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Institutional and Organisational Change in the German Rail Transport Sector

Working Paper 3 of the study Low-Carb-RFC - European Rail Freight Corridors going Carbon Neutral

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Abstract

The paper asks how the modal shift from road to rail in the freight sector is supported by institutional change. Following North (1990), institutions are understood as the 'rules of the game' in the rail freight sector. Based on the literature on institutional change, four different perspectives and mechanisms can be discerned: institutional design, collective action, institutional adaptation, and institutional diffusion. Each of these perspectives examines the situation in the German rail freight sector from a different angle. Based on this analysis, processes of institutional change and their potential impact on modal shift are discussed. Following the railway reform, new domestic and foreign competitors of DB Cargo have entered the rail freight market with business models tailored to promising segments. At the same time, this competition has triggered a transformative organisational change initiative at DB Cargo, which is currently in the process of implementation. Even though the success of this initiatives is highly uncertain, in total, the described changes are likely to result in a higher competitiveness of the sector and a stronger orientation to customer needs. Furthermore, the road freight sector has increasingly come under political pressure due to its rising GHG emissions and rail transport is increasingly seen as a viable alternative. In this respect, the recently published Master Plan for Rail Transport acts on many requirements of the railway sector and foresees a reduction of financial burdens, capacity extensions, and technological innovation. Overall, however, the analysis suggests that the current rate of institutional change may not be sufficient to cause the far-reaching changes necessary for a large scale transformation of the modal split of freight transport.

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1 Introduction

1.1 Context: The LowCarb-RFC project

This publication is one of three summary reports of work performed within the study “Low Carbon Rail Freight Corridors for Europe” (LowCarb-RFC). The Study is co-funded by Mercator-Foundation and the European Climate Fund over a three-year period from September 2015 to November 2018 and is carried out by the Fraunhofer-Institutes for Systems and Innovation Research (ISI, Karlsruhe) and for Logistics and Material Flows (IML, Dortmund), INFRAS (Zurich), TPR at the University of Antwerp and M-FIVE GmbH (Karlsruhe).

The LowCarb-RFC study concentrates on long-distance freight transport along major European corridors as this sector is among the most steadily growing sources of greenhouse gas emissions in Europe, and which is most difficult to address by renewable energies and other standard climate mitigation measures in transport. Starting from the classical suite of approaches avoid, shift and improve the LowCarb-RFC methodology concentrates on mode shift to rail and mitigation measures in all freight modes along the two major transport corridors crossing Gemany: Rhine Alpine (RALP) from the Benelux countries to Northern Italy and North-Sea-Baltic (NSB) from Benelux via Poland to the Baltic States. Besides major European strategies the project concentrates on the implications for transport policy at the intersection of these two corridors, which is the German Federal State of North-Rhine Westphalia (NRW). The project focuses on rail as a readily available alternative to carry large quantities of goods along busy routes by electric power, and thus potentially in a carbon neutral way. Within this setting, the project pursues three streams of investigation:

- **Stream 1: Railway Reforms**. This thematic area responds to the idea of rail freight as a strong pillar of climate mitigation policy. It considers the slow pace of climate mitigation in the freight transport sector and asks the question how regulatory frameworks, company change management processes or new business models can accelerate them.
- **Stream 2: European Scenarios and Impacts**. For rail, road and waterway transport along the two corridors, cost and quality scenarios are established and their impact on modal split, investment needs and sustainability modelled. This stream is the analytical core of the study and shall provide the basis for the subsequent analysis of pathways of interventions.

- **Stream 3: Case Study NRW**. This step eventually breaks down the transport scenarios and intervention pathways to the local conditions in NRW and looks at the implications for investments or de-investments in certain infrastructures, jobs, economic prosperity and the environment.

1.2 Purpose of this working paper

This working paper contributes to Stream 1 of the LowCarb-RFC project by looking into development patterns of large organisations. By doing so it approaches the question how the modal shift from road to rail in the freight sector is supported by institutional change.

The sharp increase of road freight in Germany is one of the most important reasons for the rising greenhouse gas (GHG) emissions from the transport sector and poses a threat to the country's ambition to meet its objectives for climate mitigation (UBA, 2017). The most important drivers for this growth in freight volumes are the increasing international division of labor associated with globalization and the trend towards industrial specialization (BMVBS, 2012). As these drivers continue to take effect on the German economy, freight volumes are expected to rise by 17% from 2010 to 2030 (Schubert, 2014). Because the climate impact of rail transport would be much lower than that of road haulage, the government has long been committed to increasing the railway's share of the transport market. However, success has been limited so far and the railway's share of the transport market was only 17.5% in 2016 and, indeed, this figure has remained relatively stable in the range between approximately 16% and 18% already since 2003 (destatis, 2017).

In view of the fact that today's transport market is dominated by road transport, which has a market share of 71.5% (destatis, 2017), and considering the challenges associated with shifting transport volumes from road to rail, this paper asks how the envisaged modal shift is promoted or inhibited by the relevant institutional framework. Road transport dominates much of the long distance freight transport market in Germany; whereas railway companies have concentrated on a few market segments - bulk trainload and international intermodal, especially from the North Sea ports, with long distance flows, where economies of scale of trainload rail operations are particularly important. However, while the intermodal markets in particular are growing, a major modal shift from road to rail would require the winning of new business on a much larger scale and a major, radical change of railway business. A technological leap will be necessary, to double

freight capacity in e.g. the Rhine corridor through North Rhine-Westphalia. Moreover, if next generation train control systems are deployed, this could deliver further capacity increases. However, equally important is the ability of rail freight to take advantage of such capacity increases by capturing new business on a large scale.

The basic approach of this paper is to analyse how institutional and organisational changes taking place in the last 25 years have influenced the railway sector's intermodal competitiveness in a positive or negative direction and what processes of institutional change might support the achievement of a large scale shift of (long distance) freight transport from road to rail. Similar to the situation in many other countries, a state-owned company, the Deutsche Bahn (DB), has uniquely shaped the German railway sector since its beginnings. Thus, at the micro level, the institutional analysis needs to consider processes of organisational change directed at enhanced efficiency, customer orientation, and competitiveness at the DB and its rail freight subdivision DB Cargo. At the macro level, the institutional analysis focuses on the railway sector as a whole, which has started to develop subsequently to market liberalisation in 1994, which has brought about market entries of domestic and foreign railway companies.

This paper is part of the research project *Low Carbon Rail Freight Corridors for Europe* (LowCarb-RFC) carried out between 2015 and 2018 on behalf of the Mercator Foundation. This project explores different ways to diminish the climate impact of major European freight corridors through technical, organisational, and political measures. Besides looking at innovations in road transport, the LowCarb-RFC project focuses on the role of railways as they, if solely operated on renewable electricity, can be run carbon neutral by 2050 according to current policy plans. The project is concerned with the question why actions aimed at modal shift have not been successful so far and identifies possible avenues to fuel the revitalisation of rail freight markets, such as political initiatives, organisational and institutional change, and new business models.

Departing from the research focus of the LowCarb-RFC project, other European countries were excluded from the considerations in this paper, because most of the institutions, which are relevant for the railway sector have a national character and, therefore the analysis of institutional change requires a country-specific focus.

