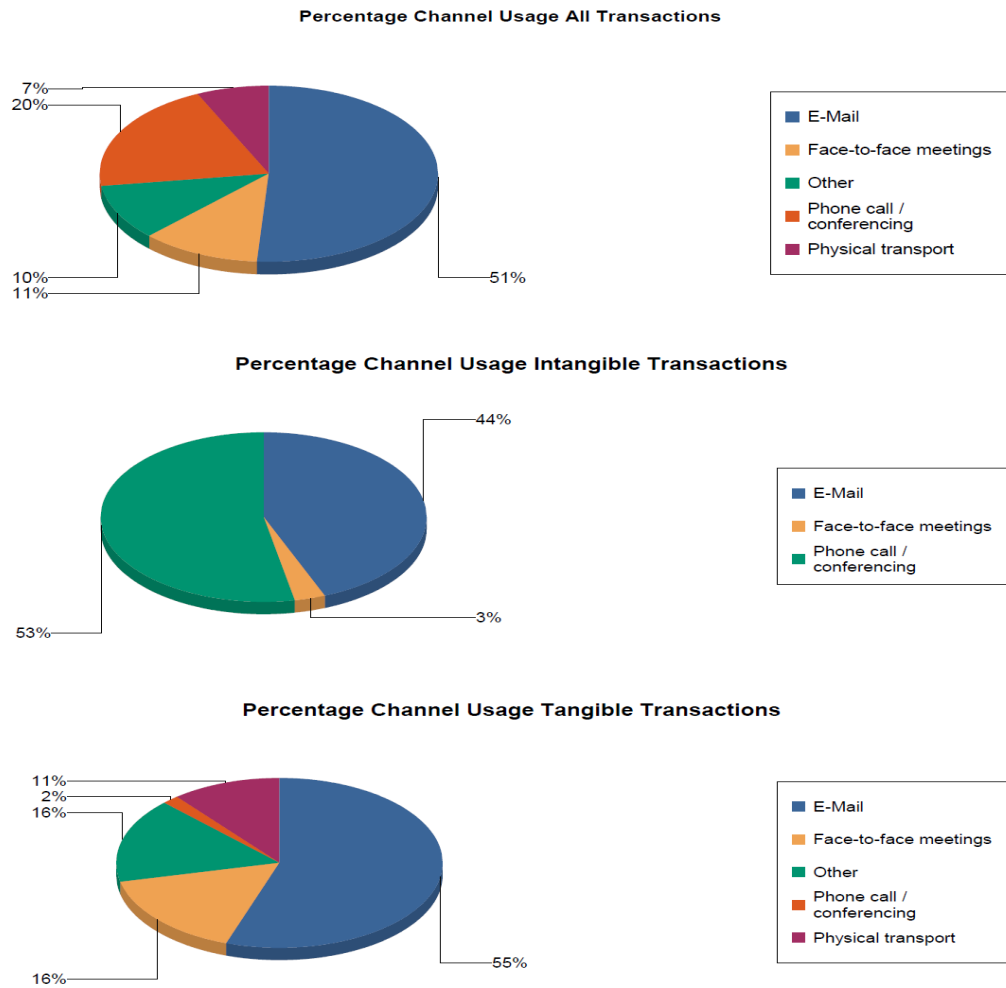


Figure 10 – Chanel profile of Cargo Network's Transactions

The **email is the most present channel in all transactions of Cargo Network**. However the preferred type of channels varies depending on the role as showed by the next figure (Figure 11).

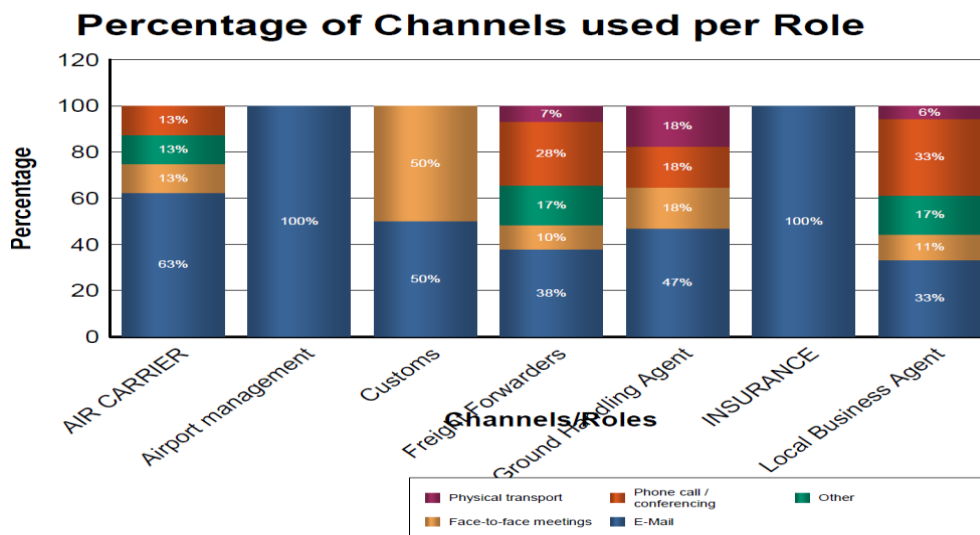


Figure 11 – Channels used per Cargo Network's Role

Agility

One indicator of network agility is how quickly information can move around the network. The “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. It is an important indicator of a network's agility in being able to make sense of and adapt to internal and external changes. It is 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

Within the Cargo Network the intangible transactions presents more agility than the tangible ones.

