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Executive Summary

1. The objective of HERMES project was the development and analysis of prototypes of business models for intermodal service between long- and short-distance transport networks. The underlying concept lies on the rational that it is possible to improve the experience in the long-distance journeys by enhancing the integration with the short-distance transport services. These services, despite representing a small portion of the mobility chain, offer an upgraded fluidity in the whole door-to-door journey and, as such, have a considerable influence on the passenger’s perception of the quality of service and of the expected difficulties of the local component of long distance transport.

2. Prototypes of business models for intermodal services are examples of new mobility schemes and related organizational patterns that describe core aspects of the intermodal transport business, including: added value to the passenger, offerings, strategies, infrastructure, organizational structures, trading practices, operational processes and policies.

3. Eleven case studies supported the design of the prototypes of business models, build on a specific business model analytical framework. Every case study refers to long- and short-distance transport example. All modes of transport have been covered in different combinations. They can be grouped in three categories according with the type of transfer terminal, being: airports, sea terminals, and road terminals. The barriers for enhanced intermodality identified in the case studies either occurred within the terminal or were related with the intermodal links. The following cases were addressed:

   1. **Case Study 1**: Gothenburg Central Station (Sweden);
   2. **Case Study 2**: Arlanda International Airport (Sweden);
   3. **Case Study 3**: Avenida de América Interchange Madrid (Spain);
   4. **Case Study 4**: Long distance bus services connected with high speed with high speed rail services (Spain);
   5. **Case Study 5**: Extension of the Adriatic-Ionian ferry corridor from Peloponnese to Crete (Greece);
   6. **Case Study 6**: Gare do Oriente Interchange Station and Connection with Linha do Norte Railways (Portugal);
   7. **Case Study 7**: Faro International Airport (Portugal);
   8. **Case Study 8**: Antwerp Airport (Belgium);
9. **Case Study 9:** Port of Patras (Greece);

10. **Case Study 10:** Part-Dieu Station at Lyon (France);

11. **Case Study 11:** Frankfurt-Hahn Airport (Germany).

4. The key conclusion taken from the surveys and case studies analysis is that intermodality between long distance and local transport services does not happen except if it is of direct business interest of one of the agents involved.

5. In some cases – mostly when we are dealing with the intermodality at nodes – it is rather likely that there will be scope for the assumption of the business of intermodality by the agent responsible for the management of that node (the “interchange manager”), as the provision of better coordination between long distance and local transport services could not only lead to higher satisfaction of those clients of the interchange, but also to a subsequent increase of the attractiveness / competitiveness of that interchange with respect to others serving the same region, or even with respect to other regions to which people travel for similar motives.

   a. So, in such cases, promotion of intermodality could easily be justified as an important part of the business interests of that interchange or of that region

6. In other cases – typically associated with creation of what was described as intermodality at links – it is generally less obvious what kind of business interests could be called upon to support that intermodality. Only after that identification has been made will it be possible to assign the responsibility for managing the associated services. The cases of the Arlanda airport and of the Patras to Kalamata link have some similarities but also some differences:

   a. in the former case, the intermodal services have only an indirect economic value for the airport manager, but a very important one, as they are necessary to keep the total emissions associated under the airport under the predefined threshold, and so to allow some growth of the main business interest of the airport, namely air traffic. So, it is natural that the airport management takes on this role of intermodality manager;

   b. in the latter case, the intermodal services have limited business interest for those directly engaged but a strong interest for the community at large, as they allow a reduction of traffic volumes on the road between Patras – Athens – Piraeus and on the saturated
ferry terminal at Piraeus. In the first dimension there are problems of road safety and emissions from road vehicles, whereas in the second dimension there are problems of poor service to the ferry clients travelling to Crete. So, in this case, the appointment of the intermodality manager should be a matter for the national road authority, the regional (tourist) authorities of Crete island, and also the port of Patras which can also increase the satisfaction of its clients (and possibly through this increase its market).

i. All cases in which three public authorities of different institutional settings have their own interest in a specific solution but view it from a different angle (for Crete and Patras an increase of quality of service and business volumes, for the road authority a reduction of problems), the formulas for cooperation must also be selected depending on particular circumstances of the people involved and the history of relations among those institutions, but the most logical solution that can be induced from these cases is for the infrastructure manager to appoint the intermodality manager and receive some financial contribution for the development of that mission from the authorities engaged.

7. It should be noted that, even if in these more complicated cases the rationale for intermodality has to be carefully investigated, this does not imply that the added value of its realization is lower. On the contrary that added value might be higher, but distributed across multiple partners, some of them with the location of their business in rather different geographical areas, and so more difficult to bring into the picture and more difficult to mobilize into the coalition of actors for deployment of a solution.

8. Two prototypes of business models were developed, for tackling the barriers and the added value factors at the terminal and at the intermodal links. The prototypes were developed from the perspective of the agent that is interested in promoting the intermodal transport. They aim to improve the passenger’s quality of transport or reduce the price, and to achieve benefits to the society, through a better intermodality promoted by intermediary agents (e.g.: private operators, public institutions, etc).

9. The prototypes are expected to be deployed by public decision makers and private operators in the development of new transport services or in the improvement of existent ones.
10. The present Handbook is meant to be a reference guide for the development or improvement of good intermodal transport services. The target readers are therefore practitioners, including: public authorities, transport operators, or infrastructure managers.

11. The Handbook was prepared to offer a simple and easy reading. The Handbook is structured in six main chapters, each one dedicated to a specific topic of intermodality. Together, they offer a comprehensive understanding on intermodal transport. In specific, at the end of this handbook, the reader should be able to understand:

   a. What are the dimensions of full intermodality (in Chapter 2);
   b. How to recognize which of them are present in the current offer, even if insufficiently developed (in Chapter 3, 3.1-3-3);
   c. How to recognize which components could present higher added value for the travelers (in Chapter 3, 3.4 -3.5);
   d. How to structure the business model analysis of the current offer (in Chapter 4);
   e. How to build a successful business model for the improved intermodal system (in chapter 5 and 6).

12. The reader will also obtain real world examples and practice, with the eleven case studies developed in HERMES research project which synopsis in presented in the Annex of this Handbook. Further details on surveys and case studies can be found in the specific reports available, namely:

   a. Deliverable of WP1: State of the Art on Crossmodal Transport Arrangements
   b. Deliverable of WP2: Cross Modal Transport Models
   c. Deliverable of WP3: Regulatory and Legal Requirements: identification of barriers and enhancement measures for interconnectivity
   d. Deliverable of WP4: Interoperability Barriers to Intermodality and Interconnectivity of Passenger Transport
   e. Deliverable of WP5: Case Studies
1 Introduction

1.1 Objectives of HERMES Project

HERMES explicitly focused on enhancing Crossmodal Transport Arrangements with the purpose of **exploring and thus developing prototypes of new business models for interconnectivity**. The project analysed the existing connections and further evaluated the level of interconnectivity in the passenger terminals where short and long-distance transport networks come together and where fluidity between those networks should ensure the maintenance of the level of service when the passenger is transferred from one to the other. Prototypes of business models are examples that represent core aspects of a business, including purpose, offerings, strategies, infrastructure, organizational structures, trading practices, and operational processes and policies. The conceptual Figure 1 below represents the building blocks of a business model and provides illustration of the concept and how it should be structured.

Using Rappa’s broad definition a business model is the method of doing business by which a company can sustain itself - that is, generate revenue. The business model spells-out how a company makes money by specifying where it is positioned in the value chain. The figure below presents the generic schematic structure of a business model highlighting its main building blocks.

![Figure 1.1 - Building blocks of a business model](image-url)
The objective of HERMES, as defined in the European Commission in the 7FP work program, is the development and analysis of new mobility schemes and related organisational patterns at the interface and interconnection between long distance transport networks and local/regional transport networks of all modes. The aim of HERMES is to develop prototypes (i.e. examples) of suitable business models for intermodal or interconnecting services that will contribute to build sustainable mobility solutions.

The concept under focus lies on the rationale that it is possible to obtain better market share in long distance passenger transport modes (e.g. rail, coach or air transport) than if only the “long-distance” part of the trip was considered by travellers for their modal choice. However, if the final destination is not easy to reach any of these advantages would be easily cancelled. Time spent on board the “long-distance” mode can be used to provide passengers with information about the best path from the arrival station to their final destination, and possibly also sell them valid tickets for that local transport, and to identify groups of passengers going to destinations close-by to one-another and organise, for example, a taxi or mini-van transport for them, selling the corresponding voucher aboard the “long-distance” mode.

These are conceptually simple operations, often requiring only some real-time telecommunication (such as the case of the train-taxi in the Netherlands) but there are organizational and contractual difficulties in its service provision that are invisible to the final customer. However, even if these services represent a small portion of the mobility chain, they offer an upgraded fluidity in the whole door to door trip and, as such, have a considerable influence on the public perception of transport attention to their needs and of the expected costs and difficulties of the local component of long distance transport. They represent the missing link of transport networks.

Case studies illustrated the possible variants to these missing links. They concentrated on the identification of key requirements of the travellers, the corresponding services and necessary underlying company agreements to provide them, followed by a business plan for the operation. Case studies should
cover a wide diversity of situations of interconnectivity providing sound examples.

The analyses embraced:

- interfaces and interconnections between different modes, such as long-distance rail/urban transport or air/rail; and
- interfaces and interconnections between different types of services of the same mode, such as long-distance rail services/ regional rail services or urban bus / express coach; and
- interfaces and interconnections between high capacity mode and low capacity, such as long-distance rail or coach / taxis, etc

In order to encompass the complex domain of interconnectivity in the passenger terminals where different transport networks involving different transport modes come together, the study of interconnectivity as a concept included the following sub-domains:

- Physical (“time and space as well as interfaces”) interconnectivity;
- Logical (“Information”) Interconnectivity;
- Economical (“Fares”) Interconnectivity;
- Contractual Interconnectivity (“company agreements”);
- Institutional (“Regulators and Organizing agencies”) aspects;
- Legal and regulatory (“Market access, minimum operating and service requirements and other relevant regulation”) conditions;

The analysis of these sub-domains provided background for the identification of the good practices in interconnectivity. This strengthened our conclusions and proposals of actions to improve the current level of interconnectivity in the coming future. Finally, a plan of actions for future improvements of interconnectivity in the passenger terminals was developed.
1.2 Structure of the Handbook

The present Handbook presents the main outputs of HERMES project. It is meant to be a reference guide for the development or improvement of good intermodal transport services. The target readers are therefore the real world practitioners, including: public authorities, transport operators, or infrastructure managers.

The Handbook was prepared to offer a simple and easy reading. It is structured in six chapters (Figure 1.2), each one dedicated to a specific topic of intermodality. Together, they provide a comprehensive understanding on intermodal transport. Specifically, at the end of this handbook, the reader should be able to understand:

1. What are the dimensions of full intermodality;
2. How to recognize which of them are present in the current offer, even if insufficiently developed;
3. How to recognize which components could present higher added value for the travelers;
4. How to structure the business model analysis of the current offer;
5. How to build a successful business model for the improved intermodal system.

The reader will also get real world examples and practice, with the eleven case studies developed in HERMES project.

Figure 1.2 presents the structure of the Handbook. The Handbook is divided into two parts. Part I has a more theoretical nature and it is dedicated to the discussion of the concept of intermodal transport. It is composed by three chapters. Following this introductory Chapter 1, Chapter 2 presents the theoretical foundations of intermodal transport, describing the concept of intermodal transport, as well as the dimensions of integration. Chapter 3 offers an overview of current practices in intermodality in the European Union, addresses the nature of the barriers to the production of intermodal transport and the merit factors for enhancement of intermodality.

Part II has a practical nature and it deploys actions for improving the current level of intermodality. It is composed by three chapters. Chapter 4 presents the concept and components of a business model. Chapter 5 offers the business
models prototypes for intermodality for deployment by practitioners. Finally, Chapter 6 describes the overall conclusions of the research and identifies the critical areas of future study.

![Structure of the Handbook](image)

Figure 1.2 – Structure of the Handbook
2 Intermodal Transport and Interconnectivity: dimensions and foundations

2.1 Theoretical Foundations

The European Commission’s definition of intermodality was proposed, in 1997, as being “a characteristic of a transport system that allows at least two different modes to be used in an integrated manner in a door-to-door transport chain. In addition, intermodal transport is a quality factor of the level of integration between different transport modes. In that respect more intermodality means more integration and complementarity between modes, which provides scope for a more efficient use of the transport system” (EC, 1997). The concept of co-modality was introduced in 2006 in the mid-term review of the European Commission’s 2001 White Paper on Transport as being “the efficient use of different modes on their own and in combination” (EC, 2006). The underlying rationale is that the optimisation of the mode or modes of transport and the optimisation of the organisation of the chain “will result in an optimal and sustainable utilisation of resources” (EC, 2006). From these definitions we may conclude that intermodal transport entails some level of integration between modes of transport; whereas co-modal transport places the emphasis on the individual and combined efficiency.

Bearing in mind that the level of the ‘combined efficiency’ of the transport operators is function of their level of integration, that is, the higher is the integration the higher will be the combined efficiency; then, the concept of co-modality embraces and widens the concept of intermodality. Co-modality implies integration, just as intermodality, but it removes the restriction on the need of having different transport modes.

The bottom line is that intermodality requires integration between the transport services. As such, if we envisage achieving full intermodality, we need to understand its structure and dynamics. Figure 2.1 schematises the sources of efficiency in intermodal transport (Reis, 2010). The right side bar presents the individual efficiency of the various transport modes. This is the maximum
expected efficiency from a non-integrated transport service (that is: multimodal transport). The middle bar presents the expected efficiency of an integrated transport service – intermodal transport service. The transport services, when jointly operated in an integrated transport service, will generate synergies (green bar in Figure 2.1) that will add up to the individual ones, resulting in an increase of the total efficiency. Sources of synergies include: coordination of schedules, elimination of redundant services, enlargement of the hinterland.

![Figure 2.1 – Benefits of integration](image)

In an integrated transport network, each mode of transport is expected to be used at its best scale and operation. This will result in the specialisation of the various modes of transport, accordingly with their operational characteristics, that is: high-speed rail, air and sea for the long and medium distances, and conventional rail, metro, bus and cars, for short and medium distances. As a consequence, the transport network's available capacity is used at maximum efficiency, with a rationalisation of the energy consumption.
Yet, in real world operations, barriers and other problems may emerge impacting the production of intermodal transport services. These barriers generate friction that ultimately results in losses of efficiency. Eventually, the frictions may be so significant that, in practical terms, prevent the implementation of intermodality. There are two types of frictions:

- **Internal sources** or friction refer to internal factors to the transport service (i.e.: factors that are related with the transport operators and the production of the transport service).
- **External barriers** refer to the external factors to the transport service system (i.e.: factors that are not related with the transport operators’ characteristics).

Figure 2.1 helps to understand the nature of the frictions and the barriers in the production of a co-modal service. If no friction or barrier existed, we would get the maximum synergies from the integration of the transport modes. This is represented in left side bar (grey bar). The frictions and barriers will reduce the maximum attainable synergies possible to reap from the integration of the modes of transport (grey boxes in the middle bar). Although friction and barriers act in a similar way: losses of efficiency, they differ in nature. Frictions are originated within the transport service and thus can be overcome if the adequate initiatives are taken by the transport operators, whereas barriers are external to the transport service and thus cannot be overcome by the transport operators, requiring external initiatives (such as: physical construction and new policies).

The following Figure 2.2 depicts the mechanisms of integration in a co-modal transport service and it can be used to better understand the nature of frictions in the efficiency of the co-modal service. The mechanisms of integration occur between five building blocks, all of them subject to barriers external to the transportation system:

1. Passengers’ mobility requirements;
2. Transport service’s profile;
3. Types of Friction;

---

1 A detailed presentation on the mechanisms of integration can be obtained in Reis (2010).
4. Dimensions of Integration
5. Co-modal arrangement’s efficiency and performance

Figure 2.2 – Mechanisms of integration in a co-modal transport service

The passenger requirements identify the merit elements valued by the system users. The choice of the properties of the transport service’s profile is determined by the passengers’ mobility requirements. The transport service’s profile refers to the set of operational and technological properties of the system: transport operator and transport mode (such as: capacity, tariffs, schedules, etc.).

At a nodal point two profiles interact from each of the services that are coming together at the nodal point. If they do no fit (that is; the properties are not compatible, like for example different capacities, different time schedules, different baggage regulations, etc.) losses of efficiency will occur. These losses or types of friction exhibit different nature and occur in different moments, being:

- **Type 1** - friction that provokes losses of efficiency during the production of the transport service, including the transfer between transport modes
as is the case of an airport, and that undermines the efficiency (such as: delay in one segment resulting in losing the next one, lost baggage, etc.).

- **Type 2** - friction that prevents the detection and recovery of a problem (for example: impossibility of fast transfer connection for delayed passengers) *during the production* of the transport service.
- **Type 3** – friction that prevents the customers to be compensated by the problems occurred during the transport service, typically this happens *after the production* of the transport service (e.g.: non-agreement between stakeholders on the compensation to the customers).

The **dimensions of integration** refer to the nature of the interactions that occur during the production of an intermodal or co-modal transport service. Along each dimension, friction may occur and lead to losses in the efficiency of the transport service. **It is the existence of frictions in each of the dimensions of integration that makes the intermodal or co-modal transport arrangements unstable and prone to failure.** Conversely, single modal transport services do not exhibit such dimensions thus making them much more stable. This is the reason for transport operators to either prefer operating on a modal basis or, when operating more than one mode of transport, prefer controlling the transport chain as a way to better control the sources of instability. There are five dimensions of integration, being:

- **Physical interaction** – refers to the physical transport of passengers (and their luggage) along the transport chain;
- **Logical interaction** – refers to the exchange of communication between the transport operators;
- **Contractual and Institutional interaction** – refers to the share of responsibilities agreed between the authorities and the transport operators and to the nature of relationships established between operators;
- **Economical interaction** – refers to the scheme of payments agreed between the transport operators and the fares offered to the users.

The existence of friction along one or more dimensions of integration will result in losses of efficiency and performance of the intermodal transport service. The sources of friction will impact one or more interaction and thus affect the level of
integration of the co-modal transport service. Likewise, the presence of external barriers will also impact the efficiency of intermodal transport services. The barriers will influence one or more dimensions of integration which, ultimately, will result in losses of efficiency and performance. Consequently, the production of stable co-modal or efficient intermodal transport service is inherently complex as it involves the streamlining of multiple dimensions (or flows) to deliver transport services to customers with different demands.

### 2.2 Dimensions of Intermodality

In the previous chapter, we concluded for the existence of five dimensions of integration or intermodality. These dimensions are now briefly discussed from the light of European Union perspective and policy.

- **Physical Dimension:** Aspects regarding the cooperation of the different modes in respect of time (transfer time needed) and space (terminals design for easy access).
- **Logical Dimension:** Aspects regarding information systems and technologies that improve the connection between the long and short distance travel providing all information the customer needs.
- **Economical Dimension:** Aspects regarding technologies and policies that allow the common fare between all the stages of an intermodal trip (integrated ticket systems).
- **Contractual Dimension:** Aspects regarding the framework of cooperation (company agreements) between different transport agencies in order to achieve a better level and quality of interconnectivity.
- **Institutional Dimensions:** Structural aspects of every entity involved in the passenger intermodal chain, concerning mainly organizational issues to achieve interconnectivity.

In addition to the five dimensions, we also must consider the legal and regulatory environment. This dimension is external to the intermodal transport, but it revealed to be an important barrier and source of frictions. Thus, a sixth dimension of intermodality is also discussed.

- **Legal and regulatory Interconnectivity.** Legal and regulatory framework relative to the intermodality issues (integration of national
laws with the European regulations and policies concerning market access regulation, minimum operating and service requirements etc).

2.2.1 Physical Dimensions

The physical domain (as has already described previously) explores the service quality of terminals interconnections in terms of ‘space’ (how close is the distance between the different modes) and ‘time’ (how easy and ‘coordinated’ is the access between the modes or networks).

