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Abstract: This paper explores rail freight services provided by the private sector in the context of a rail freight corridor through Europe and assesses the corridor through time series analysis, with new EU policy directives in place. Comparisons between the different operational time periods of the service are discussed; analysis suggests that these types of services operated on rail freight corridors can be a viable and reliable concept in the future.

Time Series Analysis of Rail Freight Services by the Private Sector in Europe:

Research Highlights

In this paper we analyse rail freight services provided by the rail private sector in Europe. Specifically, time series of analysis of initial operations, present operations, comparisons between initial and present operations were presented; based on these data future operations were forecast.

The comparisons between initial and present operations indicate the trend in data for the average duration per trip has moved towards a clear pattern of 2 days per trip on average. A comparison in data for the average number of wagons per train per month indicates a similar pattern during both operational periods. Cost coverage data indicates differing trends across both operational periods, with a move from 40-50% cost coverage during initial operations to 60-70% during present operations. Analysis of train utilisation data demonstrates an unstable pattern in initial operations with a move towards a more stable pattern with a lower overall utilisation in present operations.

Data for average duration per trip indicate that in the coming future a clear pattern of 2 days per trip on average will continue. Trends in data for the average number of wagons per train per month, suggest it is likely this trend will be replicated going forward. Operation cost coverage data demonstrates a clear trend which it seems will continue in the coming future, as there is a clear increase in cost coverage between operational periods. To increase operations cost coverage further, the operator may consider a change in cargo type, to replace less profitable cargo which require many empty runs, such as grain to more profitable cargo including chemicals. Issues which may be encountered as a result of this include, a need for investment in a new wagon fleet, as substituting grain for chemicals would require a change in wagons.

Data for train utilisation in gross tonnes indicate a move towards a stable pattern, which it seems, will continue in the near future. To ensure a stable pattern continues the development of a new business model may be considered, as this could ensure a steady demand more frequently than during present operations. This would in turn lead to an increase in train utilisation and impact on operation cost coverage.

Based on the results obtained, the following conclusions can be drawn; these types of services provided by the private sector operating across trans-European corridors, under new EU policy directives can be considered a viable and reliable concept in the future. This indicates that the revitalisation of single wagon load services and hub and spoke operations is required, as the results have demonstrated that the market in central Europe appears to be driven by a demand for single wagon load services. A viable service will be guaranteed through the increase of cost coverage of operations per month, along with a steady number of average wagons per train and train utilisation in gross tonnes.

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Time Series Analysis of Rail Freight Services by the Private Sector in Europe.

C Woroniuk, M Marinov, T Zunder, P Mortimer

Abstract

This paper explores rail freight services provided by the private sector in the context of a rail freight corridor through Europe and assesses the corridor through time series analysis, with new EU policy directives in place. Comparisons between the different operational time periods of the service are discussed; analysis suggests that these types of services operated on rail freight corridors can be a viable and reliable concept in the future.

Keywords: Rail Freight Services, Rail Private Sector in Europe, Railway Corridor, Single Wagon Load, Time series analysis, EU Rail Policy

Section 1- Introduction

1.1 Background

The significant advantages of rail freight over close competitors such as road have been noted many times. These include; benefits to the environment, rail creates less air pollution than road freight, rail has the ability to create economies of scale and to provide benefits for logistics operators.

The relationship between a sustainable rail freight system and the economy can be demonstrated using the context of a land bridge to China, where the stable environment of land bridge transport lead to a steady increase in transit business and economic development. (Zhang 2011). Likewise efficient Rail Freight flows benefit the economy through the proficient transfer of goods.

However over the past two decades, EU rail freight has declined steadily, strong competition from other modes including road and market developments in 1980 & 1990 can be viewed as contributing towards this. Consequently, policy incorporated into the European Commission's White Paper 2011 and Logistics Action Plan include measures such as; e freight and intelligent transport systems, the identification of bottlenecks, promotion of best practice to increase the utilisation of multimodal freight, Green transport corridors for freight consisting of a combination of short sea shipping, rail and inland waterways (European Commission 2007). The movement of freight from road to other modes, "30% of road freight over 300km should shift to other modes such as rail or waterborne transport by 2030 and more than 50% by 2050," (European Commission 2011 pp7) and a "core network of corridors carrying large and consolidated volumes of freight and passenger traffic with high efficiency and low emissions," (European Commission 2011 pp11) to increase rail freight through the development of specially designed freight corridors. Alongside measures such as these, new EU policy directives were introduced; Directive 91/440/EEC regarding the separation of infrastructure and operations was fundamental in opening up railway markets and rights of access to railway infrastructure. Directives 95/18/EC on the subject of common criteria for the licensing of railway undertakings established in the European Union and 95/19/EC on common criteria for the licensing of railway undertakings established in the European Union are also significant.

