

Strategic Vision Document 2020 of Integral Logistics in Spain

INTEGRAL LOGISTICS TECHNOLOGY PLATFORM, LOGISTOP

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Plataforma Tecnológica en Logística Integral

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CENTRO NACIONAL DE COMPETENCIA EN LOGÍSTICA INTEGRAL

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1. Executive Summary

The document *Strategic Vision of Integral Logistics in Spain*, compiled by the Integral Logistics Technology Platform, **Logistop**, illustrates the **vision of the mid-term and long-term future of logistics activity in Spain**, and the actions that should be carried out in certain strategic areas **for the sustainable development** of this activity. The document incorporates a strategic analysis of the state of logistics in Spain and its impact on the competitiveness, in general, of Spanish companies in the present context of market globalisation, the appearance of a new integral logistics paradigm and supply chain management.

Firstly, this document determines that, in an international context, logistics is gaining increasing importance with respect to other strategic aspects of business. For Spain and its companies, logistic activity is and will be increasingly important in the future. Its geostrategic position in European markets along with present and future competition with newly emerging countries are forcing our country to turn to product manufacturing and the rendering of services of a greater **added value**. Logistics is an essential factor in these processes.

Secondly, this document analyses the actual state of integral logistics in Spain, both from the specific perspective of the activity itself and from the need for the optimum use of logistics as a **strategic tool** by the industrial world. In this sense, the document conveys that, from both perspectives, there are some weak points and excellent opportunities that would contribute to improving our country's competitive position from an international context. From the viewpoint of logistics activity and the introduction of this concept in all of its scope to companies, Spain holds a relatively weak position with respect to other more developed countries. There are basically four reasons. On the one hand logistics has globalised rapidly and resulted in **great and very sophisticated competitors** who are well-known on an international level in almost all of the sub sectors (logistics operators, application providers, automation and robotics, etc.). On the other hand, **logistics requires very significant investments** for companies and the level of innovation of the activity requires that these investments be made frequently. Thirdly, the optimum development of logistics requires a **modern and complete infrastructure network**, with a high level of public investment. Lastly logistics is a business activity with knowledge that has become

considerably sophisticated in recent years, entailing a **high level of training** and strategic orientation on behalf of human resources for its comprehension and incorporation.

In the global context, Spain is relatively small in terms of logistic activity, formed by **small companies** with limited investment capacities, limited public funds in modest infrastructures and with limitations regarding training and strategic orientation for first and second level management.

Logistop has determined a series of **strategic fields of action**, practices and frameworks that should be developed to **encourage opportunities for logistics activity and cultivate a competitive industry in this field**, assuring that this development is accomplished in a sustainable manner. The platform has defined a series of **key actions** to be carried out in upcoming years for the different fields of action.



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2. Introduction

This document gathers the vision that the Integral Logistics Technology Platform, Logistop, has compiled concerning the future of logistics in Spain and evaluates the conditions for the **competitive sustainability** of Spanish companies in logistics. This future vision will attempt to determine the strategic fields and actions that will serve as tools to implement the changes necessary to achieve this vision in a sustainable fashion, favouring the impulse of technological development and subsequent strengthening of the activity.

As the starting point for the Logistop platform, a distinction must be made between the concepts **logistics activity** and **logistics sector**. Traditionally the logistics sector, although not considered an industrial activity sector, can be defined as all of the business activities and organisations related to the storage and transportations of goods. The platform aims to treat logistics from a wider point of view by including all of the activities performed within organisations which influence the flow of materials and information. Given this scope, the platform will address the concept of logistics activity, present in all of the sectors of industrial activity.

It is observed, by means of this scope, that logistics is not related exclusively to the supply management in an organisation. It is also related to all of the parties involved, including public and private initiative to improve competitiveness in the area of industry by creating transportation infrastructures, improvements in the flow of goods, and by favouring intermodality and compliance with environmental politics. It is worthwhile to point out the difference between the terms **logistics** and **integral logistics** which are so often used indiscriminately. **Logistics**, in an industrial context, is defined as the art and the technique used to obtain, produce and distribute material in the proper place, at the proper moment and in proper quantities at an optimum cost. **Integral logistics** is one step closer to the integration of activities and refers to the understanding that additional areas of the company and possible relationships with external agents such as logistics operators, suppliers and clients are necessary for product delivery.

This document also explains the strategic importance of logistic activity and why action must be taken in the field of integral logistics. Through an analysis of the design of the present supply chain and the identification



of supply chains of excellence in existing bibliography, the factors, strategies and underlying practices leading to **excellence** will be determined for future use as tools for the change and strengthening of this activity. The macro factors of the industrial field as well as the forces operating in the current industrial environment will also be studied from a multidisciplinary point of view. Aspects from the area of legislation will be addressed, from environmental protection to new technologies, in a way that by beginning with the present situation the **lines of evolution of the business panorama** can be analysed, along with the influence of the different aspects of this panorama on the design and management of future supply chains, and, in general, logistics activity. The objective pursued is one with a widespread scope and long timeline.

3. Integral Logistics Technology Platform, Logistop

The Spanish Integral Logistics Technology Platform, Logistop, was created with the objective of increasing the effectiveness of Spanish logistics activity for Science, Technology and Business System agents. It is a **work forum** which aims to align strategies and combine forces in order to strengthen this industrial activity in Spain. It aims to promote **innovation, encourage cooperation** among agents, **train and develop qualified personnel** and **raise awareness of the public administration** in aspects relevant to logistics activity, among other objectives, through the **generation and distribution of information**.

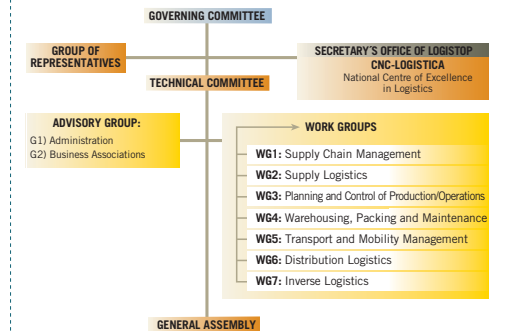
Logistop constitutes an effective means for the definition of research and development priorities, deadlines and participation in the execution and development of action plans in the scientific-technological field for the management of **supply chains, transport infrastructures and their exploitation**, in addition to the **logistics activity in all business and institutional sectors**.

This platform was also created to identify the opportunities existing in Spain for the promotion of **specialised training** of highly qualified work teams, in a way that the **implementation of technology** and the start-up of the strategic lines, as defined in the Strategic Research Agenda, are guaranteed long-term.

The platform's name Logistop corresponds to the English acronym, **Logistics Technology Platform**, in anticipation of the future creation of a European platform in this field.

The following figure describes the organisational structure of the Platform:

Structure of the Platform:



The Technical Committee, together with the platform's Technical Secretary, was responsible for writing this document. The panel of experts that revised this document is included in annex I. All of the members of the Workgroups that participated in the development of the Strategic Vision can be consulted in annex II.

For additional information concerning the Integral Logistics Technology Platform, please visit:

www.logistop.org





4. Present panorama of Integral Logistics in Spain

4.0. Introduction

Logistics is acquiring increasing importance with respect to company strategy, and has become a **determining factor for improved competitiveness in a constantly changing market**. The application of better methodologies in the logistical aspect implies competitive advantages with respect to the rest of the companies, not only from the viewpoint of improved management efficiency but also in terms of the increase in the added value of the product or final service.

As indicated by the analyses and the studies on the evolution of the business panorama since the 1950's, industrial activity has followed a constant process of continuous improvement, centred on the areas of industrial organisation considered critical for the socioeconomic situation at the time. Industrial improvement focused first on the improvements in the production systems, then the efficiency of these systems. Later came the quality, the search for new markets and clients with marketing. Improvement is currently centred on the logistics processes. Logistics management is an inevitable expense, since it is associated with **product availability**, without the addition of a direct transaction of added value. But if all of the processes involved in facilitating product availability according to the clients'

demands are analysed, many methods and **possibilities for the improvement and optimisation of the costs** can be found.

Presently, logistics management still does not have a well defined scope in the industrial world, and in companies' balances there is no consensus for the allocation of costs. In fact, in many cases, the costs associated with logistics management are not even known. According to data from the latest report on the supply chain management tendencies in organisations published by the European Logistics Association, ELA, more than 40 percent of companies do not know the breakdown of their logistics costs, which, according to the industrial activity sector, could reach 14 percent of their total costs.

On the other hand, product availability is a **valuable service** offered to the client and, although its effects are difficult to measure quantitatively, (the relationship between costs associated to the level of service and revenue is still being studied), it can be considered a tool for the competitive strategies of organisations. This aspect is becoming increasingly urgent, given the current economic and business panorama, both on a

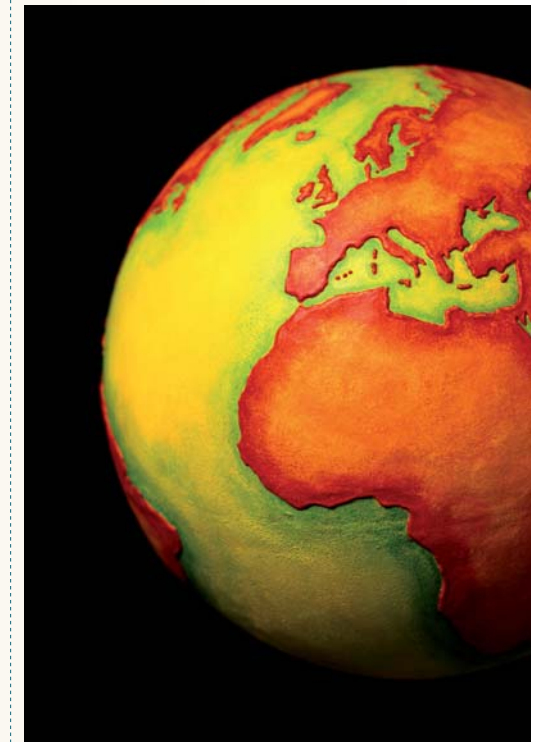
local and on a worldwide level. In order to offer **reliability**, the availability of a product according to the client's request from the quantity, packaging, and quality, and of course, on the date required. All of the industrial organisational processes are involved, including the design, the suppliers of raw materials, the production, the commercialisation, etc. Logistics management covers all of these aspects and this reliability can be strengthened by eliminating inefficiencies, improving the flow of both information and materials, and with all of the agents involved working together as a team.

Optimum logistics management has repercussions on **cost reduction**, eliminating expenses due to inefficiencies in the processes and taking advantage of the synergies produced between agents. It also increases organisations' revenue due to the added value given to the product or final service, with relation to availability. Nowadays companies, due to the growth of distribution and competition, are more and more aware of the potential of logistics for their profitability. Any decision concerning the logistics chain could affect the service given to the final client, and as a result affect sales and client loyalty.

The **client** demands more speed for the delivery of the product, the culture of immediacy is present in all fields, making product availability a distinguishing characteristic which is more and more valued. This requires an efficient and rapid supply chain adapted to the product or service. In addition, the **life cycle** of the products is becoming shorter and shorter, thus organisations are confronted with increasingly tight deadlines, with all of the implications regarding supply, transportation, and stocktaking management. The ability to satisfy client expectations, deciding on the level of service for each client depending on company objectives, is the responsibility of the management of the logistics chain. Client demands have also brought about the development of reverse logistics, independent of the environmental influences. The gradual increase in flexibility for the return of products and the proliferation of indirect distribution channels without previous sampling of the product are practices which increasingly influence logistics operations.