Concerning these aspects, special attention is given to the transport modes’ cooperation, and in particular the optimal integration of public transport in the transport terminal’s design. The integration of public transport in the terminal’s design is aiming to improve the short-leg of the passenger’s trip, which is believed to constitute the more complicated and inconvenient part (especially in cases of unknown destination). The main problems in terms of physical connection that cause the reduction of efficiency and quality of service are located in the airports and in the connections between different levels of road network (integration of TEN-Network to national road networks, national to regional and regional to local). This fact is also proved by the specific policy initiatives concerning the ‘integration of European and regional transport networks’ and the ‘enhancing of airport accessibility’ as it has been already described (chapter 2.4).

Other issues that are mainly discussed in relation to physical (“time and space”) concepts are the development of high quality infrastructures concerning the area of mode interchange. Specifically, the issues emphasized more are the creation of organized parking areas for passengers and cyclists, the creation of Park and Ride (P&R) and Kiss and Ride (K&R) facilities in respect to passenger’s convenience and the safety as well as the development of exclusive place for different categories of flows (cyclists, cars and pedestrians).
2.2.2 Logical Dimension

The principal conclusion drawn from the theoretical analysis concerning the Logical (‘information’) domain is that the provision of intermodal and multimodal information is a very complex business since it covers a whole range of infrastructure and institutions, and thus requires demanding multi-stakeholder partnerships and fusing of diverse and often incompatible data sources. The main issues of the ‘logical’ domain concern standardization procedures of user interfaces for passenger information on an international scale. In order to have an effective door-to-door service, the system should be fully inclusive of all services of different modes and network hierarchy levels. According to the review conducted, the main obstacles towards this direction are:

- The private added-value for providing data in standard formats at the operator’s own cost has not been proved adequately;
- Informational integration is still entailing certain cautiousness to private operators concerning commercial risks;
- European intermodal information presents further complications of language, and the institutional difficulties of international co-operation. There is still a lack of harmonized multimodal information architecture, which makes high quality intermodal information expensive and difficult to produce.

Conclusively, integrated and real-time door-to-door information systems (both pre-trip and on-trip) are a key tool in developing workable and attractive long-distance European passenger intermodality. Information is often available per mode and per network hierarchy level but still much progress on integrated information systems has to be made since there is no intermodal structure that could promote integrated information connecting different scales of transport networks.
2.2.3 Economical Dimension

Considering the aspects of integrated ticketing it has to be stated that across Europe a poor co-operation to achieve integration of tariffs exists, especially for long-distance and border crossing journeys.

Questions that arise with the introduction of new tariff and ticketing structures as well as electronic ticketing technologies are the interoperable fare management along with the estimation of the costs-benefit ratio, the passenger acceptance which often must be accompanied with special (integrated) tickets and the problems of disabled or elderly people when are trying to use new technologies (e.g. blind people, use of internet for booking).

It should be stated that technical solutions to the problem of integrated tariffs and ticketing are already available. The main obstacle is currently the lack of co-operation among stakeholders and the finalization and acceptance of common standards, which is especially the case in cross border and long-distance travel chains. Moreover, questions and issues concerning the financing initiative of new technologies and innovative tariff structures constitute obstacles for integrated ticketing.

But at least it should be possible to establish agreements so that information and ticket sales for local transport should be systematically possible on board the vehicles used for the long distance part of the journey. This would allow an important reduction of anxiety about where to buy those tickets on arrival and how much they will cost, and probably constitutes a more important aspect that the availability of integrated tickets, which would anyway raise enormous difficulties of contract negotiation (see next point) and management of a very large set of ticket combinations – imagine a long distance train serving a dozen urban agglomerations along its path, providing integrated tickets between possibly almost one hundred long distance fares with typically some 3 to 5 different tariff levels in each of the agglomerations along the way.

And what should be expected in the inverse direction, when the journey starts at a suburban location in one of those agglomerations and ends in another suburb
of another agglomeration several hundred kilometres away? Should we expect the local transport company on the suburb where the journey starts to have the means to set the price and sell the integrated ticket for the complete journey?

2.2.4 Contractual Dimension

This domain probably conceals the greatest barriers for the development of passenger intermodality. In order to achieve passenger interconnectivity, there is a fundamental requirement for cooperation between all modes (e.g. road and rail), between network levels (European, national, urban) and between different operators (transport provider companies). The main problem is that each of the aforementioned agents has his own single-mode planning perspective and consequently his own priorities. The main barriers for the promotion of ‘company agreements’ serving interconnectivity purposes are the fare and revenue setting in integrated systems as well as the joint management of disruptions.

The fare setting constitutes a major problem for the feasibility of integrated ticketing in many environments where for example air carriers, national railways, regional and urban public transport operators have different fare policies and models (e.g. time, zonal and distance related), making universal tickets a difficult proposition. On the other hand, the revenue (and subsidy) sharing in integrated ticketing systems entails the problem of fair income division, which constitutes a major barrier to integrated ticketing systems as it is difficult to practically monitor the complete movements of passengers within the intermodal systems. Thus, it would be necessary to estimate which partner should receive what proportion of income from common tickets, which leads to difficulties of agreement.

So, as argued in the preceding point, the more important aspect is to relieve the passenger of the anxiety related to the purchase of the ticket for the local trip at the destination area. This should be possible and quite easy (in the logical integration dimension) but not force the otherwise very complex agreements required to have a really integrated fare for the complete journey.
Furthermore, in case of disruptions in a multimodal system, there must be acute intermodal passenger information requirements, real-time timetable management and even strict emergency management procedures. These prerequisites of common management of disruptions entail particular problems of communication, management hierarchy, service planning and conflicting priorities, especially where there is only horizontal co-operation of different operators (between different modes).

In particular when the remuneration of operators is linked to the regularity of their performance, any kind of operation integration is seen as internalization of risks of underperformance by the partners for which there is generally no cover in the contract between the local operator and the corresponding authority. So, if this kind of cooperation is desirable (as we believe it is), this transfer of risks must be recognized in the contracts for local transport and treated accordingly.

Concluding, the promotion of cooperation among operators in a competitive environment requires intense public intervention, aiming at creating the appropriate investment conditions for long-term flexible profit sharing arrangements as well as encouraging special agreements have to been placed between the different authorities (especially for cross-border operators).

### 2.2.5 Institutional Dimension

Institutional aspects are defined as the structural aspects of every entity involved in the passenger intermodal chain, concerning mainly organizational issues to achieve interconnectivity. Organizational and technical aspects are strongly interrelated. While technical solutions to the problems of economical or logical domain (e.g. integrated tariffs and ticketing) are already available and will be further developed, the main obstacle is the existence of an institutional setting promoting cooperative solutions, since one of the main obstacles identified is the lack of co-operation-communication among stakeholders, especially for long-distance and border crossing journeys, in order to establish common organizational and interoperable procedures.
The research has found that in spite of the importance of co-operation and coordination of transport modes for the development of intermodality, the general situation is that there are also no specific institutional guidelines to coordinate intermodal planning and operations. Moreover, a major barrier identified in many countries is the lack of interchange management as well as the general perspective and ‘thinking’ of intermodality.

The institutional aspects of integration are clearly one of the areas still in need of deeper research to overcome some of the “X-barriers” which existence is already know but the cause and the antidote is still in need of further development.

### 2.2.6 Legal and Regulatory Dimensions

The literature review has shown that existing legal and regulatory frameworks are generally not suited to enhance intermodality in the context of decentralized transport markets that are increasingly opened to competition. Currently there are no laws or regulations in place across Europe to treat intermodality as a central issue. Neither the important aspect of co-operation for the optimal development of long-distance passenger transport has been examined with the proper attention, especially when many stakeholders are involved.

It has been concluded that in a number of countries and at the EU level, anti-monopoly laws can prevent close co-operation of private sector activities, which might lead to effective “cartel” status. Without suitable legal exceptions, this can cause major problems for attempts to create seamless intermodal systems, especially integrated products. Moreover in many cases, public transport services subsidized by public money such as urban public transport and national rail in many countries cannot in any way be allowed to “support” commercial services such taxis or air carrier.

Another crucial issue with legal implications concerns data-sharing between institutions and the private sector. Rather complete data provision to intermodal information providers is needed for consistent and comprehensive services. Data sharing is a problem when it relies on voluntary sharing between institutions. The thinking of the operators as data generators is often proprietary and
protective. When the private sector is involved in using public data, there are difficulties with data quality, exclusivity agreements, unrealistic pricing and cultural clashes between public service and profit motivations.

2.3 Proposals for improving the intermodality

In order to shed some light on the relative importance of the priority issues that must be addressed for the promotion and achievement of passenger intermodality, we summarise in Table 2.1 some of the proposals, that over time have been brought forward, for improving the efficiency along each dimension of intermodality. These proposals have been chosen taking into consideration the EU policy and context, aiming to increase their relevancy and applicability.

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>STRATEGIES / SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractual</td>
<td>Establish regulatory and legal frameworks to give incentives for co-operation or to force it where necessary, mainly by providing a safe legal net concerning the protection of sensitive data and non-disclosure issues</td>
</tr>
<tr>
<td>Economical</td>
<td>Harmonization and integration of existing standards on law and regulation issues concerning real-time information services</td>
</tr>
<tr>
<td></td>
<td>Introduction of a common European system for electronic ticketing (smart card system), along with the exploitation of mobile phone technology for providing attractive solutions</td>
</tr>
<tr>
<td></td>
<td>Establish long-term multi-party risk and benefit share arrangements (“win-win”), revising the contracts with local authorities to match these arrangements and maintaining a certain flexibility to renegotiate as investment develop</td>
</tr>
<tr>
<td></td>
<td>Develop and agree on methodologies for quantification and monetary assessment of impacts (incl. strategic and political effects). Cost-benefit studies and willingness of users to pay for certain intermodal products and services and other ways of ongoing financing have to be better evaluated (e.g. in the field of information systems)</td>
</tr>
<tr>
<td>Institutional</td>
<td>Establish long-term multi-party risk and benefit share arrangements (“win-win”), maintaining certain flexibility to renegotiate as investments develop</td>
</tr>
<tr>
<td></td>
<td>General campaigns for raising public awareness (marketing tools)</td>
</tr>
</tbody>
</table>
Promotion of passenger rights (as a lever for pushing integrated and interoperable solutions).

Include quantified strategic and political benefits in business plans (as obligations).

Establish regulatory and legal frameworks to give incentives for co-operation or to force it where necessary, mainly by providing a safe legal net concerning the protection of sensitive data and non-disclosure issues.

General campaigns for raising public awareness (marketing tools)

Promotion of suitable regulatory and legal frameworks dealing with problems related to the opening of transport market

Establish regulatory and legal frameworks to give incentives for co-operation or to force it where necessary, mainly by providing a safe legal net concerning the protection of sensitive data and non-disclosure issues

Promotion of passenger rights (as a lever for pushing integrated and interoperable solutions).

Standardization activities related to the design and layout of interchanges

Harmonization and integration of existing standards on law and regulation issues concerning real-time information services

Routing information and cross-selling of tickets for local transport at destination on board the long transport vehicles

Include quantified strategic and political benefits in business plans (as obligations).

Standardization activities related to the design and layout of interchanges
3 Intermodal transport practices: barriers and merit factors

This Chapter provides information on how to identify the barriers and challenges impacting the performance and efficiency of the intermodal transport services. The analysis was supported by extensive surveys to understand the barriers and the merit factors associated to intermodality.

The objective of the surveys was to improve knowledge on competences, responsibilities, management, etc., of transport modes in different European countries, and to identify long-short distance interconnectivity barriers and measures from a macro-meso perspective. Figure 3.1 provides the overall structure of the survey done and complete details can be found in the following two HERMES reports on “Requirements and barriers for interconnectivity: identification of Barriers and Enhancement Measures” and in the report “Barriers to intermodality and interconnectivity of passengers transport.”

![Figure 3.1 - General structure of the semi-structured survey](image-url)
The barriers have been analysed along the dimensions of integration as discussed in Chapter 2. The dimensions of integration are:

- Physical Dimension.
- Logical Dimension,
- Economical Dimension,
- Contractual Dimension,
- Institutional Dimensions,

3.1 Legal and regulatory Interconnectivity

A key aspect in the analysis of the barriers is the definition of the stakeholder, which is identifying the barrier. Each stakeholder has a unique perspective, objective and goals. Therefore, a given barrier will be certainly perceived differently by different stakeholders.

We considered four group of stakeholders:

- Public decision makers,
- Terminal managers,
- Transport operators,
- User’s associations.

Follows a brief explanation of each one.

G1: Public Decision Makers

This group comprises representatives from ministries as well as regional or local transport authorities. Their tasks and responsibilities are among others related to transport planning, passenger flow coordination, tendering of transport services, supervision of services, regulation and standardisation of requirements, public administration and traffic management. Representatives of the House of Commons of the Czech Republic Parliament, of the Danish Transport Authority (DTA) or of the Hamburg public transport association are examples for respondents contained in this group.
G2: Terminal Managers

This group comprises interchange managers who are responsible for the operational and performance management of specific intermodal stations and terminals. The respective institutions or companies can be independent entities or entities related to a public authority or private transport operator. Examples for respondents contained in this group are the intermodality manager for the Air-Rail interchange of Frankfurt-Main airport Fraport, the Head of Development and Regulation of Brussels Airport or the Corporate Affairs Manager of Budapest Ferhegy International Airport.

G3: Transport Operators

This group comprises operators of the modes air, rail, bus and ferry dealing with long- and short-distance transport services. Representatives of the German airline Air Berlin, of the Czech Railways, of the European long-distance bus operator Touring/ EUROLINES or of the Italian ferry operator SNAV (Societe Navigazione Alta Velocita) are examples for respondents contained in this group.

G4: User Associations

This group comprises consumers associations and passenger representatives as well as national, regional or local users organisations. Representatives of the rail transport user association Lyon Métro Transports Publics - FNAUT (Fédération Nationale des Associations d'Usagers des Transports) or of the German consumer association vzbv (Verbraucherzentrale Bundesverband) are examples for respondents contained in this group.

3.2 Stakeholders perception of interoperability barriers

Research in HERMES has manifested significant differences regarding perception of barriers by the different stakeholders. Figure 3.2 presents the results of a major survey conducted in HERMES project to the stakeholders. Among others, a
The purpose was to assess the relevancy of barriers for each dimension of intermodality. Public decision makers are highly aware of the challenge of coordination among different stakeholders, while user association highlights the challenge of coordination of public activities. From the viewpoint of transport operators, the coordination of services among transport operators themselves and the improvement of physical interfaces play a main role. Terminal managers regard the challenge of cooperation among transport operators the most important barrier. Thus, stakeholders tend to assign the responsibility for certain barriers to the field of duty of other actors.

![Figure 3.2 – Barriers by Intermodality Domains as perceived by stakeholder groups](image)

### 3.3 Barriers

The following table summarises the key barriers currently impacting intermodal transport. The barriers can be clustered in five groups:
As shown in Table 3.1, we have identified five clusters of barriers, which are referred to as challenges for the improvement of intermodality/interconnectivity of passenger transport. These are summarised below:

**The challenge of improving physical interfaces**, referring to barriers, which are related to physical elements of the intermodal transport chain. The issues that arise are mainly related to the planning and design of terminals, the capacity of the infrastructure, as well as the management of physical interfaces. Following the outcomes of the HERMES Seminar in Berlin, this challenge should not only address ‘hard infrastructure measures’, but also ‘soft measures’, such as improving the lightning in stations, optimising the visual orientation or the provision of elevators.

**The challenge of cooperation among operators**, representing barriers, which are related to the cooperation and coordination among operators. The corresponding issues comprise integrated planning of services, coordinated
schedules, integrated ticketing systems, the exchange and harmonisation of information, as well as common operational standards.

**The challenge of passenger information and ticketing integration**, referring to barriers, which are related to insufficient and non transparent information for passengers and inconvenient or non-existing integrated ticketing systems. It therefore particularly represents barriers for using intermodal transport services from the perspective of passengers.

**The challenge of coordinating different stakeholders**, embracing barriers, which are related to the cooperation and integration of the variety of heterogeneous actors, their different interests and responsibilities and the difficulties to coordinate their activities. Following the lessons learnt on the HERMES Seminar, the scope of relevant stakeholders may not necessarily be restricted to public decision makers, transport operators, terminal managers and user associations. In several cases, the (rail) infrastructure manager needs to be considered as an individual stakeholder, too.

**The challenge of coordinating public activities**, representing barriers, which are related to public authorities and their influence on the provision and improvement of intermodal transport services. The integration of public planning on different administrative levels and the homogenisation of regulations are core aspects of this cluster. Outcomes of the HERMES Seminar emphasise the requirement that at an early planning stage infrastructure planning needs to be integrated/vielleicht aligned with the requirements of operators.

The identified clusters of intermodality and interconnectivity barriers have been analysed with respect to the HERMES stakeholders (transport operators, terminal managers, public decision makers and user associations) in a more detailed way by Fluhrer, Szimba and Siegele (2011).

In the previous section, the cross-contextual clustering of barriers was described. Figure 3.3 shows the thematic relations between clusters and domains, which subsequently are further described for each cluster.
Cluster 1 is mainly related to the physical domain, which comprises physical/technical aspects at terminals and at the interconnection of infrastructures of different modes. Relevant issues within this domain are the definition of safety and comfort standards, the extension and improvement of physical links at terminals and in the network, as well as a coordinated management of operations at terminals.

Cluster 2 covers issues of cooperation between transport operators and is therefore related to the contractual domain. Economic and informational aspects are also concerned in the way that operators need to coordinate the exchange of information on transport services as well as ticketing systems in order to improve intermodal transport services.

Cluster 3 is both related to the informational and the economic domain. While issues of optimal provision of information are treated in the informational domain, items like transparent, affordable integrated ticketing offers are the central topic of the economic domain.
Cluster 4 has direct correlations to the institutional, contractual and informational domain. Contractual aspects play a central role in the coordination of stakeholders as binding agreements are an important instrument for the coordination of activities between actors. Institutional aspects are important insofar as independent bodies can promote the coordination of actors and supervise the adherence to agreements. Since the exchange of information is of central importance for the coordination of activities among stakeholders, informational aspects are also particularly relevant for this cluster. Legal and regulatory aspects play a role in the coordination between public authorities and other stakeholders and are therefore also treated in this cluster.

Cluster 5 is related to the institutional domain since it covers barriers which have their roots in the lack of coordination among public authorities and institutions. Further, the cluster it is related to the legal/regulatory domain insofar as barriers like regulatory and administrative constraints can be traced back to public activities.

We now briefly present for each Stakeholder’s Group the main barriers for improved intermodality and propose some measures for overcome them.

