DRIVERS FOR VERTICAL INTEGRATION IN THE RAIL SECTOR – USING WAGONS AS "RELATIONSHIP SPECIFIC ASSETS"

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Abstract

Purpose – This paper uses a combination of transaction cost economics (TCE), the resource-based view (RBV) and the relational view to analyse vertical integration in the rail sector, through which rail wagons are viewed as "relationship specific assets".

Design/methodology/approach – The empirical analysis is based on a cross-case comparison of four case studies of intermodal operators in Europe, each exhibiting different levels of collaboration and integration between terminals, operators and sub-contractors.

Findings – Viewing rail wagons as relationship specific assets rather than merely transaction specific (TCE) or firm specific (RBV) demonstrates that wagon ownership is not only a good indicator of the level of vertical cooperation but of the existence of trust and learning within a collaborative environment.

Practical implications – the organisational setup is not derived purely from transaction or resource characteristics, but by the integration of processes through the purchase of assets that will be used to produce a service, with the expected levels of trust and commitment. In this sense, the role of the wagon as a relationship specific asset is a microcosm of the key elements of a successful intermodal transport system.

Originality/value – As one of the key operational aspects of the rail sector is the use of expensive equipment and the relative responsibility for fixed and moveable assets, an analysis of the use of rail wagons as relationship specific assets allows a more dynamic

understanding of vertical integration in the rail sector than currently provided by TCE or RBV alone.

Keywords – business model, governance, intermodal freight transport, institutions, transaction cost economics (TCE), resource-based view (RBV), relational view

Paper type Research paper

1. Introduction

This paper examines vertical integration in the intermodal rail sector. The first aim is to understand the process of integration between rail service providers and rail terminal operators, as part of a deeper understanding of how to improve the efficiency and effectiveness of intermodal transport. Rather than focusing solely on the organisational aspects of firm integration, the paper looks at the operational procedures, namely the integration of locomotive and wagon ownership, operation and maintenance through which the integrated organisation operates.

From a theoretical perspective, the paper makes use of transaction cost economics (TCE), the resource-based view (RBV) and the relational view. A supplementary aim of the paper is therefore to examine the relative merits of these three theories in explaining why and how a firm chooses to integrate with another. It is the contention of this paper that the question can be understood more dynamically by combining TCE and RBV via the relational view. This paper therefore builds on earlier research by looking at a specific dimension, in particular the role of "relationship specific assets." As one of the key operational aspects of the rail sector is the use of expensive equipment and the relative responsibility for fixed and moveable assets, an analysis of the use of rail wagons can shed important light on these discussions.

2. Vertical integration in the intermodal sector

An intermodal transport chain requires the participation of many classes of stakeholder who need to work together, and these relationships can be managed under different kinds of agreements, with greater or lesser levels of collaboration and integration. The physical transport unit, usually a container, swap body or semi-trailer, moves along a transport chain from shipping line to port terminal operator to the traction provider to the inland intermodal terminal operator, then the last mile is done by truck to the shipper. Such chains also operate in reverse, and if the journey does not require a sea journey then the port terminal is replaced by another inland terminal.

Moreover, just like the port terminal, a rail terminal may have an operator as well as an owner (equivalent to the port authority) and provide associated services requiring the involvement of other public organisations, e.g. customs and inspection services (Bergqvist & Monios, 2014; Monios & Bergqvist, 2014; Bergqvist, Falkemark & Woxenius, 2010). Overlaying these physical handling operations is the administrative role played by the rail operator managing the chain. In some cases the rail operator is the same as the traction

provider and in other cases it is different. Likewise, in some cases the rail operator may be the same company as the terminal operator, or there may even be a vertically integrated chain encompassing the port, the rail operator and the inland terminal (e.g. HHLA Hamburg), or, even more rarely, that integrated chain may also include the shipping line; for example when Maersk was running not only vessels and port terminals but inland rail and terminals. They have now divested themselves of this inland operation (Monios, 2014).

In addition to the vertical perspective, there exists also the potential for horizontal collaboration. This is common with shipping lines merging or sharing slots, and in the hinterland it could potentially involve rail operators working together or, more likely, aggregators like 3PLs bringing shippers together to consolidate flows and fill trains (Monios, 2015; Bergqvist, 2008).

The need to conceptualise and understand different ways and differing levels of formality in the coordination of hinterland transport has given rise to institutional analyses of these organisational structures. New institutional economics (NIE) has been used to explore different methods of coordinating hinterland transport chains (e.g. Panayides, 2002; de Langen & Chouly, 2004; Van der Horst & de Langen, 2008; Van der Horst & Van der Lugt, 2009; Franc & Van der Horst, 2010; Monios & Lambert, 2013; Van der Horst & Van der Lugt, 2014). Van der Horst and de Langen (2008) identified four main arrangements for coordinating hinterland transport chains: the introduction of incentives, the creation of an interfirm alliance, changing the scope of the organisation and collective action. The paper highlights five reasons why coordination problems exist: unequal distribution of costs and benefits, lack of resources or willingness to invest, strategic considerations, lack of a dominant firm, risk-averse behaviour/short-term focus.

Van der Horst & Van der Lugt (2009, 2014) built on the preceding work in institutional economics by Van der Horst and De Langen (2008), making use of a theoretical framework called the 3-Layer Scheme developed by Williamson (1996). This approach highlights the importance of the institutional environment in the development of hinterland coordination arrangements. The common link with these approaches is that they are based primarily on TCE and organisational structure, with some use of RBV. These approaches will be discussed in detail in the following section.