With respect to the present industrial panorama, a clear and generalised outsourcing of production can be observed as opposed to the principal points of consumption, with the creation of distribution networks increasingly long in distance, complex in the number of agents involved and complicated in terms of the relationships between all of the parties involved. In particular, the **new competitive framework** arising in Europe and Spain should be taken into account, a framework with a clear concern for the tendencies of

the industrial world with relation to the appearance of new competition from European countries with **emerging economies**. The industrial world in Eastern European countries is in an optimal position of transport with respect to the distance between the production and the European points of consumption, so that the already established industry in our country must find an efficient way to logistically manage its products and services by means of a reduction in logistics expenses to compete with the low production costs in these new nuclei. Until now companies in general have not been concerned



with these types of costs, from the warehousing, transport of raw materials and finished products, to the management of transport, and as indicated in the report published by the European Logistics Association, ELA, in 2004, a large percentage of companies is not aware of the breakdown of their logistics costs.

The following figure shows the evolution of the focus given to logistics by the organisations, according

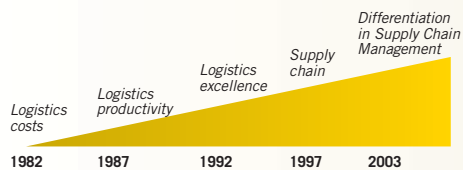


Figure 2. Adaptation of the evolution of focus given to logistics by industrial organisations. Report from the European Logistics Association, ELA.

to the ELA, where the increase in the importance of the concept of logistics management in the management of companies can be observed, beginning with logistics costs at the base, which are the associated to the transport and warehousing, on to the improvement in logistic productivity, then on to the logistic excellence needed by an organisation to distinguish itself in its field of action using supply chain management. Clear reference examples in the current bibliography are Inditex, Mango, and Mercadona, among others.

From another point of view, and with the objective of providing **data on logistics activity**, firstly from the Platform, it should be pointed out that no logistics sectors or industrial logistics activity exist on an official level in its full scope. According to the traditional classification, data exists concerning the tons of goods and passengers transported by the different modes of transport along with other types of data specific to transport, though no figures or measurement methods exist concerning the scope of logistics activity, understood to be all of the capital involved in the transport, distribution and

management of the different industrial sectors: automation, electronics, food, textiles, etc. It is difficult for official institutions to characterise a sector called logistics, since the scope of this activity is not as obvious as it is with other sectors, and even the different actors involved interpret this concept in different ways. For this reason the sector and/or logistics activity must be officially defined and the appropriate indicators provided institutionally. To do this, one of the ministerial initiatives

has been the promotion of a technology platform, with the aim of giving integral logistics its place and positioning it, within the plans of the different ministries involved: the Ministry of Education and Science for the Scientific Research, Technological Development and Innovation (R&D), the Ministry of Public Works for the infrastructures and the Ministry of Industry for the clearly industrial focus that underlies integral logistics.

The organisation DATAMONITOR, specialised in industrial analyses, examining and analysing different sectors using surveys, direct contact with companies etc., provides certain data related with logistics activity, in particular with the distribution costs. This organisation, in Spain's case, has also based its figures on data from the Spanish Logistics Centre (CEL) and, on a European level, on figures from the European Logistics Association, ELA.

Summarising the data from the DATAMONITOR report corresponding to 2005, it can be said that the distribution in Spain has experienced continual growth in recent years, and given the current framework of the national market, changes will not be seen in this growth.

The food and distribution sector is the sector that contributes the most weight to the logistics sector in general, accounting for 45.8 percent of the total, and will continue to be the driving force for the activity, so as the general economy of the country grows, final users will have greater availability of capital, demand will increase, requiring increasing efficiency in the companies' logistics management. As a reference the forecast of the evolution of the logistics market in Spain is indicated below:

Year	Billion € (10E ⁹ €)	% Growth
2005	11.4	1.50
2006	11.7	2.60
2007	12	2.30
2008	12	0.60
2009	12.2	1.20
2010	12.3	1.30

Table 3. Adaptation of the evolution of the Spanish logistics market, in terms of distribution costs, according to the DATAMONITOR report.

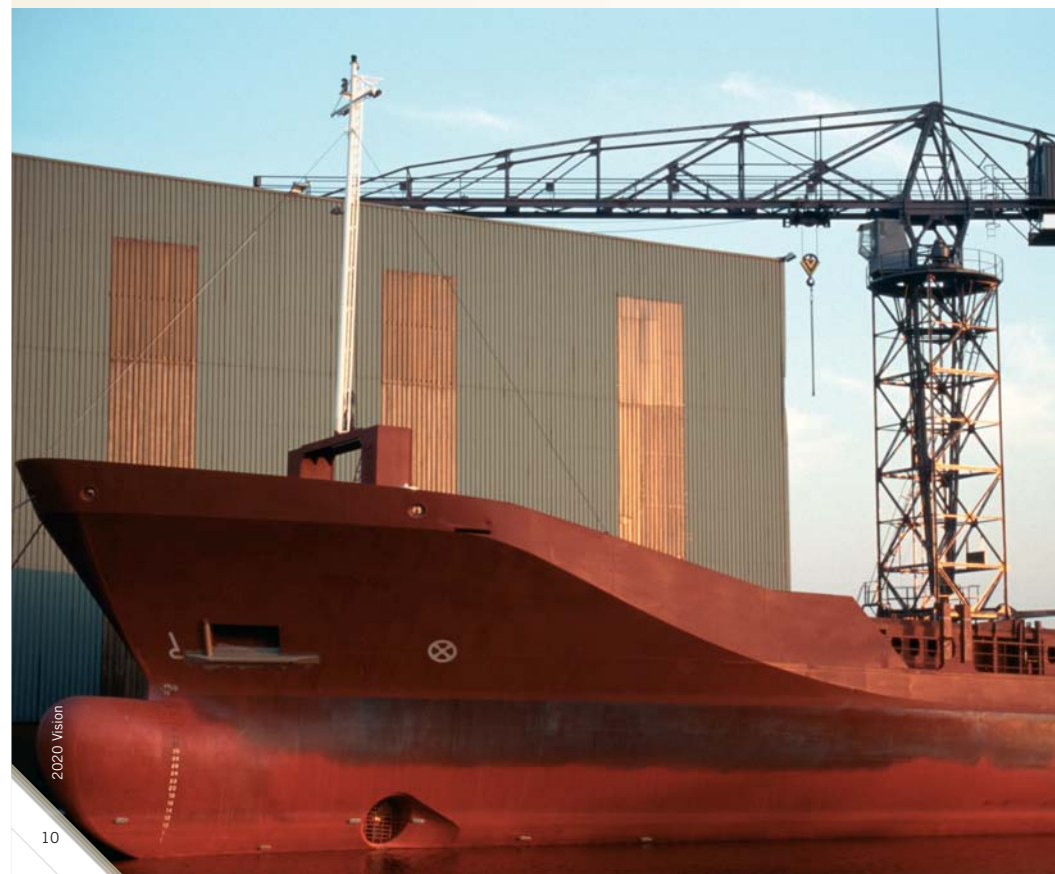
For all of these aspects, the Integral Logistics Technology Platform aims, by means of this document, to make industrial organisations aware of the **scope and impact of logistics management**, propose a **guide of key actions** in the different fields of influence, and observe the future panorama for the **development of sustainable and competitive logistics activity**.

4.1. Analysis of the environment

The following figure is a summary of the SWOT analysis performed by the agents that constitute the Logistop platform, which represents the main weaknesses, threats, strengths and opportunities of logistics activity in Spain.

For this analysis, the different fields of influence that affect the management of logistics activity were taken into account, analysing the internal processes within companies and the external processes between the different agents in the supply chain, suppliers and clients, and the availability and exploitation of infrastructures and the management of goods and information.

The weakness observed in national exports and the lack of dynamism in the industrial sector demonstrate an insufficient structural competitiveness in the Spanish economy that, in spite of continual economic growth superior to the European average and, in addition to the existence of positive data and capital resource investments which encourage industrial activity, a series of **comparative deficiencies with the European Union** exist, both in R&D investment matter and in the insight of new technologies, as in some aspects of education and professional training.



The following chart specifies the SWOT analysis performed by the Logistop platform:



Figure 4. SWOT of the logistics activity in Spain, according to the vision of the Integral Logistics Technology Platform.

Next each point of the SWOT analysis will be developed, indicating the reasons why they were identified by the Logistop platform.

4.1.1. WEAKNESSES

LACK OF STRATEGIC PLANNING IN BUSINESS VISIONS.

The Spanish business culture has only one short-term vision, there is a lack of strategic vision due to the scarce degree of awareness of the logistics concept, its scope and the benefits that an optimum management would bring to the organisation and to all of the agents involved. In particular, the Spanish industrial world is mainly made up of small and medium enterprises. The great effort that must be made by companies from an economical and personnel viewpoint to establish the improvement of logistics management as a priority supposes a weakness for the type of companies in Spain. The reactive attitude of national companies as opposed to an attitude of strategic precaution should also be pointed out. In situations where changes in demand or problems related to logistics need to be confronted, partial and punctual solutions are adapted to particular problems occurring at that moment and neither future scenarios nor strategic action plans are formulated.

SHORTAGE OF SPECIALISED HR, TRAINED FOR LOGISTICS MANAGEMENT.

In Spanish logistics activity a lack of human capital training at the level of qualified managers and technical personnel is observed. The offer of specialised training is practically inexistent, being partial and disperse, with only a few Spanish regions offering quality training, implying a low level of knowledge and the limitation of the use of advance methodologies in the management of the logistics chain.

RETICENCE TOWARD THE INNOVATION AND INCORPORATION OF TECHNOLOGICAL DEVELOPMENTS.

The use and potential of the technologies associated with logistics activity are still unknown by the agents involved. At the same time, a lack of policies advocating the development and implantation of these technologies is observed on behalf of the institutions. This lack of knowledge is observed on both a level of management and information exchange as in the use of innovative techniques for the management of logistics processes such as the calculation of routes, product tracking, collaboration practices, joint planning and quantitative methods for the prediction of demand. In particular, for the majority of the Spanish industrial world, made up of

small and medium businesses, the problem of access to these technologies is also due to economical barriers and the radical change in management that it would imply. In comparison with companies from the rest of Europe, the penetration of technologies is reduced, both in the industrial field and in general use. This means that logistical technology in the business world is even weaker and needs improvement.

LACK OF COLLABORATIVE CULTURE BETWEEN THE DIFFERENT AGENTS.

In the Spanish industrial culture a great amount of distrust is observed during the exchange of strategic and operational information between agents. The collaboration and sharing of reports, joint planning and other similar practices are not common. The collaborative culture among agents is difficult to introduce in national organisations, making it difficult to manage a collaborative environment, even for processes within the same organisation. A significant percentage of organisations still work with vertical structures, in which the departments have independent objectives, lacking a culture of works by processes. This point is tied to the previous point regarding technology, as the implantations of technologies which favour the exchange of information are virtually nonexistent in organisations.