3.3.1 Group 1: Public Decision Makers

3.3.1.1 Interconnectivity Barriers

a) Legal/regulatory

- Complex legal framework
- It’s hard to monitor a deregulated market
- Absence of implementation of existing intermodality policy by national governments
- Environmental rules curb the intermodality (e.g. standards on noise)
- Absence of planning

b) Institutional

- Lack of a coordinating authority
- Lack of cooperation between operators
• Lack of institutional cooperation between the central and the local level
• Several actors with different responsibility
• Too many different institutions to fulfill the same tasks

c) Contractual
• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

d) Informational
• Lack of a coordinating authority to define information standards
• It is necessary to create an integrated information system

e) Physical
• Absence of cooperation
• No right to change or extend the interchange

f) Economic
• Complex economic framework
• Other revenue should be charged to cross-subsidise other infrastructure facilities

3.3.1.2 Interconnectivity Measures

a) Legal/regulatory
• Integrated transport planning which requires legislative changes
• Create or improve regulation on intermodality and integrated tariff (ticketing)
• Greater focus on intermodal transport network planning
• To improve passenger rights

b) Institutional
• Creation of a true transport authority with real powers regarding planning, funding and regulation
• A coordination body should be create to improve intermodality
• Review of existing policy and implementation of policy with cooperation with all stakeholders
• Short-distance railway stations should be managed by local operators

c) Contractual
• To introduce incentives for operators
• To establish agreements with the responsible of customers/passengers

g) Information
• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

h) Physical
• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

i) Economic
• Absence of common standards in contracts
• Apply new charging system to supply better services

3.3.2 Group 2: Terminal Managers

3.3.2.1 Interconnectivity Barriers

a) Legal/regulatory
• Intermodality has not been part of planning processes of existing infrastructure
• Different regulation in different countries or cities
• There are no homogeneous standards for information services and safety aspects
• The planning times in the political process (e.g. for an extension of the airport) are too long
• There are lots of single (correcting) measures to improve interconnections between modes but there is no central long term planning

b) Institutional
• Lack of cooperation among transport modes
• The market is very irregular: there are a lot of players, with different agreements
• Different authorities and directors lead to diffuse responsibilities
• There are often different own interests of politicians and transport operators

c) **Contractual**

• Lack of temporal coordination among transport operators
• The economic aims of transport operators and terminal managers are different
• Conflict of interests (business vs. public interests)

d) **Information**

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

e) **Physical**

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

f) **Economic**

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

3.3.2.2 *Interconnectivity Measures*

a) **Legal/regulatory**

• More centralised and more long-term oriented planning of infrastructure under consideration of all levels (modes) of the transport chain
• Adaptation to the growing market!
• Transport interchanges' planning
• Introducing planning systems promoting the use of different transport modes

b) **Institutional**

• Terminal Managers should get more decision power
• Development of a legal body which will be in charge of the intermodal chain (all intermodal agents should participate in it)
• Metropolitan authority should take a more active role
• The management should be external (not internal institutions)

c) **Contractual**

• Agreement on a common understanding of intermodality, its costs and benefits among transport operators
• To find the system how to motivate transport operators who provide services on their own risk to cooperation – for example some bonus program

d) **Information**

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

e) **Physical**

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

f) **Economic**

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

3.3.3 **Group 3: Transport Operators**

The main findings concerning Transport Operators’ perspective are presented in this section.

3.3.3.1 **Interconnectivity Barriers**

a) **Legal/regulatory**

• Long-winded planning and licensing processes before investments in infrastructure can be made
• Lack of simple technical standards
• Too much regulation on the issue

b) **Institutional**
• Too many institutions that want to control and coordinate
• Cultural, political and institutional barriers that causes a lack of planning activities
• Absence of an entity / authority that coordinates the provision of operators
• Too much administrative constraints

c) Information

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

d) Physical

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

e) Economic

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

3.3.3.2 Interconnectivity Measures

a) Legal/regulatory

• Facilitation of planning and licensing processes for infrastructure projects, particularly in terms of capacity and accessibility of airports
• Raising the interest in intermodality from the demand side (higher willingness to pay)
• Quality transport planning and realization of its outputs should be enhanced
• To introduce common guidelines for information services
• Integrated planning of services and terminals

b) Institutional

• Need for an entity that undertakes / contracted with the operators and pay the intermodality which is expected from a given region
• More attention to the intermodal passenger transport by the Public Administration
• Create an effective management of the terminals

c) Contractual

• To leave initiative to global operator to mix long and short distance networks in a global contract with passenger
• To introduce specific budgets for long-/short distance intermodality
• To make contracts more transparent so that agents can learn from each other

d) Information

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

e) Physical

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

f) Economic

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

3.3.4 Group 4: Users Associations

The main findings concerning Users Associations’ perspective are presented in this section.

3.3.4.1 Interconnectivity Barriers

a) Legal/regulatory

• Intermodality is not part of the planning process
• Lack of integration with soft modes, such as bicycles
• There are not enough intermodal offers or they are not noticed by customers, which leads to a low demand

b) Institutional

• Different companies/organisations are involved when transport nodes are concerned (transport operators, infrastructure managing
company, cities, provinces,
...and there is lack of coordination among them

- Lack of city or local participation in stations’ activities
- Transport Operators are very competitive
- Lack of willingness from the side of Transport Operators to cooperate with each other

c) Information

- Absence of common standards in contracts
- Absence of incentives for intermodality (transport operators)

d) Physical

- Absence of common standards in contracts
- Absence of incentives for intermodality (transport operators)

e) Economic

- Absence of common standards in contracts
- Absence of incentives for intermodality (transport operators)

3.3.4.2 Interconnectivity Measures

a) Legal/regulatory

- To include the topic (i.e. intermodality) in the urban planning
- Legislative adjustment in the delay sanctions area
- Integration of no-motorised modes in the intermodal chain
- Development of strategies to promote and facilitate intermodality
- Structured transport policy with regard to intermodality with the participation of all stakeholders and especially the users’ associations

b) Institutional

- Transport Operators should work together and look at the other as complementary
- The establishment of a central regulating and planning body
- Continuous communication between the different operators and authorities
• An integrated organization of railways (with private and public companies) against motorways

c) Information

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

d) Physical

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

e) Economic

• Absence of common standards in contracts
• Absence of incentives for intermodality (transport operators)

3.4 Added value of intermodal elements

This section presents some current good practices in the implementation and production of intermodal transport. Dissemination of a best practice is a tool that allows getting ideas and learning lessons from others facing similar problems. The rationale behind it is to avoid ‘reinventing the wheel’ and reduce the cost and effort required to develop by learning from others’ experiences. To identify good practices on crossmodal transport arrangements capable to be transferable, the HERMES Project has undertaken two major surveys: to the stakeholders and to the customers. The former aimed to identify physical, logical, economical, contractual, institutional and legal interconnectivity barriers. The latter aimed to gather data from the case studies describing the current level of quality of the services in the terminals, concerning passenger flow, time, space and information and ticketing services.

3.4.1 Meet the Stakeholders’ needs as main factor to improve interchanges

Figure 3.4 and Figure 3.5 were developed upon the results collected in HERMES surveys. In the surveys for user associations on intermodality, the stakeholders
have been asked to rate the importance and satisfaction level regarding several issues of interchanges. The very high and high rating of these issues were collected and compared. Then, the main factors to improve interchanges were obtained based on these questions.

The figures show the significant gap between both the importance and satisfaction rating of a number of issues regarding interchanges in relation particularly to the informational and physical aspects.

Due to this rating regarding the information and physical aspects, it can be concluded that the stakeholders (targeted to terminal managers, transport operators and user associations) require a much higher level of services in accordance to the importance of the services.

As to the informational aspects (Figure 3.4), the worst performance identified is in relation to the delays for the whole intermodal trip chain, like pre-trip, on-trip and in interchanges. An integrated ticketing system is not available in the trip chain as well. Only the luggage handling seems to be perceived as satisfying by travellers.

As to the physical aspects (Figure 3.5), the issues also receive the same results when looking at the respective rating of importance and satisfaction. However, and given the low importance rating of these issues, the existing facilities at the interchanges finally show a better performance, especially on homogeneous safety and security standards, shops and retails. The waiting area and the customer service is the highest marked issue which should therefore be improved.
Figure 3.4 - Rating of the Importance and Satisfaction respect to informational issues

Figure 3.5 - Rating of the Importance and Satisfaction respect to physical issues
3.4.2 Key factors of trip value for Customers

From the customers' perspective, the most important step of an intermodal long-short distance journey is the long distance trip, in which they spend both the most money and time.

This means that travellers will probably choose first the long distance mode and then, depending on the short distance mode connections and facilities, the transfer node. Therefore it is crucial to know which aspects they weight up in their choices since any improvement will determine the success of the Airport, Port, Station or Interchange involved.

To get this information, about 300 surveys per Case Study were carried out. Among other questions, the respondents were asked about the main factors influencing their trip elections. (NB: this information is not available for all Case Studies, but from the existing data some results can be extrapolated)

Passengers were classified depending on the long distance mode they choose, since this seems to be the most important step of the journey. The figure below shows the main factors influencing trip decisions for airplane, train and bus travellers.
Figure 3.6 - Factors influencing trip election for Train travellers.

Figure 3.7 - Factors influencing trip election for Bus travellers.
The analyses of these results provide some interesting insights:

- There is usually one factor that appears by far as the most important (with the exception of Gothenburg, probably due to the fact that a 30% of respondents were not train users). So it is likely that many passengers just take into consideration one factor.

- According to the results there are two kind of passengers:
  
  - Those influenced mainly by the time spent in the whole journey; like train travelers at Gothenburg Station, Lyon Station, Zaragoza and Lleida; or airplane travelers from Arlanda Airport and Antwerp Airport. Note that most of these passengers do not mention Ticket prices as an important factor.
  
  - Those influenced by Ticket Prices, such as bus travelers of Zaragoza and Lleida; who on the opposite do not mention travel time as important in their trip election.
Therefore, it could be stated that both price and time are fundamental variables for passengers’ choices, but only one of them is taken into consideration by each market segment when making the decision.

Both kinds of passengers state that comfort and punctuality are also important, but much more important for train and airplane users, who are willing to pay more for a better service in general, as for example

- At Gothenburg Station and Arlanda Airport respondents showed a high level of satisfaction regarding time issues: less than 15% were not satisfied with waiting time or punctuality, and less than 10% with transfer time.
- At Part Dieu Station (Lyon) a 55% of respondents were going to stay less than 15 minutes at Station, and only a 10% stayed at the station due to a delay.
- At Antwerp Airport, passengers can check in until 20 minutes before departure, which is very useful specially taking into account that most of them are business travellers. In addition, the walking distances around and with the Antwerp Airport building are relatively small; which reduces the time that the traveler needs to move by around 10 minutes. These result show satisfaction regarding the time spent.
- According to the analysis done in the Port of Patras, 46% of the participants stated that the acceptable time to spend at the Terminal is up to 30 minutes. Comparing the results with the real time that they spent, only a small percentage (16%) should be disappointed.
- One of the reasons for success of Avenida de America Interchange (Madrid) is the metro connections: four Metro lines stop there, with a really good geographical coverage. Metro services are cheap, and trains have a frequency of 3-5 minutes; so they fit well to the Avenida de America users’ profile. In fact a 74% of the users access to the Interchange by Metro.

### 3.5 Recommendations for improving intermodality

To build efficient nodes should require a first analysis on the target, i.e., on the kind of passengers to be attracted and, then, focus on what they are really looking for. In the cases analysed it is seen that the travellers made their choices because of the low prices or the short time spent. So stakeholders should agree (and then, improve) on those factors involving these issues.
However, a certain level of quality in terms of comfort and punctuality should be always a service requirement. In fact, the surveys show that not everyone considers time and not everyone considers price, but everybody agrees on comfort and punctuality. So, stakeholders (transport operators and terminal managers mainly) should assume competences to force transport operators to assure punctuality and comfort through, for instance, quality contracts where any failure should be penalized.

This subsection provides information about the 4 groups of stakeholders’ perception on hypothetical measures to be implemented, in order to improve long/short distance intermodality, from very different perspectives:

a) Legal/regulatory aspects

- Homogenizing the regulation of physical and informational standards, especially for the mobility impaired passengers.
- Improvement of the regulation concerning institutional agreements and regulation on physical accessibility for passengers with disabilities is also perceived as an effective issue.

b) Institutional aspects

- Central planning institution to coordinate and optimize the actions of all stakeholders involved is perceived to be the most agreed institutional measure among stakeholders. As a conclusion, all groups prefer an external figure than an internal one, to manage and coordinate all agents within the system.

c) Contractual aspects

- Contractual measures are important for terminal managers and transport operators.
- Introduction of a rigid contractual specification concerning time synchronization and information quality in the interchanges.
- Contracts with transport operators are key factor to enhance long/short distance intermodality.

d) Informational aspects

- Provision of real-time information covering both pre-trip planning and trip assistance.
e) Physical aspects

- Need for an adequate design of waiting areas and customer services, desk information, accessibility facilities, etc.

Finally, a list with the key measures for enhancing intermodality and interconnectivity:

- Homogenize the regulation on physical and informational standards.
- Introduce a central (external) institutional body to coordinate and promoting all agents of the system in the planning and management of transport nodes.
- Strengthen quality standards and indicators in contracts and homogenize the structure of contracts with other transport operators.
- Improve the provision of real-time information covering pre-trip planning and trip assistance.
- Promote the services in terms of physical in interchanges to fulfill customers’ requirements in relation to waiting areas and customer services, desk information, accessibility facilities, etc.
- Reconsider the distribution of the costs for safety/security among administrations, authorities and operators according to pre-defined criteria.
4 Business Models for improved intermodality

4.1 Business models theoretical foundations

Business Model is a buzz word concept in the business and scientific world. Indeed, the literature is populated with multiple definitions. The business model term has been referred to as architecture, design, pattern, plan, method, assumption, and statement (Morris et al., 2003). For example, Mansfield and Fourie (2004) define business model as the linkage between a firm's resources and functions and its environment. It is a contingency model that finds an optimal mode of operation for a specific market. The evolving business model concept is derived from a quest for value creation driven by environmental developments and infrastructural opportunities. Timmers (1998) defines a business model as architecture for the product, service and information flows, including a description of the various business actors and their roles and a description of the potential benefits for the various business actors and a description of the sources of revenues. Amit and Zoot (2001) describe a business model as the architectural configuration of the components of transactions designed to exploit business opportunities. Weil and Vitale (2001) says that it is a description of the roles and relationships among a firm's consumers, allies and suppliers and it identifies the major flows of product, information and money, as well as the major benefits to participants.

Applegate (2001) perceives a business model as a description of a complex business that enables the study of its structure, of the relationships among structural elements, and of how it will respond to the real world. Magretta (2002) says that a business model is like a story that explains how an enterprise works. Business models describe or prescribe more specifically how resources are combined and transformed in order to generate value for customers and other stakeholders, and how a value generating company will be rewarded by its exchange partners that receive value from it. Stähler (2002) reminds that a business model is always a simplification of the complex reality. Afuah (2004) describes a business model as a framework for making money. According to this
author is the set of activities which a firm performs, how it performs them, and when it performs them to offer its customers benefits they want and to earn a profit. This brief review evidences the lack of a general definition on the concept of business model. Diversity in the available definitions poses substantive challenges for delimiting the nature and components of a model and determining what constitutes a good model.

Business models can thus be understood as abstraction or conceptualisation of a company’s modus operandi (Janssen et al., 2007). According to Keen and Qureshi (2006), there are two common themes underpinning the conceptualization of business models: the focus on value and a statement of the basic logic of the business. They argue that the logic of value-generation is the core of a business model and also assert that business models are a vehicle for addressing how to balance value between the customer and the provider.

A business model can then be viewed as a collection of organizational roles, the system functionalities, detailed description of a mechanism, and relationships among parties. Business models describe or prescribe more specifically how resources are combined and transformed in order to generate value for customers and other stakeholders, and how a value generating company will be rewarded by its exchange partners that receive value from it (Magretta, 2002). In other words, for business models, the quest is to identify the elements and relationships that describe the business a company does. Thus, the business model concept can best be understood as a conceptual view of a particular aspect of a specific company. The meta-model then defines the words and sentences that we use to describe this view (that consist of elements and relationships that reflect the complex entities that they aim to describe) (Osterwalder et al., 2005).

The relevance of the topic captured the interest of authors that over time have brought forward conceptual frameworks and approaches for the design and analysis of business model. Yet, in the absence of a common ground and definition, the approaches greatly differ amongst them. Table 4.1 lists for various authors the elements of the respective proposals.
Table 4.1 - Business Model Authors List (Source: Osterwalder, 2004)

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition</th>
<th>Taxonomy</th>
<th>Components</th>
<th>Representation Tool</th>
<th>Ontological Modelling</th>
<th>Change Methodology</th>
<th>Evaluation Measures</th>
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<tbody>
<tr>
<td>(Afuah and Tucci 2001; 2003)</td>
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<td>(Maitland and Van de Kar 2002)</td>
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<td>Osterwalder et al (2010)</td>
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<td>(Tapscott, Ticoll et al. 2000)</td>
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<td>(Weill and Vitale 2001)</td>
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</table>

We used seven basic elements in the analysis of the concepts of business models, being: definition, taxonomy, components, representation tool, ontological
methodological and evaluation measures. Interestingly, not all authors provided a sound definition of business models, despite proposing a conceptual framework. This is a paradox in the sense you that it is hardly possible to present a conceptual representation of an undefined object. Looking now to the modelling approach, only one author proposed a rigorous modelling approach to business model and provided an ontology that carefully defines business model concepts, components and relationships among components. In the same line, few authors presented specific indicators to measure the success of a business models. The elements typically represented in the literature are the components and the representation tool of a business model and the respective (Osterwalder, 2004). The table clearly shows that the knowledge and research in business models is still giving its first steps. Authors have been dedicated to the conceptualisation and formalisation of the business model, and very few attempts have been made to measure model it or measure its main attributes.

4.2 Analytical framework for business models

In face of the diversity of definitions and proposals, the HERMES project adopted the definition proposed by Alexander Osterwalder (2004). Accordingly with this author "a business model describes the rationale of how an organization creates, delivers, and captures value". The author identified nine fundamental dimensions of a business model and organised them in a conceptual framework that is presented in Figure 4.1. The nine building blocks of the framework are now briefly described.

- **Customer Segments** - Customers comprise the heart of any business model. Without (profitable) customers, no company can survive for long. In order to better satisfy customers, a company may group them into distinct segments with common needs, common behaviours or other attributes. An organization serves one or several Customer Segments and there are different types. Here are some examples: mass market, niche market, segmented, diversified and multi-sided markets. The questions that a company should make are: *For whom are we creating value? Who are our most important customers?*
Figure 4.1 – Osterwalder’s Framework of Analysis

- **Value Proposition** - Value Proposition is the reason why customers turn to one company (service or product) over another. It solves a customer problem or satisfies a customer need. Each Value Proposition consists of a selected bundle of products and/or services that caters to the requirements of a specific Customer Segment. Value Proposition creates value for a Customer Segment through a distinct mix of elements catering to that segment’s needs that may be quantitative (e.g., price) or qualitative (e.g., design). The questions that a company should make are: *What value do we deliver to the customer? Which one of our customer’s problems or aspirations are we helping to address? Which customer needs are we satisfying?*

- **Channels** - Communication, distribution, and sales Channels comprise a company’s interface with customers. Channels are customer touch points that play an important role in the customer experience. Channels have five distinct phases and each channel can cover some or all of these phases. We can distinguish between direct and indirect Channels, as well as between owned and partner Channels. The Channel phases are: awareness, evaluation, purchase, delivery, and after sales. The questions that a company should make are: *How are we reaching our Customer Segments? How are our Channels integrated? Which ones work best?*
• **Customer Relationships** - A company should clarify the type of relationship it wants to establish with each Customer Segment which can range from personal to automated and may be driven by the following motivations: customer acquisition, customer retention and boosting sales. We can distinguish between several categories of Customer Relationships, which may co-exist in a company's relationship with a particular Customer Segment: personal assistance, dedicated personal assistance, self-service, automated services, communities and co-creation. The questions that a company should make are: *What type of relationship does each of our Customer Segments expect us to establish and maintain with them?*

• **Revenue Streams** - If customers comprise the heart of a business model, Revenue Streams are its arteries. A company must ask itself, *For what value is each Customer Segment truly willing to pay?* Successfully answering that question allows the firm to generate one or more Revenue Streams from each Customer Segment. There are several ways to generate Revenue Streams: asset sale, usage free, subscription fees, lending/renting/leasing, licensing, brokerage fees and advertising. The questions that a company should make are: *For what do our customers currently pay? How much does each RS contribute to overall revenues?*

• **Key Resources** - Every business model requires Key Resources which allow an enterprise to create and offer a Value Proposition, reach markets, maintain relationships with Customer Segments, and earn revenues. Different Key Resources are needed depending on the type of business model. Key Resources can be physical, financial, intellectual or human. The questions that a company should make are: *What Key Resources do our Value Propositions require?*

• **Key Activities** - Every business model calls for a number of Key Activities and these are the most important actions a company must take to operate successfully. Like Key Resources, they are required to create and offer a Value Proposition, reach markets, maintain Customer Relationships, and earn revenues. Key Activities differ depending on business model type and can be categorized as follows: production, problem solving and platform/network. The questions that a company should make are: *What Key Activities do our Value Propositions require?*

• **Key Partnerships** - Companies forge partnerships for many reasons, and partnerships are becoming a cornerstone of many business models. Companies create alliances to optimize their business models, reduce risk, or acquire resources. We can distinguish between four different types of
partnerships: strategic alliances between non-competitors, strategic partnerships between competitors (coopetition), joint ventures to develop new business and buyer-supplier relationships to assure reliable supplies. The questions that a company should make are: **Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners?**

- **Cost Structure** - This building block describes the most important costs incurred while operating under a particular business model. Creating and delivering value, maintaining Customer Relationships, and generating revenue all incur costs. Such costs can be calculated relatively easily after defining Key Resources, Key Activities, and Key Partnerships. There are two broad classes: cost-driven (minimizing costs) and value-driven (focus on value creation). Cost Structures can have the following characteristics: fixed costs, variable costs, economies of scale and economies of scope. The questions that a company should make are: What are the most important costs inherent in our business model? Which Key Resources and Key Activities are most expensive?

