
Chapter 17

Foresight application for transport sector

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17.1 Introduction

The unpredictability of the conditions in which organisations operate – resulting from the dynamics and complexity of the environment – is the central issue of strategic management. Uncertainty about the future of enterprises, industries and sectors forces managers to look for new instruments and methods, on the one hand, to determine future states and, on the other hand, to create that future. In the case of a variable and unpredictable environment, a manager can choose one of three paths: (1) adopting a passive attitude – thus losing market position, (2) using past practices, often not adapted to current conditions, (3) shaping their future in a systematic, structured way, while taking advantage of upcoming opportunities in the environment [1]. If one chooses the third path, the application of foresight as a valuable instrument of the ‘creation’ of the future should be considered. The primary objective of foresight is to anticipate and shape the future strategies of organisations, regions or branches. It strengthens the unit’s ability to anticipate emerging opportunities and threats in the environment, to identify dependence paths (networks), and key success factors (drivers).

The experience gained from the utilisation of foresight studies accumulated up to date indicates a huge potential for its further application. Foresight has been used successfully in the process of building coherent and functional images of the future at national and regional levels as well as those of industries and individual organisations. The scope of foresight research includes not only the future of technology and scientific research but also the future of various other dimensions of the socio-economic reality. Transport systems and technological solutions used in the sector have been subjects of interest for numerous foresight studies.

The aim of this chapter is to present good practices and potential benefits of using foresight studies in the process of creating the future of the broadly understood transport sector. To begin with, the authors define the concept of foresight and the characteristics of foresight studies. Next, they point to potential areas of

application, leading to the typology of foresight studies. Finally, they review the existing applications of foresight research in the transport sector. The chapter is concluded with the indication of the four groups of potential benefits of foresight studies at the sectoral level.

17.2 The essence of foresight

In times characterised by high dynamism of the environment, inference about the shaping of phenomena in future is associated with the need to process and interpret information from multiple sources. In the long term, traditional methods of forecasting, owing to their assumptions concerning the maintenance of the status quo of the factors influencing a predicted phenomenon, may be unreliable. Foresight is the method which allows for predicting the future, taking into account the variability of the environment. Foresight is a systematic process, shaping the future of technology, science, economy, environment and society. Its main objectives are to identify the emerging trends, phenomena and technology, and to strengthen the areas of strategic research offering significant potential for economic and social benefits for a dozen, or several dozen, years.

The literature on the subject contains many definitions of foresight. However, this term was used first in 1985 by J.F. Coates, who defined 'foresight' as 'the process by which the forces shaping the long-term future can be understood, and which should be taken into account in policy-making, planning and decision-making'. Table 17.1 shows selected definitions of the term.

According to the authors the accurate definition of this concept is presented in the Polish literature. According to this definition, foresight is understood as 'the process of creating the society's culture of thinking about the future, in which stakeholders, that is scientists, engineers, representatives of the industry and public administration employees are involved in setting the strategic directions for research and technological development' [8].

Taking into account all the above definitions, it can be noted that the significant attributes of foresight include (Figure 17.1):

- *Anticipating*: coming down to predicting social, economic and technological needs, and predicting and designing the directions of their development.
- *Inclusivity*: being the participation of a wide range of diverse participants (i.e. the stakeholders) in the process of formulating a socially agreed vision of the future.
- *Social networking*: focusing on the formation of relationships between stakeholders of the research aimed at supporting the process of collecting and processing of the information coming from the environment.
- *Strategic vision*: being the desired future, based on the rational prerequisites of the present.
- *Activities*: consisting in mobilisation to particular steps towards the desired future.

Table 17.1 The diversity of the definitions of 'foresight' – selected explanations of the term

Foresight is...	
the process by which the forces shaping the future can be understood, relevant to policy, planning and decision-making. Both qualitative and quantitative methods are involved in this process in order to monitor the signals on emerging trends that are the implications for the policy. In the face of the passage of time and changes in conditions implementation of this policy becomes, therefore, more appropriate, flexible and more reliable. Foresight is not planning, but only its element [2]	J.F. Coates
the process, which aims to predict the long-term future of science, technology, economy and society by identifying strategic areas of science and technology to ensure the maximum economic and social benefits [3]	B. Martin
a systematic manner of assessing of the development of science and technology, which can have a big impact on the competitiveness of enterprises, creating wealth in the economic sense, and the quality of life [3]	L. Georghiou
the ability to create and maintain the high quality of coherent vision, and to use it in a manner, which is to provide measurable benefits to organisations by detecting adverse environmental conditions, support of the development of the organisation's policy, and formation of strategy in order to examine new markets, products and services [2]	R.A. Slaughter
a deliberately structured process that combines the expectations of different actors towards technologies in order to formulate the strategy of future, which takes into account the broader economic and social development [4]	A. Webster
a systematic, participatory process of building a medium- and long-term vision, aimed at today's decisions and mobilisation of joint actions [5]	I. Miles
active predicting of the future, and therefore not only identifying the possible future events, but also planning appropriate actions that will allow for making best use of what is going to happen and at the same time minimising the potential risks [6]	M. Dietrich
intense, recurring periods of open reflection, creation of networks, consultation and discussion, leading to a common development of the vision of the future and a sense of partnership built around this vision, in order to use long-term opportunities created by the development of science, technology and innovation. It is discovering a common space of open thinking about the future and incubation of strategic approach [7]	J. Cassingena Harper