As a result of the new EU policy directives private sector services emerged operating block and shuttle services. This type of service is characterised by a less complex business model which is advantageous at the set up of a service, in comparison to more complex schemes such as single wagon loads. As a result private sector operators began to run block and shuttle services with point to point operations. Block and shuttle trains were used more frequently on major European rail corridors and gained new meaning, which has led to a growth in traffic from 5-10%, it has been observed that the highest new entry of railway undertakings has been block and shuttle trains. The case for block and shuttle trains as a service which is easy to provide is supported through the argument that, "block and shuttle services can be identified as new freight services by rail to be exercised in the future," as they can provide a, "new alternative operating system for rail corridors dedicated to freight," this will reduce the complexity of the system which will in turn have benefits for both the operator and the shipper. (Marinov & White 2009).

1.2 Motivation

This research aims to identify whether rail freight services by the private sector operated on an EU rail freight corridor can be successful under the recently implemented EU rail infrastructure packages in which rail infrastructure and operations have been separated, which is the motivation of this paper. As the new directives aim to open up the rail freight market, it could be argued that a trans-European corridor, such as this is a good example of the area of rail freight which the EU is trying to promote. The paper also intends to answer questions regarding the viability and reliability of the private sector performance to provide an indication as to whether a service such as this could be implemented across other EU freight corridors and could contribute towards reversing the current EU freight trend.

1.3 Objectives

The objectives of this paper are to explore the viability and reliability of rail freight services adopted by the private sector through the use of alternative production schemes such as point to point and hub and spoke, using a corridor across Europe, through time series analysis. The paper aims to identify whether these services can be successful in the future thus providing an option for the expansion of private rail freight across Europe.

1.4 Methodology

The methods in this paper can be divided into four key sections; research into private sector services, data collection, analysis of statistical data and recommendations for future development.

Research into private sector services has been carried out using a range of quantitative sources including statistical data from pilot services together with qualitative sources such as interviews and market research. The argument that, "an efficient freight transport system is crucial for the economic competitiveness of any country or region," (Rushton et al 2000 cited in Islam et al 2010 pp 21) was deliberated when researching the plausibility of private sector services, as the corridor could provide several countries across Europe with increased economic competitiveness. Extensive market research and interviews were carried out prior to implementing the pilot services, to determine possible commodity and traffic flows. Key traffic potential centred on chemicals and hazardous materials, as rail has an advantage in terms of weight compared to road, together with safer handling.

Based on interviews with four potential market segments; dry and liquid bulk, specialised products, maritime containers and swap bodies, analysis concluded there was sufficient demand for a new rail freight service along the proposed corridor to run between 2-8 times a week, provided the service met the diverse customer requirements. However, market research was only able to identify a generalised view on traffic potential and opportunities, despite a clear indication of market demand. As a result, traffic was brought to the corridor through orthodox marketing and selling to cargo principles and forwarders. Detailed interviews with the main personnel involved in the commercial and operational development and ongoing management of the corridor were also carried out prior to operation.

Data to be used in time series analysis was collected from the pilot services. Data included; travel times, wagons carried, gross tonnage and net tonnage and cost coverage alongside system behaviour and additional remarks, these were filed in excel spreadsheets. A large coverage of pilot services dispatched can be considered a strength of the data, together with the large number of variables collected in the excel spreadsheet, providing a robust data set.

Data analysis was carried out after the separation of the data collected into two operational periods; initial operations February – September 2010 and present operations October 2010-April 2011. Future operations along the corridor were forecast using previous trends. The data for each operational period was analysed through the exploration of chosen trends including; the number of wagons moved per month, average trip duration by number of days, operation cost coverage by percentage per month and train utilisation by gross weight per month. Following this, analysis was completed to compare initial and present operations in order to determine any clear patterns across both operational periods which could be used to forecast future operations.