In the management literature (Kaplan and Norton 1992, Markides 1999) four fundamental dimensions – or pillars - are identified for achieving and maintaining business success. These four pillars are:

- **Product**: what business the company is in, the products and the value propositions offered to the market;

- **Customer Interface**: who the company’s target customers are, how it delivers them products and services, and how it builds a strong relationships with them;

- **Infrastructure Management**: how the company efficiently performs infrastructural or logistical issues, with whom, and as what kind of network enterprise;

- **Financial Aspects**: what is the revenue model, the cost structure and the business model’s sustainability.

Osterwalder’s building blocks may be grouped in these four dimensions, which provides evidence on the robustness of the framework. Table 4.2 compares the pillars for business success with the Osterwalder’s building blocks. It presents a synthesis of the business model elements.
Table 4.2 - Comparing Osterwalder’s building blocks with pillars for business success

<table>
<thead>
<tr>
<th>Pillar</th>
<th>Building Block of Business Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td>Value Proposition</td>
<td>A value proposition is an overall view of a company’s bundle of products and services that are of value to the customer.</td>
</tr>
<tr>
<td>Customer Interface</td>
<td>Target Customer</td>
<td>The target customer is a segment of customers a company wants to offer value to.</td>
</tr>
<tr>
<td></td>
<td>Distribution Channel</td>
<td>A distribution channel is a means of getting in touch with the customer.</td>
</tr>
<tr>
<td></td>
<td>Relationship</td>
<td>The relationship describes the kind of link a company establishes between itself and the customer.</td>
</tr>
<tr>
<td>Infrastructure Management</td>
<td>Value Configuration</td>
<td>The value configuration describes the arrangement of activities and resources that are necessary to create value for the customer.</td>
</tr>
<tr>
<td></td>
<td>Capability</td>
<td>A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer.</td>
</tr>
<tr>
<td></td>
<td>Partnership</td>
<td>A partnership is a voluntarily initiated cooperative agreement between 2 or more companies in order to create value for the customer.</td>
</tr>
<tr>
<td>Financial Aspects</td>
<td>Cost Structure</td>
<td>The cost structure is the representation in money of all the means employed in the business model.</td>
</tr>
<tr>
<td></td>
<td>Revenue Streams</td>
<td>Revenues accrue all the sources of income from the activities deployed in the business model.</td>
</tr>
</tbody>
</table>
Figure 4.2 presents the chain of interactions between Osterwalder’s building blocks. Any company is a living being in which each part and function influences and is influenced by others. Since, Osterwarder’s framework represent the way a company does its business, therefore, the building blocks cannot be analyzed or designed independently, but necessarily taken into consideration all others.

The fundamental building block is the *value proposition*. It defines the positioning of the company in the market, which products and services it will produce, and how it intends to deliver them to the final customer. The value proposition defines all the other building blocks.

The *Value Proposition* determines the *Key activities*. The *Key Activities* represent the necessary functions for the achievement of the *Value Proposition*. The *Key Activities* in turn define the required *Key Resources* to fulfill those activities. The *Key Resources* may imply costs and therefore they will determine the company’s *Cost Structure*.

The *Key Activities* will also enable to identify if any partnership is required. *Key Partnerships* may be forged either because there are activities that company cannot perform, or because strategic positioning in the market. In parallel, certain *Key Resources* may also lead to the need to establish partnerships (since, the company may not have or not have the need to acquire certain resources).

The partnerships naturally involve financial transactions, and depending on its nature it can either represent a source of costs or of revenues. Thus, the *Key Partnerships* influences the company’s *Cost Structure* and *Revenues Streams*.

Going back to the *Value Proposition*, this building block will ultimately determine the types of customers of the company - *Customers’ Segments*. In function of the *Customers’ Segments* and based on the *Key Activities*, the *Customers’ Relationships* can be defined. Indeed, the *Key Activities* simply materialize how the *Customers’ Relationships* will be established. The building block *Channels* emerges from the need to establish a relationship with the customers – *Customers’ Segments* – and in function of the properties of the customers – *Customers’ Segments*. Finally, the
customers will provide the company’s income and constitute the *Revenue Stream* building block.

![Diagram of Osterwalder’s Building Blocks](image)

**Figure 4.2** - Relationship between Osterwalder’s Building Blocks

### 4.3 HERMES Case Studies

A case study is a research technique that aims to investigate - *study* - an instance - *case* - of a given real world phenomenon. In a case study, the instance is analysed within its contextual conditions (that is: the object of analysis is not analysed within controlled conditions); therefore no bias results from the research process.

Case studies are very useful in instances where the frontier between the object of analysis and the context is not clear cut (Yin, 2003, pp 13). Intermodal transport is a typical situation, as its efficiency and performance are highly related with contextual conditions (such as: legal environment, demand properties, physical infrastructure, etc).
Additionally, case studies are particularly suitable in the analysis of the underlying mechanisms and causes, or the behavioural nature of the object of study. Indeed, Yin (2003) writes that case studies have distinct advantage “when a ‘how’ or ‘why’ question is being asked about a contemporary set of events, over which the investigator has little or no control” (pp 9). This was the case of HERMES project. As a matter of fact, the main purpose of the project was the development of prototypes of business models for improved intermodal transport, linking long with short distance transport. Additionally, the development of a business model, accordingly to Osterwalder’s framework of analysis, requires a deep understanding of multiple dimensions of the business – intermodal transport – and its context. The case study methodology provides the flexibility and tools to obtain the required information in an unbiased and clear manner.

Yin (2003) identifies four main stages in the execution of a case study, being:

- The first phase is the design stage where the outline of the case study is drawn. This outline contains all the subsequent steps and tasks necessary to accomplish the inquiry. Therefore, in function of the specific objectives of the case study, the outline should depict the propositions and unit of analysis, the tools and techniques to deploy, and make reference to criteria to interpret data and findings. The quality of the design of the case study will ultimately define its very success (Yin, 2003, pp 19 and 21).

- The second stage is the conduction of the case study, whereby data on the object of analysis is collected from the real world. Researchers may use one or more of the various sources of data and evidences already explained (Yin, 2003, pp 83 and 97).

- The third stage corresponds to the analysis of the data collected. “Data analysis consists of examining, categorising, tabulating, testing, or otherwise recombining both quantitative and qualitative evidence to address the initial propositions of a study” (Yin, 2003, pp 109), in order to fulfill the initial goals of the case study.

- The final stage corresponds to reporting of the case study. The report represents the descriptive memory of the entire process of research conductive to the conclusions meanwhile achieved (Yin, 2003, pp 141).
A total of eleven Case Studies have been developed in HERMES project. They are now listed:

1. **Case Study 1**: Gothenburg Central Station (Sweden);
2. **Case Study 2**: Arlanda International Airport (Sweden);
3. **Case Study 3**: Avenida de América Interchange Madrid (Spain);
4. **Case Study 4**: Long distance bus services connected with high speed rail services (Spain);
5. **Case Study 5**: Extension of the Adriatic-Ionian ferry corridor from Peloponnese to Crete (Greece);
6. **Case Study 6**: Gare do Oriente Interchange Station and Connection with Linha do Norte Railways (Portugal);
7. **Case Study 7**: Faro International Airport (Portugal);
8. **Case Study 8**: Antwerp Airport (Belgium);
9. **Case Study 9**: Port of Patras (Greece);
10. **Case Study 10**: Part-Dieu Station at Lyon (France);
11. **Case Study 11**: Frankfurt-Hahn Airport (Germany).

The Case Studies are briefly described in Annex I. For a complete presentation of each Case Study, the interested reader is referred to Lundin et al. (2011).

The information collected with the case studies provides a valuable and reliable source for a better understanding intermodal transport and interconnectivity at several levels, including:

- Barriers and missing links (regulatory, legal, physical, market-related, etc.) for an improved intermodality,
- Good practices and success cases of interconnectivity,
- Current business models in operation,

In addition, the case studies covered a wide diversity of cases across the European Union, therefore they offer a comprehensive picture of the current level of development of the intermodal transport and interconnectivity in the European Union.
In what concerns HERMES project, the Case Studies provided information for the design and validation of the prototypes of Business Models for improved intermodality.

The Case Studies were chosen to provide an accurate and reliable picture of the current state of intermodality and interconnectivity across the European Union. Factors taken into consideration in this process included:

- Geographical Coverage,
- Intermodal Transfer Point,
- Modes of transport involved,
- Potential barriers and missing links.

Although the multiplicity of countries, with different culture and backgrounds, is one of the main sources of the European Union’s richness and diversity, it is also a root for the problems affecting intermodal transport. For example: the legal frameworks, the institutional arrangements or the business environment still remains different between the member states. Also, the language barrier or the diversity of the ticketing systems are still an important factor undermining the performance of intermodal transport. HERMES case studies were developed in seven European Union member states, including:

- Belgium (Case Study 8),
- France (Case Study 10),
- Germany (Case Study 11),
- Greece (Case Studies 5 and 9),
- Portugal (Case Studies 6 and 7),
- Spain (Case Studies 3 and 4) and
- Sweden (Case Studies 1 and 2).

The case studies provide good coverage of the central and western European Union reality, as well as, northern and southern member states.
The intermodal transfer points are key in the production of intermodal transport services, since they provide the opportunity for the passengers to change between modes of transport. Inadequate transfer points will reduce the level of interconnectivity and, consequently, the efficiency of the intermodal transport service. On the other hand, these points are designed according to the properties of the modes of transport that will operate. Naturally, different modes of transport will imply different designs and functionalities. Therefore, the requirements for an adequate interconnectivity depend on the type of the transfer point. Looking now to HERMES case studies, we have three types of intermodal transfer points, being:

- Airports (Case Studies 2, 7 and 11);
- Maritime Ports (Case Studies 5 and 9);
- Terminal Stations (both bus and rail terminals) (Case Studies 1, 3, 4, 6, 8 and 10).

These represent the vast majority of the intermodal transfer points within the European Union.

Recalling the scope of HERMES project as being the issues involving intermodal transport at the connection between long and short distance transport services, we can that the case studies embrace most of the possible combinations available and all the typical ones. The next scheme (Figure 4.3) presents the coverage of the modes of transports by each case study.

The Case Studies cover the majority of the possible intermodal combinations. In practical terms, some of the combinations (such as: sea and air) are practically non-existent in the European Union and therefore of little relevance.
Finally, in terms of the barriers and missing link for improved intermodality and interconnectivity, Chapter 3 provides an overview of HERMES project barriers to intermodality. We can summarise them into the following categories: physical barriers, logical barriers, economical barriers, contractual barriers, institutional barriers, and legal and regulatory. Most case studies exhibit more than one barrier; therefore all barriers are conveniently addressed. For example purposes, we now link each barrier to a case study:

- Physical Barrier (Case Study 10),
- Logical Barriers (Case Study 7)
- Economical barriers (Case Study 5)
- Contractual Barriers (Case Study 3),
- Institutional barriers (Case Study 4)
- Legal and Regulatory Barriers (Case Study 2).
4.4 Analysis of the current business models

The main stream of research in HERMES project was related with the development of prototypes of business models for improved intermodality. The business model of each Case Study was assessed through the framework proposed by A. Osterwalder, and described in the previous chapter. The main conclusions are now briefly reviewed.

4.4.1 Value Proposition (VP)

Looking for the current transport services provided to and from the airport of Faro, we may conclude that, in practical terms, no intermodal transport services are offered at the airport of Faro (CS7). Instead, there is a set of independent services connected at the same location - the airport. Public transport is limited to buses since the other available modes are taxi and rent-a-car.

This is similar to the current situation described for the Peloponnese/Crete case study (CS5). Transport services of various modes -not integrated- are offered along the examined corridor. The customers themselves proceed to various modal combinations in order to reach the final destination, but the transport service on each leg of the chain is fully independent from those of the adjacent legs. Rail, bus and car services are offered on short distance as well as on long distance, depending on the leg of the chain.

Antwerp Airport Case Study (CS7) reported a low level of satisfaction among passengers in relation to the public transport services such as bus and taxi. Antwerp Airport is well accessible by car since there is a large parking lot in front of the airport building. However, as on most roads in Belgium, there are traffic jams on the roads leading to the airport, so public transport needs to be improved. So we can conclude that like in the case of Faro Airport (CS7) and Peloponnese/Crete case (CS5), there is a missing link.

Frankfurt Hahn (CS11) airport is another example, since it currently depends on an effective operating road infrastructure as there are no railway services to Hahn airport. Therefore, accessibility to the airport is limited to private
transport modes where car is the predominant transport mode or to public transport services that are currently limited to buses. In terms of intermodality and interconnectivity the business model was so far focused exclusively on road transport. The strategy has been to use the benefits of the small size of the airport, which assures short distances in and around the terminal and the extensive space of the former military ground, which can be used for parking facilities. Since a high percentage of passengers use private cars, the airports interconnectivity strategy particularly targeted car users by providing cheap parking and free shuttle buses from the more distant parking facilities.

Regarding Long Distance Bus (CS4), we can notice that there is also a missing link which is the integration between short and long distance services, especially between rail and bus services in Zaragoza.

In Avenida de America case study (CS3) we can notice that the current value proposition is mostly lacking on information provision. Information at the site is not clear or sufficient. There is also a lack of physical integration at the terminal.

For the Long Distance Bus Service case study (CS4) we can notice that information about all transport is a weakness too, but here there is no integration of information between transport services at all. Apparently, all that is shared by long distance and local transport operators is a location.

In Arlanda Airport (CS2) there is an agreement between transport market players to persuade people to use public transport to and from the airport. For those who choose to ride in a taxi, there is already a separate eco-taxi queue outside the airport terminals, in front of the other taxis. The airport's target is that all taxis that serve Arlanda airport shall be eco-taxis by 2011. The airport also gives preferential treatment to “clean” cars, for example by allowing them to park closer to the terminal for passengers. Nevertheless, there is still a lot of room for improvement when it comes to public transport. Today, driving a car is the only alternative from a number of areas so the goal is to find solutions to decrease usage of cars to and from Arlanda. Here we clearly have a governance issue.
Gothenburg Central Station (CS1) customers are not satisfied with the quality/service (through survey answers). The main reasons for this could be the winter problems together with the fact that Swedes tend to be self-critical. On January 1st 2012 Swedish passenger transport will be fully de-regulated. This implicates that more stakeholders and operators will probably be present at Gothenburg Central Station. The risk of getting a situation with less coordinated information and confusion among travellers is high. Expectation is to maintain/increase the information quality and standard at the station in order to maintain/increase the customer satisfaction. Here the two main problems are lack of logical integration and governance.

In Port of Patras case study (CS9) the ‘components’ of the value proposition that are affected directly or indirectly by the port authority are lack of logical integration, poor physical integration and governance.

The Part-Dieu station in Lyons (CS10) has several main Value Propositions addressing different “clients”: attraction of rail operators (mainly the SNCF) to provide regional, national and high-speed rail transport services; to attract non-rail transport operators and to propose a multimodal mobility (station proposes connections between rail transport, urban public transport, non-urban public transport, cars and self-service bicycles); improve quality of the service for passengers (which includes passengers’ information in the station but also real-time remote information), signage improvement for different transport modes, shops and other services, offers different types of in-station services and shops. The three main problems identified are: poor physical integration, logical integration and governance.

4.4.2 Customer Segments (CS)

Since all these case studies are related with transport terminals or transport connections, passengers are diversified. Nevertheless, for some case studies the main customers’ group are travelling for tourism or leisure and in others for business purposes.
Faro Airport (CS7), for example, presents more than 80% of customers travelling for tourism in 2010, and more than 53% with family. The most common choice of land transport to leave the airport is rent-a-car (33%). This airport has more than 5 million passengers per year. On the contrary, Antwerp Airport mainly serves business people.

Young passengers use Frankfurt-Hahn (CS11) as airport for leisure trips (e.g. vacation or family visit). Business customers which are a primary segment of other airports only play a minor role at Hahn airport. The self-image of Hahn is a low cost airport which mainly serves price sensitive customers which is underlined by the trip purpose distribution.

In Long Distance Bus Service case study (CS4) we can notice the two types of passengers with the same weight depending on the transport mode. For example, the main passengers' travel purpose for high speed railway is business. Nevertheless, for bus trips the main travel purpose is “private reasons” where we can include leisure and tourism. This is consistent with the principle that tourism passengers are more price sensitive than business passengers, so they choose a cheaper transport mode.

### 4.4.3 Channels (CH)

Multiple channels are used by transport providers and other stakeholders of transport services to communicate with customers. However, channels to communicate with their passengers are similar. In many case studies we notice that all channels are proprietary and transport provider based. This means that passengers need to use several channels to get information on (and eventually buy the tickets from) the diverse transport providers.

Websites on the internet are the most common channels mentioned in the case studies. Airports, Central Stations and transport operators have websites with information about their services. Faro Airport (CS7), Antwerp Airport (CS8), Frankfurt-Hahn Airport (CS11), Arlanda Airport (CS2), Part-Dieu Station (CS10), Gothenburgh Central Station (CS1) are good examples of this.
Terminals (or interchanges) where multiple transport providers operate sometimes use a common instrument to spread information, namely through audio or posters. This is the case, for example, of Avenida de America (CS3) and Long Distance Bus Service (CS4) case studies.

Information desks are also a common channel. All airports have this service and information desks are managed by airlines and land transport operators. Moreover, terminals like Long Distance Bus Service (CS4), Gothenburg Central Station (CS1) and Part-Dieu (CS10) for instance, also present these information desks.

Information displays about transport schedules are present at all airports. Moreover, stations like Part-Dieu (CS10) or Gothenburg (CS1) for instance, also have these displays to spread information about railway schedules. The main difficulty identified is the integration of the information of different transport operators.

In the case of Port of Patras (CS9) for instance, advertising through media represents another mentioned channel to spread information and raise awareness of transport service.

### 4.4.4 Customer Relationships (CR)

We did not identify strong relationships between stakeholders and their customers besides the actual delivery of the service in general. Several cases were found in which different stakeholders in the same case do not have any kind of relationship. Those who have invested in building some sort of relationship with their customers use the typical loyalty programs or offer cheaper bundled services. Nevertheless, there are few examples of customer relationship worth of being mentioned.

For instance, in the Corridor Peloponnese to Crete (CS5) ferry services have rewards programs for frequent travellers which offer benefits in the form of discounts, participation in promotions and special offers.
In Port of Patras case study (CS9) it was noticed that major customer relationship is assured by desk information and ticket-selling desks. This is also the case at Gothenburg and Part-Dieu stations (CS10), where besides that automated services there are also personnel available at the sites to sell tickets and give information. Studied airports (Faro (CS7), Arlanda (CS2), Antwerp (CS8) and Frankfurt-Hahn (CS11)) also present this kind of desks that are managed by airlines. Nevertheless, Antwerp Airport (CS8) as well as Faro Airport (CS7) has little interaction with customers. This is also true for Frankfurt-Hahn Airport (CS11) since the demand is represented by highly price-sensitive customers so customer relationship programs do not play a role and are not offered by the air transport operators (since they are LCCs). Arlanda Airport (CS2) presents more interaction with customers since it has a large desk to provide assistance and information to passengers concerning land transport modes.