TYPOLGY OF THE SPANISH INDUSTRIAL STRUCTURE OF THE TRANSPORT SECTOR AND LOGISTICS OPERATORS.

There is a large level of atomisation in the logistics operators sector predominated by small and medium enterprises, as in the rest of Spanish industrial activity (almost 85 percent of industrial companies have less than 20 employees, representing 13 percent of the industry's revenue and employing 29 percent of the industry's employees, according to data from the National Statistics Institute). According to specialised surveys consulted, there are few organisations which can be considered leaders in the sector, and the rest of the market is fragmented. As a result competitiveness is based mainly on price, with few offers of specialised and distinguished services.



INSUFFICIENT DEVELOPMENT OF SPECIALISED LOGISTICS OPERATORS.

There are relatively few operators developed enough to offer specialised services, not only in the aspect of transport, but also in all of the aspects related to logistics, such as warehousing, stock management, information exchange management, handling added value operations, etc. On the other hand there are a relatively small number of Spanish companies that outsource services to logistics operators (only in sectors like the automobile industry, where the majority of the demands are imposed). The development of alliances and the association of carriers and operators against the atomisation of the sector will facilitate the concentration of business and provide these companies with a better position in the market, allow them to survive in the future, and avoid the threat of absorption of the logistics processes by non-Spanish organisations. This aspect is also related to the lack of collaborative culture and distrust not only for information exchange and but also for outsourcing operations.

HEAVY DEPENDENCE ON ROAD TRANSPORT. LACK OF INTERMODALITY.

There has been little implantation of intermodal transport and a lack of infrastructures which permit and strengthen it, on both an urban and interurban level. Many of the strategic practices on the level of supply chain management, such as *zero stock*, *cross docking* and *just in time*, entail an increase in the transport of goods, especially by road. The dependency creates a greater

impact with respect to sustainability, environmental repercussion, energy costs and accidents. The fleet should be provided with more ecological alternatives for the correct fulfilment of the existing regulations for these aspects, for environmental development and to offset the aid given by the European Union to other means of transport it considers to be more ecological. Regarding intermodality, efficient relationships should be created between ports and shippers, dry ports, infrastructure and railway management, air consolidation, the practice of short sea *shipping* and the use of sea highways should be developed, in addition to the creation of efficient platforms for the exchange of information. There must also be planning and preparation for the continuous increase in goods transported by sea resulting from the continuous increase in commerce with Asia and South America.

LACK OF GLOBAL VISION TO MANAGE EXISTING INFRASTRUCTURES.

The inherent difficulty of Spanish geography with regards to the creation of infrastructures, and above all, alternatives to road transport, leads to a lack of intermodality culture and the use of different means of transport, especially the railway, for the transport of goods and passengers. At the same time, the inexistence of navigable rivers that connect points of interest and the scarce use of sea transport between national ports (excluding obviously, the islands), has not allowed for the promotion of an intermodality culture and the management of infrastructures, as they would exist in other countries. Railways are not efficient, neither in Spanish territory nor in its connection to countries abroad. On the other hand there is not sufficient development in the principal centres of land communication with Europe, a key point for the flow of the international market.



4.1.2. THREATS

ABSORPTION OF THE LOGISTICS PROCESSES BY LARGE FOREIGN ORGANISATIONS.

This threat is analysed from the viewpoint of small businesses and Spanish logistics operators that should associate or join forces to face the large foreign companies.

This is due to the scarce development in the practice of national logistics operations, which could cause a loss of this market niche to foreign organisations that already practise these operations.

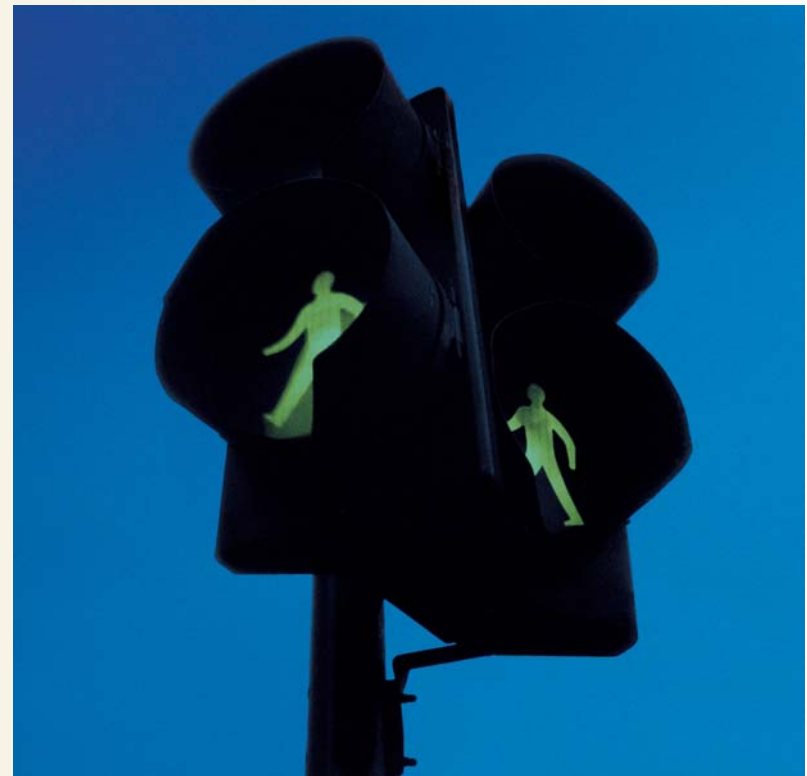
Delay in the Spanish industrial panorama with respect to the areas of industrial improvement.

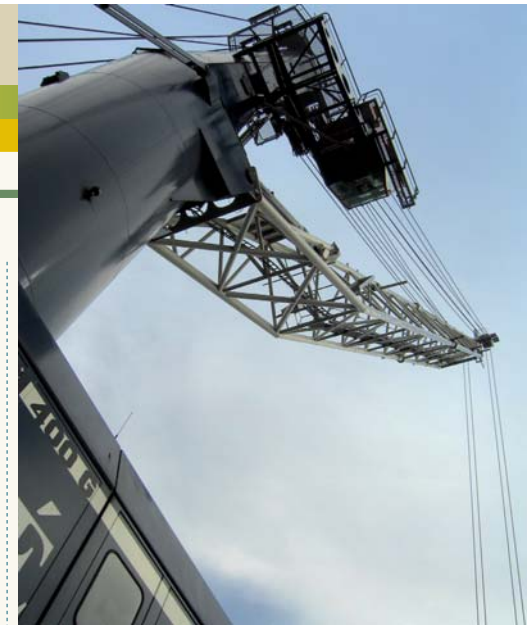
Logistics is still not a priority among the other areas of improvement such as quality, productivity, etc. The fact that small and medium enterprises are the principal component of the Spanish industrial world means that the lack of resources is a barrier for the innovation and

the commitment to technological development. The majority of Spanish companies are still in a stage of improving production and quality, with a view on logistics which is very operative but not very strategic, prioritising buying and productions costs as deciding criterion.

Excessive regulation and lack of harmony in the legislative and normative fields with respect to logistics operations.

Excessive regulation regarding taxes and labour requirements on an autonomic, national and European level are challenges for Spain. This means that the majority of companies dedicated to logistics services (with few resources, in a competitive environment with low margins, or the requirements are not fulfilled) will be devoured by the large organisations with more resources or have to compete with companies from different legal frameworks and with greater restrictions.





4.1.3. STRENGTHS

BUSINESS AWARENESS OF THE IMPORTANCE OF LOGISTICS AS A DISTINGUISHING FACTOR IN COMPETITIVENESS.

There are sectors and national companies which, based on an efficient logistics, have been able to position themselves on a national and international level. As a reference, organisations should use business experiences that verify the success and differentiation in their activity through logistics management, and in Spain we have great examples recognised worldwide, such as Inditex. This type of example can encourage, little by little, a change in the notion of logistics and its potential as a competitive tool and distinguishing factor for organisations.

STABLE SITUATION OF ECONOMIC GROWTH IN SPAIN.

This favourable situation in Spain permits the promotion of industrial development and new investments. Spain is in a phase of economic growth in the Spanish industrial world in general. The uninterrupted growth process of the Spanish economy during the last several years is more intense than that registered in the principal European economies, and is strongly tied to the stability and trust derived from the convergence process and the integration of the economic and monetary union. This fact is a good starting point for the development of new industrial and business activities, in addition to the positive indicators that show an increase in the investment in capital resources, and the support of innovative market practices, that could lead to, particularly, the need for good logistics management.

EXISTENCE OF LOGISTICS KNOW-HOW.

Logistics management in Spain is found to be at a relatively high starting point. By understanding other countries' experiences and the management of logistics by different organisations already established in the activity, Spanish organisations can compare knowledge and learn how to take advantage of the knowledge that has already been developed in these cases. From this viewpoint, we begin with an advantageous position.

OPTIMUM GEOGRAPHIC POSITION OF SPAIN.

Our country is the entrance to Europe from Africa and Latin America, and additionally, its ports are strategically positioned for commerce with Asia, which

favours the promotion of logistics activity as seen in the evolution of commercial tendencies worldwide. The countries of the Maghreb constitute a strategic opportunity; an increase in traffic is forecasted, due to production relocation to these countries. With respect to Eastern European countries, the Spanish business world must face relocation by offering other competitive advantages, which includes reliability in product delivery, the principal characteristic influencing logistics.

PROGRESSIVE AND PROPER ADAPTATION TO ENVIRONMENTAL AND TRACEABILITY REGULATIONS.

Both central and regional governments are encouraging environmental practices and the compliance of product traceability guidelines. These standards influence logistics management and the information systems related to it in order to preserve traceability. Spain must abide to the legislation and European and worldwide guidelines for the management of environmental impact, as logistics affects the environmental field in different ways, from the collection and disassembly of products for recycling to the devolution and exploitation of products returned for remanufacturing and/or reuse.

INCREASE IN TOURISM.

Spain continues to be a tourist country because of its geographic location and its climate. This situation is associated to an increase in the movement of people and the movement of materials needed by these people to cover their demands, resulting in increased commerce and a greater market in terms of final clients, users who will be better served with increasingly improved logistics management of the services involved.

HIGHER QUALITY OF LIVING IN SPAIN.

The Spanish lifestyle is attractive to companies and workers that wish to settle in national territory, in contrast with countries in Eastern Europe or Asia. It is clear that Spain is an attractive centre of operations for organisations that want to position themselves, on a geographic level, in the European market, and as a connection between Asia and the Americas, as previously observed in other industrial fields.

4.1.4. OPPORTUNITIES

GLOBALISATION OF THE MARKET AND COMMERCE.

This fact contributes to the appearance of new business opportunities for the Spanish industrial industry, with a global logistics scope, making proper logistics management essential for the operations to be profitable.

Globalisation encourages the participation of Spanish companies in more global and extensive logistics chains, giving our companies the opportunity to learn about and access new markets. This opportunity is considered to be a challenge for the Spanish industrial sector and therefore sustainable development and competitiveness will depend on the manner in which the industrial world faces this new framework.

INCREASE IN THE PRACTICE OF REVERSE LOGISTICS.