Recommendations for future development of the service have been based on trends from the comparison of initial and present operations and operations forecast for the future.

1.5 Paper Organisation

This paper studies private sector rail freight services using the example of a recent pilot. It analyses pilot services using time series analysis, the rest of the paper is organised as follows: Section 2 explores EU policy rail directives and framework. In Section 3 the pilot operations and services are discussed as a case study example. Time series analyses of operations and issues are completed across initial, present and future operations in Section 4. Comparisons between the different operational periods are also discussed in Section 4. The paper concludes by discussing whether private sector services can be a viable concept in the future.

Section 2- EU Policy

The numerous advantages of carrying freight by rail both for logistics operators and the environment have been cited many times. Zunder (2011) explains, “massive economies of scale can be achieved with long trains of unitised cargo over relatively long distances,” (Zunder 2011 pp1). One train unit may carry as many as 50-60 truckloads, their infrastructure covers a lot of territory and is generally in a good state. Statistics demonstrating the advantages rail freight can have for the environment have shown that, “freight rail is fuel efficient and generates less air pollution per ton-mile than trucking,” (AASHTO 2000 cited in Marinov & White 2009 pp 11).

However, a large proportion of the EU rail industry has been in decline for much of the last two decades. Many Rail operators were loosing money and often relied on levels of government subsidy, this is indicated by the decline of market shares, “falling from 10% to 6% of passenger kilometres and 20% to 8% of freight tonne kilometres over 30 years,” (Nash & Rivera-Trujillo 2004 pp.1).

It can be argued that rail decline occurred very rapidly as a result of, “market developments over the 1980s and early 1990s,” (CER 2008 pp.26). The rapid decline of rail alongside a high demand for competitive modes such as road, “in 1970 railways carried one third of the road and rail freight market. By 1990 this figure had dropped to one fifth,” (CER 2008, pp. 27), provided a clear indication that an EU rail policy was needed to reverse the trend.

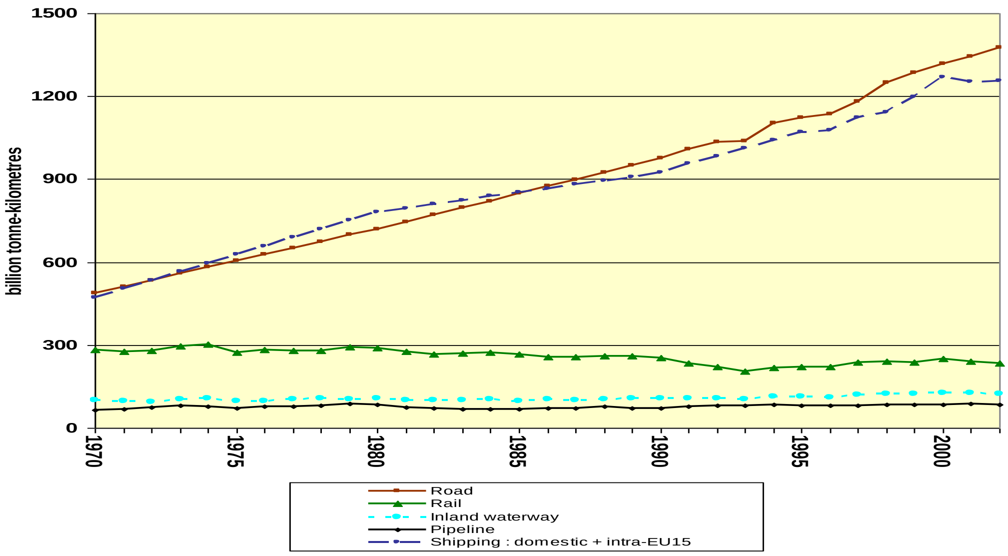


Fig 1 Performance by mode for freight transport EU-15 from 1970 to 2002

Towards the end of 1980s early 1990s the EU came to the decision that action was needed on the impact of transport on the environment. A measure to increase freight transport and simultaneously help the environment was proposed; modal shift of some goods from road to rail. Following this, three central objectives were proposed by the EC; the first aimed to achieve an open relationship between the member state and rail operators subsidised by the state. The standardisation of technical operating conditions across member states which will increase competition between manufacturers and decrease market entry costs. The second objective aimed to monitor modal competition in relation to costs to society. These may include; pollution, congestion and accidents, meaning that the most environmentally friendly mode will obtain the lowest taxes. The final objective aimed to support investment in areas such as borders, which Member states did not invest in.