Some transport operators offers cards and discounts for frequent customers. For instance, in Avenida de America case study (CS3) it was noticed that bus company “Alsa” offers a card that supports schemes for discounts in tickets and other advantages to its customers. Spanish railway operator, RENFE, presents discounts for frequent users and young or elderly customers as it was noticed in Long Distance Bus Service case study (CS3).

4.4.5 Revenue Streams (RS)

The main revenue stream of transport providers operating at the studied sites is ticket sales. Transport operators feed the revenue streams of the terminal since they pay for using the interchange as it is noticed, for example in Long Distance Bus Service (CS4) and Avenida de America (CS3) case studies. In the latter case study it is also highlighted that the rental of commercial premises and the parking revenues are other revenue streams. This also happens in other case studies such as Gothenburg Central Station, but in this case municipalities contribute with more than 40% of the revenues.
Government participation is also mentioned in Antwerp Airport (CS8), since the Flemish Government contributes with subsidies. Advertising revenue is relatively low for all case studies where this revenue is mentioned for example Gothenburg Central Station (CS1), Faro Airport (CS7) and Avenida de America (CS3).

The main revenue streams for the airports are fees paid by airlines to operate. This is the case of Faro (CS7), Arlanda (CS2), Frankfurt-Hahn (CS11) and Antwerp airports (CS8). Aviation revenues include landing fees, passenger charges, etc. As it is noticed on Arlanda case study, other important revenues come from non-aviation revenues such as parking fees, commercial site rentals, office rentals, advertising spaces and commercial services. Stakeholders who want to operate at the interchange have to accept both conditions and fees set up by the terminal manager.

4.4.6 Key Resources (KS)

On each case study there are several stakeholders and each one of them has its own set of key resources depending on its business and positioning in the transport chain. In general terms the resources can be divided into the following types in the case studies:

- Vehicles;
- Infrastructure
  - Physical infrastructure (includes: airport terminal, parking lots, parking stands, front desks, etc);
  - Technological infrastructure (includes: websites, communication systems, etc);
- Human Resources.

4.4.7 Key Activities (KA)

The key activities are related with the provision of transport services. Like the previous building block, the activities are function of the stakeholder’s positioning in the transport chain for each case study.
In general terms, key activities described for all case studies can be divided in the following ones: customer oriented activities or stakeholder (or company) oriented activities. Customer oriented activities are pointed out as being information and marketing, tickets selling, transferring (resting and foods areas), transport service, parking. Company oriented activities are mainly financing and economics (related with the assessment of costs, revenues, financing and similar activities), planning and management operations (schedule, services), monitoring, maintenance and security.

4.4.8 Key Partnerships (KP)

Few relevant partnerships have been identified in the case studies. Nevertheless, some case studies are richer than others in this aspect.

Airport case studies (Arlanda (CS2), Faro (CS7), Frankfurt-Hahn (CS11) and Antwerp (CS8)) present only partnerships between airlines and the airport manager. In Avenida de America (CS3) and Long Distance Bus Service (CS4) no partnerships were pointed out. Public companies are responsible for managing the terminals and they do not have any partnerships with other companies. However, we can notice that transport providers that operate at the site do have contractual agreements with the terminal managers.

Frankfurt-Hahn (CS11) and Arlanda (CS2) present evidence of schedule integration between airlines and land transport and in the latter case, it is also noticed that there are several transport operators providing similar services which increases competition but not partnerships.

4.4.9 Cost Structure (C$)

It is possible to observe in all case studies that the cost structure is specific of each stakeholder. Yet, the main items of the cost structure for all case studies include: human resources, vehicle and fleet (acquisition, rental and maintenance), infrastructure (planning, building and maintenance), fuel, debt, amortization and other taxes.
Transport operators are described in the case studies as interested in minimising costs with the four main items mentioned above and indirectly in increasing revenues.

**4.4.10 Conclusions**

The value proposition is the less similar building block among the case studies, which is understandable since it reflects what the transport operators and local authorities aim to deliver and provide to its passengers; and, this varies considerably across the case studies (different types of market segments are concerned) and across Europe (as the notion of public service also changes).

In what concerns the remaining building blocks, there are multiple similarities, which is expectable since the majority is related with the public transport of passengers. The Customers Segments are essentially the same across the case studies, since in local public transport there tends to be no customer segmentation. The communication channels and customer relationships are also rather similar, existing in some case special features such as frequent passenger programmes.

Interestingly few partnerships have been identified, which highlights the relatively poor level of integration between transport operators. Naturally, the lack of stable partnerships is a factor precluding the implementation of intermodal or co-modal services.

Finally, in what concerns the cost structure, unfortunately information was hard to find and collect, owing to confidentiality issues. Even so, from the analysis of the case studies, we may conclude that, although the items of cost structure are similar, their relevancy may differ significantly from one case to the next.

**4.5 Analysis of the Barriers**

Table 4.3 identifies the barriers found in each Case Study, according to the dimension of integration. All Case Studies exhibit at least one of the barriers. Figure 4.4 describes the relevance of each barrier in HERMES case studies. All
barriers exhibit a similar degree of prevalence; yet the Logical barrier is the most frequent barrier; while the Legal and Regulatory barrier is the less frequent.

The Case Studies revealed the existence of barriers and missing links affecting the performance and efficiency of the intermodal transport services. Barriers have been identified at two levels, accordingly with the location, being:

- **Type 1: Barriers related with the Intermodal links** – the barriers are related with lack or poor integration of the transport services that, consequently, undermine the performance of the intermodal transport. In this type, problems reach farther than just at the point of connection of services.

- **Type 2: Barriers related with the transfer node** – the barriers are related with the inadequate characteristic of the intermodal transfer point, the make difficult the transfer process between the modes of transport.

The following picture distributes the Case Studies for the two types of barriers.
In what concerns barriers of Type 1 (link), they may arise due to either a missing link or a low quality link. In the former case (missing link), there is no short distance transport service to integrate with the long distance. Passengers travelling in the long distance service, when arriving to destination, have no integrated service for the short distance. Instead, they have to build their transport chain, leg by leg. Case studies in this situation include CS4, CS5, CS7, CS8 and CS11. In the latter case (low quality link), there are short distance transport services, but the integration level is so poor and low quality that, in practical terms, the passengers have to build their transport chain leg by leg. Case studies in this situation include CS6.

Practical examples of these barriers found in the case studies include the following list:

- Non-coordination of schedules (e.g.: CS7);
- Absence of (short distance) service (e.g.: CS5 and CS11);
- Non-tariff integration (e.g.: CS4);
- No joint marketing initiatives (e.g.: CS8);
• Incomplete information (e.g.: CS11);
• Lack of strategic alignment between agents (e.g.: CS5)
• Low level of service (e.g. CS6)

Looking now to barriers of Type 2 (Node), three types have been identified, namely:

• Logical barriers (Case Studies: 1, 3, 4, 9, 10)
• Physical barriers (Case Studies: 3, 4, 9, 10)
• Institutional barriers (Case Studies: 1, 2, 3, 9, 10)

Each type of barrier presents specific characteristics and properties. In what concerns the logical barriers, examples include lack of or unclear information to passengers, on either the transport services (routes, frequencies, tariffs or schedules) or on the layout of the terminal (location of quays or ticket machines). The physical barriers are those that appear in a wider array of forms and aspects, in overall terms they are all related with the inadequate architectonical and functional design of the terminal. Such inadequacy induces multiple problems, such as: lack of or low legibility (difficult to understand on how to move between places); long walking distances, location of related functional areas in different floors, etc.) or, even, lack or insufficient equipment to easy movement within the terminal (lack of elevators, escalators, etc.). Some case studies also identified as a barrier for intermodality, the low comfort of the stations. Comfort is related with the adequate illumination, perception of safety, or temperature, as well as properly dimensioned seating areas when there are services with low frequency of departure.

Finally, in what concerns the institutional barriers, the typical one was related with an inadequate governance structure of the transfer point. Indeed, multiple stakeholders operate within a transfer point. However, often their roles are not clear or are incorrectly assigned, resulting in a highly bureaucratic and inefficient system. In Case Study 4, the transport operators can only formally communicate with each other through a ladder in the respective hierarchies, which in practical terms prevents any communication.
### Table 4.3 - HERMES Cases: Barriers, Measures and Value Propositions Summary

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Barriers Addressed</th>
<th>Measures Proposed/Impacted</th>
<th>Central theme of Value Proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
<td>LR</td>
<td>C</td>
</tr>
<tr>
<td>CS1: Gothenburg Central Station</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>CS2: Arlanda International Airport</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>CS3: Avenida de America Interchange Madrid</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CS4: Long Distance Bus</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CS5: Peloponnese-Crete</td>
<td></td>
<td></td>
<td>*</td>
</tr>
<tr>
<td>CS6: Gare de Oriente</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CS7: Faro International Airport</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CS8: Antwerp Airport</td>
<td></td>
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<td>*</td>
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<tr>
<td>CS9: Port of Patras</td>
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<tr>
<td>CS10: Intermodal Network of Lyon Metropolitan Area</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>CS11: Frankfurt-Hahn Regional Airport</td>
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</tr>
</tbody>
</table>

**Key:** Barriers/ Measures: I: Institutional; LR: Legal and regulatory; C: Contractual; L: Logical; P: Physical; E: Economic
4.6 Analysis of the proposed business models for improved intermodality

Proposals for overcoming the current barriers and to establish the missing links have been brought forward in each Case Study. Table 4.3 indicates the envisaged solution for each case study. Table 4.3 also indicates which dimensions of intermodality have been changed to overcome the current barrier. The proposals have naturally been tailored to the properties and features of each case study. Of interest, is the recognition that the proposals for action are not necessarily of the same type as the barrier identified.

We may expect that each proposal will bring about a change to the current business models. The specific nature of that change is a function of the current business model and of the actual proposal. In this chapter, we summarise the changes expected in the business models of the case studies. The discussion of the expected changes in the business models was divided between the type of barriers (Figure 4.5), for an easier explanation and understanding.

4.6.1 Case studies with barriers on the links

4.6.1.1 Value Proposition (VP)

Regarding the value proposition of the six case studies named above we can observe that besides the specification of each one of them, they all propose a new connection or transport service to improve interconnectivity.

4.6.1.2 Customer Segments (CS)

No changes are expected in the building block Customer Segment vis-à-vis the current situation. However, since Corridor Peloponnese to Crete is related with a connection that currently does not exist, potential customer segments were taken into consideration.

4.6.1.3 Channels (CH)

There are no relevant changes at the channels. New transport connections will be provided by a new transport operator or by an existing one. Nevertheless, common channels mentioned to sell tickets, provide information, etc., will remain the same.
It mentioned in the case studies that integration tickets are a concern of the new proposals since it is our understanding that this option improves interconnectivity. For Faro Airport case study it is pointed out that besides the basic sales channel another foreseen channel is selling tickets for the new transport service on board aircrafts. This will imply the establishment of a commercial agreement with the air transport companies.

4.6.1.4 Customer Relationships (CR)

A new transport provider that will operate the proposed services in these case studies must establish a system for customer relationships, namely for claims, and particularly for objects forgotten aboard the bus, both on the arriving and on the departing bit of their trips. Sales and information could also be provided through desks to increase customer relationships as it was mentioned on the case studies.

However, no significant changes are expected in the building block Customer Relationships vis-à-vis the current situation.

4.6.1.5 Revenue Streams (R$)

General consideration regarding this building block for the case studies with issues on the links are that the transport provider which will operate the new proposed services (when they are introduced), would collect all the direct revenues from the various sales channels. Additional sources may include advertisement on board the vehicles or on the internet website. This consideration does not include Oriente Central Station.

No significant changes are expected for Revenue Streams vis-à-vis the current situation.

4.6.1.6 Key Resources (KS)

The services proposed will entail a new set of resources, including: fleet of vehicles (such as: road vehicles or trains), human resources (such as: drivers or other administrative staff), infrastructure (such as: administrative buildings, parking lots, railways tracks or terminal) or technological infrastructure (such as: IT infrastructure, signalling posts and panels, or escalators). Case studies that present as
a solution to the current interconnectivity problems a new transport connection
mentioned these resources.

If a current transport provider decides to operate this service, we can observe that
despite the fact that some resources are already available it will be necessary to
invest in the fleet or employees (for instance, drivers).

4.6.1.7 Key Activities (KA)

The introduction of a new transport connection generates a new key activity at the
sites for all case studies. This new activity will be similar to other activities related
with transport operators and their positioning in the market.

We expect in all case studies a change in transport structure (that we can observe on
the agents graphical representation of the case studies) and an improvement on
interconnectivity at the sites.

4.6.1.8 Key Partnerships (KP)

Key partnerships are different and specific for each case study. However, we can
notice that transport operators have to fulfil certain requirements of transport
regulation and also to accept some aspects in order to operate at the terminals.

Some new partnerships are suggested in the case studies, for example in Faro Airport
with hotels and other transport operators. But once again, those are specific of each
case study.

4.6.1.9 Cost Structure (C$)

No significant changes are expected for Cost Structure vis-à-vis the current situation.
However, a new transport operator will represent a new player at the transport
operators' stakeholder group that will contribute the cost structure of terminals, for
example.

4.6.1.10 Conclusions

Interestingly, all case studies bring forward a similar value proposition for
overcoming the current barrier to intermodality: implementation of a new service to
improve interconnectivity. This conclusion shows that this value proposition can be an
interesting solution to overcome the current barriers.
The implementation of a new service will have some impact in the key resources and possibly in the key activities, but no major changes have been identified. Likewise, the channels and customer relationships have not been significantly affected. The key activities will remain essentially the same, as the new service is also a transport service.

No changes in the customer segments are expected which denotes that the proposal of business model is not expected to attract different types of passengers, but it should attract more passengers of similar segments besides improving the quality for the existent ones, which by itself is very positive.

Of importance is the fact that again no significant changes are expected in the revenue streams building blocks; yet, the new service will naturally imply changes in the cost structure. Therefore, we may conclude that for the viability of the intermodal service, efficiencies will have to be generated. In parallel, as explained above, more customers may be attracted into the transport system.

4.6.2 Case studies with barriers on the nodes

Looking now to the Case Studies with Barriers of Type 2 – Barriers related with the Transfer Points, the proposals include the following changes into the current business models.

4.6.2.1 Value Proposition (VP)

The most referred changes in the value proposition are related with integration of information, governance and physical integration.

Information and signalling improvement through real-time information displays are mentioned in all case studies with issues on the nodes: Avenida de America (CS3), Long Distance Bus Service (CS4), Port of Patras (CS9), Gothenburg Central Station (CS1) and Part-Dieu station (CS10). As we can notice, this is most important action in the value proposition to improve interconnectivity. It is important to highlight that information improvement is the pillar of the new proposal for Gothenburg Central Station.

Interchange websites with schedules information and schedule coordination between transport modes operating in interchange are also two important referred measures,
especially in Avenida de America (CS3) and Long Distance Bus Service (CS4) case studies.

Governance improvements are also pointed out in the case studies but details are specific for each one. Cooperation between transport operators and among them and the terminal manager are also mentioned on these six case studies. Cooperation between transport operators is important to achieve schedule coordination and integrated tickets. As it is mentioned in Long Distance Bus Service case study (CS4), local transport authorities should be more involved with terminal managers. This entity could manage and checked cooperation between transport operators.

Apart from Gothenburg (CS1) and Port of Patras (CS9) case studies, physical integration is pointed out as an issue to mitigate with the new value proposition.

### 4.6.2.2 Customer Segments (CS)

No changes are expected in the building block Customer Segment vis-à-vis the current situation. Nevertheless, with the improvements of interconnectivity at the sites it is expected an increase demand of customers.

### 4.6.2.3 Channels (CH)

Since the six case studies pointed out improvements on logical integration of information, channels will be subject of change. Information displays with real-time integrated information, suggested for instance in Avenida de America (CS3) and Long Distance Bus Service (CS4) case studies, represent a new channel that currently do not exist.

Despite website is mentioned in all case studies as a channel of information, only in the case study of Port of Patras (CS9) and Airport of Faro (CS7) it is suggested ticket sell through it.

Besides these changes, no other significant alterations are expected on channels building block comparing with the current situation.

### 4.6.2.4 Customer Relationships (CR)

Customer relationship is service-based. Customers can interact at the sites with transport providers or terminals managers as it was described for the current
situation. The channels, especially the website will improve customer relationship but no significant changes are expected.

4.6.2.5 Revenue Streams (R$)

Revenue streams of transport operators are expected to increase for the six case studies, due to a rise of customer demand as it is pointed out on Port of Patras case study (CS9).

If integrated tickets are implemented, revenue streams should not decrease but origin should change since customers will not be the direct source (another entity will manage the shares). Besides this, no other significant changes are expected on revenues streams building block when comparing to the current one.

4.6.2.6 Key Resources (KS)

As it is mentioned in Gothenburg Central Station case study (CS1), information is going to be the key resource. Human resources can include IT-technicians, marketing managers, staff at the site and office. Most of these resources are already available at the site (for example, offices, marketing managers)

No significant changes are expected for Key resources vis-à-vis the current situation.

4.6.2.7 Key Activities (KA)

Here the results are specific of each case study, but some similarities were found. Major activities will be: gather information, integrate information from different transport operators and to distribute integrated information to the customers. This is valid for each one of the six case studies, since all of them mentioned information improvements.

Besides this, no significant changes are expected for Key Activities vis-à-vis the current situation.

4.6.2.8 Key Partnerships (KP)

The most common partnerships among the six case studies are related with transport operators, terminal managers and public decision makers. But they are specific of each case study, so there are no relevant similarities to point out.
4.6.2.9 **Cost Structure (C$)**

The cost structure might be a challenge. One important cost structure is the share of revenues as it mentioned on Gothenburg Central Station case study. Probably, the new agents (Traffic Information Brokers) are going to be private companies and these are going to charge for integrating the information. Information management is a large cost for many companies and it is necessary to find solid financial solutions. This is also important for Long Distance Bus Service (CS4), and Avenida de America (CS3) case studies.

4.6.2.10 **Conclusions**

Like in the other case studies, the value proposition is the building block that shows more difference vis-à-vis the current situation. Yet, conversely to the other cases, different value propositions have been proposed to overcome the current barriers. Furthermore, the most referred changes in the value proposition are related with integration of information, governance, and physical integration. Integration of information is related with improving the readability of the terminal stations (in particular, directions and information on arrivals and departures), the physical integration is related with improving the accessibility to the passengers, in particular to those with reduced mobility. The governance is related with the need to improve the relationships between transport operators, terminal managers and local authorities in order to provide a better quality services to passengers. Consequently, multiple barriers may occur in the terminals (nodes), which denotes that conversely to the problems with the links, there might be no universal or more general solution for tackling the problems with the nodes. In addition, it also shows that solving the problems in nodes is probably more difficulty to solve than solving problems with links.

Another building block that presents considerable evolutions vis-à-vis the current situation is the channels. In all case studies substantial improvements have been denoted. Likewise, the case studies whose problems are related with the governance, also exhibit evolutions in the building block key partnerships.
The building block key partnerships is improved in the case studies, whose barriers are related with inadequate governance or poor relationship between stakeholders (as the case of Avenida da America Interchange Station).

In what concerns the remaining building blocks (customers segments, customer relationships, revenue streams, key resources and key activates) no significant changes have been introduced comparing with the current situation.
5 Prototypes of Business Models

This chapter describes two prototypes of business models. Prototypes are conceptual representations of business models, ready-to-use in a real world situation. Recalling from Chapter 3, barriers have been located on the links and on the transfer point. Each prototype was designed to overcome a specific barrier. Therefore, the choice of the prototype depends on the location of the barrier.

The prototypes are classified as follows:

- Prototype 1: designed to overcome barriers in the links.
- Prototype 2: designed to overcome barriers in the transfer point.

Stemming from the previous chapters, some basic guidelines could be produced for the development of proposals and improvement of business models. These should be considered explicitly in each case of application and in conjunction with the development of the business model.