3. Conceptual approaches – TCE, RBV and the relational view

Much theory in logistics has been derived from older disciplines, particularly economics (Stock, 1997). In an inventory of theory in logistics and supply chain management research, Defee et al. (2010) found that almost 20 per cent of all theory use related to transaction cost approaches (TCE) and resource-based view (RBV). Both of these approaches can help understand why and how individual organisations choose a particular level of integration.

TCE is a framework for understanding when a firm should internalise transactions, i.e. integrate or operate through contracts, "make or buy" (Williamson, 1975, 1985), or, more simply, why firms exist at all. It is derived from Coase's (1937) work on transaction costs, which need to be analysed in order to decide under which arrangement they will be minimised. These costs include information costs, bargaining costs and enforcement costs (Williamson, 1985). The transactions can also be assessed by their frequency, uncertainty and asset specificity. If transaction costs are considered high due to high uncertainty and high asset specificity, then TCE recommends vertical integration or internalisation of the transaction, also referred to as a hierarchy rather than a market. On the other hand, if transaction costs are low because asset specificity is low, TCE recommends outsourcing through contracts; for example, transport services are fairly generic. In the case of intermodal transport, it could be argued that asset specificity is high due to the specialised equipment and expertise, but it depends somewhat on whether there is a high degree of competition on a particular route, thus making transport provision more easily interchangeable. It has been suggested that, beyond the initial "make or buy" or outsourcing decision, the TCE theory does not cover evolving, dynamic relationships (Wilding & Humphries, 2006), or the relational costs paid by the partner firms to cover the uncertainties in the partnership, aiming for indirect positive outcomes from intangible assets and corporate social capital (Todeva & Knoke, 2005).

RBV is based on obtaining competitive advantage through the exploitation of resources within the firm (Penrose, 1959; Barney, 1991; Wernerfelt, 1984) and, increasingly, across all actors in a supply chain (Dyer & Singh, 1998; Lavie, 2006; Peters et al., 2011; Schmoltzi & Wallenburg, 2011). Following an RBV approach, having more partners in the cooperation agreement provides more resources from which to benefit, whereas according to TCE, communication and coordination become more complex as the number of firms increases (Schmoltzi & Wallenburg, 2011). According to Barney and Clark (2007) the resource should be valuable, rare, inimitable/non-substitutable and the firm must possess the organisational

capacity to obtain competitive advantage from the resource.[1] Just as TCE predicts that high uncertainty leads to integration, RBV proposes that strategically valuable resources should be kept inside the firm.

Several authors have combined both approaches. Franc and Van der Horst (2010) discussed the relationship between TCE and RBV in the way that the partners are dependent on unique resource configurations that have been developed in the collaboration. Hernández-Espallardo et al. (2010) applied both TCE and RBV to supply chain governance, examining how TCE safeguards knowledge-sharing risks, while RBV coordinates learning within the supply chain. Similarly, Rollins et al. (2011) analysed customer knowledge sharing in logistics by applying the knowledge-based view, which is an extension of RBV that foregrounds knowledge as the most important resource. Herz et al. (2013) used a combined framework of TCE and RBV to analyse a case of collaboration in the maritime logistics chain, concluding that the two approaches are mutually reinforcing. Madhok and Tallmann (1998) go further, suggesting that transaction costs are not separable from asset investments, and that trust as a major explanatory factor of why firms do not take advantage of their partners can be replaced by investments in future value, thus proposing a relationship between transaction specific assets (drawing on TCE) and firm specific assets (drawing on RBV). Their argument rests partly on the view that TCE accounts mostly for the potential value obtainable by entering an alliance, thus explaining the initial decision to adopt a new governance form, while RBV relates more closely to the actual relationship over time, thus relating to the actual realisation of that value and therefore an expectation of more to come.

Dyer and Singh (1998) combined TCE and RBV into what they call the relational view, by exploring asset specificity in relationships between supply chain partners. One of their key concepts is the "relationship specific asset," which can be a physical, human or technological resource. The two influences on the ability to generate rents from this asset are the processes for and length of safeguarding, and the ability to replace general purpose assets with more specific equipment that can increase efficiency, but this is generally only possible if a large number of transactions justifies the additional investment.

4. The conceptual framework: rail wagons as relationship specific assets

[1] In the earlier formulation of Barney (1991), the four features of the resource were that it should be valuable, rare, inimitable and non-substitutable.

In this paper, the vertical integration process being explored is primarily that between the terminal and the services, and how these are linked by the use of wagon sets. Therefore, this section expands on the key features of vertical integration in intermodal transport from section 2 by describing the particular aspects of wagon ownership and operation that make them relationship specific assets. These features and then combined with the results of the literature review from section 3, which identified the key features of the three theories, in order to develop a conceptual framework for analysis of the different ways of treating wagon assets.

The two influences on the ability to generate rents from relationship specific assets proposed by Dyer and Singh (1998) are present in the ownership of rail wagons. Like locomotives, they are relatively long-term investments that nonetheless can be sold to another operator if market conditions change and stock becomes surplus to requirements. Similarly, asset specificity with regard to rail wagons is not high, in the sense that all operators have them and they are interchangeable, subject to suitable sizes and compatibility with particular national infrastructure. However, an operator will need to make decisions for certain routes or flows; for example, low-deck wagons for physically constrained routes or shorter wagons for flows with a predominance of 45ft containers rather than multiples of 20ft common on port shuttles. The ability to match the right wagon to the right flow and maintain utilisation without wasted capacity is essential to the economic viability of intermodal transport (Woodburn, 2011; Monios & Wilmsmeier, 2014). Therefore, the assets themselves are not fixed sources of competitive advantage but rather "quasi-fixed", as the supply cannot be expanded immediately or rapidly (cf. Peteraf, 1993).