Recently, the promotion, development and the obligatory nature of recycling and practices for the return of products has brought an increase in the practice of reverse logistics. With the objective to provide better service for the client, new return policies are increasingly flexible, leading to an increase in the return of products susceptible to reintroduction into a new productive and logistics cycle. On the other hand the shortage of raw materials also encourages recycling, reutilisation and remanufacturing, implying an increase in the collection and processing of products at the end of their useful lifecycle, processes that still have a wide potential for logistics optimisation.

PROGRESSIVE DEVELOPMENT OF R&D ACTIVITIES.

There are more and more activities that strengthen the collaboration between the Science and Technology system and the business world, taking advantage of the incentives promoted by national and international governments. Additionally, Spain finds itself immersed in European programs for the promotion and support of R&D, in a way that although it is starting off at a disadvantage, Spain is becoming progressively aware of the necessity and all of the investment potential in research and innovation.

PROMOTION OF LOGISTICS INFRASTRUCTURES ON A PUBLIC, PRIVATE AND CONSOLIDATION LEVEL.

In the last several years the proliferation of logistics activity zones can be pointed out; air freight facilities, dry ports, encouragement of the creation of logistics platforms and other logistics infrastructures, all resulting

in the progressive awareness of the importance of logistics activity, serving as exchange points for goods on an international level as a result of the strategic geographical location of our country.

POSSIBILITY OF CONVERTING SPAIN INTO THE CENTRE OF LOGISTICS FOR SOUTHERN EUROPE.

Spain should strengthen itself and aim to become the centre of distribution for southern Europe, regarding commercial connections with the rest of the world, the relocation and long transport distances that should be covered with respect to future production points. The hubs for geographic consolidation will be increasingly essential for the organisation of logistics worldwide, and Spain is in an optimum position to serve as Europe's consolidation centre.

GROWTH OF THE LOGISTICS MARKET.

It is an objective fact that a larger number of logistics activities have been conducted in recent years. Globalisation and the relocation of production has caused a rise in the logistics activities of economies on a large scale, the growing client demands and the decrease in product lifecycles have increased the complexity of operations and services, and finally, the competitive business panorama encourages the use of logistics management as a distinguishing element. The new business tendencies and the increase in Internet buying, influence aspects such as transport with capillary distribution and production management, using the study and practice of more efficient methodology to combine the real-time demand with production.

4.1.5. CONCLUSION

Following the analysis of the integral logistics environment in Spain, it is observed that several stages are lacking in the awareness process of the Spanish industrial world concerning the scope and potential of integral logistics management. In particular, there is potential in the incorporation of integral logistics as a valuable generating process, a process which involves not only the departments within an organisation but also involves all of the external agents related to the product or final service, requiring the creation of collaborative environments. The Spanish industrial world, according to the integration scale of the concept of supply chain management by Stevens, is found to be between the first and second stage, where the transition to the third stage is the concept of integration between all of the agents, an opportunity which should be taken advantage of. See the following figure with integration scales, by Stevens, adapted:

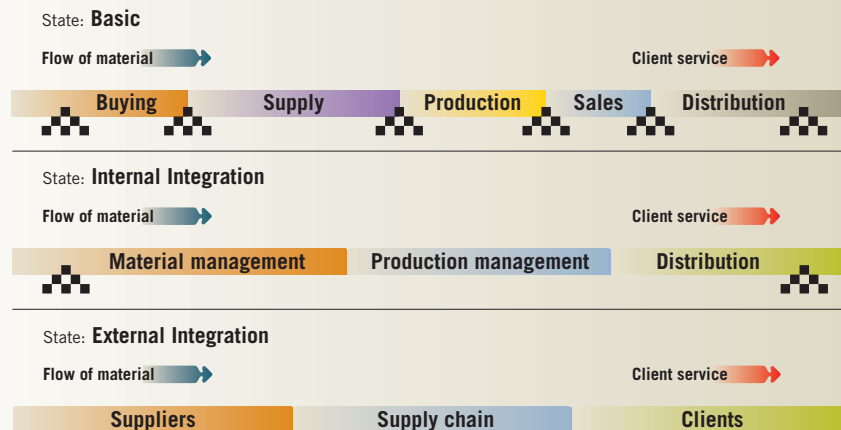
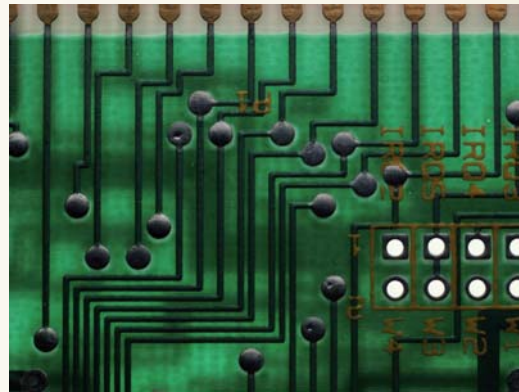


Figure 5. Adaptation of the figure of integration stages in the supply chain by Stevens.

The **coordination and integration of the logistics chain** is an essential element, not only of an internal nature within an organisation, but also between all of the agents that intervene in the supply chain for the product or service provided. Coordination refers to terms such as combined planning, combined development of new products, information exchange, coordination between the different hierarchic levels of companies in the network,

long-term cooperation, fair division of risks and benefits, etc. As the author Skjoette-Larse determines in his work "European Logistics beyond 2000", there should be an open and cooperative effort between all of the agents involved in the production, supply and distribution of the products.

5. Strategic Fields

5.0. Introduction

The Integral Logistics Technology Platform has identified a series of strategic fields of action, which are those practices and frameworks which should be worked on to promote logistics activity opportunities and develop a competitive industry while maintaining sustainable development. The Logistop platform establishes the strategic fields of action for integral logistics in Spain as indicated in the figure below:

to manage and apply the **technology** available, to develop and access the **R&D** performed in this activity, to create and act in **collaborative frameworks** between the different agents that make up the supply chain in which the organisation is embedded, to apply **co-modality/intermodality** in the transport of goods, and to manage both materials and information in a **safe** environment. Furthermore, all of this must be based on the necessity for **sustainable development**.

The figure demonstrates that the primary objective of logistics should be **client satisfaction**, while also acknowledging that **profitability** and growth are principle objectives within the business strategy of a business organisation. To comply with these requirements, logistics management should be set up to allow the organisation to be **flexible** to the changes in demand and new settings, to be **efficient** in order to handle any action in the best possible way, and to be **quick** in order to service an ever changing environment in a way that offers **reliability** for the product or service provided.

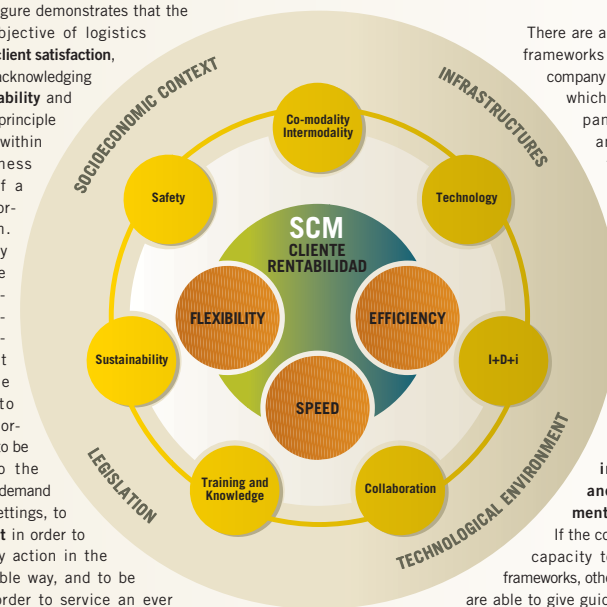


Figure 6. Strategic fields of action in Integral Logistics.

There are a series of action frameworks over which the company has little control, which affect the company significantly and constrain to the area of work where the strategic fields as defined in this document by the Logistop platform are developed: the **legislative framework, the socio-economic environment, the infrastructures and the development of technology**. If the company has little capacity to modify these frameworks, other external agents are able to give guidance to modify, or partially modify, these points.

In the following sections, each area will be developed more extensively. This analysis will allow the visualisation of the lines of action which will lead us towards the desired situation for logistics in a medium and long-term future panorama, and the definition of the actions and projects which make up the Strategic Research Agenda.

In order for an organisation to be able to act in accordance with these objectives, it must promote development of a series of complementary **strategic fields** which support key aspects of logistics management. These include the ability to develop **human resources that are trained** in the material and have the knowledge

5.1. Sustainability and Corporate Social Responsibility

The growing social demand for companies to perform their activities within a framework that permits **sustainability and respect towards human principles and values** also has repercussions for the field of logistics. In spite of the fact that a significant percentage of companies are generally reluctant to incorporate new principles (above all when these principles viewed as an imposition, rather than as something of interest from a strictly business point of view based on the potential financial returns or other economical justification), an increase in the number of companies that incorporate new actions, in addition to their habitual practices, which have a lesser environmental impact throughout the lifecycle of their products or avoid certain irresponsible labour practices, is expected.

This trend is driven not only by social demand or by clients, but also by Public Administrations who are also playing a fundamental role. At the same time, new legislation is appearing in developed countries and in Europe, forcing action in this area. However, generally speaking, a **lack of awareness** still exists in certain administrations in Spain. This is evidenced by administrations that do not provide the collection of certain waste on a local level, do not demand the compliance of standards with the intensity required, or lack the knowledge at an institutional level pertaining to reverse logistics and its practices. (This type of training could be encouraged from this platform through all of the agents specialised in logistics activity.) On the other hand, the recycling activities have significant positive effect on the employment of people at risk for social exclusion and the disabled, providing not only employment but the active participation of these collectives in a labour activity necessary for society.

The companies should begin to change the design of their products (avoiding materials with difficult handling properties at the end of its life), where management plays a crucial role, making strategic decisions in this sense. A greater collaboration between the different links in the logistics chain would favour awareness and better waste treatment. Regardless, the **progressive increase in the cost of raw materials and energy**, due to the decrease in resources, will eventually drive companies with little environmental conscience who are more worried about profitability, to act in this sense in the long term.

Globalisation is also considered a great challenge in this field. The search for mass markets and low-cost manufacturing will drive logistics long distances. The suppliers will be located in countries where legislation is not as restrictive as in Europe and Spain in the environmental and human rights fields, where there will be increasing pressure to guarantee supplies that maintain minimum standards in these fields. On the other hand

companies should strive for a reduction in transport time, due to shorter lifecycles, and measures should be articulated for the use of the **friendliest means possible**, in an attempt to avoid congestion, accidents, achieve a better use of freight, etc. Less contaminating vehicles must be used, as well as telematic services and control services to maintain an intelligent distribution of traffic, using the infrastructures available in a rational manner. Long distance road transport will be reduced, although road transport in general will increase. The environmental impact of large logistics zones, ports and airports, must also be minimised. The most dynamic sectors (the automobile, textile and consumer electronics industries) will surely be pioneers in establishing new standards for relationships with suppliers in areas related to sustainability and corporate responsibility.



In summary, the **key actions** with respect to the strategic field of **Sustainability and Corporate Responsibility** are identified as follows:

- Analyse products from the **design stage to increase recycling, reuse and remanufacturing**, both in the disassembly and in the inclusion of recycled materials in the products.
- Encourage the creation and implantation of work methodologies that **optimise the reverse flow**, reuse of materials and production, and all of the functions associated: traceability, information, transport, sales, etc.
- Create awareness among the population and foster increased participation in the **elimination of waste and in the use of recycled materials**.
- Make administrations aware of the **effective implementation of different regulations** that deal

with waste collection and treatment and the production of quality recycled raw materials for later use.