Registering stakeholders perception of barriers to intermodal transfer could provide significant input, and should be considered a starting point. The anticipated measures can also assist in the direction of setting the attributes of the Value Proposition. These perceptions also reflect the respective relations between stakeholders.

When referring to the terminals (nodes) the factors of modal integration should be addressed. Most cases used this as their initial approach to the proposed measures. When considering “information Integration”, this was addressed in two ways: (i) In cases where competition between actors can be managed, cooperative solutions can be appropriate, coordinated by the Terminal Manager. (ii) When competition and multiple actors are present, information integration can be a specific service provided by an independent agent.

Nodes (Transport Terminals) are the focus of integration of networks. When of smaller size (usually regional) the basic requirements of modal integration in most cases may be provided for, even at very basic levels, as the size compensates for any deficiencies. What is usually the problem is the absence of transport services (links). This issue may take on various forms: low frequency connections, irregular service, non-existence of service. In a de-regulated market, this is a transport operators’
response to a service with a low revenue basis. To address the issue the wider beneficiaries need to be identified. This was the case of the Value proposition for, eg. the Faro Airport case (FTCS supported by Hotels), the Peloponnese – Crete (a PPP service operation) etc. This general approach is presented in Figure 5.1.

It is evident from the highlighted approach that the useful categorization of cases is that of nodes and links. Equally so, within a node the number of stakeholders operating and their respective relations (cooperative or competitive) dictate the need or not of an independent agent to take up the role of “terminal coordination” in face of modal integration. With respect to “links”, this highlights the issue of low revenue services and the emphasis is placed on identifying potential partnerships “outside” the immediate transport service sector.

The presentation of the prototypes of business models will follow the framework of Osterwalder for an easier interpretation. As already explained in Chapter 2, to ensure the applicability and feasibility of a business model, not all building blocks need to be defined. Instead, only a set of building blocks are required, the remaining ones can be tailored in function of the specific condition of the case study, provided they are in line and are compatible. The required building blocks are: value proposition, key activities, key resources, key partners and channels. In order to keep the prototypes as flexibility as possible (and thus to improve its range of applicability) we will only specify the necessary building blocks.

Business model are commonly utilized to describe the activity of a given company or organization. In the case of an intermodal transport service, we have multiple stakeholders with different perspectives and objectives. As such, there is the need to define the perspective and he agent from which the prototype is designed. The perspective and the agent must be defined at the outset. We recommend that the agent should be the one responsible for promoting quality in intermodality. This agent varies from case to case, and should be identified in each application. For example, in case of HERMES project, the agent responsible were the:
We now describe for the Prototypes of Business Models for each of the required building blocks. Figure 5.2 and Figure 5.3 present the Prototypes of Business Model in the framework proposed by Osterwalder.

5.1 Value Proposition

- terminal manager (e.g.: Faro Airport, Arlanda Stockholm)
- public institution or regulator (e.g.: Frankfurt Hahn)
- transport operator (e.g.: Ferry Operator to Kalamata)
The fundamental building block of a business model is the **value proposition**. Value Proposition creates value for customers through a distinct mix of elements catering to that segment's needs that may be quantitative (e.g. price) or qualitative (e.g. design).

In the case of Prototype 1 the value proposition can be described as: *to improve the passenger's quality of transport or reduce price and to achieve benefits to the society, through a better intermodality promoted by intermediary agents.*

In case of Prototype 2 the value proposition can be described as: *to improve the passenger's quality of transfer service through an integrated approach to the transfer process.*

![Figure 5.2 – Prototype Business Model 1](image-url)
5.2 Key Partnerships

The Key Partnerships refer to the relationships and agreements established between companies. Along with the value proposition, the Key Partnership is another fundamental building block. The reason is well-known and it is related to the fact that partnerships are the cornerstone of any intermodal transport service. Therefore, without adequate partnerships we cannot expect high quality intermodal services (except when the same company performs all services). There are multiple partnerships, ranging from simple informal agreements until fusions or joint ventures. The specific degree of partnership depends on the conditions of the case.

This building block is similar in both prototypes and it should include: partnerships between transport operators, partnerships between transport operators and the terminal manager, partnerships between terminal manager and the local authorities.

5.3 Key Activities

The Key Activities refer to the most important actions a company must take to operate successfully.

In the case of Prototype 1 the key activities should include: coordination of schedules, traffic integration, and integrated information system.
In case of Prototype 2 the key activities should include: integrated scheduling system.

5.4 Key Resources

The Key Resources allow an enterprise to create and offer a Value Proposition, reach markets, maintain relationships with Customer Segments and earn revenues.

In the case of Prototype 1 the key resources include: knowledge of the local market by the short distance transport operator (this operator knows the local market much better than the long distance transport operator, such knowledge is a valuable resource), brand of the long distance transport operator (the long distance transport operator is usually better known than the short distance transport operator, such brand awareness is a valuable resource).

In case of Prototype 2 the key resources include: the terminal infrastructure, the information system.

5.5 Channels

Channels comprise a company's interface with customers. Channels are customer touch points that play an important role in the customer experience.

This building block is again similar for both prototypes and it should include: web based communication channels, information and sale desks at terminals.

5.6 Cost Structure, Revenues Streams, Customers Segments and Customer Relationship

These building block are considered not necessary for the design of a prototype of business models. Instead they must be defined case to case, but necessarily must not enter into conflict with the other building blocks.

In Figure 5.2 and Figure 5.3 these building blocks are filled in only as example. Other conditions and factors may be used, as long as they are aligned with the necessary building blocks.
6 Conclusions

The HERMES project developed eleven case studies. The case studies offer a valuable and reliable source of information on the current level of intermodality and interconnectivity within the European Union.

The analysis to the current business model offers some interesting conclusions. Firstly, the value proposition is the building block that differs the most between the case studies, which reflects the diversity of the case studies, and in them the natural differences between the strategies of the transport operators and local authorities. Secondly, no significant differences have been recorded between at the level of the remaining building blocks of the business model canvas. This shows a similarity of the operation and management across case studies (after all, we should keep in mind that we are always dealing with intermodal transport). The Customers Segments building block is essentially the same, since in local public transport there tends to be no customer segmentation. The communication channels and customer relationships are also rather similar, with only a few cases showing special features such as frequent passenger programmes. Thirdly, few partnerships have been identified. Taken into consideration that intermodal transport is based on integration between transport operators, terminal operators and other stakeholders, the few partnerships demonstrate a lack of integration between stakeholders. Naturally, the lack of stable partnerships is a factor precluding the implementation of intermodal or co-modal services.

The analysis of the Case Studies allowed the identification of two primary locations for the barriers and the missing links: in the intermodal links or in the transfer points. The former location refers to problems of integration between the transport services; while the latter location refers to problems inherent with the transfer point that precludes a seamless modal transfer between the long and short distance services.

Proposals have been brought forward for overcoming the existent barriers and to establish the missing links. Changes in the current business models are certainly associated with the possible implementation of these proposals. An assessment to the changes in the building blocks was undertaken. The analyses of the changes provide
information about which aspects of the transport services are required for obtaining an improvement in the quality of the intermodality.

The analysis of the improved business models considered the existence of fundamental barriers to intermodality, concerning the links and concerning the nodes. The case studies concerning the issues on the links are Long Distance Bus (CS4), Corridor Peloponnese to Crete (CS5), Oriente Central Station (CS6), Airport of Faro (CS7), Airport of Antwerp (CS8), and Airport of Frankfurt Hahn (CS11). The case studies concerning the issues on the nodes are: Gothenburg Central Station (CS1), Airport of Arlanda (CS2), Avenida da América Interchange (CS3), Long Distance Bus (CS4), Lyon Part-Dieu Station (CS10) and Port of Patras (CS9).

The main conclusion from the analysis to the improved business model focused on the links is a similitude in the improved value propositions for overcoming the current barriers to intermodality, that is: implementation of a new service to improve interconnectivity. In addition, the proposed business models do not imply significant changes in the remaining building blocks, with the exception of the cost structure that is affected with the introduction of the new service. No changes in the customer segments are expected which denotes that the proposal of business model is not expected to attract different types of passengers, while it should attract more passengers besides improving the quality for the existent ones, which by itself is very positive. The implementation of a new service will have some impact in the key resources and possibly in the key activities, but no major changes have been identified. Likewise, the channels and customer relationships would not be significantly affected. The key activities will remain essentially the same, as the new service is also a transport service.

Looking now into the analysis of the business models focussed on the nodes, the main conclusion is a lack of a unique suggestion for improved value proposition (as occurred with the other group of cases). Indeed, several value propositions have been suggested related with integration of information, governance, and physical integration. Integration of information is related with improving the readability of the terminal stations (in particular, directions and information on arrivals and departures), the physical integration is related with improving the accessibility to the
passengers, in particular to those with reduced mobility. The integration governance is related with the need to improve the relationships between transport operators, terminal managers and local authorities in order to provide a better quality services to passengers. Secondly, another building block that presented considerable evolutions vis-à-vis the current situation is the channels. In all case studies substantial improvements have been denoted. Likewise, the case studies, whose problems are related with the governance, also exhibit evolutions in the building block key partnerships. Thirdly, no relevant changes were identified in the remaining building blocks.

Comparing the results of the two analyses we may reach several conclusions. Foremost, in the set of cases with issues on links the proposed value proposition is rather similar across case studies. This may indicate a similarity of the barriers causing problems in the links and, therefore, the likely existence of a solution to overcome it. Conversely, in the cases with issues on the nodes a multiplicity of improved value propositions were suggested. This shows that the barriers causing problems on the nodes are multiple and more complex than those causing problems in the links. Also, it highlights that a generalisation of the solutions is not likely possible for this type of cases. Consequently, it should also be expected that solving the problems in nodes is more difficult than solving problems with links.

Another conclusion is that the proposed business models do not require major changes in the remaining building blocks (the changes result from the new value proposition), suggesting that improvements in the intermodality level may be possible to achieve with well-defined and precise changes in the business model.

The purpose of the Handbook is to provide the reader with the necessary knowledge and tools for developing new business models for an improved intermodality. The Handbook blends theory with practice offering a balanced piece of text that any practitioner could use in their daily operations. A general framework for the dynamics of intermodal transport and business models is presented. Practical and real world application includes the presentation of the eleven Case Studies, developed in HERMES project. The Case Studies offer a unique opportunity for understanding
how to assess the current level of intermodality and the business model, to identify the barriers, and to design and testing new business models. In addition, the Handbook offer indications for the identification of the barriers and missing links, and examples of good practices. Finally, ready-to-use prototypes of business models are given for deployment in real world cases.

The main result of the HERMES Project – based on the surveys made in the initial workpackages and strongly corroborated by the 11 case studies – is that intermodality between long distance and local transport services does not happen except if it is of direct business interest of one of the agents involved.

In some cases – mostly when we are dealing with the intermodality at nodes – it is rather likely that there will be scope for the assumption of the business of intermodality by the agent responsible for the management of that node (the “interchange manager”), as the provision of better coordination between long distance and local transport services could not only lead to higher satisfaction of those clients of the interchange, but also to a subsequent increase of the attractiveness / competitiveness of that interchange with respect to others serving the same region, or even with respect to other regions to which people travel for similar motives.

So, in such cases, promotion of intermodality could easily be justified as an important part of the business interests of that interchange or of that region.

In other cases – typically associated with creation of what was described as intermodality at links – it is generally less obvious what kind of business interests could be called upon to support that intermodality. Only after that identification has been made will it be possible to assign the responsibility for managing the associated services. The cases of the Arlanda airport and of the Patras to Kalamata link have some similarities but also some differences:

- in the former case, the intermodal services have only an indirect economic value for the airport manager, but a very important one, as they are necessary to keep the total emissions associated under the airport under the predefined threshold, and so to allow some growth of the main business interest of the airport, namely air traffic. So, it is
natural that the airport management takes on this role of intermodality manager;

- in the latter case, the intermodal services have limited business interest for those directly engaged but a strong interest for the community at large, as they allow a reduction of traffic volumes on the road between Patras - Athens - Piraeus and on the saturated ferry terminal at Piraeus. In the first dimension there are problems of road safety and emissions from road vehicles, whereas in the second dimension there are problems of poor service to the ferry clients travelling to Crete. So, in this case, the appointment of the intermodality manager should be a matter for the national road authority, the regional (tourist) authorities of Crete island, and also the port of Patras which can also increase the satisfaction of its clients (and possibly through this increase its market).

All cases in which three public authorities of different institutional settings have their own interest in a specific solution but view it from a different angle (for Crete and Patras an increase of quality of service and business volumes, for the road authority a reduction of problems), the formulas for cooperation must also be selected depending on particular circumstances of the people involved and the history of relations among those institutions, but the most logical solution that can be induced from these cases is for the infrastructure manager to appoint the intermodality manager and receive some financial contribution for the development of that mission from the authorities engaged.

It should be noted that, even if in these more complicated cases the rationale for intermodality has to be carefully investigated, this does not imply that the added value of its realization is lower. On the contrary that added value might be higher, but distributed across multiple partners, some of them with the location of their business in rather different geographical areas, and so more difficult to bring into the picture and more difficult to mobilize into the coalition of actors for deployment of a solution.
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8 Annexe I – Case Studies Fact Sheets

8.1 Case Study 1 - Gothenburg Central Station

8.1.1 Brief characterisation of the Case Study

Gothenburg Central Station is the major national, as well as the regional, transport hub for passenger transportation in the south west of Sweden. The station is an interchange of great importance with about 100 000 passengers per weekday, furthermore the travelling to and from the Central Station is increasing continuously. The following public transport services are offered at Gothenburg Central: 13 lines for long-distance rail services, 6 lines for short-distance rail services, 13 lines for long-distance bus services and 25 lines for short-distance bus services.

Figure 8.1 - Map displaying Gothenburg station’s area (left) and Stakeholders at Gothenburg (right)

The case study of Gothenburg Central Station covers all three levels of interconnectivity which are addressed in the HERMES project:

- Interfaces between different modes: rail–road
- Interfaces between different type of service of the same mode: rail-rail, road-road
- Interfaces between high capacity and low capacity mode: bus and taxi etc.
8.1.2 Current Business Model

Gothenburg Central Station has many transport services as well as other functions and a good overall passenger approach. Shuttle services from the central station to the airports and the port gives additional opportunities to travel further. Västrafik as well as the train operator SJ has in general a good reliability and punctuality. However there have been some problems with the infrastructure and also with the train material during the last two winters, which has resulted in a large number of delays and a decreasing reliability. This together with bad systems for delivering information about disturbances and delays in the time schedules has contributed to a decreasing reliability. SJ had an overall punctuality at 85 % during 2010 but still a low customer satisfaction. The reliability for SJ has decreased during the later years due to delays. Therefore the current business model is focused on maintaining and increasing transport quality and the quality of information in order to maintain and increase customer satisfaction.

![Figure 8.2 - Current Business Model at Gothenburg](image)

8.1.3 Current Level of Quality and Missing Links

According to the customer survey and interviews with the stakeholders the current level of quality at Gothenburg Central Station is very high. Customer’s satisfaction is very high with coordinated timetables, possibilities to combine transport modes and
walking distance to transfer services. Customers are overall satisfied with facilities at the site. It should be noted that the customer survey was not carried out during winter times. According to the customer survey several possible improvements can be highlighted. When it comes to Facilities, the customers would like to see improvements regarding total seating capacity, toilet capacity and toilet cleaning, better access to the WiFi/Internet and improved security on the site. The missing link that has been identified at the station concerns information. The customers demand better integrated ticket systems, integrated departure/transfer information, integrated time-tables for different transport operators and accurate information why there are delays and by how much, especially during winter season. It will be crucial to have well-functioned information services in the future as Sweden also will deregulate all passenger transport from January 1st 2012. This implies that there will be more transport operators at the station and the passenger needs co-ordinated information.

8.1.4 Changes for improved Interconnectivity

The main concept of our proposal is to: “Integrate traffic information on various transport services provided by different transport operators and make this information available to customers”. This can be achieved by introducing a new agent at Gothenburg Central Station. This/these new agents are here called “Traffic Information Brokers” and their task should be to create a new and innovative way to integrate and distribute traffic information. They can also have traffic information centres at the Site. The most critical service level for this information is information reliability.
8.2 Case Study 2 - Arlanda International Airport

8.2.1 Brief characterisation of the Case

Stockholm-Arlanda Airport is Sweden’s largest international/domestic airport located 37 km north of Stockholm, with about 17 millions of passengers per year; 13 million international passengers and 4 million domestic passengers. The map below shows the four aviation terminals as well as interchanges for ground transport services such as bus, car and rail services at Arlanda Airport. When it comes to parking facilities there are about 25 000 parking spaces nearby the terminals, in p-houses, in long-term parking and in private parking just outside Arlanda with free bus transport to the terminals. The case study of Arlanda-Airport covers all three levels of interconnectivity which are addressed in the HERMES project: Interfaces between different modes: air-rail, air-road, Interfaces between different type of service of the same mode: air-air and Interfaces between high capacity and low capacity mode: air vs taxi etc.
There is a large network of actors linked to Arlanda Airport, see figure above.
8.2.2 Current Business Model

Arlanda’s airport permit is linked to certain “emission limits”. The emissions are assessed from starting and landing aircrafts, all ground traffic to and from Arlanda Airport, internal traffic at Arlanda Airport together with heating of buildings at Arlanda. The Airport therefore has as priority to minimise the environmental impact of its operation being able to expand further. In order to further reduce emissions there is an agreement between the transport market players to persuade people to use public transport to and from the airport. Today, driving your car to the airport is the only alternative from a number of areas. Therefore the current value proposition besides maintaining high levels of reliability and punctuality is to find solutions to decrease usage of cars to and from Arlanda. Target groups for this measure are passengers and employees.

Figure 8.5 Current business model of Arlanda Airport

8.2.3 Current Level of Quality and Missing Links

The current level of quality at Arlanda airport (according to customer survey) is very high. It is important to point out that 76 % of the customers are satisfied and have no requirements for additional information. Improvements are possible on a very high level. In order to fulfil the emission limit and further expand the airport the
stakeholders at Arlanda Airport want to increase the number of passengers who are using public transport (bus and rail modes) to and from Arlanda. Arlanda Airport has already implemented several measures. For passengers who choose to travel by taxi, there is already a separate eco-taxi queue outside the airport terminals, in front of the other taxis. The airport’s target is that all taxis that serve Arlanda Airport shall be eco-taxis by 2011. The airport also gives preferential treatment to “clean” cars, for example by allowing them to park as close as possible to the terminal for passengers. A total of 190 parking spaces were 2007 reserved for clean cars at Swedavia’s parking facilities at Arlanda.

Still, there are some issues which have to be solved:

1. How to decrease emissions from passengers’ cars (parking and picking-up/leaving someone at the Arlanda)
2. How to decrease emissions from employees’ cars (parking)

8.2.4 Changes for improved Interconnectivity

In order to decrease carbon emissions it is important to increase usage of public transport. Our value proposition is: to provide integrated and qualitative transport services for passengers and employees and thereby offer integrated information and ticket-selling. The target is to enable passengers and employees to use bus and rail transport services to and from Arlanda Airport.
8.3 Case Study 3 - Avenida de América Interchange Madrid

8.3.1 Brief characterisation of the Case Study

Avenida de América is an interchange located in the city of Madrid, in the interface between the A-II motorway and the M-30 orbital road, collecting the flows from the so called Henares corridor and the North-East of Spain. This is a dense part in the NE of the city, only 1.6 km from Paseo de la Castellana, the central artery of the Madrid CBD.

Avenida de America is made up of four underground floors on a rectangular layout (208 x 49 meters). The structure is about 16 meters depth. Level “-1” is dedicated to long-distance buses and has 18 platforms; level “-2” was designed for urban and regional buses and has 19 platforms; levels “-3” and “-4” are dedicated to the underground network connection (Metro) and the rotation (253 places) and residents (392 places) car parking. Commercial areas, together with ticket offices, are located at levels “-1” and “-3”. Although the interchange shows a vertical design, good accessibility is provided.