The paper is structured as follows: Section 2 provides information on current challenges of Germany's rail transport sector. Section 3 draws on the literature on

industrial and institutional change, which is applied to the situation of the German rail transport sector in section 4. Section 5 concludes and discusses results.

2 Current Challenges of the Rail Transport Sector and the Need for Institutional Change

Fundamental changes will be required to foster the railway's intermodal competitiveness. Currently, the sector targets several objectives to enhance its competitiveness, e. g. halving of life cycle costs, doubling capacity, as well as increasing reliability and punctuality. Measures to achieve these objectives include lightweight construction of trains, longer trains, high-speed trains, on-board and interconnected control systems and real time customer information. Given the slow pace of innovation uptake in most European railways and the reluctance of forwarders to use rail due to the sector's complexity and inflexibility, it is assumed here, that in order to substantially strengthen the railway sector, measures need to go beyond mere technological improvements and might include among others (Doll et al. 2017):

- Introduction of new business models to enter new markets and to become more responsive to customer needs;
- Intensified use of digital business models;
- Cooperation with the road and the shipping sector to make best use of available capacity;
- Introduction of new forms of transportation to more effectively serve specific markets and regions,
- Changes of organisational structures and processes;
- Regulation directed to innovation and enhanced flexibility of the railway sector.

Doll et al. (2017) have pointed out some of the difficulties arising in the process of restructuring the railway sector. These include the technological and organisational fragmentation of railway companies; long life span and high fixed costs of railway technology; difficulties associated with the introduction of new technologies and regulations; resistance of trade unions to organisational change; and low market pressure due to subsidies and state protection. Technological change can sometimes be implemented rapidly, e. g. in the adoption of diesel locomotives to replace steam in the US 1945-1955 and the UK 1955-65, such a switch could also happen in the field of train control. The adoption of moving block operation

could deliver cost reductions and performance improvements, but requires large scale infrastructure investment.

3 Theoretical Background on Institutional and Industrial Change

Empirical analysis of large scale industrial change has shown that radical technological change and organisational change co-evolve with each other (Freeman and Soete, 1997; Freeman and Louçã, 2001). The combination of radical technological change and a major market challenge suggest that a large scale transformation of rail freight is needed. This then suggests that an appropriate analytical framework for such radical innovation is the Multi-Level Perspective on transitions (MLP), introduced in Grin et al. (2010) and Köhler et al. (2018). Socio-technical systems (e.g. transport) comprise interlocking economic, social, cultural, infrastructural and regulative subsystems. The dominant firms in an industry are usually resistant to such change. A dominant system has a set of cognitive, normative and regulative institutions which legitimise it and are necessary for its successful operation, called a regime (Rotmans et al., 2001). Regimes typically focus on limited system optimisation rather than radical innovation. Past investment and expertise in the current technology and institutions lock in patterns of organisation and business methods. Niche technologies and actors are often the setting for radical innovation. The regime come under pressure from the niche level, or from changes at the broader landscape level of economic, ecological and cultural trends, or from internal misalignment amongst regime actors. If the regime responds to the changes by changing some of its practices and institutions, possibly replacing some actors, it may successfully adapt to the new circumstances. If a regime is unable to adapt, it collapses or is overthrown, and is (eventually) replaced by a new regime better suited to the new conditions, a transition to a new regime. Köhler (2012) suggests that a planned change, such as the political decision to move freight transport to lower carbon forms of transportation will require a large scale pressure for change. Such pressure can come from the landscape level.

In light of this paper's objectives, the MLP is linked to the literature on institutional change in order to provide a fine-grained perspective on how the forces of institutional change affect different actors on the landscape, regime, and niche level

and ultimately lead to changes of the overall system. Such changes can materialise in terms of technology adoption, but equally important are changes in, for example, organisational structures, business models or legislation.

First of all, it is important to provide a definition of the terms institution and institutional change. Moreover, the relationship between the terms institution and organisation needs clarification. One of the most frequently cited definitions of the term institution is the one proposed by North (1990, 3), who states that institutions are "the rules of the game in a society, or more formally, … the humanly devised constraints that shape human interaction." Scott (2009) identifies cultural-cognitive, normative, and regulative elements that make up or support institutions. Regulative elements of institutions encompass aspects such as rule-making, monitoring, and sanctioning; whereas normative elements are based on shared values and norms which can constrain but also legitimate social behaviour. The cultural-cognitive element of institutions can effectuate compliance in even more subtle ways "because other types of behaviour are inconceivable; routines are followed because they are taken for granted (Scott, 2009, 58)." Apparently, institutions are a diverse and pervasive phenomenon, which can range from simple to complex institutional arrangements (Van de Ven/Hargrave, 2004).

According to Scott (2009), three different views about the nature of this relationship between the terms institution and organization can be distinguished in the current literature. The first view is developed by North (1990) and, by using a game analogy, states that organisations can be conceived as the players in a game; whereas institutions are the game's formal and informal rules. A contrasting view is put forward by a group of organisational sociologists and stresses the cultural-normative element of institutions (e.g. DiMaggio and Powell, 1983). Their view on the nature of the relationship between institutions and organisation is that organisations and their institutional environment are so closely interrelated that the distinction can largely be ignored. From this perspective, the operations of organisations are not specifically designed to achieve efficient outcomes, but rather assembled from available cultural practices. The third view is proposed by institutional economists and takes an intermediate position that regards organizations as institutions or modes of governance of production and exchange processes (e.g. Williamson, 1975). In contrast to the second view, organisations are considered to have unique features and to be consciously designed.

Given the focus of this paper, the second view seems to be most appropriate because rail transport fulfils a unique and important purpose for society. Thus, at least some of the relevant institutions governing this sector have been specifically

designed and cannot be taken “off the shelf” of available social and cultural practices. On the other hand, the clear cut distinction between organizations on the one hand and institutions on the other, as proposed by North (1990), would ignore the fact that organisations in the rail transport sector have a strong influence on the design of the institutions governing their activities. Consequently, the perspective taken here is that organisations in this sector can be conceived as unique types of institutions that are shaped by their institutional environment, but are likewise able to influence their institutional environment in their favour.

The institutional environment encompasses “the norms, customs, and laws that regulate and provide security of expectation to the actions of individuals and organizations” (Van de Ven/Hargrave, 2004, 264).” North states that the institutional framework must be stable, if complex exchange is to occur, and he argues that stability is normally obtained because the rules of the game – routines, customs, laws – are complex and interdependent (Van de Ven/Hargrave, 2004, 265).

Institutional theory refers to actor groups, which constitute a recognized area of institutional life, as organisational fields. Organizational fields consist for example of producers, suppliers, customers, and regulatory agencies that are involved in the production of similar products or services (DiMaggio/Powell, 1983). According to Scott (1994, p. 71), “fields identify communities of organizations that participate in the same meaning system, are defined by similar symbolic processes, and are subject to common regulatory processes.” In our case, we consider the following actors and actor groups as being part of the relevant organisational field:

- Railway companies, consisting of infrastructure undertakings and railway companies;
- Railway industry, consisting of OEMs and several levels (tiers) of suppliers;
- Regulatory bodies, consisting of national and transnational agencies;
- Transport policy makers, consisting of supranational, national and local entities;
- Transport users, consisting of forwarding and logistics companies and their national or international associations;
- Actors with interests related to rail freight transport, i.e. citizens organisations, NGOs, etc.