As a result of the objectives a series of Directives were put into place beginning in 1991 with 91/440. CER have argued this was, “the beginning of the end of railways as state operated monopolies,” (CER 2008 pp28). This directive was successful in providing railway management with independence from the state, while stipulating that rail should be operated commercially as a business with separate accounts for infrastructure and operations. Further legislation followed in 1995 with Directives 95/18 and 95/19 in relation to licensing and fair access to infrastructure.

Despite the stabilisation of the rail market in Western Europe towards the end of 1990's, rail freight was still loosing a large percentage of market share to road haulage this is indicated by a total growth of 18% in freight transport from 1995-2002 while rail transport only grew by 6% (Eurostat:2004). To counteract this and to encourage growth in the rail freight sector the EC proposed three separate infrastructure packages more commonly known as 'railway packages'. Rail package 1 (proposed in 2001 and adopted in 2003) includes Directives which aim to allow rail operators access to a trans European network on a non discriminatory basis with the intention to open up the rail freight market for international competition. The package attempted to clarify further two formal relationships; between the state and the infrastructure manager and between the infrastructure manager and railway undertakings.

Package 2 was proposed in 2002, it aimed to revitalise the railways through the rapid construction of an integrated European railway area, it was adopted in 2004. This was in response to the trend of declining rail market share, despite an increase in financial performance. The final rail package was proposed in 2004 and included proposals to, "open up international passenger transport markets and to regulate passenger rights and the certification of train crews," (European Commission 2007). Directives regarding the certification of train crews were also included alongside the introduction of a European driver licence allowing train drivers to circulate on the entire European network. This package was adopted in 2007.

To support the implementation of the railway packages, a series of goals and lines of action were published. Goals consisted of; ensuring high-quality rail services, improving the environmental performance of rail freight services, improving rail passengers' rights. While lines of action were; removing barriers to entry into the rail freight market, gradually setting up a dedicated rail freight network, progressively opening up the market in passenger services by rail. (Marinov 2007 pp6).

As cited in Zunder (2011) rail packages were implemented in a variety of ways across the EU. The UK has complete implementation, whereas other countries comply to the letter but do not further promote the policy. Some Baltic countries had already liberalised their rail infrastructure using a different method to the one being proposed, which caused some problems. 24 EU Member States were sent formal notices by the EC in June 2008 in relation to their failure to execute the first railway package legislation properly. As of June 2010, 13 of these states were facing legal action from the EC at the European Court of Justice. As with the first railway package, several member states (10), "failed to notify the Commission of their transposition of the package," (Marinov 2007 pp4), in March 2007 the EC decided to take these 10 Member states to the European Court of Justice. As indicated by the numbers of states facing legal action over railway package transposition, implementation did not go as well as the EC had hoped. This may be because the new packages are as yet unproven; if and when the packages yield results, over time the implementation rate may change.

The 2011 White Paper 'Roadmap to a single European Transport Area- Towards a competitive and resource efficient transport system' addresses the need for an increase in rail freight transport across Europe. The White Paper (2011) cites rail freight as a mode with large potential to increase and in so doing will benefit the environment alongside logistics operators. The EU believes, "specially developed freight corridors," (European Commission 2011 pp 7) such as the one demonstrated in the pilot between Rotterdam and Constanza can be the way forward for freight transport. The pilot corridor already goes some way towards meeting the objective set by the EU for the next decade, “to create a single European transport area through the elimination of residual barriers between modes and national systems,” (European Commission, 2011 pp 10) further analysis will provide a clearer indication of whether private sector services on freight corridors will be profitable in the future.