According to Barney and Clark (2007) the resource should be valuable, rare, inimitable/non-substitutable and the firm must possess the organisational capacity to obtain competitive advantage from the resource. Rail wagons are valuable, but not in comparison to the key rail asset of locomotives. They are not particularly rare or inimitable in themselves, except in certain times and places; for example, whether an operator has the required wagons on hand or can acquire them when an opportunity arises with specific timetable and capacity requirements. Of major relevance for this research is the fourth criterion, as the subject of this paper is not the wagon per se but the decision of an operator to use their own wagon sets as a means of integrating the joint production of rail services and terminal operations.

The decision to lease or own wagons is a key strategic decision. Being able to exit an intermodal transport service quickly is one of the key reasons for leasing wagons instead of

ownership. Leasing wagons also establishes flexibility as to which wagons to use; if the operator is uncertain of the type and distribution of load units to use,, a leasing option makes switching wagons easier. Other influencing factors are the weight of containers that might require a set of wagons with more axles and reinforced frames, e.g. type SGNSS. However, if more wagons that can load heavier containers are used than necessary there is an unnecessary increase in maintenance costs. The most efficient setup is to use one single type of wagon for the whole wagon set. This makes unloading and loading easier as the operator does not need to consider questions such as where the heaviest containers should be loaded. However, such a strategy is more expensive, as wagons that can load heavier containers are generally more expensive and heavier themselves which might limit the loading capacity of the whole train as the locomotive has a particular traction power. Wagon leasing also includes maintenance, whereas owning the wagons requires the intermodal transport operator to contract an ECM (Entity in Charge of Maintenance) that then manages the scheduled maintenance as well as emergency repairs.

There are seven main factors influencing the choice of wagon ownership by the intermodal transport operator. (1) Gap in cost between the leasing and ownership option. (2) Level of long-term commitment and deployment of wagons on the same route over time. (3) The ownership option requires the owner to be able to set up and manage the rail wagon maintenance equally effectively and efficiently as the leasing option. This factor also relates to the possibility of increased integration into the transport chain by the use of technologies such as geo-fencing and the use of RFID for wagon maintenance monitoring and positioning. (4) Level of integration with terminal operators, i.e. understanding the importance of win-win relations in the terminal operation efficiency. (5) Possible and maybe favourable financing. (6) Stable goods flows where the level and characteristics of the flow do not change over time. (7) Sometimes there is a seventh factor derived from the tax advantages of over depreciation. A firm may depreciate an asset on its balance sheet in such a manner that the asset is recoded as being worth less than it would be if it were sold. This results in the firm understating its earnings and/or the value of its assets.

The basis for analysis in this paper is to explore how the ownership and management of a set of wagons can be viewed as a relationship specific asset and how analysis of different models can contribute to the understanding of TCE and RBV, based on the key elements of each and the modified relational view as derived in the previous section (Table 1).

Table 1. Key features of TCE, RBV and the relational view

	TCE	**RBV**	**Relational view**
Way of obtaining competitive advantage	• Reducing transaction costs	• Exploiting resource heterogeneity of the firm	• Exploiting resource heterogeneity of the inter-firm relationship
What is required in order to obtain competitive advantage from an asset	• High asset specificity	• Valuable • Rare • Inimitable • Non-substitutable	• Processes for and length of safeguarding • Ability to replace general purpose assets with more specific equipment that can increase efficiency
Type of asset specificity	• Transaction specific	• Firm specific	• Relationship specific
When to integrate firms	• High uncertainty • High asset specificity • High transaction frequency	• When greater efficiency (and thus competitive advantage) can be obtained through the joint use of resources	• When greater efficiency (and thus competitive advantage) can be obtained through the joint use of resources

TCE supports vertical integration when uncertainty, asset specificity and transaction frequency are high, evidenced by regular problems coordinating intermodal shipments leading to delays, lack of reliability and frequency, but market transactions are recommended when these characteristics are low. RBV suggests vertical integration when greater efficiency and thus competitive advantage can be obtained through the use of resources such as assets or staff. Examples include not just economies of scale through increased firm size as a result of integration but economies of scope and density gained by the integration of two firms possessing unique resource configurations that then enable the provision of more than one kind of service as well as increasing asset utilisation by adding additional routes. In terms of strategy, TCE predicts that high uncertainty, asset specificity and transaction frequency leads to integration, while RBV proposes that strategically valuable resources should be kept inside the firm. These are the key factors that will form the basis of the analysis and discussion in this paper.

5. Methodology

Barney (2001) discusses the pros and cons of parameterisation and empirical testing of a theory like RBV, but that is not the goal of this paper. The aim is rather to explore the process by which an asset is used as an enabler of collaboration and integration. The aim of this paper is therefore to investigate a "how" question (Yin, 2009), which will be explored through four qualitative case studies. A single-case design might analyse one of these cases as a "representative case" but under the multi-case design adopted for this paper they are used purposefully as "critical cases", because, as representative of different types of development strategies, they can be used in conjunction to extend theory (Yin, 2009; Bryman, 2008).

The goal of this paper is not simply the organisational coordination but the operational aspects. Therefore, the four cases were selected because they exhibit different models of operational integration through the use of fixed and moveable assets (Table 2). All four cases are based in Europe, where a variety of models are in evidence, compared to the intermodal network in other countries such as the United States where a handful of large vertically-integrated companies compete against each other.