- 19 long distance bus lines
- 14 regional bus lines
- 17 urban bus lines
- 4 metro lines
8.3.2 Current Business Model

![Current Business Model in Avenida de America](image)

8.3.3 Current Level of Quality and Missing Links

The specific problems of the cases study can be classified into three groups:

Bad information or signalling:

According to the surveys this issue should be improved. (30 % of the respondents)

Lack of physical integration:

- Insufficient number of quays (which does not allow operators to offer more destinations).
- Bad organization of the motorized mobility around the interchange. There is no place for cars to drop travelers (kiss and ride).

Non adequate relationships between agents:
- There is a lack of coordination among the different stakeholders, particularly between Transport Operators, which results in a lack of coordination among short and long distance modes.

- Decision Makers are not well aware of the specific problems of the Interchange, and the Terminal manager - who is very close to the users’ opinions and complaints -, cannot make decisions.

### 8.3.4 Changes for improved Interconnectivity

In this paragraph feasible actions to overcome the above mentioned barriers are described:

**Information and signalling**

There should be integrated information systems for all modes, regardless long or short distance.

**Physical Integration**

- We propose an extension of the geographical coverage: if operators should increase the long distance supply more passengers should use the Interchange.
- There should be joint parking management according to the interchange needs (space for bus parking or drop off parking).

**Relationships between agents**

We propose the following relationships between stakeholders: a Terminal manager acting independently from Transport Operators, Decision Makers delegating some decisions to the Terminal Manager (those affecting transfers into the interchange or station). In addition, not only Transport Operators should be responsible for the service provided to users, but also the Terminal Manager, since users highly value the whole journey where the transfer is very relevant; and all of them should work coordinated.

A better management of the existing resources will benefit all agents.

### 8.4 Case Study 4 - Long distance bus services connected with high speed rail services, the case of Lerida and Zaragoza

#### 8.4.1 Brief characterisation of the Case Study

Zaragoza and Lleida are two Spanish cities located in the North, 150 km distance one from the other but very well connected, especially by High Speed Railway.
connections. With this Case Study Lleida Train Station and Zaragoza Train-Bus Station have been analysed in parallel, to find out similarities in their business models and key barriers.

**Zaragoza**

The building of the Zaragoza Interchange (opened in 2003) covers an area of 190,000 m². It consists of 8 rail platforms about 400 meters long, for high-speed and conventional rail passenger service lines. As regards parking facilities, there are two external areas with 1800 places available as well as underground parking lots. To improve intermodality with soft modes a bicycle storage outside the interchange is provided. Inside the station a travel agency, one hotel, a Police Station, and several waiting areas, restaurants, shops and car rental services are located.

The central bus station is physically integrated in the building, but only interurban and long distance bus services are available. There are 46 bus platforms.

**Lleida**

Lleida railway station underwent an important refurbishment and expansion to fit high speed requirements (1999-2001).

However, only urban bus services and taxis are provided. Some regional buses at the station provide a second stop near the train station. In addition, a new bus station will be constructed next to the railway station, together with other 600 parking places.

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<thead>
<tr>
<th>Zaragoza Services:</th>
<th>Lleida Services:</th>
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<tbody>
<tr>
<td>-High Speed Rail Services</td>
<td>-High Speed Rail Services</td>
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<tr>
<td>-Long Distance Rail Service</td>
<td>-Long Distance Rail</td>
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<tr>
<td>-11 long Distance Bus Services</td>
<td>-Regional Rail Services</td>
</tr>
</tbody>
</table>

8.4.2 Current Business Model

**Zaragoza**

Figure 8.9 - Zaragoza & LLeida Stations
8.4.3 Current Level of Quality and Missing Links

The specific problems of the cases study can be classified into three groups:

Bad information and signalling:

No integrated information provided for all existing modes at the Stations, but separated information systems for bus and train services.

Physical Integration:
At Zaragoza Station there is a physical barrier (a fence) between the railway and the bus station; therefore despite the fact that both stations are adjacent, passengers have to walk a long distance to get one or another; which affects intermodality between long distance bus and train very negatively. In addition, there are parking places at the train station side, and as a consequence of this physical barrier the street facing the bus station side is permanently congested, with cars illegally parked to the detriment of local buses and taxi services performance.

At Lleida Station, despite the fact that most passengers arrive by car, there is no parking at the station. However, a 600 car places parking will be constructed in the near future.

Relationships between agents:

- Both the Terminal Manager and the Decision makers are appointed by Adif, the owner of the railway infrastructure, both too focused into railway services, not in intermodality; which results in a lack of collaboration.

- Local Transport Authorities are not involved nor in the management of the station neither in the decision making process.

- There is no collaboration between bus and train Operators.

### 8.4.4 Changes for improved Interconnectivity

In this paragraph feasible actions to overcome the above mentioned barriers are described:

**Information and signalling:**

**Integrated information systems for all modes** should be provided, regardless long or short distance.

**Physical integration:**

- At Zaragoza Station, **accessibility** between bus and train stations should be improved

- At LLeida Station, the lack of car places and the high number of passengers arriving by car make the **construction of new parking lots** a top priority

**Frequencies and services of local buses stopping in front of the station** should be improved as well.

Relationships between stakeholders:

**Local Transport Authorities should be more involved in Terminal Manager and Decision Makers** (both appointed by Adif) **activities.** All
stakeholders should collaborate and coordinate their activities in order to foster transfers.

8.5 Case Study 5 – Extension of the Adriatic-Ionian corridor from Peloponnese to Crete

8.5.1 Brief characterisation of the Case Study

In the current situation, the maritime transport (ferry) services linking continental Greece - including the Peloponnese- to Crete are mainly based on the Piraeus hub port; passenger flows coming from Western and Central Europe through the Adriatic corridor and having Crete as final destination, are oriented from the port of Patras to the port of Piraeus, primarily, through the road transport network (private cars or bus services) and then ferry services to Crete. Instead of a nodal interchange, the "area" of reference for Case Study 5 is the corridor Patras- Piraeus- Crete. The examined corridor consists of two legs: a) Patras- Piraeus and b) Piraeus- Crete. Concerning the first leg (215 km) the connection is realized by bus, Car or rail. Concerning the second leg a port to port Ferry service is offered. In the port of Piraeus three (3) private operators are activated realizing the route Piraeus – Crete. The existing connections from the port of Piraeus are to Iraklio and Chania.

The proposed case study examines the conditions for the successful creation of an alternative integrated intermodal passenger service from Adriatic- Ionian corridor to Crete through the Peloponnese, avoiding deviation through Piraeus. In addition, the future business model includes a second –enlarged- alternative, including new touristic services.

Figure 8.12 - Map of the corridor Patras- Piraeus- Crete
8.5.2 Current Business Model

The topic falls into the analysis of typical “monomodal” public transport service (either urban or inter-urban).

<table>
<thead>
<tr>
<th>Key Partners</th>
<th>Key Activities</th>
<th>Value Proposition</th>
<th>Customer Relationships</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The topic falls into the analysis of typical “monomodal” public transport service.</td>
<td>Transport services of various modes -not integrated- are offered along the examined corridor.</td>
<td>Each transport service has its own customer service relationship plan.</td>
<td>Internet services through a safe on-line booking system and advertising through media.</td>
<td>59% male and 41% female</td>
</tr>
<tr>
<td>Analysis of typical “monomodal” public transport service.</td>
<td></td>
<td></td>
<td></td>
<td>47% between 36-55, 35% above 65 and the 12% between 21-35</td>
</tr>
<tr>
<td>Analysis of typical “monomodal public transport service.</td>
<td></td>
<td></td>
<td></td>
<td>The most common destination to Crete is the city of Chania; start origin of the passengers is 36% from Italy</td>
</tr>
</tbody>
</table>

Figure 8.13 - Current Business Model of Patras-Piraeus-Crete

8.5.3 Current Level of Quality and Missing Links

The passenger flows from the Adriatic corridor to Crete reach the final destination via the hub port of Piraeus. The identified barriers are mainly of functional and operational “service” character, since from the physical viewpoint infrastructural connections exist and, therefore, the necessary conditions are fulfilled. The port of Patras, offers direct access to the entire Peloponnese Region. On the contrary, the maritime transport (ferry) services linking continental Greece (including the Peloponnese) to Crete are mainly based on the Piraeus hub port. There are already some established ferry lines between southern the Peloponnese and northern Crete but the service frequencies and quality are not satisfactory while the seasonal character of these flows creates wider problems of fleet optimization. Resulting from this “missing link”, the majority of passengers use the Piraeus port thus creating important trip deviations.

In the current situation, ferry operations in the Adriatic-Ionian corridor are fully independent from the other legs of the chain. Ferry services from the Peloponnese to Crete are neither completely regular nor coordinated with Patras’ ferry services. In
addition, any inland (bus or train) transport service from the port of Patras to the port of Kalamata is missing. Significant opportunities exist for the improvement and coordination of these connections. Ferry services in the Adriatic–Ionian corridor steadily present a high level of service; this is not the case for ferry operations between southern Peloponnese and Crete. There is considerable space for improvement of the latter, as well as to inland connections between the ports of Patras and Kalamata.

It is revealed that the main Gap for Case 5 is the “Low level of service of current intermodal transport service”, according to WP2 classification and typology. Moreover, this corresponds to an extreme gap case since the current situation is based on successive independent mono-modal services on various legs of the corridor, neither coordinated to each other nor integrated. The main focus of the proposed model is on the current “missing link” i.e. the inland leg between Patras and Southern Peloponnese, which needs to be integrated into the network.

### 8.5.4 Changes for improved Interconnectivity

The proposal of Case Study 5 deals with the development of an alternative, fully integrated intermodal transport service for passengers between Western/Central Europe through Italy and the Adriatic–Ionian corridor and Crete, avoiding deviation through Piraeus. The study examines the entire network configuration of such an integrated service, including: a) the long distance ferry transport between Italy and the port of Patras; b) the inland leg connecting the port of Patras to the southern Peloponnese and c) the medium distance ferry transport from southern Peloponnese to Crete. The proposed business model activates the “missing link” i.e. the inland leg between Patras and Southern Peloponnese.

In addition, the proposed business model is related to new touristic services. The Service Offering consist of two packages: the “direct transport to Crete” (for Non-Stop Travellers) and the “Transport and Tourism” package. The package for the Non-Stop Travellers offers the direct access from an Italian Adriatic port to Crete through the ports of Patra and Kalamata. This service will cover the missing link that exists today, minimizing the trip deviations. The “Transport and Tourism” package combines the transfer from an Italian port to Crete with a two days sightseeing tour.
in the Peloponnese. This package includes transportation, accommodation and sightseeing tour with one ticket for the whole chain.

**Description of the future Business Model**

**Value proposition**

- Service improvement: travel time reduction, transport cost reduction
- Service enlargement and additional benefits for users: integrated package including transport and touristic services (accommodation, cultural activities etc.)
- Additionally, the bundle of new products and transport services relates to “newness”, “performance” of the transport system, “accessibility”

**Channels**

A 3rd Party Provider (the entity) assumed to operate the proposed business model will have two main channel categories for reaching its customer segments:

- The “direct” -mainly electronic- channel, through the use of the Internet websites of stakeholders directly involved in the proposed business model
- The indirect channels, notably travel agents or tour operators involved as “intermediary” customers

**Customer Relationship**

Using the mentioned channels, the customer relationships will be led in a more personalized and reliable frame.

**Customer segments**

- Non-Stop Travellers (64% of the target population)
- Travellers with Stops (travellers’ that want to use their car, such as those that travel with children and/or have high incomes- 36% of the target population)

**Revenue Streams**

Tickets per destination, services related to touristic activities (museums, archaeological areas, other touristic sights etc) and provided services at the level of interchange.

**Key Resources**

Resources to be committed by the transport operators include:

- Physical (vehicles, vessels, customer support centers, terminals)
Assets required by the 3rd party provider include:

- Human resources of the 3rd party provider will include the following critical posts (manager, administrator, technical support, helpdesk, operators)
- Financial (investment for the development of upstream interfaces and, if necessary, for increasing platform capacity)

Key Activities

The required Key Activities can be separated in two sectors. The Key activities realized by a 3rd Party Provider and the ones realized by the transport operators. Concerning the 3rd Party Provider, the Key activities are related to the management and the monitoring of the service offering (Implementation of a Platform, Implementation of a system of repair services). Concerning the transport operators, key activities are related to the provision of transport and the high level of handling services with integrated schedules, to an upgraded booking system which will provide real time online reservations, to customer support before during and after the trip, to implementation of software and support technology.

Key Partnerships

The business model is based on partnerships between the transport operators, the travel agencies, the port authorities, local authorities, Chambers of Commerce.

Cost Structure

The suggested business model is clearly cost-value driven. From a management accounting standpoint there are two types of costs in delivering the planned service bundle:

- Fixed Costs
- Variable Costs
- Total Costs – the sum of fixed and variable costs.

From a decision-making standpoint, a price must be selected so that the contribution margin is positive. A simple and workable way to calculate the (minimum) price required for the service bundle to breakeven is by setting the contribution margin to zero.
8.6 Case Study 6 - Gare do Oriente Interchange, Lisbon

8.6.1 Brief characterisation of the Case Study

This case study refers to the connections from the Portuguese north rail-line (Linha do Norte) to small cities nearby, in the Greater Lisbon area. Nowadays, connections to these small cities are provided by bus from Lisbon (Gare do Oriente) although rail stations in north rail-line could represent a closer starting point for these cities. It was our belief that there could be enough passengers whose final destination is a city geographically near from a rail station in the north rail-line that could justify the creation of new transport connections from those railway stations, instead of having to travel (southward) by rail till Lisbon and take the bus there (northward) to those small cities. Our motivation was to check whether it would be possible to provide better transport service to those rail passengers in the final link to their destinations, without affecting the railway service on a negative way.

Linha do Norte (North rail-line in English) is the main railway line in Portugal. This line connects the two main Portuguese cities: Lisbon and Oporto. The most emblematic and important railway station in the north rail-line is Gare do Oriente Intermodal Terminal, in Lisbon. This terminal is located some 10 km away from the city center. It gathers subway, short and long distance rail, taxis and local, suburban and long-distance bus transport services. There are also rent-a-car services at the site and an underground parking lot.

Another relevant station in the north rail-line is Vila Franca de Xira. In this station circulates inter-urban, inter-cities and regional trains. Vila Franca de Xira station is 20 km away from Gare do Oriente. In the cities surrounding the Vila de Franca de Xira there is a significant population concentration within a 10 km radius from the station (92,656 inhabitants). This population concentration might justify the creation of dedicated feeder services from these locations to the Vila Franca de Xira station.

Linha do Norte stakeholders are:

- CP – responsible for the railway operations;
- REFER – responsible for the railway infrastructure management.

Vila Franca de Xira train station stakeholders are:
• **Public Decision Makers:** REFER (owner of the railway stations) and the municipality of Vila Franca de Xira;

• **Transport Operators:** short distance bus operator (BoaViagem) and taxis;

• **Consumers’ Association:** DECO.

### 8.6.2 Current Business Model

According to Osterwalder (2004) there are nine building blocks: Customer Segments (CS), Value Propositions (VP), Channels (CH), Customer Relationships (CR), Revenue Streams (R$), Key Resources (KR), Key Activities (KA), Key Partnerships (KP) and Cost Structure (C$).

![Figure 8.14- Current Business Model at Gare do Oriente/Linha do Norte](image)

### 8.6.3 Current Level of Quality and Missing Links

The main problems identified along the north rail line are:

• Poor connections to small-sized cities from train stations in the greater Lisbon area (most connections are only provided from Gare do Oriente);

• Poor or inexistent information about further connections (besides train) or adjustments of connections;
• Poor information signaling in the stations;

We had also identified the opportunities at the site:

• Good road connections from other train stations besides Gare do Oriente to small-sized cities;
• Space for information desks at train stations or information displays;
• Good access for people with special mobility needs.

Current value proposition is characterized by good railway service in the Linha do Norte rail link, with good integration to bus services from Lisbon Oriente to small-cities. Passengers with destinations in the greater Lisbon area always have to use Lisbon as an origin point despite other rail stations being geographically closer to serve these small-cities. Vila Franca de Xira, for instance is closer to Coruche than Lisbon but there are no bus connections nowadays from there. Other example is Santarém which is closer to Peniche than Lisbon but once again there are no bus connections to Peniche except from Lisbon. Vila Franca de Xira is the city that we choose to analyse.

Our expectation is that there could be an interesting number of passengers whose final destination is a city geographically near from a rail station in the north rail-line that have to departure from Lisbon since there are no transport connections from the other rail stations. This is the case of Vila Franca de Xira rail station, which is closer to some of those small-cities than the Oriente station in Lisbon, but does not offer adequate bus transport connections.

Our intention is to provide better transport service to rail passengers without affecting the quality of the rail services.

8.6.4 Changes for improved Interconnectivity

The analysis of the survey results clearly shows that our initial hypothesis was not confirmed, thus leading to the conclusion that it does not make sense to develop new direct bus services from Vila Franca de Xira rail station to small-cities nearby. With such a small market potential the new transport service is not feasible.
The analysis of the measured demand patterns shows that the market to feed railway service is already balanced, and passengers are already well served in terms of public transport accessibility by the large amount of urban and suburban services available at the Gare do Oriente station.

Since the initial hypothesis was not confirmed, no new services are needed and no change in the prevailing business models is necessary. As it was mentioned above, transport market regulated and balanced, so, passengers that need to travel to the small-city are using other transport (i.e. private car) and not train plus other mode.

In theory, because surveys were only done at the railway station, it is possible that there are several potential customers for those bus services feeding the intermediate railway stations that currently use another transport mode for their long distance trip, for example, private car. We believe this is not the case, because in any case the travel time by car or bus from those small cities to the Oriente station is rather short (always below 30 minutes) and so the advantages of using the rail for the long distance trip are already within reach.

8.7 Case Study 7 - Faro International Airport:

8.7.1 Brief characterisation of the Case Study

The airport of Faro is the main gateway for accessing the touristic region of Algarve, in the south of Portugal. The airport is located 5 km away from the main city in the region: Faro. The airport of Faro presents a high seasonality since it fundamentally serves the tourist activity of Algarve region which attraction lies in natural conditions such as sun and sea during the summer. Therefore, there is a structural imbalance between the IATA Summer and Winter demand.

Only road based connections are offered at the airport. The nearest train station is located in the city centre of Faro. The available transport services are: public bus, private bus (shuttle), taxi, rented-cars, or private cars.

In terms of public bus, there is one transport operator serving the airport: EVA – Transportes. This operator links the airport with the main bus terminal in the city centre. From this terminal there is a large variety of routes to the main cities of Algarve region and to the main cities in Portugal. Bus terminal is located near the
train station of Faro, which offers the possibilities of regional and a long distance lines. The offered bus service between airport and the city centre starts at 5 a.m. and ends at 11 p.m. more or less during the summer.

**Private bus** (shuttle) services are also available at the airport. These services can either be booked on-line directly to the transport providers, or as a transfer service in a hotel package. The private bus operators cannot directly sell tickets to the passengers at the airport.

There is a wide and permanent offer of **taxi services**. Besides normal taxi services there is a special taxi for tourist passengers that is more expensive. Taxis are one of the most common options to leave Faro Airport.

The agents with relevancy for the definition of the business models are:

- Passengers;
- Airport of Faro Manager (ANA);
- Rent-a-Car companies;
- Taxis;
- Public Transport;
- Private Shuttle Companies;
- Hotels.

### 8.7.2 Current Business Model

According to Osterwalder (2004) there are nine building blocks Customer Segments (CS), Value Propositions (VP), Channels (CH), Customer Relationships (CR), Revenue Streams (R$), Key Resources (KR), Key Activities (KA), Key Partnerships (KP) and Cost Structure (C$).
The business model is defined from the perspective of the airport manager. In this sense, we may say that intermodal transport is not included in the current value proposition of the airport.