- Encourage **collaboration** between the different links of the logistics chain, favouring better waste treatment.
- Encourage the use of **more friendly means of transport** with respect to the environment and develop actions which lead to the improvement of **logistics infrastructures in terms of sustainability**, promoting actions leading to improvement in detection systems and in the management of waste and contaminants, as well as optimisation of the use of energetic resources.
- Encourage the development of methodologies for a more efficient **treatment of products at the end of the life of the product**.

5.2. Development of Safety and Reliability

It is predicted that the progress of logistics in upcoming years will be based on safety and reliability. The continuous development of logistics, favoured by the globalisation of the market, the changes in traditional productive systematics, improvements in means, systems and ways of transport and the continuous evolution of the means of information transmission and management, are the driving forces of the increasing awareness among the users and the Public Administrations respecting safety and reliability both of which directly influence the internal points of the supply chain and the final client. The **improvement in the levels of reliability** allows the assurance of the availability of the product requested, in the desired conditions, on the dates planned and the fulfilment of

all necessary information requirements. But this will not be achieved successfully if the product does not go through **sufficiently safe processes**, during the supply chain, for which these two concepts are directly related.

These aspects, which in and of themselves are important, take on a special meaning in the case of logistics related to the movement of strategic products or with direct effects on public health, already resulting in the continuous appearance and evolution of specific legislation, on a local, national and European level, focusing on safety and reliability in logistics chains for these types of goods.

Logistics development should be accompanied by the development in parallel of mechanisms aimed towards guaranteeing safety and reliability in all of the aspects present in and around the supply chain. Therefore, the **control of safety and the reliability of transactions**, for both goods and information, between the agents of the supply chain, tools, methodologies and systems should be developed to allow the validation and control of suppliers, operators, clients and the rest of the elements present in the logistics chain, valuing and weighting up real time capabilities and their adaptation to the chain.

In order to ensure these safer transactions, methods, means and technologies are developed for the exchange of information and the daily work of carriers and operators associated with the task of moving merchandise. Another key aspect will be the **safety of facilities and elements**,



for which new systems should be developed to prevent the uncontrolled output of products from the supply chain and provide means of tracking for this output in less time. United to this concept is the need for tools that fine tune **product reliability**, using systems that control the characteristics of the evolution of a product or the entire product which may suffer along the supply chain, as with its **traceability**. Traceability is outlined as one of the most critical points in order to guarantee the safety of the final user. On the other hand, the **safety of the environment** must be also considered, as this is an especially critical subject in the applied logistics of dangerous goods, where the development and the start up of new devices and environmental safety measures will be one of the fundamental requirements insisted upon for each of the agents in the supply chain, in a qualitative and legislative sense.

In spite of this, it is a fact that all of the advances in logistics will come directly determined by the advance in technologies and the systems in charge of their control. For this, systems will need an increasingly sophisticated **means of data protection and reliability assurance**, guaranteeing its sturdiness and avoiding breaches in security which would enable unauthorized access or manipulation. The collaborative information platforms, for the improvement of flows and services by means of P2P networks, future tendency of information management in the supply chain, will require this security and reliability in the information.

To achieve this, the **key actions in the strategic field of Safety and Reliability** will as follows:

- Develop tools and methodologies that support improvement of the **safety of transaction for goods and information** between the agents in the supply chain.
- Perfect and implement systems which would prevent the uncontrolled output of products in the supply chain and develop the **means of tracking** these products.
- Develop tools to guarantee the **reliability** of the product, controlling its evolution along the supply chain and ensuring its **traceability**.
- Perfect the control devices and the **environmental safety measures** used in the logistics of dangerous goods.
- Develop the means for **data protection** as an assurance of reliability, guaranteeing its integrity and safeguarding against breaches in security.

5.3. Encouragement of Collaboration

An analysis of the present state of integral logistics in Spain suggests the existence of strength with respect to the incorporation of tactics in the area of strategic collaboration among companies. This potential arises from the implementation of the concept of **integrated management of the supply chain**, in which all of the materials, resources, assets and systems are managed in an integrated manner to achieve a safer, more flexible, quicker and more efficient flow of materials and information through all of the agents that make up the chain, from suppliers to the final client, and in the other direction. All of the above supports achievement of the strategic objectives of the company with a spirit of continuous improvement.



In the business operations performed with a more classic approach, a series of costs take place without adding value, simply because of the **duplicity in the operations of various agents** that work for each other. In addition, legal restrictions and technological changes implemented with non-complimentary approaches by the different agents, once again encourage unnecessary reprocessing in the operations. These types of inefficiencies have consequences, such as the loss of product loyalty on behalf of the clients. Cultural changes in companies and organisations should be proposed with the aim to share information, on both an internal and external level, and even incorporate the consumer as an intelligent client who provides information about the service *on-line*, and virtually in real-time.

Correct designs of the collaboration strategies among different agents that make up the chain lead to **cost reduction**, an **improvement in quality**, and a **decrease in the time-to-market**. These collaboration strategies range from the integration of the suppliers with the manufacturer during the design phase of a product, resulting in higher product quality at a lower cost, to the joint design of the logistics operation of the supply chain. Presently new approaches to collaboration are arising, such as the “*consumer to consumer*” modality in which increasingly refined methodologies are developed to ensure efficient transactions, avoiding the use of intermediaries that could make the final product more expensive.

The design of a collaboration strategy in the field of supply chain must be approached from different angles, always with the objective of achieving the **best performance** possible given the resources implemented, including time.



From the viewpoint of **quality**, each co-producer and agent in the chain must be considered responsible for the satisfaction of the final user; and furthermore, the requirements for quality must be developed and improved collectively. From the perspective of **cost reduction**, the agents should share methods and *know-how*, with each agent being pro-active in his/her area of competency. From the standpoint of **supply**, the agents need to adopt similar operational procedures, documents, etc.; and the planning and control systems should be linked, since all of the agents are involved in the planning and control of the supply chain. The choice of agent depends on the speed or the capacity to contribute to the **decrease in lead-time**. The collaboration plan should be flexible and all of the agents must contribute toward product improvement and development from the beginning of the process.

Nevertheless, due to the tight relationship between the agents in the chain, there are a series of **risks to identify** in each case which should be controlled from the start. On the one hand, the agents could abuse or misuse knowledge obtained through their cooperation in the chain, with the objective of establishing business with their own competitors. On the other hand, due to the low transaction costs, replacing a supplier can be easy, which can lead to investments that are not profitable due to the brief cooperation periods involved.

Considering the aforementioned, the Logistop platform identifies the following as **key actions in the strategic field of encouraging collaboration**:

- Create policies to encourage the culture associated with the **inter-organisational collaboration** among agents and to promote its implementation.
- Develop methodologies that favour the **creation, exchange and management of joint knowledge** in organisations and the exchange of useful information without affecting the protection of proprietary knowledge.
- Encourage strategic alliances between agents in the chain with the objective of satisfying the final client.
- Develop methodologies that favour a **joint strategic vision** among the organisations, which includes collaboration.
- Develop tools that permit the application of **collaborative methodologies in the small and medium enterprise sector**.



5.4. Co-modality/Intermodality

One of the strategic fields that should be addressed to improve integral logistics is co-modality. For the European Commission co-modality is the **efficiency in the use of modes of transport**, individually and in the framework of multimodal integration in the European transport system, to achieve optimum and sustainable use of resources.

The areas of action in this strategic field must contribute to the **rebalancing of the different modes of transport** to increase **productivity** of these modes as well as improve reliability, efficacy and competitiveness of these modes within the logistics chain and must encourage the use of advanced management techniques that enable a different approach to transportation within the supply chain. The encouragement of co-modality must promote actions and initiatives that favour the interconnection between different modes of transport and between these modes and the infrastructures. Actions should be implemented for the optimisation of the **technological aspects of the logistics infrastructures and for the management and operation of the networks** associated with the different modes of transport, to strengthen operations and develop specific techniques that enable the identification of bottlenecks.

The problems of the EU and Spain due to the imbalance in the different modes for freight movements implies congestion, pollution and lack of safety due to the **excessive weight of road transport and the poor exploitation of the potential for other modes**, such as rail or ship transport, which are safer and better for the environment. An improvement in co-modality would address these problems due to the advantages in energy, profitability, safety and environmental factors. From the Göteborg Council, the consolidation of intermodality, as part of co-modality, to rebalance the distribution between

the different modes represents the nucleus of the **strategy of sustainable development of transport**, and therefore, a chain of efficient, profitable and environmentally-respectful supply. With the encouragement of co-modality, the "door to door" service offering will expand through the connection of long distance railway systems with individualised transport systems. There will also be improvement in the practical use of infrastructures and cargo handling procedures as well as more effective installations for cargo handling (or both) with the aim of reducing cost. In particular, **the handling times, costs and transport time will be reduced** by using quicker and more reliable systems and entailing a decrease in the number of controls due to the sealing of the containers, which reduces the theft and damage to transported goods. All of these improvements will be completed with a **greater simplicity** in the documents associated with transport and with the possibility of tracking the transported goods using systems for the electronic exchange of information.

The technological developments should be directed towards adaptation of infrastructures to the **transfer needs**, such as the design of new vehicles and the extensive use of information and communication technologies that make dynamic planning and the efficient management of intermodal transport possible.

In summary, the following are identified as **key actions in the field of co-modality/intermodality**:

- Implement actions for the optimisation of the **technological and methodological aspects of the management and operation of the logistics infrastructures**.
- Strengthen optimum operation of the **networks associated with each mode of transport** and develop techniques in order to identify "bottlenecks".
- Promote **innovative models of public-private collaboration** in the management of logistics infrastructures.
- Encourage the **connection of long-distance railway systems** with individualised transportation systems.
- Promote actions and incentives in management procedures that favour the **interconnection between modes of transport** and between these modes and the infrastructures.
- Encourage the use of **railway transport for goods**, for both domestic and international commerce and for the access to maritime ports.
- Implement actions for the adaptation of the **physical/technological aspects of the vehicles**.

5.5. Training and knowledge

The strategic field concerning the promotion of knowledge and training plays a key role to achieve optimum logistics development. The biggest difficulty presented by this subject is that the **continuous and dynamic evolution of logistics concepts and strategies** prompts companies to use solutions and apply strategies that did not exist in the year 2000. An advantage to this evolution is that while many key concepts have remained valid, new concepts are developed, not as a substitution but as an extension, caused by new requirements or a change in the business environment. This factor however, creates the necessity of **continual dissemination** of the logistics innovations and promotion of the possibility to create new strategies that fit the real needs of companies with the appropriate research.

In the area of training the situation in Spain is not very favourable since, with some very noteworthy exceptions, the training of management falls on private entities and some university foundations whose participants are active professionals with business experience but lacking theoretical logistics knowledge and recent graduates that view logistics as a professional opportunity but have little business culture. The offerings for **university graduates** in logistics are scarce, with the majority restricted to official and unofficial masters; and the incorporation of logistics concepts into the core subjects provided in the corresponding technical degrees is minimal.