Table 2. Key features of the four case companies

	HUPAC	**PCC Intermodal**	**Freightliner Ltd**	**JULA & Schenker (specific joint venture)**
Founded	1967	2009	1996	2013
Head office	Switzerland	Germany	UK	Sweden
Company background	Set up as umbrella company of road and rail operators	Set up as subsidiary of chemical producer	Management buyout of former national rail operator. Bulk business started in 2000.	Newly established cooperative joint venture on a specific route
Country of operations	Europe-wide	Poland, Germany	UK, Netherlands (intermodal)	Sweden
Staff	414	190	1,800 (across whole group)	2,400 (all of JULA)
Turnover	377m euro	178m PLN (42m euro)	£250+m (across whole group)	0.5bn euro (total for JULA)
Traffic (trains)	100 per day	200 per month	106 per day	5 per week
Traffic (units p.a.)	650,000 units (2012)	151,131 TEU (2012)	700,000 containers (2013)	15,000 TEU (2013)

Site visits were undertaken by the authors at company terminals where management and operational staff were interviewed and documentary information obtained, as well as providing the opportunity to view the operations and ask additional questions. Both the semi-structured interviews and document analysis were used to obtain factual information about the business and operations, including company structure, portfolio of terminals and provision of services. After obtaining factual and practical information on the business, the main focus of the questionnaire was on the internal and external aspects of the business model. The former relates to the structure of operations, the levels of integration and ownership and the sharing of information relating to the services produced by the company. The latter covers the relationship with external organisations. The respondents were asked to describe the barriers overcome and benefits realised. More specifically, as the goal of the interviews was to understand how wagon assets are owned and used, the respondents were asked their reasons for choosing to purchase some assets and lease others, and the role played by sub-contractors in their business model. The interviews were semi-structured, allowing the conversation to range beyond the responses possible using a structured survey methodology (Given, 2008). It is recognised that response bias in interviews tends to result in a rational account of behaviour, thus potentially obscuring an important part of the process. This problem was reduced by not relying solely on interview results; these were triangulated with desktop research and document analysis to build case studies that could be compared.

The first step was to review the interview and documentary data several times. The data were then organised and reduced by collating evidence in a matrix based on the conceptual framework, according to a three-stage process of data reduction, display and conclusion drawing and verification (Miles and Huberman, 1994; Aastrup and Halldórsson 2008; da Mota Pedrosa et al., 2012). Gaps in the matrix were identified and filled by follow-up emails as well as further data collection via desk research. An iterative process was followed, moving back and forth between data collection, analysis, interpretation and explanation, making use of triangulation to strengthen interpretations. In this way, the data were reduced into manageable sections, which then guided the presentation under headings and sub-headings used in this paper, which are necessary for cross-case comparison

6. Case studies

6.1 HUPAC

6.1.1 Company background and structure

The HUPAC group was formed in 1967 in Switzerland from partners engaged in road haulage in conjunction with Swiss Railways SBB, with a specific intention to focus on transalpine traffic. Currently, 72% of the shares are owned by transport and logistics companies and 28% are owned by rail operators. In 1970, HUPAC joined with other companies to create the umbrella group UIRR (Union Internationale de societies de transport combine Rail-Route). The interesting aspect of this partnership is that, in order to avoid competition between modes, the founding principle was that road operators should have the dominant voice in this consortium. This is related to HUPAC's core business model of neutrality.

The company structure is a group comprising 13 independent organisations. The separate operating company HUPAC Ltd deals with the customers and books the shipments. HUPAC companies within the group operate nine intermodal terminals (Busto Arsizio-Gallarate, Singen, Antwerp, Aarau, Basel, Chiasso, Piacenza, Lugano Vedeggio, Novara) and they also serve other terminals.

6.1.2 Rail operations and business model

The group currently operates around 100 trains per day and handles around 650,000 road consignments per year, almost double the level of a decade ago. They carry containers and swap bodies as well as semi-trailers on piggyback wagons. All the terminals they serve are linked by an ICT system that manages the shuttles and tracks the unit movements.

HUPAC operates intermodal terminals and manages shuttles between all of these locations but they are not traction providers. HUPAC manage 5,166 wagons in total, of which the vast majority are owned, the remainder leased. HUPAC sets up the timetabled services, then runs tenders to sub-contract traction providers to provide the locomotive power to haul the shuttles between terminals. The first and last mile by road haulage is organised by the transport companies themselves rather than by HUPAC.

Although they are not traction providers, they have shunting locos in the terminals. They also have a rail operation licence in Germany and Italy, and they do sometimes pull their own services for local shunting, e.g. from Busto Arsizio to Milan. But normally the external rail operator takes the wagon set from the gate. Handling containers at the terminal is their core business so they do not want to enter the traction market. Also, neutrality is one of the core principles and they do not want to change that by competing with rail operators. Bernhard

Kunz, director of the HUPAC group, says: “Entering the market on a grand scale ourselves is out of the question. But we are retaining our option to provide our own traction if there are no alternatives.”

Onsite at Busto Arsizio they have a workshop and refurbishing centre. Using their own wagons means they can manage maintenance and safety checks without the delays of dealing with external organisations. Having their own workshop also makes it easier to use fixed wagon sets as much as possible, especially with wagons of similar age and condition, to reduce having to remove wagons from a set for maintenance.

Their main value-added is maintenance and repair, as they have their own repair centre. But they also provide additional small tasks such as for example checking dangerous goods labels on containers. They don’t get directly involved in logistics. Busto Arsizio is the only terminal in their network where they provide inland customs clearance.

Next door to the Busto Arsizio terminal is a subsidiary 3PL called Fida Divisione Magazzini Generali. The company already existed before HUPAC came here but then HUPAC purchased the company. So some warehousing is available there but it is not really a direct strategy for feeding the terminal.

The core business for HUPAC remains transalpine block trains but they recognise that the unique conditions in this market will not remain indefinitely, as subsidies for transalpine routes will be reduced due to the opening of the base tunnel through the alps. They are, therefore, highly motivated to develop their other intermodal routes.