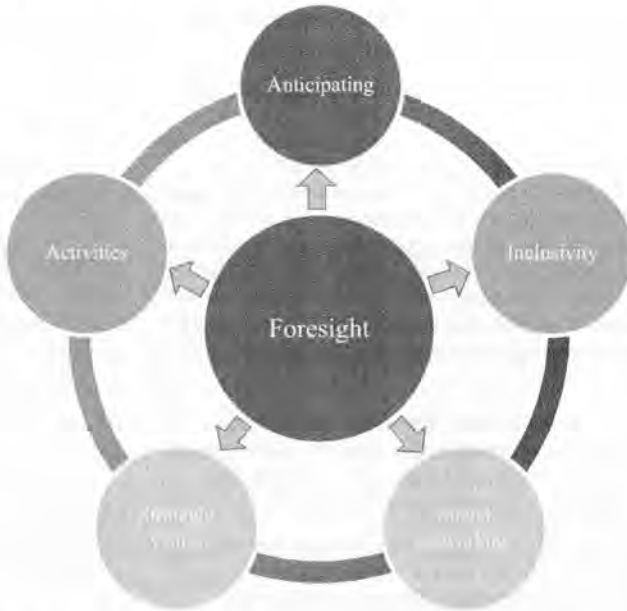


Figure 17.1 Features of foresight
 [Source: own elaboration on the basis of Reference 5.]

Foresight is often wrongly identified with forecasting. However, the aim of foresight is not prediction, but ‘the determination of certain (desirable) visions of development and shaping the future in the social process’ [9]. A forecast is only a single image of reality, the point in the area of uncertainty, and therefore can safely be applied to phenomena that are less sensitive to disturbing events [10]. On the other hand, foresight, through the use of scenarios, allows the study of the behaviour and interaction of trends in a large area of uncertainty. It allows a broader look at the phenomenon and its consideration from a greater distance (usually 5–30 years) than forecasts. In contrast to the forecast, it takes into account the discontinuity of events through the identification of unprecedented events, the so-called wild cards and weak signals [11]. This way it is possible to study the future more comprehensively. Foresight is not a substitute for forecasting or strategic planning [12]. Each of these plays a separate role and often complements the others.

In order to examine the frequency of the use of foresight a database of scientific publications, Web of Science was analysed. The choice of the database was dictated by its availability. Basing on the search of databases using keywords such as *foresight*, in the last ten years, 1,956 articles were identified (Figure 17.2).

The growing interest in foresight studies is also confirmed by the number of uses of the term ‘foresight’ in bibliographic databases of scientific journals (Figure 17.3).

After a thorough analysis of the literature, it can be concluded that foresight is a combination of intuition, research methods, anticipative analysis and examination

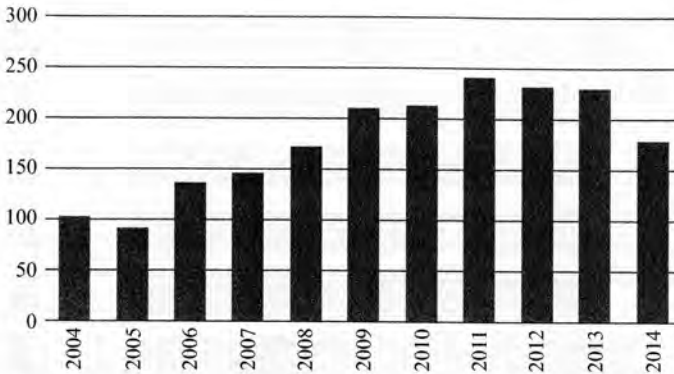


Figure 17.2 Number of publications in the database and Web of Science on foresight
[Source: own elaboration.]

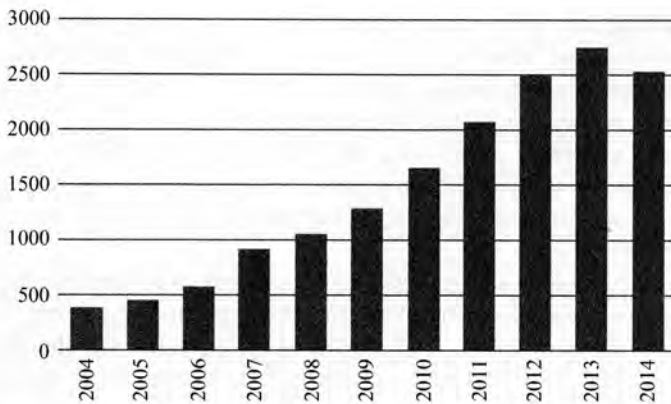


Figure 17.3 The number of uses of the term 'foresight' in the Web of Science in the years 2004–2014
[Source: own elaboration.]

of the development of trends. It should be an ongoing process and is usually carried out in the form of research projects [13]. The aim of implementation of the foresight approach is, among other things:

- Determining the direction of scientific policy – drafting policy guidelines and determining the plan for the use of funds for research and development.
- Determining the priorities aiming at the identification and selection of the most promising options from the entire spectrum of possibilities – provision of rational prerequisites determining the allocation of funds for research, identification of needs for scientific apparatus, or the assessment of future requirements for qualified scientific personnel.