Institutional change can be defined as “the difference in form, quality, or state over time in an institution (Van de Ven/Hargrave, 2004, 261).” One important issue frequently raised by scholars interested in institutional change pertains to the

distinction between continuous and evolutionary or discontinuous and revolutionary change (van de Ven/Hargrave, 2004). Although the organisational environmental encompasses a broader set of influences than the institutional environment, we will draw on the literature on environmental change in order to highlight different attributes of change processes. Suarez and Oliva (2005) propose the following dimensions of environmental change:

- Frequency: The number of environmental disturbances per unit of time;
- Amplitude: The magnitude of the deviation from initial conditions caused by a disturbance;
- Speed: Rate of change of the disturbance;
- Scope: The number of environmental dimensions affected by simultaneous disturbances.

These dimensions are presented in figure Figure 1, which characterises five different types of environmental change.

Figure 1: Attributes of change and typology

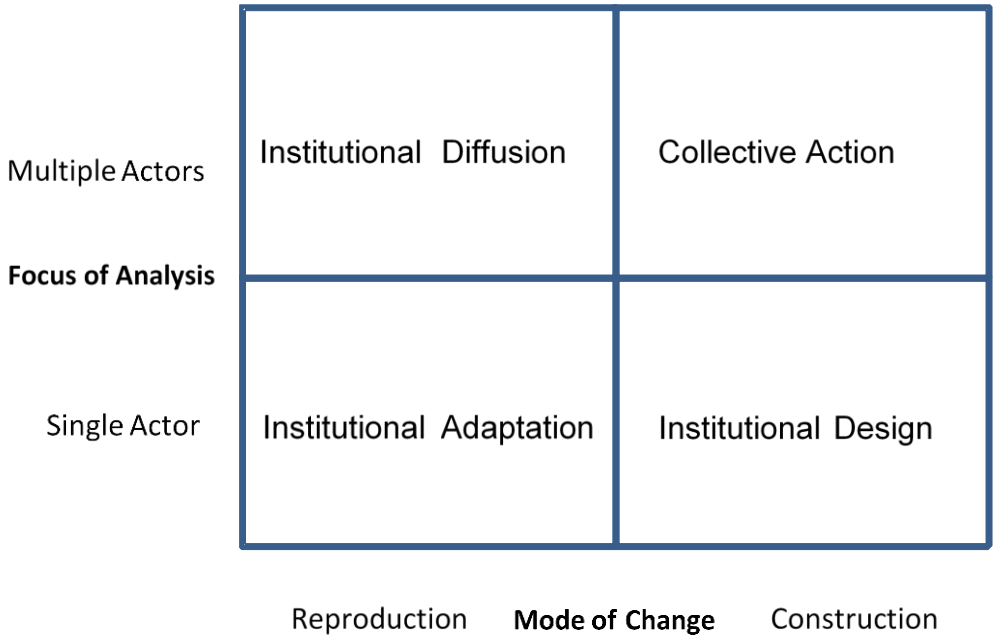
Frequency	**Amplitude**	**Speed**	**Scope**	**Type of environmental change**
Low	Low	Low	Low	Regular
High	Low	High	Low	Hyperturbulence
Low	High	High	Low	Specific Shock
Low	High	Low	Low	Disruptive
Low	High	High	High	Avalanche

Source: Suarez, F.F./Oliva, R., 2005

With regard to the current situation of the railway sector and the difficulties associated with achieving a modal shift as describe above, the aspired changes of the institutional framework should show a high amplitude, high speed, and high scope (Avalanche type). The frequency of changes can be low, if amplitude, speed and scope of institutional change are sufficiently high, but should increase if not so. Scope is a very relevant aspect here due to the fact, that an increasing demand for rail transport can also be induced by disincentives for road transport.

Van de Ven and Hargrave (2004) have conducted a literature review of theories of institutional change, which revealed four distinct perspectives. Before these different perspectives are discussed in more detail, Figure 2 provides a systematic overview based on the following two-dimensional framework.

Figure 2: Perspectives on institutional change



Source: Van de Ven/Hargrave (2004)

The dimension *mode of change* on the horizontal axis refers to the causal relationship between actors and institutional change. The two perspectives on the right, collective action and institutional design, share the perception that institutional actors are actively engaged in the change of institutional arrangements and able to construct new institutional realities. The two theories on the left, institutional diffusion and institutional adaptation, in contrast, have in common that institutional actors are regarded as being constrained in their ability to bring about institutional change and only able to reproduce existing institutional arrangements. Due to these constraints, these perspectives focus on the question how institutional arrangements can change the structure and behaviour of actors (Van de Ven/Hargrave, 2004).

On the vertical axis, the dimension *focus of analysis* refers to the perspectives' level of analysis. On the micro-level, institutional adaptation and institutional design both address behaviour of single actors who design or adopt new institutional arrangements. On the macro-level, the institutional diffusion and collective action

perspectives focus on the diffusion or construction of institutions at the industry level or within the relevant organizational field (Van de Ven/Hargrave, 2004).

In the following subsections, the four perspectives are described in a more comprehensive fashion, before they are applied to the situation in the German railway sector.

3.1 Institutional Design Perspective

The institutional design perspective builds on the premise that „through choice and action, individuals and organizations can deliberately modify, and even eliminate institutions (Barley/Tolbert, 1997, 2).” Hence, today’s institutional arrangements can be regarded as the results of decisions and actions taken by actors in the past. In general, due to the complexity and interrelatedness of institutional arrangements, institutional change is incremental (North, 1990). However, a crisis can offer opportunities for discontinuous change. According to North (1988), important drivers of institutional change are changes in real prices, which force individuals and organizations to either adapt to the new situation or to effectuate changes in the institutional framework. Changes in real prices can be attributed to changes of the capital stock, which in turn are influenced by population changes or technological progress. North (1988) also points to changes in ideology as another important source for institutional change, because such changes can fundamentally alter the way people think about existing institutions and their evaluation, whether they are legitimate or not. As Stinchcomb (1997) argues, the existence of institutions is closely tied to values and beliefs that the enforcers of the institution themselves believe in.

To bringing about change in large and complex organisations can be conceived as a specific form of intended institutional change. Organisational change management programs are usually triggered by changes in the organization’s environment. Environmental changes can have a negative impact on the organization’s performance when the organisation’s structures do not fit the requirements of the new environmental situation anymore. According to Nadler (1993, 89), the transition of the organization to a new configuration that is better adapted to the organization’s environment is effectively managed when:

- The organization is moved from the current state to the future state;
- The functioning of the organization in the future state meets expectations;
- The transition is accomplished without undue cost to the organization;