Their position in the market is to remain neutral with regard to transport operators. That is why their customers remain transport providers rather than shippers, therefore they do not compete for direct custom. Additionally, they do not compete with traction providers for rail operations. It is the core of their business model to retain this neutrality and continue to sub-contract rail traction, even though they do run some short services themselves and they have licences to provide traction in two countries.

One change in their business model is that they are now focusing more on attracting smaller customers. This will diversify their traffic base and leave them less vulnerable to the loss of custom in future.

There are loading gauge restrictions on the Italian network. It is not always the money that is the issue but the institutional difficulties involved in getting the permissions and agreements. In general, the infrastructure in Switzerland and Italy needs to be upgraded to the same profile as Netherlands, Germany and Belgium in order to maintain the corridor from

Northern Range ports to HUPAC's heartland. This includes train length, weight and loading gauge profile.

HUPAC is a big supporter of rail liberalisation and believes that it must be accelerated. Otherwise many operators are cross-subsidised by the national infrastructure operator and true competition is not possible. Their brochure states that "state grants are given to state-owned railway companies in all sorts of different forms: through covering deficits, restructuring at no cost to the company, or credit guarantees."

6.1.3 Conclusions

The HUPAC business model gives them the best of both worlds – they manage the wagons so they can control their equipment needs and ensure availability, but they don't have the difficulties and risks of loco purchase and maintenance, training drivers, managing their hours, getting licences in each country and so on. There is an inherent limitation of using external traction in that it can limit flexibility, likewise with the use of third-party terminals, but this must be traded off against other factors. Another interesting aspect of the business model is that they have no involvement in logistics and no direct relationship with the shippers. This is good because of neutrality but it means they are one step removed from the market.

6.2 PCC Intermodal

6.2.1 Company background and structure

The headquarters of the PCC group is located in Duisburg, Germany, and 2,000 staff are employed across the group. PCC Intermodal is one part of the group, the other activities being energy and chemicals. Their intermodal activity started in 2005 with shipments for the chemical production of the group, which made PCC the first private intermodal operator in the country. Today PCC Intermodal employs over 190 staff and runs over 200 trains per month, handling around 8,000 containers. In 2012, total throughput was 151,131 TEU, an increase of 26% on the year before. The company is owned 62% by the PCC group, 14% by rail operator DB Schenker and national rail infrastructure owner Rail Polska and 24% by other shareholders who bought into the company when it was listed on the stock exchange.

PCC Intermodal started with a strategic plan to cover all of Poland and they then developed sites accordingly. When they started hauling the company chemical traffic it was only from Brzeg Dolny, but the other terminals at Kutno, Gliwice and Frankfurt/Oder have

been acquired/built since. PCC group provides about 20% of PCC Intermodal's traffic, although this is just from the one terminal; other terminals are all public traffic. Having the backing of a large, diversified group is good for stability and was good for reassuring early investors in PCC Intermodal.

In 2009, PCC Intermodal was the first intermodal company on the Polish stock exchange. This was done in order to raise capital to build the Kutno terminal. Kutno was opened in 2011, the same year that they took over management of the Gliwice terminal, and in 2012 they took over management of the terminal in Frankfurt Oder. They also received an EU grant in 2012 to upgrade the Brzeg Dolny terminal. The Frankfurt terminal is actually owned by the city, but PCC has a 25-30 year lease to operate it. In addition, the city obtained EU funding for new cranes, so PCC have a good partnership with the city.

6.2.2 Rail operations and business model

PCC operates intermodal terminals and manages shuttles between all of these locations but they are not traction providers. They own about 400 wagons, mostly 80ft (for 2x 40ft), then 60ft and the rest 90ft (for 2x 45ft). PCC sets up the timetabled services, then runs tenders to sub-contract traction providers to provide the locomotive power to haul the shuttles between terminals. The first and last mile by road haulage is organised by the transport companies themselves rather than by PCC.

Although they are not traction providers, they have shunting locos in the terminals. They also have a rail operation licence in Poland, but normally the external rail operator takes the wagon set from the gate. Handling containers at the terminal is their core business so they do not want to enter the traction market. Also, neutrality is one of the core principles and they do not want to change that by competing with rail operators.

Their main customers are shipping lines and forwarders – only rarely are they actual shippers. They offer a door-to-door service, although this isperformed by sub contractors as they don't own their own trucks). They have one tractor at Kutno so they can do shunts to Nyhof Wassink next door – see next section. So they are flexible and develop sensibly in line with the market. They have some leased chassis for internal operations.

PCC offer minor services at the terminals, such cleaning and minor repairs but they are not in the logistics market. Their core business is terminals and shuttles, and the next important activity is door to door transport. Nyhof Wassink is a large company located next door to the Kutno terminal. They provide a lot of the traffic, which provides a good underpinning to the

site. Originally Nyhof Wassink was located 20km away, where they had a small terminal and started running intermodal services, but they didn't want to be an intermodal operator so they decided to move to the new site where PCC could provide the service for them. This is a good business model as traffic was guaranteed at the site from the start. There is farm land around the Kutno terminal so there is a possibility that other firms will locate there in future. PCC would like to work in partnership with such firms, as they do with Nyhof Wassink, but they will focus on their core business which is transport.

The core business for PCC is to remain neutral with regard to transport operators. That is why their customers remain transport providers rather than shippers, therefore they do not compete for direct custom. Additionally, they do not compete with traction providers for rail operations. It is the core of their business model to retain this neutrality and continue to sub-contract rail traction, even though they do have a licence to provide traction in Poland.