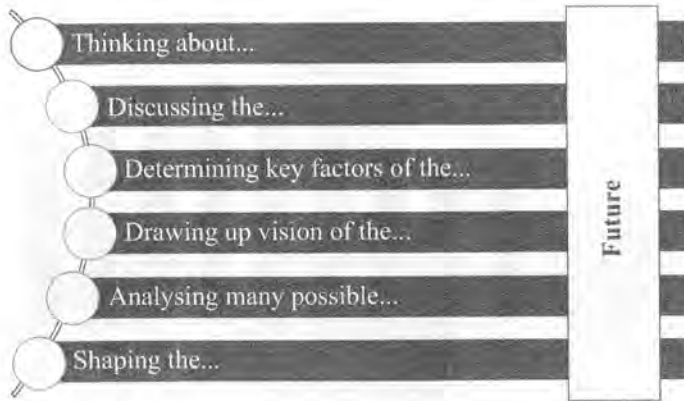


Figure 17.4 The purpose of foresight studies
 [Source: own elaboration.]

- Anticipating trends in science and technology – providing information on the opportunities and risks of future scientific research, and identification of unprecedented events, that is, events of which the probability of occurrence is negligible, while their impact would be very high.
- Consensus building – stimulating the involvement of scientists, various institutions, and end users in order to establish priorities for the R & D sphere.
- Promoting political decisions that are compatible with the preferences of R & D stakeholders.
- Communication of results and education – perception of foresight research as a social process aimed at improving the communication between participants and potential beneficiaries, and educating the potential stakeholders and all those who have influence on the creation of the desired vision of the future of science and technology.

The purpose of foresight studies is primarily (Figure 17.4): (1) thinking about the future (analysis of the situation and development trends); (2) discussing the future (taking into account the views of different environments); (3) determining the key factors (e.g. political, economic, social, cultural, environmental, technical); (4) drawing up visions of the future (scenario building); (5) consulting – analysing many possible ‘futures’; (6) shaping the future (recommendations).

It should be emphasised that foresight research should be carried out in compliance with the triangulation principle: theoretical, of methods, researchers and data sources [13]. Theoretical triangulation is the use of different theories for interpretation of the phenomenon. Methodological triangulation involves using multiple test methods to evaluate the same phenomenon [14]. The triangulation of researchers is based on the use of multiple stakeholders, representing various scientific communities, for the interpretation of the same phenomenon.

Data triangulation is based on the use of data from various sources for the analysed phenomenon [15].

Foresight is a future-oriented study, aimed in particular at informing, among others, policy makers and other opinion-forming environments about the desired direction of long-term growth and change, thus facilitating the formulation of innovation policies and strategies [16]. The foresight projects' results help those involved in agreeing upon scenarios of future development and harmonising the activities of social partners (government, local government, academia and business, small and large companies, sectors of the economy), and provide assistance in establishing the criteria for funding science and technology [17].

Owing to the lack of a commonly accepted equivalent of the word 'foresight' in Polish and in many other languages, the English term is used in the literature. The most accurate possible meaning of the term 'foresight' may be its translation as 'active building of an image of the future'.

17.3 Types of foresight initiatives

Taking into account the primary objective of the foresight studies, which is to create the future in a systemic and participatory manner, the scope of their applications, and thus the typology of research, are very extensive. Despite the fact that in the world the vast majority of foresight projects were and still are initiated and financed by the state [18], foresight is being used increasingly both at organisational and at governmental level. A classification of foresight studies can be made taking into account the institutional, territorial and conceptual dimensions of foresight. The institutional perspective reflects the type of entities interested in developing and implementing the foresight research results (companies, local authorities). The territorial perspective reflects the spatial object (country, region), which is of interest to the foresight research. The conceptual dimension of foresight studies relates to the subject of the research, that is the search for answers to questions about future states of a reality (technology, development of the industry, the transport system, the development of the health system, education, etc.). Table 17.2 presents examples of foresight projects, taking into account their typology.

Many of the identified foresight projects concern the transport sector. The foresight research categories most commonly used in the literature and practice include regional foresight, corporate foresight (strategic or organisational), technological foresight and regional economic foresight (business information foresight).