### 8.7.3 Current Level of Quality and Missing Links

There are several problems affecting the interconnectivity at the Airport of Faro. These problems are visible at the various levels of decision. At strategic level, we could identify a lack of strategic alignment between stakeholders. Indeed, intermodal transport is not a priority for any of the stakeholders. They are only interested in providing their own transport service, and essentially consider all the others as competitors, in particular, in the land based transport providers.

At tactical and operational levels, we could identify the following barriers, such as:

- **Information** - there is no available aggregated information concerning the several transport solutions. Each mode of transport only offers information about its own services;

- **Ticketing** - there is no integrated fare system. The passenger needs to buy a ticket for each leg;
- Scheduling - there is no integration of schedules. This problem is somewhat reduced since the majority of the passenger use flexible land based transport services, such as: taxi, rented cars or private shuttle.

The airport is being negatively affected by the lack of intermodality, which is evidenced in the growing amount of negative reviews and references posted by the passengers on some major international travel websites. Therefore, the airport is in a key position to perform the role of facilitator and negotiator, between all transport providers. Finally, the airport plays a key role in the economical development of the region. It has therefore some degree of influence in many other agents, such as: municipalities, hotels and similar, which can be fundamental for the viability of the proposed business model.

**8.7.4 Changes for improved Interconnectivity**

In order to overcome the current problem and to implement a truly intermodal service between the air and the land based transport services, we propose to include air-land intermodality into the value proposition of the airport. We propose to implement a flexible small-scale collective transport service integrated with the air transport, in terms of tariffs, scheduling and information. The collective transport service will provide transport to some destinations in the region of Algarve. Passengers would be offered a seamless transport journey, since their airport of origin until their final destination in Algarve. By seamless we understand no (or short) waiting time at the airport and direct transport to final destination. In Figure 8.16 we present the canvas according to Osterwalder for the new business model.
Figure 8.16 – Proposed Business Model for Faro Airport

The FCTS operator will concentrate all the information about the new service, including schedules and tariffs. The basic sales channel must be a clearly marked counter on the arrivals hall, although it is possibly useful to consider from the beginning a web-based sales channel. Another channel is foreseen, which consists in selling tickets on board aircrafts. This will imply the establishment of a commercial agreement with the air transport companies.

8.8 Case Study 8 – Antwerp Airport

8.8.1 Brief characterisation of the Case Study

Antwerp Airport\(^2\) is a small regional, slots free airport which mainly focuses on business travellers, but a market opportunity can be found in offering leisure flights.

To respond to the needs of the time sensitive business traveller, check-in counters open one hour before and close only twenty minutes before departure of the flight. Given the size of the airport, walking distances around and within the airport building are relatively small. Furthermore, Antwerp Airport is a site where short distance air

\(^2\) When comparing Antwerp Airport to the other Belgian regional airports (Charleroi, Kortrijk, Liège and Ostend) one can see that Antwerp Airport represents a rather low number of passengers and tonnage.
transport meets up with short distance land transport (car/taxi and bus). Currently, there are about 5 flights a day scheduled to London City Airport and 2 flights to Manchester, which are performed with small airplanes (Fokker 50). In the airport building there are offices of car rental companies and several taxis available. Next to the airport building, there are 500 free parking spaces and a bus stop where about every fifteen minutes there is a bus that brings the travellers to the two nearest train stations (15 min. ride).

The airport management and the carrier, CityJet, co-operate to offer an air transport connection. The other modes available do not co-operate whatsoever and offer their services independently from each other, in order to maximise their revenue and thus profit.

Figure 8.17 - Interactions between agents in Antwerp Airport
8.8.2 Current Business Model

<table>
<thead>
<tr>
<th>Key partners</th>
<th>Key Activities</th>
<th>Value Proposition</th>
<th>Customer Relationships</th>
<th>Customer Segments</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The airport is part of the Flemish Government</td>
<td>Providing short distance air transport services</td>
<td>• 2 destinations: London (City) &amp; Manchester</td>
<td>• Personal service (thanks to the relatively small airport)</td>
<td>Business traveller, majority is male and between 36 and 55</td>
</tr>
<tr>
<td>• Concessions from the businesses on the site</td>
<td></td>
<td>• The services are adapted to the demand of the main customers:</td>
<td>• Fidelity programs (thanks to the merger with KLM/Air France)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Quick (20 minutes concept, large parking close by, small building with short walking distances)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Not much additional services (such as retail needed)</td>
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</tr>
<tr>
<td>Key Resources</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Infrastructure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Fleet of small airplanes</td>
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<td></td>
</tr>
<tr>
<td>• No slots</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Cost Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Exploitation and investments</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(partly paid by money from endowments): maintenance of airport building, salaries, ...</td>
<td></td>
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</tr>
<tr>
<td>• Safety and security costs are the main costs</td>
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</tr>
<tr>
<td>Revenue streams</td>
<td></td>
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<td></td>
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<tr>
<td>• Airport has some endowment from the Flemish Government</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Concessions from the businesses on the site</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Ticket sale</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 8.18 - Current Business Model at Antwerp Airport

8.8.3 Current Level of Quality and Missing Links

Currently, 75% of the passengers access the airport by car. However, the roads surrounding the airport are congested. To improve the accessibility of the airport, the use of the car has to be discouraged and the passengers have to be convinced to use the public transport more often. However, there is no direct train connection at Antwerp Airport and the other modes (bus/taxi) are underused because the services are rather poor (unreliable and expensive). Furthermore, if Antwerp Airport wants to try and attract also leisure passengers, a good accessibility is important. Improving the current public transport services and providing direct rail access would probably imply a mode shift for some of the existing customers.
8.8.4 Changes for improved Interconnectivity

Nowadays, some complaints are raised about the unreliable bus services and the expensive taxi rides. These services can be improved if the transport operators and the airport management come to an agreement concerning services levels. For example, the bus and taxi companies commit to improving their services and, in return, the airport management promotes the public transport services. Integrated ticketing, where passengers take the bus by using their boarding pass, would also stimulate the use of public transport.

On a longer term, the airport can come to an agreement with the rail services provider and a train station could be installed at the airport site. Physically this is possible, since rail tracks are running next to the airport site. Service level agreements and ticket integration are also needed here.

Note: Besides poor services delivered by their drivers, bus and taxi companies also have to deal with congestion around the airport. These problems cannot be solved easily. Furthermore, although installing a train station is physically possible and useful, economically it is not viable due to the fact that too little passengers would take the train to access the airport. Therefore, one can conclude that improving intermodality is not easy at Antwerp Airport and thus not possible everywhere.

8.9 Case Study 9 – The Port of Patras

8.9.1 Brief characterisation of the Case Study

The Patras Port consists of a Passengers Port which handles an important part of the total passenger’s sea traffic between Greece and other countries and also of a Commercial Port. The overall international flows of Passengers for the period 1999 – 2010 reach the 1million regarding mainly the Greece-Italy connections while the national flows are almost the half of it mainly from/to the Ionian islands.
According to the figures above regarding the annual passenger demand, there is a small decrease during the last eight years. The limited accommodation capability of the current Port and the construction of the Egnatia Motorway which improved the accessibility of other competitive ports, may constitute some reasons for this decrease.

The port of Patras constitutes an intermodal hub. The main intermodal connections of the port are between long and short distance ferries with long and short distance rail, air, bus and road services. The different agents involved in this intermodal operation of the port are the Port Authority, the interurban and urban Bus Authority, the Municipality of Patras, the Shipping companies, the Passengers and the Taxi drivers. The interaction between them is presented in the following diagram.

The case study aimed at identifying the gaps of the current business model of Patras port regarding mainly the factors that influence the passenger behavior and choice in order to propose a new business model and a value proposition capable of attracting additional passenger demand in relation to the additional cost.
8.9.2 Current Business Model

The description of the current Business Model of the Port of Patras is presented in the following Table.

![Table describing the current Business Model of the Port of Patras](image)

8.9.3 Current Level of Quality and Missing Links

According to the results of the passenger survey that took place in the port during the summer period, the overall satisfaction with the current level of quality of the offered services was high. The main problems and opportunities for the port of Patras...
identified concerned the physical dimension of interconnectivity, the logical (information display) and economical (integrating ticketing) as well as the different organization of some existing services (luggage handling).

Specifically a main (connectivity) problem of the port constitutes the long distance between the main port area (passengers’ waiting area) and the platforms, for which the passengers are compelled to traverse carrying their luggage. This issue becomes even more critical as far as people with disabilities and elderly people are concerned. The port authority could overcome this interconnectivity barrier by putting small buses for transferring the passengers from the main port area to the platforms.

Another major issue the passengers’ survey has emerged concerns the information displays and the signposting of the port. All passengers identified this issue as highly important and at the same time not sufficiently covered by the port. Low cost investments in signs and info displays could resolve this issue and constitute an opportunity for attracting additional passenger demand in the port.

Finally, a main (institutional) problem that was identified by the passengers’ as well as the stakeholders’ surveys is the lack of cooperation among the transport (and the other) stakeholders of the port. This fact affects the quality of service of the port since it leads to the lack of timetables’ coordination as well as integrated ticketing. The particularity of the last interconnectivity problems is that the cooperation of all involved stakeholders is a prerequisite in order to resolve them. On the contrary the previous barriers could be arranged by the terminal operator (port authority) alone.

8.9.4 Changes for improved Interconnectivity

The first two measures that must be taken in order to improve interconnectivity are the improvement of signposting and the free transfer of passengers and luggage and are strictly related to the port authority. The other two measures are integrated ticketing and coordinated timetables presuppose the close collaboration between all different agents involved. The first group of measures addresses the problem (barrier) of increased waiting times and low passenger comfort while the second group promotes interconnectivity as a whole, resulting in the enhancement of the quality of services.
The combination of the proposed measures tackle all the major barriers for the promotion of passenger intermodality in the port of Patras which are mainly related to the lack of sufficient info provision and lack of cooperation between the stakeholders (which both lead to increased transfer times).

The modifications of the business Model in relation to the aforementioned suggestions are described in detail in the next figure.

![Diagram of the business model modifications for the Port of Patras](image)

**Figure 8.22 - Proposed modifications in the Business Model of the Port of Patras**
8.10 Case Study 10 – Intermodal Network of Lyon Metropolitan Area (REAL Project)

8.10.1 Brief characterisation of the Case Study

The REAL project (REAL is a French acronym for Express Network for the Lyon Metropolitan Area) aims to develop intermodality at the Lyon metropolitan Area. To achieve this goal, involved partners reinforce public transport networks integration and coordination.

Many institutional actors are involved in this project with local governments, public transport organizing authorities, the French rail transport company (SNCF) and the owner and manager of the French rail network (RFF).

The REAL project is a huge and very ambitious project not only focusing on a station or a transport mode but referring to interconnection between every public transport modes at short (local or regional by urban public transports or regional trains and bus) and long distance (national or international by train or plane). To bring out some lessons for intermodality coordination and integration, the contribution to the project will focus on the specific case of the Part-Dieu intermodal station.

The Part-Dieu station is today one of the most important station in Europe for transit passenger traffic. It proposes and connects different transport modes (rail, bus, car and two-wheel modes) at long and short distances. The station has been planned in 1983 for a daily traffic of 35.000 passengers. In 2001 its traffic hit 80.000 daily users. The number of persons using the Part-Dieu station at the end of 2008 is estimated to 135.000 per day (22,8 million per year) with among them 105.000 rail passengers (see RFF, 2011). More than one user in five crossing or spending time on the Part-Dieu station is not a rail passenger.
Three main categories of agents have been identified in the Part-Dieu case study: the terminal manager, public decision makers, users (with users’ associations). Transport operators, also using the Part-Dieu station are not really involved in the inter-modal transfer issue.

To achieve transfer time minimization and in-station passenger flow improvement, terminal managers can implement passenger traffic lanes. These traffic lanes should be clearly delimited with stopping areas. Visual signs and/or personnel should be used to inform the Part-Dieu station user.

Part-Dieu station user could adopt a new strategy changing departure and/or arrival time in the Part-Dieu station for non-constrained trips. First, they don't suffer any more from passenger traffic congestion and then, they limit congestion in peak-hour. Another strategy, more radical than previously, consists in changing the departure/arrival station. Indeed, most of short and long distance trains serve both the Part-Dieu station and the Perrache station. The last station is not congested and is also linked to metro, tram and bus network.

The strategy of public makers is more complex. It consists mainly in coordination between urban, departmental, regional and national transport policy makers to limit transport network development around the Part-Dieu station and therefore the station-crossing by public transport users. Another strategy, not really feasible today, is to extend the station with an underground level.
8.10.2 Current Business Model

Figure 8.25 - Current Business Model of Part-Dieu Station
8.10.3 Current Level of Quality and Missing Links

The Part-Dieu station has been planned in 1983 for a daily traffic of 35,000 passengers. In 2001 its traffic hit 80,000 daily users. In this context, the crucial point for the Part-Dieu station managers is to improve passenger quality of services and more precisely the following items:

- Passengers information (on delays, train track...);
- Signage improvement;
- Modal and intermodal transfer time improvement;
- Facilities development: shops and other services;
- Safety, comfort improvement in waiting areas;
- Cleaning and hygiene.

According to forecasts, the number of daily passengers should increase to 130,000 in 2013 and 156,000 in 2020. Such an increase can be explained first by a higher demand for short rail trips from or to Lyon, mainly for home to work trips. Between 2004 and 2009, short rail trip demand has increased by 7% per year and the tendency should continue (an increase hypothesis of 4.8% until 2030 is announced by RFF). The second main factor explaining an increase of the Part-Dieu station daily passengers is the long distance rail network improvement.

To prevent from a saturation increase and to renovate the station, a multi-phased improvement program is planned with a new platform access and signage improvement scheme and a new passenger rail track (in 2010), a central walking lane widening and an east entrance improvement, a new track development, a plan to improve intermodality on the station neighbourhoods (in 2013).

Missing links can be summarized within the 6 following items:

- Real-time information system to passengers/transport operators and terminal manager on the station
- Timetable synchronization for interconnected modes
- Signage improvement to access to facilities (other than shops) and linked sound signposting
- Passengers corridors inside the station to regulate traffic flow
8.10.4 Changes for improved Interconnectivity

The proposal developed in this sub-section aims to overcome the current barriers using a three-type improvement scheme. In a first time, improvement need is “physical”. It doesn’t need to high financial resources and refers first to passengers corridors implementation coupled to signage improvement and then to a waiting time areas capacities increase.

The second improvement is technological and/or technical. It is composed central by a real-time information system for passengers, transport operators and terminal manager. Its aims also to reduce differences on accessibility to facilities between disabled and non-disabled persons, with adapted equipment. Technical improvements need high financial resources.

The third improvement refers to transport system organization with a timetable for interconnected modes, mainly for short and long distances rail modes.
Figure 8.26 - Proposed Business Model for Part-Dieu Station

Key Partners
1/ trading partners: "intermediate" customers
2/ Institutional partners: local governments; transport organizing authorities

Value Proposition
1/ Timetables synchronization associated to a real time information system;
2/ Intermodal transfer and access to facilities improved with both appropriated signage and sound signposting;
3/ Traffic flow regulation with corridors;
4/ Waiting rooms number (with seats) increase;
5/ Web-access generalization;
6/ Facilities for disabled people increase.

Customer Relationships
Part-Dieu station

Customer Segments
1/ Passengers:
- rail passengers
- urban public transport passengers
- other passengers
- Focus on intermodal regular users and disabled users
2/ Railway companies
3/ Non-rail transport operators
4/ Trading partners located on the station

Key Activities
1/ Provision and maintenance of buildings, facilities, equipment and services
2/ Management of inter-station passenger flows
3/ Assistance for people with disabilities or reduced mobility
4/ The provision of passenger information, both visual and audio.

Key Resources
Increasing licence fees due to level of services offered to rail operators (real-time information system) and their passengers.
- Increase of trading renting.

Cost Structure
Equipment and human resources are increasing as well as infrastructure ones.
- Equipment costs refer to the real time information system, facilities dedicated to disabled users or free web-access.
- Human resources refer to the timetable synchronisation.
- Infrastructures expenditures are linked to the station development.

Revenue Streams
- licence fee paid by rail operators for using the station
- receipts from trading renting
8.11 Case Study 11 – Regional Airport Frankfurt-Hahn

8.11.1 Brief characterisation of the Case Study

Frankfurt-Hahn Airport (IATA Code: HHN) is a commercial airport located in Rhineland-Palatinate to the west of central Germany. The former military airport was opened for civil flights in 1993. Since then the airport has become one of Germany’s fastest growing airports especially since 1999 when the Irish low cost carrier Ryanair settled on Frankfurt-Hahn and developed the airport to one of its major airport bases. In 2010 around 3.5 million passengers and 228,000 tonnes of freight was handled at Hahn airport. Since January 2009 Frankfurt Hahn airport is owned by the federal states of Rhineland-Palatinate (82.5%) and Hessia (17.5%) but the airport management is currently searching for private investors. At Frankfurt-Hahn airport all three levels of interconnectivity which are addressed by the HERMES project are covered, namely different transport modes (air to road), public (bus) versus private transport modes (car) as well as high (air) versus low capacity transport modes (car/taxi). Different stakeholders are therefore operating at the airport as illustrated in the following.

![Figure 8.27 - Interactions between agents at Frankfurt-Hahn Airport](image)

8.11.2 Current Business Model

Frankfurt Hahn airport is depending on an effective operating road infrastructure as railway is currently not operating to Hahn airport. Therefore, accessibility to the airport is limited to private transport modes where car is the predominant transport...
mode or to public transport services that are currently limited to buses. In terms of intermodality and interconnectivity the current business model is focused on road transport exclusively. The strategy has been to use the benefits of the small size of the airport, which assures short distances in and around the terminal and the extensive space of the former military ground, which can be used for parking facilities. Since a high percentage of passengers used private cars, the airports interconnectivity strategy particularly targeted car users by providing cheap parking and free shuttle buses from the more distant parking facilities. According to Osterwalder (2004) the following characteristics of Hahn airport’s business model can be deduced.

![Figure 8.28 - Current Business Model of Frankfurt-Hahn Airport](image)

### 8.11.3 Current Level of Quality and Missing Links

The current level of quality at Hahn airport and especially the customers’ satisfaction with space, signposting, added values, friendliness of staff, waiting times, direct services etc. is already on a very high level. Still on an acceptable satisfactory level but with much lower absolute values is the accessibility situation of Hahn airport. Customers perceive the access / egress situation as time consuming and not very satisfactory which is due to the geographical location of the airport. A rail connection is planned but still has to pass through the process of financial planning and public approval. Thus, a completion of the rail connection is not expected for the near future.
The intermodality and interconnectivity gaps identified for Frankfurt Hahn airport are therefore related to HERMES Cluster 1 interconnectivity barriers which relates to improving physical interfaces.

8.11.4 Changes for improved Interconnectivity

In 2011 the existing federal road which passes by the airport has been upgraded and extended that now new and comfortable capacities for access/egress exist. Therefore, improvements for road infrastructures are not required. Contrarily, accessibility opportunities for railway are still discussed because a former railway line passes close to the airport which is currently not in operation. A reactivation of approx. 60 km of tracks, which are single-tracked and currently inoperative, is planned (including approx. 10 km of tracks which need to be double-tracked and an airport station at Hahn). Approx. 95 Mio Euro is necessary for the connection of Hahn airport to the German railway network. Travel times between Hahn airport and connection stations to the German railway network are predicted to 90 minutes between Hahn airport and Mainz Central Station and around 125 minutes for the distance Hahn Airport – Mainz – Frankfurt Central Station which is longer than average travel times by car (around 60 minutes to the centre of Mainz and 90 minutes to the centre of Frankfurt). Therefore, travel time savings are not the driving force behind the investment plans. The main value of the proposition stems from a number of improvements, such as reduced waiting times, higher flexibility, higher reliability, lower necessity to transfer between different modes and higher comfort, which may lead to improved accessibility of the airport via public transport modes. Changes in the business model (including rail access) are illustrated in Osterwalder's scheme hereafter.
Figure 8.29 - Proposed Business Model for Frankfurt-Hahn Airport