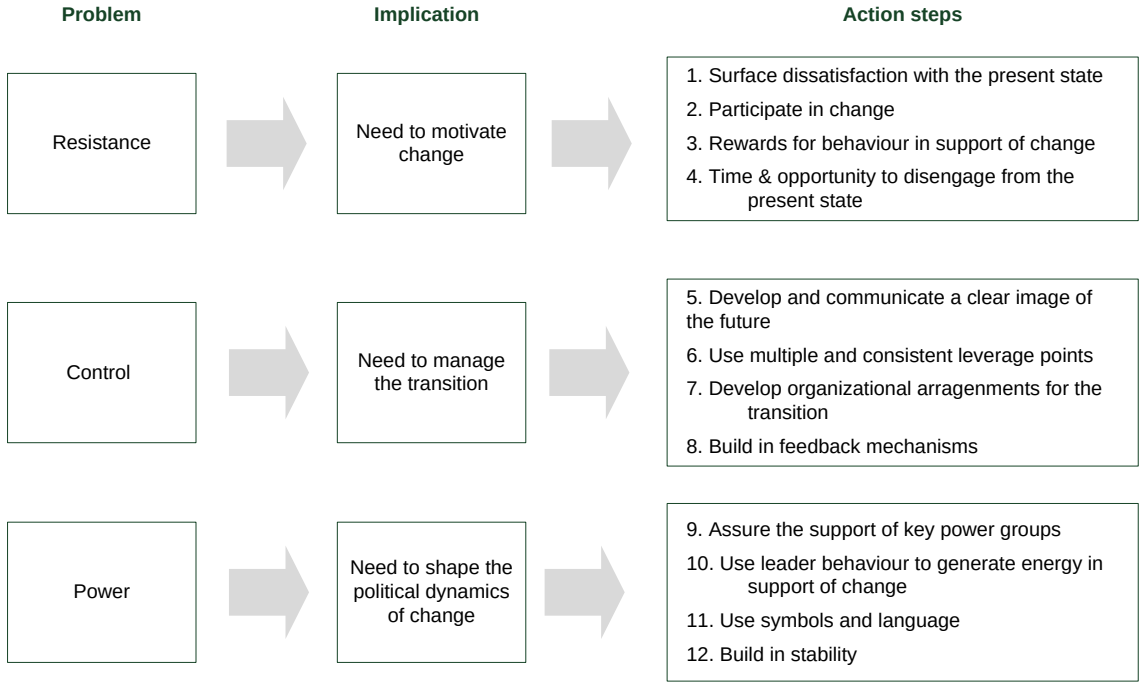
- The transition is accomplished without undue cost to individual organizational members.

Bringing about major organizational change is a difficult task, which is frequently bound to fail. One problem is resistance to change, because people working in an organization have a need for a certain degree of stability. Major changes in their working environment can cause insecurity and a reduced sense of autonomy and self-control. Furthermore, resistance to change is frequently caused by the perception that the way things have been done in the past is superior to the proposed changes (Nadler, 1993). Nelson and Winter (1982) stress that to keep hold of existing organizational routines can be a rational approach, because these routines act as a storage of knowledge about effective and efficient task coordination which have resulted from learning in the past. Furthermore, organisational changes can shake-up the existing equilibrium of power within the organization and result in conflicts between different coalitions in the organization, which can retard or block organizational change (Hannan/Freeman, 1977). Another challenge associated with major organizational change is the disruption of organizational control. As formal organizational rules are designed for stable states, change can render existing structures obsolete before the new structures have been fully implemented. In the course of such a transition it becomes difficult to monitor performance as goals, structures and people are shifting (Nadler, 1993).

In view of these problems, the literature on organizational change has developed guidelines for successful implementation. The problem of resistance to change might be approached by motivating change and by allowing employees to actively participate in the process. The power problem can be addressed by influencing the political dynamics of the change process and by making sure that a new power centers emerges that is supportive to the change process. Finally, the control problem can be dealt with by actively managing the transition process so that control can be maintained.

Figure 3 provides an overview of the major problems associated with organisational change, their implications, and specific action steps to deal with these problems.

Figure 3: Problems of change, implications and action steps



Source: Adapted from Nadler (1993)

In general, the institutional design perspective regards institutional change as a gradual, incremental, and deliberate process, which is induced by changes in material conditions or changes in the beliefs of individuals and organizations and prompts these actors to question taken for granted institutions. Exceptions from this general view pertain to times of crisis, which can trigger discontinuous institutional change. From the institutional design perspective, institutional change is brought about by negotiations between individuals or groups with conflicting interests. Thus, the existing institutional framework represents a merely imperfect and pragmatic solution to reconcile past conflicts (Commons, 1950).

3.2 Collective action perspective

Like the institutional design perspective, the collective action perspective views institutional changes as being intentionally pursued by social actors. However, the collective action perspective focuses not on single individuals or organizations but on groups of actors that try to trigger institutional change. Hence, from the collective action perspective the appropriate unit of analysis is the interorganisational field or industry.

The collective action perspective builds on contributions from social movements theory as well as on insights from the literature on technological innovation and industrial change (Van de Ven/Hargrave, 2004). Social movements theory deals with networks of individuals, groups or organizations which share a collective identity and try to effectuate or prevent social change (Rucht, 1999). According to McAdam et al. (2008), the emergence and development of social movements rests on three different kinds of factors, i.e. mobilizing structures, framing processes, and political opportunity. Mobilizing structures refer to the formal and informal networks that connect individuals and organizations. Political opportunities can arise only, when a particular issue is identified by a group of actors that shares a common definition of the problem and is able to mobilise the necessary resources. Framing processes are a crucial element of collective action because they help to strategically create a shared understanding of the problem and of appropriate solutions. Political opportunity describes political conditions in which institutional change will be easier to achieve than usually. Such opportunities can e. g. arise from unstable political coalitions or alliances between politicians and members of the social movement (Van de Ven/Hargrave, 2004).

The literature on technological innovation and industrial change has pointed out that technological and institutional innovations are coevolving and can be regarded as collective achievements of different actors. Technological innovation is seen as a process that is not confined to technological activities but involves social and political activities. From the analysis of different technologies, it has become evident, that many complementary and cumulative technological and institutional innovations of different actors are necessary before a technology can successfully diffuse (Van de Ven/Hargrave, 2004).

3.3 Institutional Adaptation Perspective

The institutional adaptation perspective examines, how and why organizations conform to forces in the institutional environment. In contrast to the institutional design and collective action perspectives, change originates in the institutional environment and affects the organisation. Institutional adaptation processes have been analysed by researchers interested in the question why modern organizations resemble each other so much in their structures and processes (DiMaggio/Powell, 1983). The answer of researchers addressing this issue is that organisations have to conform to similar environmental norms, rules and believes in order to achieve social legitimacy. For example, accounting practices in public companies have to conform to international accounting standards. Organisations

that adhere to these standards achieve legitimacy and have advantages over maladapted organizations in accessing important societal resources. Meyer and Rowan (1977) stress, that compliance to environmental pressures results in organisational structures that reflect the requirements of society rather than the demands of the organisation's operations. They point to potential conflicts arising from inconsistencies between institutionalised structures and operational processes. These inconsistencies can lead to inefficient organisational practices or problems resulting from the fact that institutionalised structures are often too general in order to provide meaningful guidance for specific operations.

3.4 Institutional diffusion perspective

The institutional diffusion perspective analyses, how institutions diffuse among a population of organizations. In contrast to the institutional adaptation perspective, institutional change is examined at the industry level or at the level of the interorganisational field. Institutional change is frequently explained with the help of evolutionary theory, based on processes of variation, selection or retention. A major objective of studies on institutional diffusion is to examine the conditions under which institutions are being reproduced within the organisational field, as well as the speed and coverage of this process. Processes of deinstitutionalisation that result in the abolition of institutional arrangements have also been studied (van de Ven/Hargrave, 2004).