Professional training does not exist on a lower level with the exception of National Vocation Qualification training in transport (FP2) which enables the **professional training of the carrier** and creates an adequate training for the development of transport management in any company. The parallel figure of a hypothetical National Vocation Qualification in warehouse management (FP2), which would enable the professional training of a logistics operator, does not exist and has not been developed. A warehouse worker or product handler does not need any training in our country. In other more advanced countries (Sweden or Germany for example) a FP1 degree is required.

In another aspect, the Law of the Prevention of Labour Risks requires that **warehouse machine operators** have sufficient training, but leaves it up to the judges to define this degree of training, with different levels of training present in companies and organisations and in the training offered by the equipment manufacturers.

In summary, the **professional profiles** of the logistics operations in companies are not recognised professionally or academically in our country, and **academic training should be strengthened** on an official level.



The key actions taken in the field of **Training and Knowledge** should be:

- Strengthen promotion in the business community of the Logistics/Supply Chain concept.
- Strengthen the **dissemination and knowledge of the new strategies** and logistics applications that appear continually, especially in the area of small and medium enterprises.
- Carry out a **job profile diagram**, clear to both the logistics operators' sector and to companies in general, indicating the key functions, the training required and finally the skills necessary for each job position.
- Design and determine, with this job profile diagram, the **map of education** for National Vocation Qualifications levels FP1 and FP2, for University Training; a degree in Logistics if it is considered appropriate; the teaching of key logistical concepts in the adequate specialised fields of Engineering, Business and Economics; University Masters; and finally the Management Training and refresher courses for Professionals typical of the Business Schools, University Foundations, etc.
- Use this job profile diagram to define and recognise, in a labour context, the **new professional functions** that logistics has imposed on both companies in general and the sector of logistics operators.

5.6. Technology

The availability and use of technology differs greatly in function according to the area of the supply chain analysed.

From analysis of the present situation of the use of technology in the **Management of the Supply Chain** in Spain, a lack of understanding of the true application of logistics activity is evident on different levels: 1) on an internal level in each company (management of information, use of planning/optimisation systems for routes, quantitative methods of the forecast of demand, etc.), 2) on an inter-organisational level, interaction with other companies (subscription to platforms for the exchange of information, traceability, collaboration techniques, joint planning, standards for the exchange of data, indicators of joint fulfilment, etc.). Additionally, for many small and medium enterprises, the problem of access to technology is due to barriers of an economic nature, as previously mentioned. The use of technologies leads to benefits from the **improvement of management and the reduction of errors and inefficiencies, to the possibility of the appearance of new business models**, or the reinvention of existing models. From the viewpoint of supply chain management two great trends can be pointed out: a) the growing adoption, on an internal level, of enterprise resource planning (ERP) systems; b) the growing tendency towards ad-hoc development of methodologies and tools for supply chain management. This requires the development of adequate technology platforms for the exchange of information and the

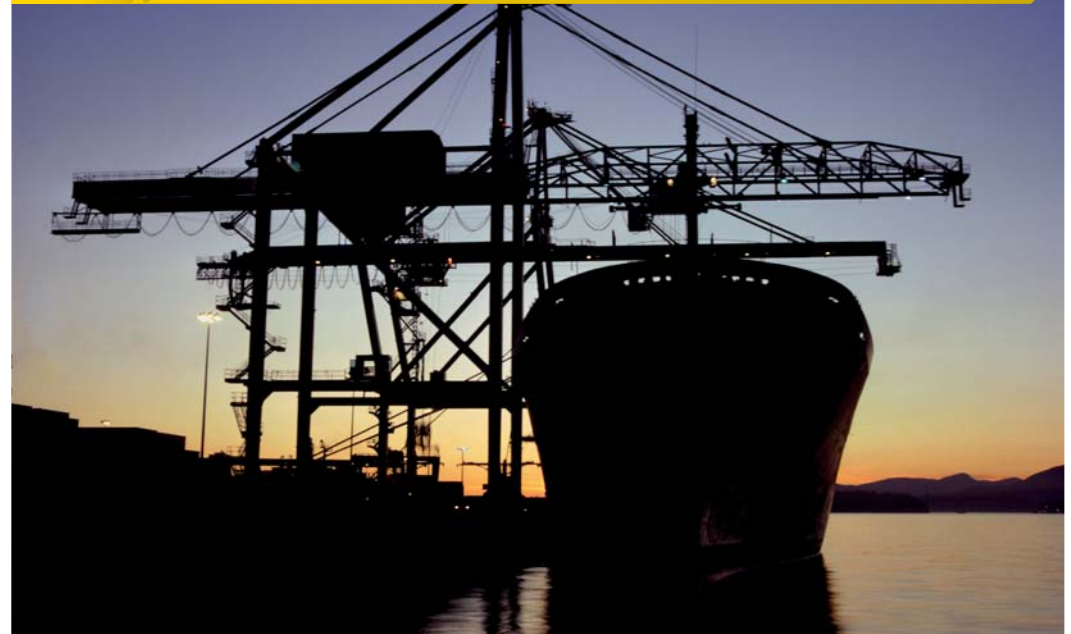


development of solutions for aspects concerning interoperability. There is a low level of understanding and little use of *Advanced Planning Systems and Supply Chain Planning* tools, among others, especially in small and medium enterprises. The only tools that are somewhat common are the *Warehouse Management Systems* and the *Transport Management Systems*, with few Spanish initiatives as reference.

In **Purchase and Supply Management**, with the aim to optimise the supplier-client integration, the need for technology is evident. The degree of integration achieved (or at least in interdependent relationships) between supplier and client, in addition to the functionality that the technological solution offers, will depend on the accessibility (understood as the ease in gaining access) and the degree of standardisation. The use of collaborative initiatives, and above all the *Efficient Consumer Response and Collaborative Planning, Forecasting and Replenishment* technological support (methodologies and tools) is low; and adoption is still confronted by **cultural and economic challenges**. On the other hand, the use of **tools** related to the Internet, such as *e-purchasing, e-procurement*, procurement portals and marketplaces is, in general, low. However, the use of technologies to automate warehousing, such as bar code management, is fairly widespread. The development of technologies for radio frequency identification (RFID) is still very limited, both in Spain and worldwide, due to cost and the reliability of its results. There has been little implantation of the use of decision support systems and their corresponding information management systems.

In the relation between technology and **Planning and Control of Production/Operations (PCPO)**, the following critical aspects can be detected:

- a) The identification of the different subsystems of the PCPO system could be low, mainly in small and medium enterprises, as with the relationships and objectives of each. In large companies and multinationals there is greater understanding and awareness with regards to technology for the PCPO, but in the majority of the small and medium enterprises there is not sufficient dissemination of these concepts. There is also a lack of understanding regarding the use of the technologies and information technology tools adopted for PCPO, both on a **decision-making level and for process optimisation**. The technologies for the PCPO are still not a considered a priority and, in many cases, they form only a small part of the business strategy. In some cases, the existence of information technology applications for the PCPO specific for small and medium enterprises is unknown.



- b) It is important to take into account the possibilities that Information and Communication Technology (ICT) offer, such as **support for the Order Commitment process**. The role of ICT is essential when the clients increase the level of customisation and personalisation of the products/services requested as an increase in the volume of information handled can delay its execution. On the other hand, the interactions that exist between the Order Commitment process and the PCPO are not totally resolved, specifically with the Master Production Plan.
- c) There is a tendency towards the development and application of collaborative networks and/or virtual organisations among different manufacturing plants.
- d) An integrated action which promotes a **service oriented vision** must be considered, such as the technological support for the operation of new business models within and between organisations.
- e) Companies lack a coordination culture both on an external level and among its areas and internal departments. There is little incorporation of the Business Process technologies in the PCPO within an organisation, in individual plants or in a network of production plants.

- f) Little attention is paid to performance measurement systems (PMS) applied to the PCPO and supply chain management to identify the **level of fulfilment of their objectives** and their evolution in successive time periods.

There is a also need to integrate, in the PMS, all of the elements that will allow organisation to be measured and controlled as a global system and not as partial subsystems. There is also a need to define PMS capable of managing the PCPO in collaborative contexts in supply chain management, facilitating the value measurement created by each plant and by the individual and extended processes.

The technological advances in the area of **Warehousing, Packing and Maintenance** will also influence the evolution of logistics, not only centering itself on the devices, but also on the changes in daily operations that its use will involve on a logistics level, such as with packaging and packing. Thus, the development of new materials that are better for the environment or developed using renewable sources will allow for the use of packaging and packing with a **lesser impact on the environment**. Packaging and packing systems will be developed to facilitate reuse and/or recycling. The **improvement in the design** of the packaging and packing system, the

determination of the most adequate palletising approach, and the correct choice in materials will make a better pallet use possible and reduce logistics costs associated with the breakage of products during the transport, warehousing and handling processes. Along the same line, the developments in the area of **ergonomics** will be a focus area, with packaging and packing systems that improve the manageability of packages and the automatic handling of products reducing the costs associated with manual handling. Additionally, the continual increase in the requirements for identification and traceability of products will result in the progressive **integration of automatic identification devices** on the containers and packages as well as the development of the technologies and systems associated with monitoring the information along the complete lifecycle or value chain of the product. **Automation** is another practice that should prevail in short-term and medium-term warehousing and maintenance. Thus, the possibilities offered for the progressive integration of automatic identification systems will lead to the development of warehousing systems and/or *cross-docking* that uses these data for the automated movement of freight, especially in the case of large companies or logistics operators where these investments can have a clear economic justification. Nevertheless, for this process to be carried out, systems that make the **fluid exchange of information** possible should also be developed among the different agents, using EDI (Electronic Data Interchange), XML, or similar systems. For small and medium enterprises, the improvements will be due fundamentally to the advantages that the automatic identification will enable in its **daily operations** and to the development of more economical and secure means of maintenance and warehousing.

The growing use of new technologies on the behalf of transport companies, in the **Management of Transport and Mobility**, is giving rise to an important transformation of operational logistics. The technology platforms found on the Internet give support to different initiatives intended to promote optimisation of transport management and facilitate the mobility of people, e.g. the web portals that enable the link between the supply and demand for transport services. Another important advance is the *Global Positioning System (GPS)* technology. Regarding the mobility of people, the new business models driven by the ICT are allowing travellers to access mobility information almost in **real time**, in addition to improving client service and allowing the development of related added value. With respect to the air transport of goods, the fact that the management of Spanish airports is centralised with AENA guarantees certain safety standards in the operations and the availability of technologies applied to air transport. In the road transport of goods, the incorporations of technologies such as *Intelligent Transportation Systems* are able to help increase competitiveness in the sector; and the technologies related

to traceability, allow for very important improvements in the tracking of products and the identification of accidents, among others.

In the area of **Physical Distribution Logistics and Reverse Logistics** it will be necessary to promote new logistics concepts and train companies in new policies, strategies and technologies for implementation. The following tendencies are observed: **a)** the increase in *e-business* and telephone sales will make the distribution of goods more relevant; **b)** ICT (Wi-Fi, RFID, etc.) will become more important in upcoming years for traceability, **c)** eco-design will play an increasingly important role.