Stability

Stability is revealed by measures of network Density. Density is calculated as the number of actual connections between Roles divided by the number of potential connections between Roles. The most significant Density indicator is Weak Tie Stability, which 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 is the 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. A resilience of 1 shows a perfect balance between densities of tangible and intangible connections.

Weak Tie Stability:
(intangible/tangible)

0.57

Within the Cargo Network the density of tangible connections are dominant.

4. SYNTHESIS AND CONCLUSIONS

Value Networks are sets of roles, interactions, resources and relationships that generate economic or social value. In this context any purposeful organization or activity can then be understood as a value network.

Applying the VNA methodology to the Cargo Scenario we concluded that Cargo Network presents a formal structure with systematized processes and established routines, where density of tangible connections is dominant.

Having in mind that the active agents for Value Creation are the Roles in the network, the Freight Forward's Role is generating more value (tangible and intangible) within the Cargo Network. Also the Freight Forward's Role has the strong structural position (more ties), receiving and sending more value. However, unless two roles (customs and airport management), the other roles have many ties which means that the Cargo Network is not a very centralized one.

There are different delivery mechanisms for specific deliverables depending on the role, but email is the most present channel in all transactions. Within the Cargo Network all transactions (tangible and intangible) are fast executed and released by the roles. Nonetheless the intangible transactions have more agility (how quickly information can spread out across the network to reach all members).

The role of Freight Forwarder has great impact over business relations, competence and financial assets, while the Ground Handling's role impacts essentially over the asset "competence". The business relationship is the asset most affected by the network behavior as a whole.

Notably all transactions have more positive impacts (benefits) than negative impacts (costs) on the assets, mostly for the roles of Airport Management, Customs and Insurance.

We argued that networks are fundamental instruments for the development of business system of airport's landside areas. The ability of VNA to better describe effective network of the Airport System justified the option for this methodology. We conclude that the application of the VNA provided a network ecosystem perspective into how processes and people create

value within the Cargo Network. The next research steps will allow extending the analysis using more indicators.

REFERENCES

- Allee, V. (1998). Human Capital and Value Creation in the Knowledge Economy. *HR Monthly*, May 1998
- Allee, V. (2000). Reconfiguring the Value Network. In *Journal of Business Strategy*, July-August 2000
- Allee, V. (2002). A value network approach for measuring and modeling intangibles, paper presented at the *Transparent Enterprise Conference*, Madrid, available at: www.vernaaltee.com
- Allee, V. (2008) Value Network Analysis and Value Conversion of Tangible and Intangible Assets, *Journal of Intellectual Capital*, Vol. 9 (1:5-24).
- Allee, V. (2008). Value Network Analysis and Value Conversion of Tangible and Intangible Assets. In *Journal of Intellectual Capital*, Volume 9, Issue 1, pp 5-24
- Allee, V. (2009). Value Creating Networks: Organizational Issues and Challenges. The Learning Organization. *Social Networks and Social Networking*, Special Issue, 6 (6:427-442).
- Allee, V. and Schwabe, O. (2009). Measuring the Impact of Research Networks in the EU: Value Networks and Intellectual Capital Formation, *Proceedings of the European Conference on Intellectual Capital*, Haarlem, Netherlands, 2009
- Allee, V. and Taug, J. (2006). Collaboration, Innovation and Knowledge Sharing in a Global Telecom. In *Journal of Organizational Learning*, November, 2006
- Gulati, R. (1998). Alliances and Networks, *Strategic Management Journal*, 19, 293-317
- Kasarda, J. (2010) *Airport Cities and the Aerotropolis: the Way Forward in Global Airport Cities*, J. Kasarda (Ed.), Available: http://www.aerotropolis.com/files/2010_The_Way_Forward.pdf (04/03/2011)
- Powell, W. and L. Smith-Doer (1994). Networks and Economic Life, Smelser and P.A. Foundation (Ed.), *The Handbook of Economic Sociology* (368-403), New York, Princeton University Press
- Requena, F. (1989). El concept de Red Social, *Revista Española de Investigaciones Sociológicas*, 48:137-152
- Romeiro, P. (2007). *O Papel das Redes de Gestão na Inovação e Competitividade do Turismo Rural*. Tese de Mestrado, Universidade de Aveiro, Aveiro.
- Stevens, N., Baker, D. and R. Freestone (2007) *Understanding the Australian Airport Metropolis*, Adelaide, State of Australian Cities National Conference (SOAC), 28-30 November 2007
- TRB (2008). Airport Cooperative Research Program (ACRP) Synthesis 7: Airport Economic Impact Methods and Models. A Synthesis of Airport Practice. Transportation Research Board, National Academy of Sciences, Washington

- Venezia, C., Allee, V., and Schwabe, O. (2008). Designing Productive Workspaces: Roles Insights from Network Analysis. In *Information-Knowledge-Systems Management: Special Issue: Enterprise Mobility: Applications, Technologies and Strategies*. April/May, 2008
- Vernon, J. (2005). Collaborative Policymaking - Local Sustainable Projects, *Annals of Tourism Research*, 32(2:325-345).