Based on the extant literature on institutional change, four different perspectives and mechanisms of institutional change can be discerned (Van de Ven and Hargrave, 2004): institutional design, collective action, institutional adaptation, and institutional diffusion. Each of these theoretical perspectives allows us to view the situation in the German rail transport sector from a different angle and offers a distinct explanation for processes of institutional change and their impact on the envisage modal shift.

4 Institutional Change in the German Rail Transport Sector and Implications for the Envisaged Shift from Road to Rail Transport

Based on the four perspectives described in section 3, this section addresses questions about the nature and direction of change, different actors groups and their motives, as well as drivers and barriers of change. The analysis is focused

mainly on the regulative dimension of institutions, although the normative and cultural dimension will be included whenever possible and appropriate.

3.5 Institutional Design Perspective

As already mentioned above, the institutional design perspective views institutional change as being deliberately effectuated by single individuals or organisations. As DB Cargo is the market leader for rail transport in Germany and Europe, change related activities of this company are of particular relevance for the overall sector and will thus be considered in greater detail here.

In the past few years, the business of DB Cargo has been affected by operative losses and shrinking market shares. In the years that followed market liberalisation, DB Cargo not only faced competition from road transport, but increasingly also from other rail transport companies. Major competitive deficits as identified by DB Cargo itself are related to timeliness and reliability of shipments, as well as to low productivity of personnel and locomotives (DB, 2015).

The operational deficits of DB Cargo have been addressed by strategic change programmes initiated by the management of the DB Holding, such as 'Aktionsplan Deutschland/Aktionsplan Deutschland Plus' (running from 2012 to 2016) and the ongoing transformation initiative 'Zukunft Bahn' which started in 2016. As these initiatives deliberately aim at changes of DB Cargo's business model and its underlying organisational structures and routines, they are discussed here under the rubric of the institutional design perspective.

The 'Aktionsplan Deutschland' aimed at increased efficiency and quality of operations by improving the control of the wagon fleet, the maintenance of wagons, and locomotives, as well as enhancing the utilisation of existing capacity (DB, 2014). In reviewing this initiative in its recent annual report, the management of the DB Holding states that, with regard to the impacts on DB Cargo, those measures targeted at revenue increases or reductions of material costs have been more successful than measures with impact on personnel (DB, 2017b, 146). Obviously, the resistance of employees and trade unions is conceived as a major obstacle to organisational change. The ongoing large scale organisational transformation programme 'Zukunft Bahn' is designed to have even more substantial implications than the 'Aktionsplan Deutschland', because it schedules fundamental changes of the business model. Overall, 'Zukunft Bahn' seems to aim for discontinuous rather than continuous change. In essence, the programme is organised around the following principles (DB, 2015):

- Concentration of activities on European railway corridors with high frequency and high transport volumes;
- Increased standardization of services and operations;
- Overcoming the problem of regionally fragmented operational responsibility;
- Higher flexibility of personnel, e. g. train drivers.

The program reflects the need for transformative change of the current business model due to the deteriorating competitive position of DB Cargo. The declared objectives of 'Zukunft Bahn' which are envisaged to be accomplished by 2020, are to increase customer satisfaction by providing reliable services (97% reliability level), to outperform average rail transport market growth by 1%, and to achieve competitive productivity and profitability levels.

What can be concluded from this perspective is, that DB Cargo, as the focal actor in the German rail transport sector, is actively engaged in a large-scale transformation of its business model triggered by ongoing operative losses. This transformation aims at further growth of the DB's rail transport business by enhancing efficiency of operations. However, implementing these changes will probably be faced by strong resistance from employees and trade unions. From the change management literature discussed in section 3.1 it becomes evident that "…many of the most troublesome problems of changing organisations occur not in the strategic/task shift, but in the implementation of the organisational transition to support the change in the nature of the strategy and the work (Nadler, 1993, 90)." Hence, it remains to be seen whether the management's initiative to trigger discontinuous institutional change can be successfully implemented and whether the competitiveness of DB Cargo not only vis-á-vis other railway companies, but also compared to road transport might be increased. Another limitation of DB Cargo's change management activities is that they are very much supply-side driven and that no attempts are made to fundamentally change the relationship to customers and other actors in the market.

3.6 Collective Action Perspective

Similar to the institutional design perspective, the collective action perspective regards institutional change as a process, which is intentionally triggered by actors. In contrast to the Institutional Design Perspective, the Collective Action Perspective examines the activities of actor groups from the same organisational field, not of single organisations or individuals. The organisational field relevant for our analysis has already been briefly touched upon in section 2. It consists of railway companies, railway infrastructure providers, railway industry, regulatory

bodies, and transport customers. In addition, transport policy makers and environmental NGOs have to be considered.

Building on insights from social movements theory, collective action requires mobilising structures, framing processes, and political opportunity to trigger institutional changes (McAdam, 2008). One important example for mobilising structures in the rail transport sector is the network 'Allianz pro Schiene' (Pro-Rail Alliance), founded in the year 2000, which represents 23 members, non-profit organizations from civil-society, and 123 supporting members, which are mainly companies from different areas of the railway sector. The DB is a supporting member of the Pro-Rail Alliance (Allianz pro Schiene, 2017). In addition to the Pro-Rail Alliance there are similar networks at the national and European level, e. g. the Verband Deutscher Verkehrsunternehmen (VDV), Verband der Bahnindustrie (VDB), or the European Transport Alliance (ETA). However, our analysis here will be concentrated on activities of the Pro-Rail Alliance as it is currently bundling the activities of a broad portfolio of railway actors.

The objective of the Pro-Rail Alliance is to promote safe and environmentally friendly rail transport. Based on the Alliance's public announcements and publications, the members' shared understanding of the sectors problems seems to be that the regulative environment in Germany one-sidedly favours road transport over rail transport. Consequently, the alliance has repeatedly demanded a reduction or abolition of regulative and financial benefits of road transport and called for greater political support for and public investments in rail infrastructure. The Pro-Rail Alliance's vision for 2020 is to reach a market share of 25% for rail freight in Germany (Allianz pro Schiene, 2017).

Among the Pro-Rail Alliance's currently most important political targets is the reduction of track access charges. In recent years, these charges have been steadily increasing, whereas the road toll for trucks has remained stable and even decreased slightly. Moreover, the network demands greater financial contributions from the federal government to finance the maintenance and extension of the railway network. A more recent emphasis of the network's activity is the fight against the admission of mega-trucks in Germany. Next to these political activities, the Pro-Rail Alliance calls for more innovation in the sector and the implementation of measures that strengthen the environmental performance and social acceptance of railways in Germany.

Building on social movements theory, political opportunity is another necessary condition for successful institutional change. Such opportunities can arise from

unstable political coalitions or alliances between politicians and members of the social movement. For example, the Pro-Rail Alliance has successfully supported the introduction of a road toll for trucks in Germany, which came into force in 2005, and had faced fierce opposition of forwarding agents and their customers at that time.

In view of upcoming major technological changes in the road transport sector, such as electrification of trucks and autonomous driving, and due to the rising political pressure on the transport sector to reduce its GHG emissions, the political situation of the transport sector at this stage can be considered as unstable and is likely to offer opportunity to trigger changes of the institutional framework in favour of more sustainable modes of transport.