<u>Section 3- Pilot Services & Case Study</u>

The context used to examine private sector services is a backbone corridor initially between the Netherlands and Romania. This route allowed the pilot to address a number of key issues which have constrained the performance of rail freight in multilateral operations. It has been acknowledged that while the chosen corridor is ambitious it has a high potential for modal shift of cargo from road to rail. This is in support of the aspirations of the EC to induce a sustainable modal shift of freight traffic from road to rail to achieve a market share of 15% by 2020. (European Commission 2011)

Fig 2 Trans European Freight Corridor

Together with helping to increase rail freight another aim of the private sector services on the chosen rail freight corridor was to assist a number of organisations and entities within rail freight and logistics operations. These include; European shippers and logistics service providers, as they are being offered multimodal door to door transport including a rail freight service which fits into their SCM and has a high level of reliability and frequency against competitive prices. New or prospective European rail freight operators will also benefit, as the corridor can provide them with the opportunity to transport a substantial volume for a variety of shippers and logistics service providers leading to a viable rail freight service. In addition there are potential benefits for European society and citizens as the corridor provides potential annual savings in transport kilometres of around 12 million. The innovative Train Control Centre leads to the possibility of strongly improved cross border interoperability for rail freight services.

Privately operated rail freight services have been designed, developed and piloted on an axis linking Rotterdam and Constanza. This route serves major port and industrial complexes in The Netherlands along with options into Belgium and North German Ports. It also supplies major industrial areas in Germany and Austria and links to major cities in Hungary and Romania with new port potential in the latter as a source of traffic. The route will include 4 multimodal terminals; Rotterdam Rail Service Center (NL), Ludwigshafen KTL (DE), Budapest Bilk (HU) and Constanza Port (RO).

Pilot services began operation in February 2010 on a single rotation per week basis between Cologne- Eifeltor in Germany and Gyor in Hungary. During the planning of the pilot it was the intention to use block trains for the service, as unlike multi stopping and feeder trains within the hub and spoke model they would be subject to less frequent delays and as a result would provide a more efficient and reliable service.

However a review of EU railway undertakings have shown that above 60% of existing business participates in Single Wagon Loads or multiple block train services, this indicates a high market demand for feeder and multi stopping trains along the pilot corridor. As a consequence pilot operations adhered to market constraints and shunting tracks were made available at both ends of the main route, alongside branch services between the hub and final destination sources at the need of customers.

As stated, the hub and spoke model was employed on this corridor, it has been suggested that “a failure of the conventional hub and spoke system is root of delays,” (Marinov & White 2009 pp.15), this is due to collapse of connections between freight trains. The impact of this potential issue to the pilot scheme will become clear when analysing the pilot data using time series analysis. Train operations were a mix of wagon sets, allocated specific accounts and commodities ranging from agricultural products and powdery bulk cargo to semi finished products from the coal and steel industry and chemical products, together with single wagon load traffic which was concentrated and distributed at Koln and Gyor. This model has proven to be a useful and cost effective means of handling wagon load traffic despite being different to conventional operating systems, which do not view the wagon load as a source of revenue and traffic.

The train traction providers leased eight locomotives and nine sets of wagons. This was necessary, as every locomotive can only run in one or two countries. The nine sets of wagons consisted of fourteen 6-axle wagons (for 4,5 TEU) and six 4-axle wagons (for 3 TEU) this ensured that a maximum of 81 TEU per trip was transported. The total maximum weight of the train was 1,600 tonnes. The cargo balance was from East to West and largely consisted of corn traffic from Hungary to the Benelux countries, however the balance was addressed as additional EB traffic was secured. Corn base traffic provided a flexible but consistent source of revenue and volume with the ability to attract other higher paying traffic as this was identified and attracted to the service. During initial operations the trains consisted of two customers and their respective wagon groups, time constraints for grain traffic were not overly demanding. In April 2010 Chemical wagons were added to the pilot and containers transporting car parts were added in June 2010.

The key commercial and operational partners in the pilot project are; TransPetrol GmbH (Hamburg), LTE Vienna and CER Hungary. TransPetrol lead on the commercial and operational planning of the train services including shipper contacts and pricing. To allow them to carry this out efficiently they have opened an office dedicated to the pilot from where they can track trains in real time in Germany and Austria. This ability allows them to advise shippers and receivers of any identified train delays or other disruptions. To plan train loading profiles TransPetrol use a simple board based system based around the three trains per week on the main corridor with details of any satellite traffic able to be easily identified. Other considerations in the management of the operation include the maintenance of the rotation of the grain wagons, wagon and traction maintenance, crew availability and empty running.