In 'A Practical Guide to Regional Foresight', developed by FOREN, *regional foresight* is defined as the implementation of anticipation, participation, network structure, vision and actions on a limited territorial scale, where proximity is a determining factor [19]. Regional Foresight is a specific process of creating a vision and undertaking action within a limited territory characterised by a specific concentration of growth factors [20]. The main objectives of foresight activities carried out at the regional level are analysed in two areas: facilitating the

Table 17.2 *Foresight research typology with examples*

Foresight dimension	Criteria	Examples of foresight initiatives
Territorial	Supranational	Creating prospective value chains for renewable road transport energy sources in Nordic countries Sectoral Innovation Foresight: (sector: automotive, food and drink, knowledge-intensive services, aerospace, and wholesale and retail) Transportation & Logistics 2030
	National	Competitiveness Monitor: an Integrated Foresight Platform for the German Leading-edge Cluster in Logistics Future of Super Intelligent Transport Systems for the Netherlands Forecasting of long-term innovation development in Russian economic sectors: results, lessons and policy conclusions (sector: the aircraft industry, commercial shipbuilding)
	Regional	Future Fuel Technology for APEC Regions
	City/metropolis/district	Research, Technology and Innovation Policy in Vienna Technology for Industry Foresight – Kocaeli 2012 An Innovation System for the Manchester City Region Imagine Dublin 2020
Institutional	International organisation	FreightVision UE
	Private sector organisation (strategic, corporation foresight)	Shell energy scenarios to 2050
	Government (central, local)	FreightVision Austria 2050
	Non-government organisation	Foresight on Advanced Technologies in Poland Corporate Foresight in Small and Medium-Sized Enterprises
Conceptual	Technology/sectoral/branch/industry	Démarche Prospective Transport 2050. For a Better French Transport Policy
	R & D	Research and Innovation Futures RIF VERA – Forward Visions on the European Research Area
	Socio-economic development	The Future of Learning: New Ways to Learn New Skills for Future Jobs (A Foresight Study)
	Selected part of reality	Quality and Leadership for Romanian Higher Education (QLHE) Foresighting Food, Rural and Agrifutures in Europe Future Strategies for Ageing Management in the Working World of Salzburg Province
	Business information foresight	Regional business information foresight. Scenarios of the innovation development of the enterprises of Mazovia

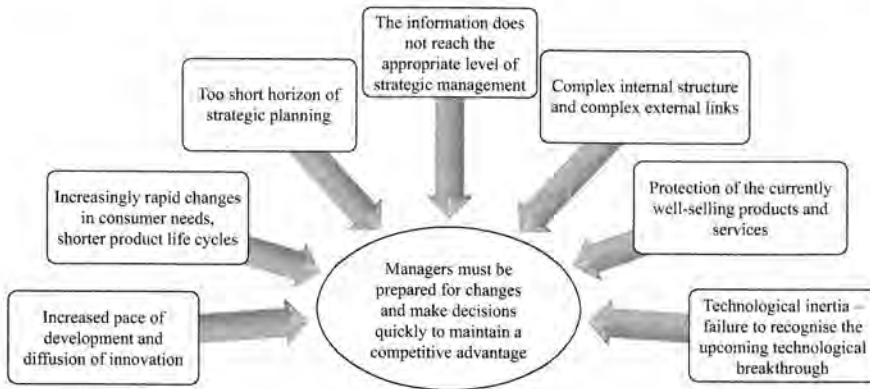


Figure 17.5 Why do companies need foresight?
[Source: Reference 22.]

implementation of the policy of development and the mobilisation of regional stakeholders [13].

Corporate foresight is a systematic, participatory process taking place in an enterprise, which aims to support strategic decisions through anticipation, analysis, and interpretation of long-term directions of social, economic and technological development, as well as actively shape alternative visions and ideas about the future [21].

Branch (Sectoral) foresight is a nationwide initiative (less often regional), analysing and anticipating possible future scenarios and the development of technology in a given sector of the economy, sponsored by the state, and sometimes by research institutions, industry associations and individual companies. An example of industry foresight could be foresight in just the transport sector. The main reason for companies to employ foresight is the fact that managers must be prepared for changes and make decisions quickly to maintain a competitive advantage (Figure 17.5).

Technology foresight is a systematic means of assessing those aspects of scientific and technological development which could have a strong impact on industrial competitiveness, wealth creation and quality of life [23]. Technology foresight involves long-term views of technology-related developments, aimed at informing ongoing decision-making, and using a wide range of formal techniques, an interdisciplinary approach, the involvement of wise pools of experts but also stakeholders, and creating networks that promote a shared view of the developments discussed, along with joint commitment to the approaches or actions emerging from these exercises [24].

Business information foresight is aimed at setting strategic directions and defining areas of economic development, affecting the development of the region. The concept was introduced by J. Nazarko, who pointed out that business information foresight can be identified by determining its informational function as relating mainly to economic information. The determinant of the regional nature of foresight in this case is the spatial dimension referring to the processes occurring or having an impact on the development of a regional system [13].