Such an opportunity developed with the installation of the round table for rail transport in September 2016, headed by the State Secretary of the German Federal Ministry of Transport and Digital Infrastructure (BMVI). The round table's work culminated in a master plan for rail transport, published by the BMVI in June 2017. The master plan's objective is to strengthen the competitive position of rail versus road transport by enhancing the efficiency of rail infrastructure, using available potentials for innovation, and creating a more favourable political framework (BMVI, 2017). The master plan includes the following measures:

- Reduction of track access charges by 50%;
- Reduction of financial burdens from electricity tax, German Renewable Energy Act surcharges, and emission trading;
- Creating incentives for intermodal transport;
- Extension of the railway network's capacity in critical bottlenecks;
- Further electrification of the railway network;
- Adaptations of the railway tracks to accommodate for longer trains (740 m standard);
- Investment in hybrid locomotives;
- Extension of digital services;
- Automation of operational processes, e.g. shunting.

In view of this master plan, three strategic approaches to strengthen the competiveness of rail transport can be discerned. First, the regulatory framework is changed in order to reduce the financial burdens for rail transport. Second, the German government is committed to invest in capacity extensions and technological improvements (electrification, digitalisation, 740 m trains) of the railway

network. Third, the railway infrastructure manager, DB Netz, and railway undertakings actively pursue productivity enhancing innovation of their equipment and operations through automation and digitalisation. Obviously, the master plan acts on many political demands of the Pro-Rail Alliance and other actors of the railway sector, which supports the assumption that at present there is room for political opportunity and institutional changes triggered by collective action of railway companies.

3.7 Institutional Adaptation Perspective

The institutional adaptation perspective examines institutional changes stemming from environmental forces working on the organisation. As organisations aim to be compliant to societal norms and regulations in order to attain legitimacy, institutional changes can result from organisational adaptation to changing social requirements. However, the literature on institutional adaptation has pointed out that institutional adaptation can have negative impacts on the organisation's efficiency when they are in conflict with the needs of the organisation's operations.

In reviewing the past 25 years of railway history in Germany, a critical event in which several fundamental requirements of a modern, market-oriented society were placed upon the German railway system, is the Railway Reform Act of 1994. In the late 1980s, a political consensus had emerged that a major railway reform was needed. This led to the establishment of an independent commission that was assigned to develop recommendations for organisational reform (Lodge, 2003). The major objectives of this reform were to enhance the efficiency of the German railway in order to cope with rising transport volumes, to increase the railway's market share, and to relieve the federal budget from financial burdens (Schwilling/Bunge, 2013). According to Schwilling and Bunge (2013), the following points can be considered as crucial elements of this reform:

- The merging of the Deutsche Bundesbahn and the former GDR's Reichsbahn into a publicly listed company, the Deutsche Bahn AG;
- Relief from 34 billion Euro dept by the German government;
- Reorganisation of financial responsibilities for railway infrastructure;
- Liberalisation of the German railway market.

The railway reform aimed at substantial changes in the nature and character of the German railway, which was envisaged to operate like a private, market-oriented company in a liberalised market environment. However, compared to the

situation in other countries, such as the UK, separation of infrastructure and operations was not strictly established, but resulted in the infrastructure manager (DB Netz) and the railway undertakings (DB Cargo, DB Regio, and DB Fernverkehr) being part of the DB holding (Nash et al., 2013).

In the aftermath of the reform, regulatory oversight of the railway sector had to be reorganised. The Bundesnetzagentur (BNA) was assigned responsibility for safeguarding a non-discriminatory access of competitors to rail infrastructure. Furthermore, the Eisenbahnbundesamt (EBA), founded in 1994, was established as the supervisory, licensing and safety authority for railways and railway undertakings in Germany.

The DB was assigned the legal structure of a publicly listed company, although, at present, the German government still owns 100% of its shares. In 2006, the DB's advisory board opted for a partial privatisation of the company, excluding the railway infrastructure. This plan, however, was cancelled by the end of 2008 due to the negative impacts of the global financial crisis on the stock market.

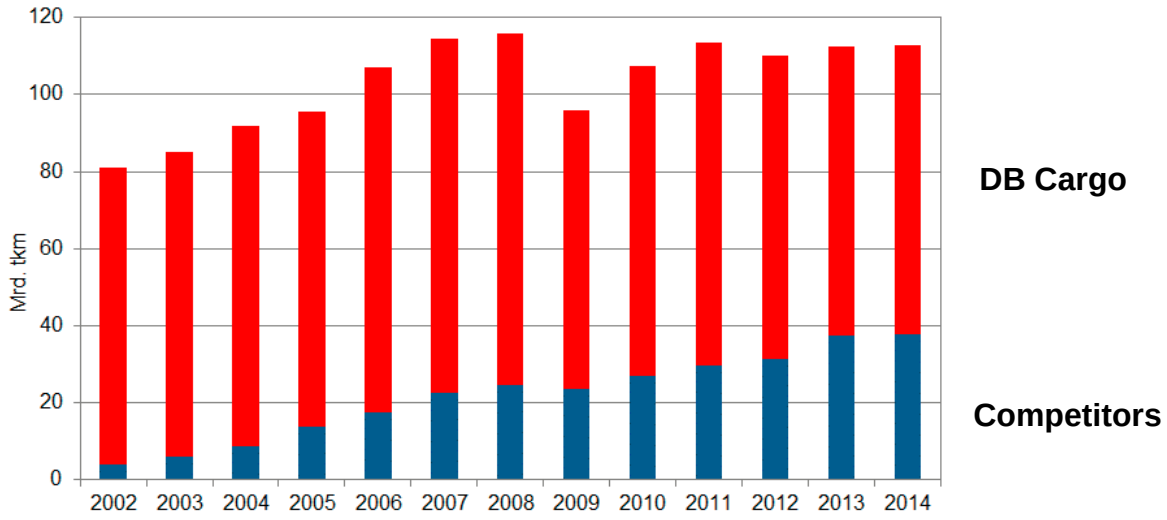
The railway reform has changed the DB's institutional framework according to the principles of a market-oriented and liberalised economy, even though these principles were not applied as consistently as in other countries and the emphasis was more on reducing financial burdens and enhancing the efficiency of railway operations than on fostering competition (Lodge, 2003). According to calculations of the DB itself, the German government’s annual inflation adjusted fiscal obligations for railway operations in 2015 had been reduced by 37% compared to the situation prior to the railway reform, even though the volume of goods and passengers had increased by 50% (DB, 2017a).

These disruptive changes, however, seem not to have fundamentally moved the organisational culture and operations of DB Cargo towards greater flexibility and attention to customer needs. Instead of profound organisational changes that would have resulted in greater efficiency and competitiveness in the long term, the management seems to have prioritised cost reductions. For example, after the Railway reform came into effect, the DB dramatically reduced the number of companies' railway sidings. It is obvious that these abandoned or deconstructed parts of the railway network would have been crucial assets to incentivize companies to shift freight back from road to rail (Mofair/NEE, 2015).

One possible explanation for DB Cargo’s missing adaptation to the liberalised market environment might be that intramodal competitors started to gain significant market shares only a couple of years after the railway reform (see Figure 4).

In the following years, DB Cargo lost market shares in a slow, but steady process. The maladaptation of DB Cargo's business model was strikingly revealed when the global economic and financial crisis hit Germany in 2009 and resulted in dramatic reductions of sales and operative losses, whereas at the same time the negative impacts on competitors were much weaker.