In this way the following **key actions** are identified in the strategic field of **Technology**:

- Creation of **policies for the incorporation of logistics technologies** (Hardware and Software) in and between the members of the chain.
- Encourage the creation of logistics technologies (Hardware and Software) for Spain and the adaptation of non-Spanish technologies in companies and local supply chains.
- Develop appropriate technology platforms for information exchange and solutions to tackle interoperability aspects in and among members of the supply chain.
- Encourage collaboration initiatives and, above all, their technological supports (e-purchasing, e-procurement, buying portals and marketplace, etc.), in and among members of the chain.
- Encourage the development and application of collaborative networks/virtual organisations, especially in small and medium enterprises, on an internal level and between agents in the chain.
- Foster an integrated action that promotes a service-oriented vision as technological support to the operation of new business models in and between members of the supply chain.
- Reinforce the incorporation, especially in the small and medium enterprises, of the vision and technologies of business process and performance measurement systems.
- Promote technological advances in packaging and packing and coordination with the warehousing and maintenance, strengthening the strategic consideration in the supply chain field.
- Strengthen the new business models driven by the ICT and Intelligent Transportation Systems technology in the management of transport and mobility of people.



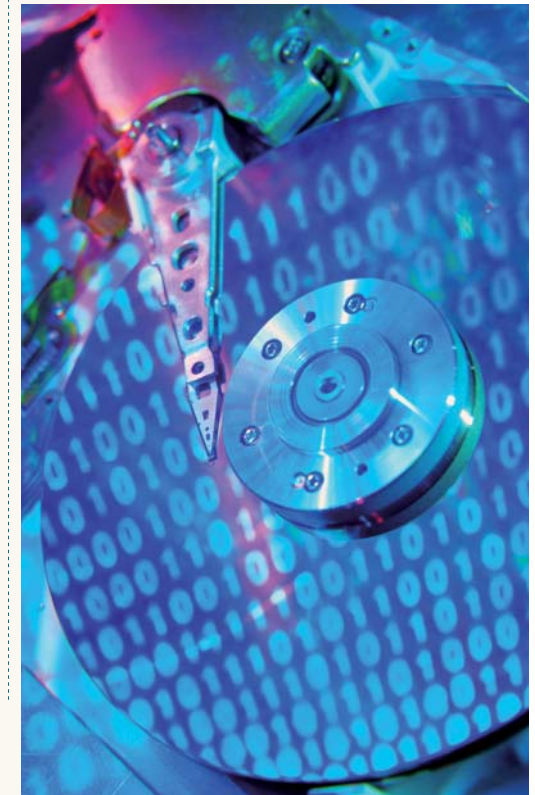
5.7. Scientific Research, Technological Development and Innovation (R&D)

The analysis of the degree of development in R&D, from both the viewpoint of the generation of new basic and applied knowledge and the viewpoint of the development of improvements in existing knowledge and the application of this knowledge in logistics management in Spain clearly shows important **opportunities for improvement**. Basically there are three types knowledge applicable to logistics management: 1) those associated with the management of physical flow and the flow of information, 2) those associated with the technologies that give support to the management of the flow of information and communication in logistics management (*hardware and software*), and 3) those associated with the technologies that give support to the management of physical flows.

Presently, the **development of knowledge** is being based on the concept of Supply Chain Management. In Spain, the business schools and some university foundations and institutions working in this field, carry out a very important task, although they basically work on understanding, adapting and spreading the knowledge developed in other places. The development of our own knowledge is very limited, basically for two reasons: a) because the budget assigned to research is very small

and b) because there is very little critical mass of practical experiences in Spain. On a business level, in some sectors, the level of application of the most advanced knowledge is high; but they are normally sectors in which multinational companies have acted as changing forces, and the application of this knowledge forms part of a more global project on an international level.

Regarding the knowledge associated to the **management of information flows**, on a worldwide level, the knowledge tends to be promoted and developed by supplier companies in the sector. In Spain, there are very few of these companies and they are generally quite small, in comparison with those that exist on an international level, for which the majority of the most recent offerings of management tools are American, Australian, English, German and, more recently, Indian. Although there are excellent technicians in Spain, the Spanish market is too small to stimulate sufficient demand for the creation of very large companies with the resources to develop their own knowledge. The resources required for developing knowledge in the information and





Lastly, regarding the knowledge associated with the **management of physical flows** (automation and robotics, new materials, packing and packaging, etc.) Spain continues to be a country with a very limited market. This field of development of new knowledge is also very costly and led by the private sector. Although there are very competitive Spanish companies, they are few and generally small in comparison to their international competitors. On the level of application of innovations in this field, once again the cost of this type of projects is an important barrier for its implementation, making it inaccessible for the majority of Spanish companies that make up the Spanish business world: the small and medium enterprises.

From the Logistop platform, the following **key actions** are identified in the area of **R&D** and classified into three groups:

- Create awareness of the importance of **R&D in the logistics sector**, promoting the importance of logistics among companies and institutionally supporting the public and private entities that are dedicated to R&D in the logistics field.

- Dedicate more **economic resources** and a more efficient and coordinated use of these resources, specifying strategic priorities for the development of knowledge in the logistics field in our country; strengthening certain complimentary specialised fields in the centres where the knowledge is

developed; using the budgets, if they are public, or the incentives and grants if they are private, after a detailed analysis of the areas with the most deficiencies; and establishing an ambitious program of stimuli for R&D in the private sector in Spain to achieve more investments and to attract R&D centres to Spain from the most important companies on an international level.

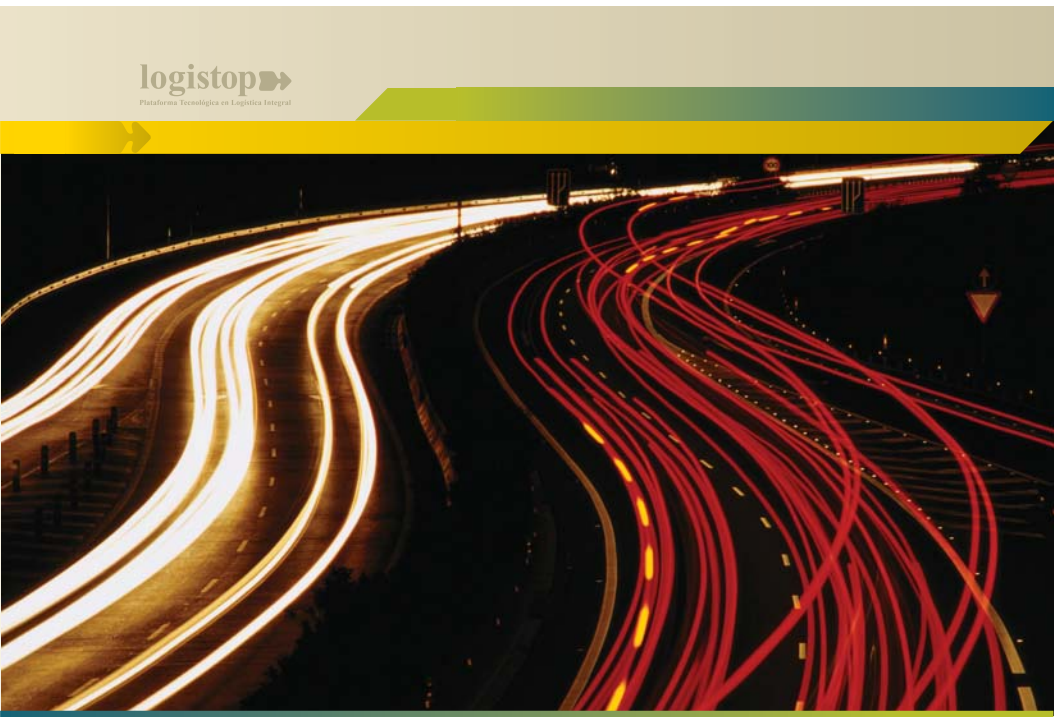
- Encourage the **development of large projects on a national and international level** in the strategic fields among centres for the development of knowledge in Spain, with international centres, between centres and the private sector and among private companies.

communication technology fields are very high; and for this reason, they are only within the reach of very large companies. Although the domestic market is small, supposedly globalisation would have helped to promote large companies in Spain; but this has not been the case, probably because in this field, as in many others, the level of internationalisation of the Spanish companies, although growing, is still low in certain companies and sectors. The high cost of development and implementation of the innovations in this field makes access difficult for many companies and makes the level of real use of this advanced knowledge low and centred in specific sectors and large companies.

5.8. Summary chart of actions by strategic field

STRATEGIC FIELD	KEY ACTIONS
Sustainability and Corporate Responsibility 1	<ul style="list-style-type: none"> • Analyse products from the design stage • Optimise the inverse flow of the materials and all of the associated resources • Create awareness among the population for greater participation in the elimination of waste • Create awareness among the Administrations for the effective implantation of the different regulations that regulate the collection and treatment of waste • Encourage the collaboration between all of the links in the logistics chain • Encourage the use of more environmentally friendly means of transport • Encourage the development of methodologies for product treatment at the end of the life of the product
Development of Safety and Reliability 2	<ul style="list-style-type: none"> • Develop tools and methodologies for the improvement of transaction safety • Perfect and implant systems to prevent the uncontrolled output of products from the chain • Develop tools to guarantee product reliability • Perfect the control devices and the environmental security measures • Develop means of data protection and reliability assurance
Encouragement of Collaboration 3	<ul style="list-style-type: none"> • Create policies for the encouragement of the culture associated with inter-organisational collaboration • Develop methodologies that favour the creation, exchange and management of knowledge • Encourage strategic alliances among agents in the chain • Develop methodologies that favour the exchange of information without affecting the Know-how privacy • Develop methodologies that favour a joint strategic vision • Develop tools that allow for the application of collaborative methodologies in the area of small and medium enterprises
Co-modality/ Intermodality 4	<ul style="list-style-type: none"> • Implement actions for the optimisation of the technological and methodological aspects of the logistics infrastructures • Strengthen the optimum operation of the networks associated to each mode of transport and develop techniques to identify "bottlenecking" • Encourage the connection of long-distance railway systems • Favour the interconnection between modes of transport, and between the infrastructures • Encourage the use of railway transport of goods • Implement actions for the adaptation of the physical/technological aspects of the vehicles

STRATEGIC FIELD	KEY ACTIONS
Training and knowledge 5	<ul style="list-style-type: none"> • Strengthen the business popularisation of the concept • Strengthen the popularisation and knowledge of new strategies and logistics applications • Create a job profile diagram • Design and decide the education map of Vocational Training, University Training, University Masters, Management Training and refresher courses for Professionals • Define and recognise in a labour context, the new professional functions in the field of logistics
Technology 6	<ul style="list-style-type: none"> • Creation of policies for the incorporation of logistics technologies • Encourage the generation of Spanish logistics technologies and the adaptation of foreign technologies • Develop technology platforms for the exchange of information • Encourage collaboration initiatives and their technological supports • Encourage the development and application of collaborative networks / virtual organisations, fundamentally for small and medium enterprises • Foster an integrated action that promotes a service oriented vision, as technological support to the operation of new business modes • Reinforce the incorporation, fundamentally for small and medium enterprises, of the vision and technologies of business processes and performance measurement systems • Promote the technological advances, in packaging and packing, and their coordination with warehousing and maintenance. • Reinforce the new business models driven by the ICT and the Intelligent Transportation System technologies
R&D 7	<ul style="list-style-type: none"> • Create awareness of the importance of R&D in the logistics sector • Dedicate more economic resources and a more efficient and coordinated use of these resources • Encourage the development of large projects on a national and international level in the strategic areas



6. Conclusions

The present industrial landscape and the mid-term and long-term forecasts of the future indicate that integral logistics management should be considered as a **competitive tool**. In order to achieve sustainable development of the activity, action is needed in various strategic fields, both on a private and public level. Spain and its logistics activity are still in a **phase of awareness** concerning the scope of integral logistics management and all of its potential. As the Public Administrations and the private industrial sector become aware of this subject, because of the internal necessities for competitiveness and due to the external imposition of sustainable development, logistics in Spain can be considered an **activity that manages knowledge, innovates and applies technology for its development**. In order to position logistics as a strategic tool, education is needed on operational, business and governmental levels, along with the development of policies that promote innovation and enable the implementation of initiatives in this area.

reduce costs, eliminate inefficiencies, improve productivity, and change the work environment to a collaborative environment, all of which can pave the way for the success of the present and future economic framework. On the other hand, investments in infrastructure and the exploitation of infrastructure should be encouraged, including initiatives that connect the peninsula with Europe. The flow of goods should be increasingly efficient, favouring the reliability of delivery, in a manner that the operations are profitable for the organisations.