Another key aspect of their business model is that they have the backing of a parent company that also provides around 20% of their traffic, granting some stability. They also have a large customer located onsite at Kutno which underpins their investment there.

Infrastructure limitations prevent business growth as trains cannot reach 750m on the Polish network because, for example, some passing loops aren't long enough. The average speed on the Polish network is 25kmh even though the locos and wagons can do 100+.

Poland has one of the highest track access charges in Europe and there is no government policy for intermodal transport. PCC would like some consistency and security with government plans for the infrastructure network so they can invest with confidence. One of the results of this lack of strategy is overcapacity of terminals in some locations (e.g. 5-6 terminals in Poznan). A clear government plan could increase coordination and system-wide planning.

6.2.3 Conclusions

Similar to HUPAC, the PCC business model gives them the best of both worlds – they manage the wagons so they can control their equipment needs and ensure availability, but they don't have the difficulties and risks of loco purchase and maintenance, training drivers, managing their hours, getting licences in each country and so on. There is an inherent limitation of using external traction in that it can limit flexibility, but this must be traded off against other factors. Another interesting aspect of the business model is that they have no

involvement in logistics and no direct relationship with the shippers. This is good because of neutrality but it means they are one step removed from the market.

There are many positive aspects of the PCC strategy. It was a good decision to phase the development of the Kutno terminal, starting small then expanding, they are backed by a large group and have some traffic from that group. It is also a sound business model to have one large customer located at the site, with whom they work in partnership. They are also flexible, e.g. buying one tractor to do small shunts. These points can be generalised as positive lessons for intermodal terminal development. Also, PCC has a good strategy to serve the whole country, from ports to inland and they are developing one site at a time.

6.3 Freightliner

6.3.1 Company background and structure

Freightliner was originally a division of the national UK rail operator British Rail. When BR was privatised in 1996, its divisions were sold separately and Freightliner was purchased by a management buyout. It has subsequently been bought by a private equity firm. A bulk division was added in 1999: Freightliner Heavy Haul. In the last decade they have also expanded into Poland and Australia, primarily bulk traffic, and in 2013 they bought European Rail Shuttle B.V, Maersk's intermodal carrier in the Netherlands.

6.3.2 Rail operations and business model

Freightliner is the largest intermodal rail freight operator in the UK, carrying more than 80% of all the maritime containers that are moved by rail. This is because, due to the geography of the UK, the vast majority of intermodal services are port shuttles.

Freightliner serves 14 intermodal terminals in the UK, of which they own and operate 9 (Birmingham, Bristol, Cardiff, Cleveland, Coatbridge, Doncaster, Leeds, Liverpool and Manchester), 4 in/near ports and 5 inland. Their core intermodal business is port-hinterland shuttles, for which they provide the locos and wagons and take bookings directly for the slots. Many of these are purchased by shipping lines as hinterland transport in the UK is dominated by carrier haulage.

The company own over 75 diesel and electric locomotives and around 3,500 rail wagons. Their trainsets are based for the most part on 60ft flat wagons to handle a mixture of 20ft and 40ft deepsea containers, but more recently introducing a percentage of 40ft wagons. They run

over 100 daily intermodal services, generally around 72 TEU capacity but up to 90 TEU based on 30 wagons.

Freightliner does not get involved in logistics and their business is simply from port terminal to inland terminal. They do a moderate amount of road haulage, operating 300 trucks but for the most part that is organised by the customer, carrier or freight forwarder.

The business model is based on vertical integration between terminal and rail operations and running their own equipment. This model is facilitated by the carrier haulage trend in the UK which means that the majority of each service is underwritten by a major deepsea carrier such as Maersk. Additional containers can then be booked on either directly by the shipper or via a freight forwarder or 3PL.

As the terminals were ex-national, some are quite old and there are issues about the lack of investment and whether the public sector in the UK should provide some grants for old terminals, as there were until recently grants available for new terminal sites if they could be shown to be supporting new services facilitating modal shift from road to rail.

6.3.3 Conclusions

The vertical integration and focus on port shuttles is a strong business model. Also they focus on their core business and are not involved in logistics or value-added, although they do take bookings directly from customers.

6.4 Jula and Schenker

6.4.1 Company background and structure

This case study is based not on a pure intermodal operator but on a cooperative joint venture between a large shipper and a freight forwarder to operate a specific intermodal route, which is now expanding to a second route.

Jula operates in the DIY sector. As of 2014, the company has 73 department stores in three countries (Sweden 41, Norway 21, Poland 11) and 2,400 employees. In 2013 the company turnover was €0.5 billion while profits reached €57 million. All flows are coordinated and consolidated at the 150,000m^2 central warehouse and distribution centre in Skara. The majority of incoming goods to the central warehouse consist of imported containers, mainly from Asia. Schenker Air and Ocean in Sweden hold the Jula key account and coordinates incoming container flows.

6.4.2 Rail operations and business model

The initial idea for an intermodal transport service came from the municipality of Falköping who did a pre-study to analyze the possibilities of a rail service between the port of Gothenburg and Falköping. Schenker and Jula established a joint project team to realize the idea in January 2013. The rail operations are sub-contracted to a rail operator based on a tender, but the wagons were bought by the shipper Jula. The goods consist mainly of Jula's imported containers from the Far East which amounts to about 10,000 TEU per year. As of January 2015, the train capacity is averaging 84 TEU per day. The intermodal transport service operates 5-6 times a week. The majority of containers are provided by Jula but they are also taking bookings from individual shippers.