Figure 4: Rail Transport of Goods in Trillion tkm



Source: Mofair/NEE, 2015

In conclusion, analysis from the perspective of institutional adaptation suggests that, in the 20 years following the railway reform, the DB has been primarily concerned with maintaining its legitimacy through enhancing its profitability as a holding. This was mainly achieved through cost reductions at the operational level as well as through acquisition of profitable businesses in the transport sector (Stinnes/Schenker, Arriva) and their integration in the DB Holding. At least thus far, the railway reform was less successful in triggering fundamental changes of DB Cargo's business model.

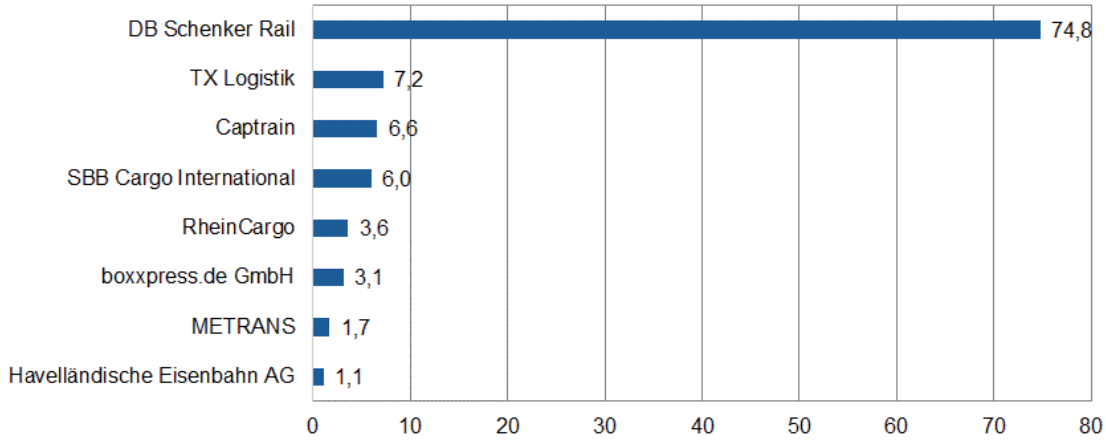
3.8 Institutional Diffusion Perspective

In contrast to the institutional adaptation perspective, the institutional diffusion perspective is concerned with the diffusion of institutions not within a single organisation, but within the relevant organisational field. It can be argued, that the organisational field in the German railway sector fully developed only after the Railway reform of 1994 came into full effect. As Figure 4 highlights, DB Cargo's competitors have constantly gained market shares in recent years. As of 2015, 232 railway undertakings were licensed to transport goods in the German railway

network, thereof 216 companies were actively engaged in the business (Mofair/NEE, 2015). Most of the DB Cargo's competitors are specialised on certain types of goods and are only active on a regional level, but some of them are subsidiaries of large foreign railway companies which were able to rapidly expand their business in Germany: TX Logistics is a subsidiary of Trenitalia, Captrain is a subsidiary of the French SNCF, and SBB Cargo International is Joint Venture of SBB Cargo and Hupac (Mofair/NEE, 2015). According to the Bundesnetzagentur (2017), DB Cargo's competitors had generated returns on sales between 2% and 3% during the period from 2013-2015, whereas the figures for the overall sectors, which include DB Cargo, where 0.2% (2013), -1.5% (2014), and -4.0% (2015).

DB Cargo's competitors are very active in the combined transport of containerised goods, especially from ports, which is a growing market segment. In contrast, DB Cargo is focused on the transport of bulk goods from mining and other heavy industries, which is a declining business due to the shrinking economic importance of the respective industries. Another important but declining segment of DB Cargo is the transport of single wagons with goods from the mechanical engineering and chemical industries (Mofair/NEE, 2015).

Figure 5: Largest Rail Transport Companies in Germany in 2014 in Trillion tkm[1]



Quelle: Mofair/NEE (2015)

DB Cargo's competitors pursue business models which are much more narrowly focused on growing segments of the transport business. According to Mofair/NEE

[1] DB Schenker Rail has been renamed DB Cargo in 2016.

(2015) the market share of rail transport would have been further declining without the emergence of new competitors (Mofair/NEE, 2015). The business models of smaller companies, such as RheinCargo, boxxpress.de, METRANS, and Havelländische Eisenbahn is very much focused on the transport of goods from seaports or inland ports. Furthermore, these competitors are frequently subsidiaries of port operators, e. g. METRANS is a majority ownership of HHLA, the operator of the port in Hamburg, and RheinCargo is a Joint-Venture of the inland port operators in Cologne and Neuss-Düsseldorf.

The diffusion of these specialised business models and the strong equity links between private rail transport businesses and port operators seems to leave little scope for DB Cargo to adapt to the changing situation, which is characterised by strong growth in maritime trade of containerised goods. Alliances with the SBB, BLS and Cargo Tren Italia may be necessary, it these companies are also willing to open up their business.

Next to the emergence of new competitors and business models in the German rail transport market, important institutional changes which have diffused among the organisational field are concerned with noise protection. Noise protection has become an increasingly pressing issue because the social legitimacy of rail transport and the timely realisation of the network's much needed capacity extensions is closely connected to the reduction of noise levels (DB, 2015). The German government's objective is to reduce railway noise by 50% in 2020 compared to the situation in 2000. Related measures include the upgrading of freight wagons, noise protection on the track, and regulation, such as a ban on noisy wagons. Until the end of 2020, wagons have to be fitted with 'whisper' brakes in order to meet new regulations (Weedy, 2017). Although the retrofitting is supported by the federal government, DB Cargo expects higher costs for daily operations, due to increasing efforts for maintenance and inspection as well as due to higher replacement costs (DB, 2017c).

The institutional diffusion perspective points to institutional changes resulting from the market entry of new competitors in the German rail transport market which pursued very specialised business models. Furthermore, regulatory changes related to noise protection imply investment needs and technological changes for railway infrastructure and operations.

4 Discussion and Conclusions

In this section, the analysis of institutional change from four distinct perspectives is summarised and discussed with relation to their impact on the political objective to strengthen the railway's position in the freight market. The discussion is then put into the context of the MLP.

Institutional Design Perspective

The analysis highlights that DB Cargo, the market leader in rail transport, is currently undergoing a process of large scale transformational change, which has been designed in response to the ongoing financial crisis, a lack of competitiveness, and low customer satisfaction. Before the ongoing change management initiative ‘Zukunft Bahn’ started, prior activities directed at organisational change were not sufficient to overcome organisational inertia. At this point in time, it is difficult to assess, whether the envisaged changes can be successfully implemented and result in profitable growth of DB Cargo’s business. However, the academic literature on change management has stressed that implementation is the most difficult and challenging part of organisational change processes. Moreover, opposition from trade unions and employees at DB Cargo is likely and might result in deviations from the original design and time delays. A conceptual weakness of ‘Zukunft Bahn’ might be the strong orientation on operational efficiency and the lack of creative and visionary elements with regard to the future of DB Cargo. The plans adopted all seem to emphasize efficiency of supply-side operational, with the objective of reducing costs. While long distance freight transport is highly cost competitive, there might also be possibilities in new information systems and services to logistics customers and an increased use of e-markets. Thus, the impact of these institutional changes on the overall competitiveness of DB Cargo and rail transport as a whole is highly uncertain.