Regardless of the application field, the foresight research tool is associated with the system of innovation, both at regional and at organisational level. In this context, the objectives of foresight studies mainly concern:

- Future research, in terms of determination of the RDI policy priorities (research-development-innovation policy).
- Reorientation of the innovation strategy.
- Indicating the technological capabilities necessary to implement the innovation strategy which is a source of competitive advantage.
- Stakeholder involvement in the creation of the policy of innovation and the implementation of innovation strategies.
- Building a network of connections within the innovation system (the triad: science-business-government).

The chapter presents the extent to which foresight studies were used in the process of creating the broadly understood transport industry. Authors have indicated good practices in this area, and the main results of the foresight research.

17.4 Examples and good practice of foresight application in the transport sector

Issues of mobility, transport and logistics constitute an attractive research area for various kinds of forward-looking activities. The future of moving people and goods from one place to another may be seen as a variable that is heavily dependent on a wide array of heterogeneous factors. This provides a space for an interdisciplinary future-oriented reflection where various economic, social, technological, environmental, political, legal etc. trends and phenomena are taken into consideration. At the same time, the future of mobility and transport is a variable that strongly influences the development trajectories of human civilisation as a whole. It is not surprising, therefore, that companies, governments and other organisations have been conducting foresight studies in the field of broadly understood mobility.

The aims and scope of foresight initiatives depend mainly on the actors performing (sponsoring) such studies. This general observation also applies to future-oriented studies in the field of transport, logistics and mobility. Companies that maintain any sort of a foresight activity (from simple systems based on indicators and extrapolations, through causality analysis and weak signals identification, to integrated foresight systems that convert future insights into strategic actions at the managerial level) see it as a means of achieving competitive advantage and increasing shareholder value in the long term. Public entities (government agencies, EU bodies), in turn, usually see foresight as an effective policy intelligence tool helping to design regulations, incentives and procurement programmes that will push the mobility sector in the direction of a desirable future. In this context, Figure 17.6 complements the foresight typology presented in Table 17.2 (specifically, foresight's institutional dimension).



Figure 17.6 Aims of foresight as a derivative of a foresight sponsor [Source: authors' own elaboration.]

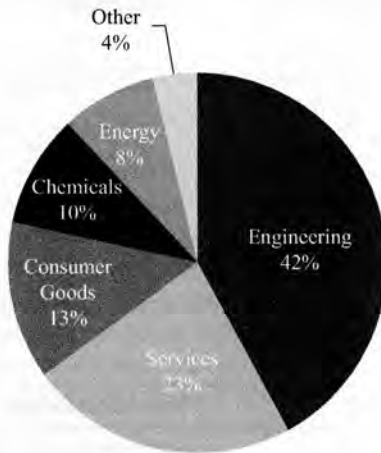


Figure 17.7 Multinational companies participating in the corporate foresight benchmarking study [Source: Reference 29.]

17.4.1 Corporate foresight in mobility, transport and logistics

It is quite understandable that companies do not eagerly disclose all their foresight work, as this may deprive them of the advantage in the highly competitive and fast-changing environment. Thus it is not possible to provide a precise answer to the question about the scope and intensity of foresight application by the companies operating in the mobility, transport, and logistics sectors. General studies of corporate foresight show, however, that the transport industry, transport services and logistics companies are among the leaders in terms of corporate foresight use. A benchmarking report on strategic foresight in multinational corporations includes such companies in the two top categories: 'Engineering' and 'Services' (Figure 17.7). Other studies also feature enterprises related to the notion of mobility [25–28].

Some enterprises, however, share the information about their internal foresight processes, presumably in order to build the image of a modern and innovative company and to benefit from the insights and reviews of their work by external specialists. Volkswagen may be seen as a company speaking openly about their foresight methodology (not so much about the results, however). The company's underlying foresight concept is the reconciliation of the two somewhat opposing (but not mutually exclusive) notions: strategy (implying focus and clear orientation) and innovation (implying openness and diffusion). The process was divided into four stages, presented in Figure 17.8.

In the course of the foresight project implementation some good practices and recommendations were developed. They are presented in Table 17.3.

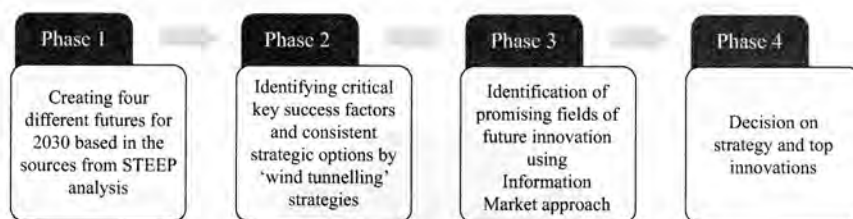


Figure 17.8 *Foresight project phases at Volkswagen*

[Source: Reference 30.]

Table 17.3 *Good practices and recommendations for corporate foresight developed at Volkswagen*

Heading	Principle	Recommendations
Organisational enablers	Futures thinking must be owned and adequately supported.	Supported by top management Allocated sufficient resources and capacity Cross-functional teams Embedded in business units
Process enablers	The process must be pluralistic, engaging and focused.	Clear objectives Sufficiently broad to generate new thinking Accepting of multiple futures Consultative: internally and externally
Implementation enablers	Implementation must be strategic and sufficiently embedded.	Make the process transparent Outputs relevant to corporate strategy Iterative Integrated into planning process Established audience

Source: Reference 30.