A critical concern in the setup has been to develop the rail shuttle in such a way that Jula and Schenker are flexible and independent so that the rail operator does not gain too much power. This is often the case as they normally own the wagons, control the timetable and the time-window in the container terminal at the seaport. To avoid this problem, Schenker signed the agreement with the port terminal operator APM Terminals and Jula invested in wagons. Jula becoming a wagon owner means that they had to contract an ECM (Entity in Charge of Maintenance) and a maintenance provider (Swemaint and the local service provider BS Verkstäder).

Schenker takes the responsibility for three main functions: bookings, accounting and monitoring. Besides the operating functions, Schenker also has the responsibility of marketing and sales of the intermodal service. Schenker and Jula continuously discuss market issues since the aim is for Schenker and Jula to attract complementary flows, meaning customers with export flows and ideally using the same shipping lines as Jula. This enables effective repositioning of containers and high utilisation rates on the intermodal service. This also means that Schenker does not merely sell capacity on the intermodal service but takes full responsibility of the customers' export and import flows in order to be able to coordinate them.

For the purpose of effective repositioning of empty containers, Schenker and the terminal operator have signed agreements with shipping lines in order for them to set up an empty container depot in Falköping, a process more time-consuming and challenging than expected according to the representatives of Schenker. Furthermore, Jula has developed their customs clearance process so that the goods do not need to be cleared until they reach the warehouse in Skara.

The business model is based on cooperation between Schenker and Jula, based on an open-book basis where both the risk and the profit on the service are shared between the two companies. The business model is interesting because even though the rail operations are sub-contracted, the wagons are owned by the shipper Jula, therefore the shipper controls both the wagons and the goods. Additionally, the revenues received from other customers on the service flow to the joint partners Jula and Schenker, thus allowing the shipper Jula to cross-subsidise their own transport costs.

After the initial success, the partners are planning to expand to a second route, allowing greater triangulation opportunities and better asset management. The new service will also be sub-contracted, which is interesting because it reduces profit margin of the rail operator compared to if they were running the two routes directly themselves in their own right.

Schenker is also working together with the terminal operator in order to develop more agreements with shipping lines in hopes of establishing more container depots at the intermodal terminal in Falköping. Schenker focuses on attracting more shippers to the intermodal transport service which sometimes is time-consuming since they are often locked in to existing 1-2 year agreements. The goal is to reach about 25-30,000 TEU annually (fully loaded containers in total for both directions) within 2-3 years. Currently the service handles about 15,000 TEU annually, excluding empty containers.

6.4.3 Conclusions

This case demonstrates the need for a continuous improvement process that requires all stakeholders to remain committed to develop the service, value-added activities and infrastructure. The elements of entrepreneurship and trust are evident and the cooperative business model is crucial for the construction of a sustainable win-win context.

The partners now consider extending the concept to other regions and destinations; however, this requires the same long-term commitment and perspective on mutually beneficial relationships with key stakeholders such as large shippers/customers and transport service providers. This is currently the main challenge since few shippers are used to or wiling to engage in the type of cooperative business model and setup. Schenker hopes that the best practice the Jula case illustrates can help convince shippers and other stakeholders of the potential associated with the cooperative business model.

7. Results and discussion

The key features of each case are summarised in Table 3. Freightliner operates an integrated model between rail services and terminals, with full management and operation of the rail service assets. HUPAC and PCC likewise integrate terminals and services, but they sub-contract the traction while owning their own wagons. The final case is an innovative model not involving terminals, but in which the shipper itself owns the wagons and has set up a kind of joint venture with a rail management operator that then sub-contracts the traction. Thus the cases provide different models of operational integration that reflect the organisational motives of the actors.

Table 3. Cross-case comparison

	HUPAC	**PCC**	**Freightliner**	**Jula & Schenker**
Terminals	Own/operate the majority but also serve others	Own/operate all of their terminals	Own/operate the majority but also serve others	Use third-party terminals
Track	National public	National public	National public	National public
Rail management	HUPAC	PCC	Freightliner	Jula & Schenker
Rail operation (traction)	Sub-contract	Sub-contract	Freightliner	Sub-contract
Locos	Responsibility of sub-contractor	Responsibility of sub-contractor	Freightliner	Responsibility of sub-contractor
Wagon owner	HUPAC	PCC	Freightliner	Jula
Wagon asset specificity	Firm specific	Firm specific	Firm specific	Relationship specific
Logistics	No	No	No	Yes
Key specific influences on the business model	Key principle is to remain neutral towards shippers and only serve transport operators	Key principle is to remain neutral towards shippers and only serve transport operators	Carrier haulage allows them to book up majority of capacity with shipping lines	Jula controls majority of the traffic so reliable

An interesting finding from the case analysis is that it is more common to outsource traction than wagons. One potential explanation could be that the choice to invest in wagons has a more integrating dimension with other stakeholders as it heavily influences the efficiency of all operations, including not just the service but the marshalling and loading at the terminals. It may also be that traction is integrated when there is no favorable option

available suggesting that there are well-functioning markets where deregulation has worked. For wagons, the decision is less related to how well the market for wagons works but more to the benefits of integration as explored in the theoretical approaches in this paper, such as control over supply, control over maintenance times and costs and the ability to create and then exploit a heterogeneous advantage. The next step is then to determine which of the three theories explains the case results.

TCE supports vertical integration when uncertainty, asset specificity and transaction frequency are high, but market transactions when they are low. This explains why a large operator like Freightliner has integrated terminals and services, including locos and wagons. It does not explain why HUPAC and PCC have decided not to operate their own traction. Interviewees explained the importance of neutrality with regard to customers who are transport providers, which is not a particular problem for Freightliner as the majority of their bookings come from shipping lines. The Jula and Schenker case is only for a single service, therefore low transaction frequency explains why they would not need to integrate with a terminal or a traction provider, yet this also raises the questions of why they would take the decision to purchase and maintain wagons.