In general, in order to reach these objectives, **qualified personnel** with a high level of training is essential, the **collaborative processes** should be promoted and regulated on an official level and supported by the **use of technology**, actions of awareness should be carried out regarding the impact on the environment and **social corporate responsibility** should be encouraged. In addition, on a public and private level, **research, development and innovation initiatives should be encouraged** both in industries and in infrastructures. Co-modality and intermodality in transport, the **safety** of goods, and information exchange in transport should be encouraged and developed. The Integral Logistics Technology Platform would like to designate all these aspects as strategic fields of action for the development of logistics activity in Spain.

Logistics management should be carried out on an internal level within the organisation, on an external level in the relationships between suppliers and the other agents involved, and in the relationship with the final client. In order to consider a business strategy oriented to the client, either being the final user or the next step in the supply chain, **involvement of logistics management** is vital. This vision can increase client satisfaction,

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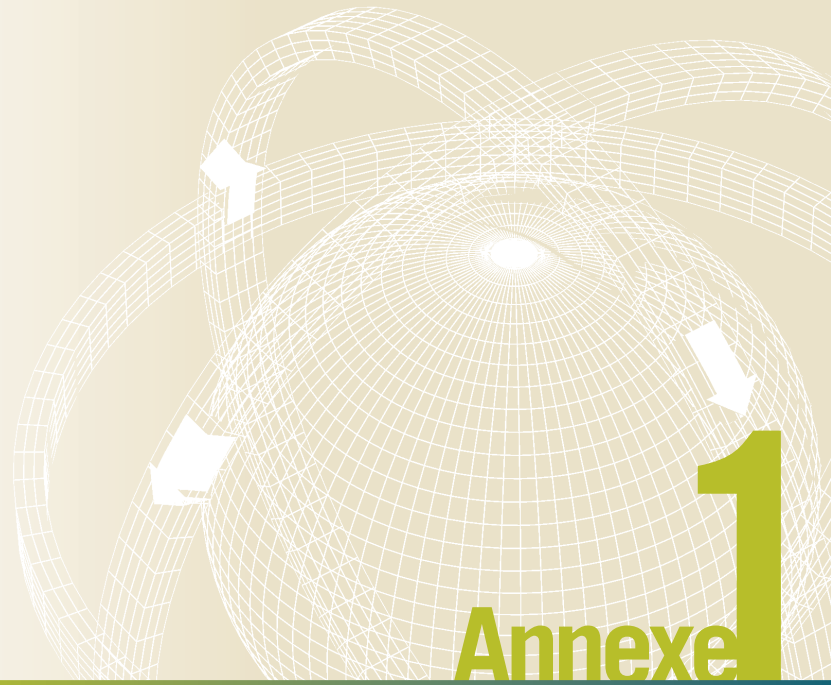
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 Catalan Institute of Logistics (ICIL FOUNDATION)
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 University of Oviedo, Spanish Reverse Logistics Network, Revlog
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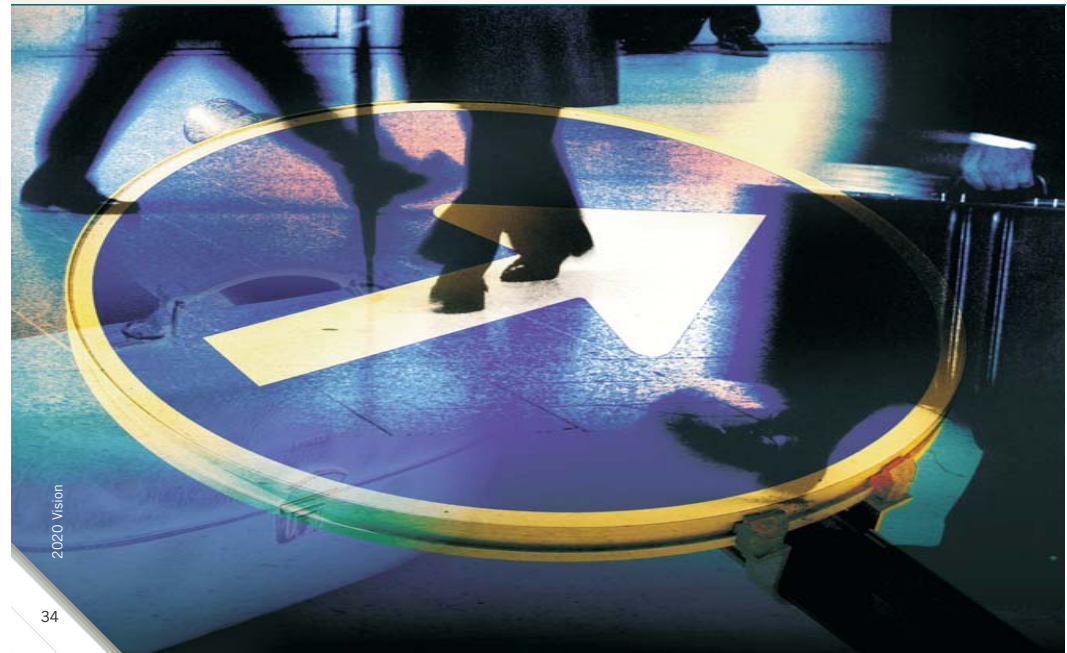
NAME

Francisco Cruz Lario
 Juan Manuel Castanedo
 Jaume Mira
 Luis Miratvilles
 Pablo Zubía
 Adenso Díaz
 María Jesús Sáenz



Annexes 1

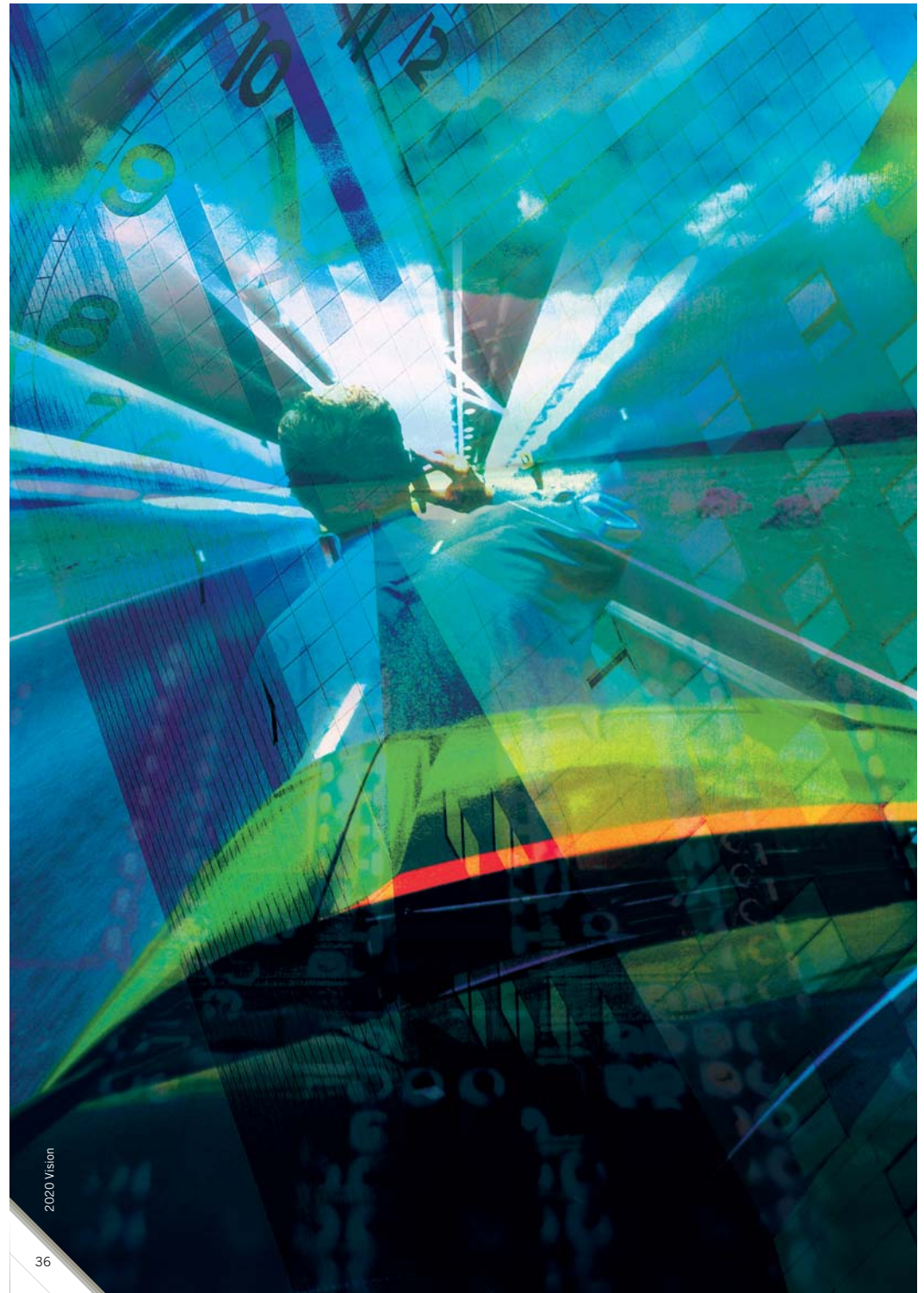
Panel of Experts from the Technical Secretary, Technical Committee and the Governing Committee of the Integral Logistics Technology Platform.



2020 Vision

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C.T.M. de Levante, Ltd. (CBL Logistics Spain, Ltd.)	Jaime Agramunt
Car Volum, Ltd.	Joaquín Antonio Rodrigo
Cartonajes Levante, P.L.C	Angel Sánchez
CEL – Spanish Logistics Centre	Vicente Sánchez
Airport Logistics Centre, P.L.C. (CLASA)	José Jorge del Castillo
CETM – Spanish Confederation of Transport of Goods	Miguel Valeverde
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Ministry of Public Works	Paloma Iribas
Ports of the State	Mariano Navas
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Annexe 2

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Mikel Santiago Epelde	M & L Group
Julen Galarza Badiola	M & L Group
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