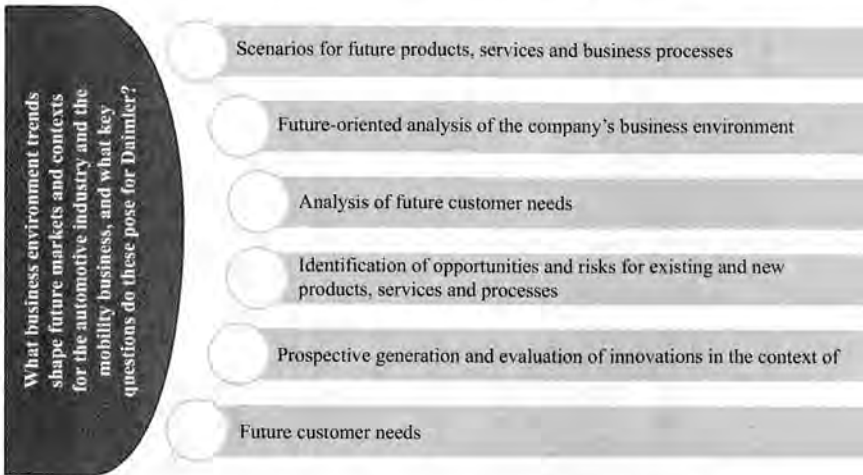


Figure 17.9 Main types of activity at Daimler's Society and Technology Research Group
[Source: Reference 32.]

Another notable example of foresight application in corporate activity is the work of the Daimler Chrysler's Society and Technology Research Group (STRG), which since 1979 has been systematically reflecting on the conceivable long-term trends influencing the automotive market. This makes Daimler one of the earliest founders of a company-based futures research group with a portfolio of more than 300 foresight projects [31]. The STRG underlying philosophy reflects the core foresight approach to the notion of the future, namely that that it is not possible to reliably predict the long-term future. However, it is possible (and necessary) to prepare for an uncertain future by considering possible alternative developments and analysing the forces influencing them. In this light, the STRG quest is to find answers to the question: 'What business environment trends shape future markets and contexts for the automotive industry and the mobility business, and what key questions do these pose for Daimler?' [32]. To accomplish this mission STRG performs five types of activity, presented in Figure 17.9.

The types of activity presented above translate into specific research fields. Examples of such research fields are laid out in Table 17.4.

Similarly to Volkswagen, Daimler's vast experience in corporate foresight has resulted in some lessons learned (collected by F. Ruff) applicable to foresight activities in the mobility sector and beyond (Table 17.5).

These recommendations help face the classic challenge in automobile industry (and, for a matter of fact, not only in that industry), the fact that the companies are forced to take decisions today that will have consequences for the next few decades, owing to the vehicles' life cycles (from design studios to obsolescence) [31].

17.4.2 Sectoral foresight in mobility, transport and logistics

Unlike the corporate sector, where most foresight knowledge is concealed from the general public, government agencies and EU bodies provide a considerable amount

Table 17.4 Foresight research fields at Daimler

Foresight research field	Premise	Examples of research questions	Project example
Mobile societies of the future	Success or failure of the products and strategies of an automotive company depend on their long-term fit with the societal business environments.	<ul style="list-style-type: none"> ● Which societal factors will drive the mobility patterns of the future? ● Which relevance and which forms will the mobility of persons and goods have in the future? ● Where are fundamental changes and escalation risks recognisable? 	Future perspectives of mobility and transport in Asia
Markets and customers of the future	The increasing complexity of markets is driven by changes in target groups and customer needs.	<ul style="list-style-type: none"> ● Where and how will the future (private) customer live? ● Who will transport which goods how and where (commercial customer)? ● Which requirements will customer groups in changing business environments have? 	Needs of new customers regarding a new product segment
Enterprises and value creation of the future	Corporate value creation and business models are subject to continuous change, which is strongly driven by changes in the external business environment of companies.	<ul style="list-style-type: none"> ● Which market developments in other branches could have an impact on the automotive industry? ● Which technologies affecting future developments are relevant for future value creation? ● How can the collaboration in innovation management be improved? 	Informed Employee Workspaces

Source: Reference 32.