Collective Action Perspective

Based on existing organisational structures and a shared understanding of the sector’s problems, various actors from the railway sector have taken collective action to demand changes of the regulatory framework in favour of rail transport. Recently, this strategy has been successful due to the increasing pressure on policy makers to reduce the GHG emissions of the transport sector. This situation has opened a window of political opportunity, which, for the moment, has resulted in the transport ministry’s recently published master plan for rail transport. The

master plan acts on many key demands of the rail transport sector and its implementation might lead to significant costs reductions, capacity enhancements, and increased intermodal competitiveness.

However, in order to substantially increase the railway's market share and to trigger profound behavioural changes on behalf of the forwarders, additional regulatory changes would be required which would result in increased costs for using road transport. Hence, although the amplitude of institutional change might be sufficiently high to improve profitability of the railway sector, but the scope of these changes is probably too narrow to substantially change the current modal split based on the technologies in use today. Obviously, technological changes taking place in rail transport (e.g. moving block train control and full automation) and road transport (e. g. electrification of trucks and platooning) might fundamentally change this situation, even with regard to the environmental advantages of rail versus road transport.

Institutional Adaptation Perspective

The Railway reform of 1994 aimed at profound changes in the nature and character of the German railway, which was envisaged to operate like a private, market-oriented company in a liberalised market environment. During the years following the Railway reform, the DB Holding has been primarily concerned with maintaining its legitimacy through enhanced profitability. However, instead of implementing organisational changes that would have resulted in greater efficiency and competitiveness in the long term, the management seems to have focused on short-term cost reductions and diversification of its business. Diversification was mainly achieved through the acquisition of profitable businesses in the transport sector (Schenker, Arriva). Although the integration of Schenker, which is Europe's market leader in road transport, would have opened up large potentials for offering combined transports, these potentials have not been realised.

Due to DB Cargo’s lack of adaptation to a liberalised market environment, the company lost market shares to intramodal competitors in a slow, but steady fashion. Thus, for a longer period of time, the incremental nature of these changes generated only a weak stimulus for organisational change at DB Cargo. What may be concluded with regard to the competitive situation at the intermodal level is, that the institutional changes stipulated by the railway reform were not focused clearly enough on developing a healthy business model for DB Cargo, but rather prioritized the reduction of the government’s financial burdens.

Institutional Diffusion

The combined forces of market liberalisation and changing customer demands have resulted in the emergence and diffusion of new competitors and business models in the rail transport market. These business models are focused on growing segments of the transport market, such as the combined transport of containerised goods, and can play an important role in enhancing the market share of rail if these niche players can grow not only at the expense of DB Cargo but also at the expense of road transport. One of the most important drivers might be the higher speed of innovation uptake at these smaller entities.

In total, the four perspectives highlight that the present situation of the German rail freight sector and of DB Cargo in particular is subject to substantial institutional changes. On the one hand, intramodal competition has increased as a consequence of the railway reform, which can be described as a disruptive form of institutional change. New domestic and foreign competitors have entered the rail freight market with business models tailored to promising segments of the market and have rapidly gained market share. At the same time, the increasing pressure from intramodal competitors has triggered an attempt at a transformative organisational change initiative at DB Cargo, which is currently in the process of implementation. Even though the success of this initiatives is highly uncertain, in total, these changes are likely to result in a higher competitiveness of the sector and a stronger orientation to customer needs. On the other hand, the road freight sector has increasingly come under political pressure due to its rising GHG emissions and rail transport is increasingly seen as a viable alternative. The recently published master plan for rail transport acts on many requirements of the railway sector and foresees a reduction of financial burdens, capacity extensions, and technological innovation in the railway sector. However, these political initiatives will probably not result in significant changes of the current modal split as long as the external costs of road freight are not taken into account.

Another important driver of institutional change in the transport sector which was only be briefly touched upon in this analysis, is technological progress brought about by the digitalisation of the railway freight sector and its customers. This is the fundamental change facing the rail sector as a whole. Digitalisation cannot be fully introduced by new train operators, because it requires fundamental changes in the train control systems, currently still run by DB Netz as a monopoly.

Furthermore, much progress has been made with regard to the electrification of trucks. Both developments are likely to induce disruptive changes of the transport sector.

The rail freight sector in Germany is currently dominated by DB Cargo. The MLP suggests that, unless strong pressure for change is placed on DB Cargo and DB Netz, changes in adopting new technology and new forms of organisation and business models will be resisted and be slow.

The four perspectives on institutional analysis suggest that the current processes and rates of change may not be strong enough to cause the far-reaching changes necessary for a large scale transformation of the modal split of freight transport. The MLP suggests that the inertia of the rail freight regime could be overcome by the development of new organisations and institutions, which can utilise new technologies in internet based business models and railway operations to drastically improve the competitiveness of rail freight as a part of intermodal supply chains. The MLP suggests further that such new organisations and institutions may need to be implemented by a range of actors in rail freight and not just DB. Van Mossel et al. (2018) review organisation theories and their application to the behaviour of regime incumbents. They suggest that if an incumbent does adopt the new technologies and organisation of a niche, its chances of survival are greater.

The conclusion here is that DB Cargo may be able to take advantage of the large opportunity provided by the supportive political environment through the sustainability debate. However, this means that they will need to change their organisation to develop new business models and institutions that lead the internet based logistics industry of the 21st Century. Other actors, whether new rail operators or entrants from the logistics sector, may provide the competitive pressure to DB Cargo and deliver the innovations necessary. They may also grow to become major actors in the sector. A new structure of the industry with a changed business model for DB will be necessary.

5 References

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6 LowCarb-RFC Project Publications

The below list of 9 working papers and 3 summary report is in parts preliminary as some of the material is in preparation by the time of releasing this report. A current list of publications is at:

- Fraunhofer ISI: LowCarb-RFC project website: https://www.isi.fraunhofer.de/en/competence-center/nachhaltigkeit-infrastruktursysteme/projekte/lowcarb_rfc.html
- Stiftung Mercator, Climate-Friendly Freight Transport in Europe: https://www.stiftung-mercator.de/en/project/climate-friendly-freight-transport-in-europe/
- Transport & Environment, Low Carbon Freight: http://lowcarbonfreight.eu/

Working Papers

Doll, C., J. Köhler, M. Maibach, W. Schade, S. Mader (2017): The Grand Challenge: Pathways Towards Climate Neutral Freight Corridors. Working Paper 1 of the study LowCarb-RFC - European Rail Freight Corridors going Carbon Neutral, supported by Stiftung Mercator and the European Climate Foundation. Fraunhofer ISI and IML, INFRAS, TPR and M-Five. Karlsruhe.

Petry, C. and M. Maibach (2018): Rail Reforms, Learnings from Other Sectors and New Entrants. Working Paper 2 of the study LowCarb-RFC - European Rail Freight Corridors going Carbon Neutral, supported by Stiftung Mercator and the European Climate Foundation. Infras. Zurich.

Gandenberger, C., Köhler, J. and Doll, C. (2018): Institutional and Organisational Change in the German Rail Transport Sector. Working Paper 3 of the study LowCarb-RFC - European Rail Freight Corridors going Carbon Neutral, supported by Stiftung Mercator and the European Climate Foundation. Fraunhofer ISI. Karlsruhe.

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