Turning to RBV, this theory suggests vertical integration when greater efficiency and thus competitive advantage can be obtained through the use of resources such as assets or staff. This approach explains the choice of all four cases to purchase wagons, even while not integrating with traction provision. In the case of Jula and Schenker, it gives them a competitive advantage because Jula can use the correct wagon type for their needs as they are the main customer, and their open book relationship with Schenker means they are not paying any rent on top. Any profit that is earned through the joint venture is shared between the two companies, meaning that if their service is successful Jula can cross-subsidise their own transport costs. It also means they don't need to be concerned with asset utilisation of expensive locomotives. HUPAC and PCC interviewees stated that wagon ownership enables them to keep maintenance in-house, thus ensuring their safety and reliability. It also reduces the need to split and reform wagon sets to achieve the correct composition required for their traffic. RBV proposes that strategically valuable resources should be kept inside the firm, thus explaining the decision of all four cases to purchase rail wagons and underlines the way in which rail wagons can be seen as relationship specific assets according to the relational view.

The RBV explanation for asset utilisation suggests not only economies of scale through increased firm size as a result of integration but also the production of economies of scope and density. These are obtained by the integration of two firms possessing unique resource configurations that then enable the provision of more than one kind of service, as well as increasing asset utilisation by adding additional routes. This applies particularly to the fourth case, where the joint venture between Jula and Schenker is leading to an additional route that will increase wagon utilisation and earn profit, again without the risk of owning and maintaining locomotives. This is particularly interesting because under normal circumstances a traction provider would compete for this new route in their own name and earn the profit themselves, thus generating rents from their market position. In this case, the joint venture will earn the rents and simply pay the traction provider a contractual rate to provide the service. So the decision to set up a joint venture and purchase wagons for their own flows has enabled a new venture in which a large shipper is indirectly becoming a rail service provider due to their decision to invest in a relationship specific asset. The ability to safeguard the asset and to use more specific types of assets, two key aspects of the relational view, are thus well represented in this final innovative case.

8. Conclusion

Treating the wagon as a relationship specific asset in this paper has enabled an exploration of some of the key elements of successful intermodal transport; namely trust, learning, knowledge sharing, coordination and complementarity. Intermodal transport involves the coordination and cooperation of many actors, in addition to its inherent practical and operational complexities. In this sense the role of the wagon as a relationship specific asset is a microcosm of the intermodal transport system.

Madhok and Tallmann (1998) suggest a relationship between transaction specific assets, drawing on TCE, and firm specific assets, drawing on RBV, while Dyer and Singh (1998) produced the modified version of the “relationship specific asset”. The findings in this paper show that the wagon purchase provides an important signal of commitment. It is more than simply transaction specific (TCE) because it is a long-term action that is not easy to reverse at short notice, and in particular has high specificity with regard to a particular traffic flow. Similarly, wagons can be more than firm specific (RBV), in cases where more than one firm is involved; in three of the four cases, the traction is provided by another company who will be hauling the wagons of the case company. Therefore there is a clear relationship element,

involving trust and learning within a collaborative environment, essential for the relational view (Rossiter Hofer et al., 2014).

Important management implications can be derived from the research findings presented in this paper, based on an understanding of how treating wagons as relationship specific assets can inform strategy. A key tenet of RBV is that a resource should not be easily obtained or replicated by competitors, therefore the strategy selected by management must identify first, how to create a competitive advantage through wagon purchase and, second, how to maintain it. Wagons in themselves are not unique or rare (depending on the type), but the strategic decision is whether the operator should own and maintain their own wagons or pay the traction provider to provide not only the locomotive but the full wagon set. Owning their own wagon sets provides the benefits described earlier regarding control and maintenance without the larger risks of locomotive ownership and operation, such as staff training and management; moreover, the sub-contracted traction provider cannot easily compete on the route because the company has already won the route and manages the traffic, in addition to the effect this strategy would have on the existing business relationship. Therefore, the combination of terminals and wagons without traction procures an advantage for three of the four case companies not available if they integrated terminals, wagons and traction. As shown by case three, the latter model could give superior advantage in the right circumstances, but the market and geography must be suitable.

The analysis in this paper has focused on the relationship specific asset in order to enable a locus of comparison between the three theories, but a full exposition of the relational view includes knowledge sharing routines and the complementarity of both resources and capabilities between partners (Dyer & Singh, 1998); these have been found to be present in all four cases, even if it is primarily the fourth case that illustrates the relationship specific asset most clearly. More importantly, the findings reveal that wagon ownership is not only a good indicator of the level of vertical cooperation, but it also signals that the transport service itself is recognized as part of the core business of the relationship. Thus the organisational decision is not related purely to integration of organisations but integration of processes through the purchase of assets that will be used to produce a service. This is particularly interesting in the fourth case where a shipper and a freight forwarder operate a joint service on an open book basis.

Given the policy context of modal shift from road to rail and the many challenges already identified in previous research, future research should examine how such innovative business

models can overcome these barriers. The generalisability of these findings to other sectors also lies in this definition of new cooperative business models, which are found not just in the intermodal sector, but speak to the broader theoretical discussion of the use of assets, vertical integration and cooperation between stakeholders and the production of joint services in any business sector. Such innovative approaches raise questions as to whether transport service provision is the core business of the rail operator, the traction provider, the wagon owner, the 3PL or even the large shipper. This paper thus opens for future research the redefinition of transport as a core business and how the search to increase efficiency and lower costs can be achieved through the use of not just a transaction specific or firm specific but relationship specific asset. Future work in transport and logistics as well as other sectors can explore and classify the best way to design and execute such business models in order to obtain the potential benefits.

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