Table 17.5 Good practices and recommendations for corporate foresight developed at Daimler

Heading	Principle	Recommendations
Business model	Corporate foresight embedded in and closely connected to core processes of the company	<ul style="list-style-type: none"> • Distinguishable impact on corporate decisions has to be evident and appreciated by top management. • Foresight agenda and the transfer of results have to be closely connected with core processes of the company. • Funding model which mixes elements of (indirect) corporate research funding with contract-based (direct) assignments by internal customers results in a healthy balance of 'thinking forward' and 'being relevant'.
Diversified customer portfolio	Direct, strongly interactive relationship with a diversified portfolio of internal customers	<ul style="list-style-type: none"> • Keeping in mind that the demand for foresight is neither continuous nor always growing. • Proceeding to unravel new relevant topics and accessing new customers with these topics. • Corporate foresight has to anticipate the life cycle of relevant topics at the boundaries of the company.
Corporate foresight and science	Corporate foresight practitioners have to keep close connections to the scientific communities	<ul style="list-style-type: none"> • Foresight in a company is not about doing science and basic research but about creating and brokering specific knowledge types (content) and by designing and conducting structured interaction about business and corporate issues (process).
Methods	Corporate foresight has to invest strongly in the development and validation of methods	<ul style="list-style-type: none"> • Methodological pluralism and activity is essential but an end in itself. • Corporate customers generally do not want methods but solutions.
Make or buy corporate foresight	Reasonable choice between own corporate foresight unit and external foresight consulting	<ul style="list-style-type: none"> • For small and medium-sized companies, that have a limited number of external risks and a limited need to capture long-term uncertainty, project-based and externally assigned foresight is usually a reasonable option. • Large and multinational companies with an internal foresight unit can leverage a competitive edge over external services (generation of exclusive knowledge inaccessible to competition, deeper understanding of company's business logic, no 'start-up' costs at every foresight initiative).

of information on foresight projects they have conducted and sponsored. As shown in Table 17.6, specialised sectoral foresight research focused on mobility, transport and logistics has been conducted for at least a decade (this applies to the specific understanding of foresight presented at the beginning of this chapter; one may be certain that a general future-oriented reflection on mobility and transport – not necessarily called explicitly foresight – has a much longer history).

An interesting recent example of a study exploring the future of logistics is ‘Delivering Tomorrow Logistics 2050 – A Scenario Study’. It was conducted by a specialised German consulting company and commissioned by Deutsche Post AG. Five alternative scenarios of the global logistics environment were developed as a result of the project. They are presented in a synthetic form in Table 17.7.

Satisfying the more inquisitive reader, the applied scenario building methodology was diligently described in the report. It was based on the environmental scanning and key factor analysis. The factors influencing the studied subject (i.e. logistics in 2050) were identified, systematised and classified. Eventually, 27 factors (out of 60) were distilled. They were further evaluated by the experts from the point of view of their impact and uncertainty. As a result, 14 key factors that formed the backbones of the five scenarios were determined. Next, the factors were set in a morphological box to project different possible states of each factor in order to create qualitatively different scenario narratives. Additionally, this allowed the validation and enrichment of the scenarios as carried out. Finally, the crucial stage of identifying the implications for the logistics industry was conducted.

17.5 Benefits from using foresight approach

The use of foresight studies in the long term may be the source of many benefits for the transport organisation. The experience of the authors concerning the implementation of foresight studies allows the identification of four basic groups of benefits, which include:

- early warning system
- foresight as a tool of innovation creation
- creation of the current and future image of the organisation
- engagement and participation tool (Figure 17.10)

Foresight as an early warning system allows organisations to:

- prepare for unexpected changes in the environment, both positive and negative
- prepare for the use of future market opportunities
- track changes in the society: consumers and competitors
- overcome current problems by proposing unconventional organisational, economic, business, and technological solutions in the long term, developed as a result of social consensus
- minimise the negative effects of the variability and unpredictability of the environment

Table 17.6 Sectoral foresight and technological foresight exercises related to mobility, transport and logistics

Project	Authors/leading institutions	Years
Foresight for Transport: A Foresight Exercise to Help Forward Thinking in Transport and Sectoral Integration	ADELPHI Research, University of Cardiff, NESTEAR, ALAMO Online	2004
FreightVision – Freight Transport Foresight 2050	AustriaTech	2008–2012
FreightVision Austria 2050	Federal Ministry of Transport, Innovation and Technology of Austria	2012
Towards a Sustainable Transport System – Supporting Economic Growth in a Low Carbon World	Secretary of State for Transport, United Kingdom	2007
Analysis of factors influencing the development of transport infrastructure until the year 2030 – A Delphi-based scenario study	S.W. Schuckmann <i>et al.</i> , ‘Technological Forecasting & Social Change’, 2012, No. 79, pp. 1373–87	2012
Scenarios of technology development in road construction materials	General Directorate for National Roads and Motorways, Warsaw, Poland	2011–2013
Innovation for our future mobility	European Commission	
Foresight for transport	The Interdisciplinary Centre for Comparative Research in the Social Sciences – ICCR, ADELPHI Research, University of Cardiff, NESTEAR, Grupo ALAMO	2002–2004
Security of Road Transport Networks		2009–2012
STAR-TRANS ‘Strategic Risk Assessment and Contingency Planning in Interconnected Transportation Networks’	Project coordinator: INTRASOFT International SA	2009–2012
‘Delivering Tomorrow’ Logistics 2050 – A Scenario Study	Z-punkt GmbH	2012
Europe INNOVA (transport)	European Commission	

(Continues)

Table 17.6 (Continued)

Project	Authors/leading institutions	Years
Competitiveness Monitor: an integrated Foresight Platform for the German Leading-edge Cluster in Logistics	European Foresight Platform	
Future of Super Intelligent Transport Systems	European Foresight Platform	2011
Transportation & Logistics 2030	European Foresight Platform	2010
Démarche Prospective Transport 2050 – For a Better French Transport Policy	European Foresight Monitoring Network	2007
AGORA 2020 – Transport, Housing, Urbanism and Risk	European Foresight Monitoring Network	2005
Transport and Mobility in an Enlarged Europe – 2020	European Foresight Monitoring Network	2004
Foresight Vehicle Technology Roadmap 2020. Technology and Research Directions for Future Road Vehicles	European Foresight Monitoring Network	2004

Source: Own elaboration.

Table 17.7 Five alternative scenarios of the global logistics environment developed in the framework of the 'Delivering Tomorrow' project

Scenario name	Core idea	Key factors
Scenario 1: untamed economy – impending collapse	When the world is driven by materialism and faces frequent natural disasters.	Materialism, resource exploitation, rising incomes, pollution, climate change, free trade, Arctic mining, Asia, natural disasters, urban congestion, unsustainable growth, consumption.
Scenario 2: mega-efficiency in megacities	When megacities become epicentres of green growth.	Urbanisation, megacities, automation, sustainability, wealth, green growth, collaboration, virtual reality, interconnectedness, efficiency, city logistics, global hubs, urban-rural divide, robotics, technology, rent-and-use, supergrid.
Scenario 3: customised lifestyles	When individualisation becomes pervasive and 3D printing dominates manufacturing and households.	3D printing, FabShops, dematerialisation, global hubs, affluence, creativity, consumption, regional trade, progress, unique lifestyles, decentralisation, presumption, Internet security, customisation, individualisation, digital piracy, home fabbing.
Scenario 4: paralysing protectionism	When globalisation is reversed and protectionist barriers are raised.	Resource scarcity, contraction, nationalism, productivity decline, ageing societies, customs delays, international conflict, regional blocs, fragmentation, stagnation, security, protectionism, nationalised logistics.
Scenario 5: global resilience – local adaptation	When frequent catastrophes lead to a paradigm shift away from efficiency maximisation to vulnerability mitigation and resilience.	Vulnerability, climate change, supply disruption, regional trade, international collaboration, energy security, backup infrastructure, resilience, decentralised solutions, redundant system, supply security, disaster response, flexible technology, disasters, energy logistics, automation.

Source: Reference 33.



Figure 17.10 Foresight – key benefits for organisations
 [Source: authors' own elaboration.]

Foresight as a tool for creating innovation allows organisations to:

- redefine and create the future-portfolio of a company
- identify future niches
- identify the changing needs of consumers
- interact with key players in the business and business-related processes, such as customers, suppliers, legislators – creating new technologies, products and services
- provide strategic information to decision-makers by identifying the prioritised directions for the development of technologies, products and services
- concentrate the funds on key future areas

Foresight as an instrument creating the current and future image of the organisation allows:

- internal and external stakeholders to identify with the organisation
- explore the unique features of the organisations distinguishing it from others

Foresight also means involvement and participation, expressed through:

- the participation of all stakeholders in the process of building a shared vision of the future
- stakeholder involvement in the creation of the future
- a sense of responsibility for the present and the future of the organisation

17.6 Summary

The rapid development of technology and increasing consumer demand, with the simultaneous pressure to adapt operations to the principles of sustainable development, present new challenges for transportation systems. Questions about the future are still valid: traveller information, traffic management, vehicles, public transport, emergency, electronic payment and safety issues.

The answers to questions about the future of transport systems can be sought on international, national, regional and local levels. Foresight is the tool enabling the creation of the desired vision of the future with the intrinsic involvement of all stakeholders. So far, the practical application of the foresight studies in the transport sector has confirmed its applicability and effectiveness.

The results of foresight projects can contribute to the strengthening of research and development, as well as to the growth of the innovation and competitiveness of the entire transport sector. The participatory nature of foresight research allows for mutual co-operation and the diffusion of knowledge in the process of solving problems and shaping the future. This type of co-operation attracts the interest of entrepreneurs, representatives of science, and the wider public. Foresight studies may also attract the interest of the representatives of international organisations (e.g. International Road Transport Union, International Union of Railways, SMDG), ministries at the national level responsible for the development of transport, transport associations (e.g. Freight Transport Association, International Air Transport Association), companies in the transport sector, academic institutions dealing with the issues related to the development of transportation systems (e.g. Transport Research & Innovation Portal – TRIP).

The methodology of foresight research, based on the use of both quantitative and qualitative methods, fosters social consensus while ensuring the implementation of the most innovative solutions consistent with the principles of sustainable development.

Abbreviations

STEEP	(foresight term) Social, Technological, Economical, Environmental and Political
STRG	Society and Technology Research Group (Daimler Chrysler)
TRIP	Transport Research & Innovation Portal

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