Due to changes in production strategy with many companies switching to the just in time method, railways are not always as competitive as road haulage. This is mainly due to very long stops en route, as other trains (passenger services especially) have priority and because procedures at borders are complicated and time consuming. The technological developments within this freight corridor which make it innovative are two IT developments for train management; the Train Control Centre (TCC) and Customer Information Centre (CIC). The Train Control Centre links customer delivery requirements with the ability to deliver, through active monitoring of the status of the train, track availability, congestions and other disturbing events which could impede a non-stop train movement along the Rotterdam-Constanza corridor. Procedures will be triggered if the train is diverted from its path and schedule in order to minimise the delay and damage. The TCC will be realised through the following measures; risk analysis of the corridor as a productive system, formulating measures to enhance the corridor-wide transfer propulsion, facilitating control of the corridor production system, implementing monitoring and control of the corridor.

The CIC links the Supply Chain Management (SCM) service requirements with integrated services offered by local rail operators, it receives freight monitoring information including deviations from expected arrival times and provides this information for customers. The CIC can also be used by rail freight operators to analyse the quality of the services delivered and the profitability of orders. Another use of the CIC will be to optimise sales and operational activities by providing e-booking, e-planning and functionalities for yield management.

LTE provides traction through a dedicated locomotive which is capable of operating across international borders. This eliminates one of the main problems faced by international freight in allowing it to be competitive. CER supply shunting services and local traction, specific traffic destined to Austrian receivers is also moved by CER to and from the train when in transit.

Section 4- Time Series Analysis

4.1- Initial Operations Analysis

Initial operations began in February 2010 on a single rotation per week basis between; Cologne- Eifeltor and Gyor in Hungary. This rotation was transporting grain and it appears that the operational issues were not overly demanding, as grain is not a time sensitive cargo and is not a perishable good.

The average number of days per trip per month are summarised in the table below, as the figures suggest there is not a large variation from month to month, apart from July, which has an average of 8 days per trip. This can be explained through problems encountered with reduced staffing which increased the waiting time of transition and through the use of the wrong wagons on a number of occasions, which also increased the trip time.

Table 1 Average number of days per trip per month.

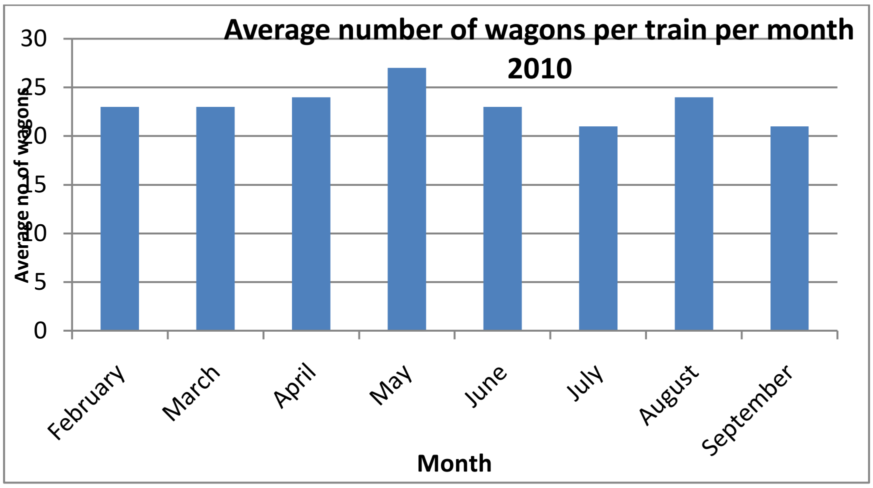
Month	Average days per trip.
February	2
March	3
April	2
May	2
June	2
July	8
August	1
September	1

Operational issues transpired from a number of sources; the issue of highest frequency can be viewed as wagon failures. This occurred as a result of the use of ageing Romanian wagons which were used for a couple of months, until they were rejected by the customer as their use was considered unsafe. This lead to the mass withdrawal of over 160 grain wagons from April-October 2010. This period, during which grain traffic was effectively shut down has impacted on the project overall through the delay of the move towards profitability.

In April 2010 Chemical single wagons were first added to the route, extra consideration in operations had to be taken as these were dangerous goods (sulphur diaphate). Further cargo was added to the route in June 2010 with the addition of wagons carrying car parts, however issues arose during the period of July-September when not enough cargo was available to run a complete train as the main cargo provider (grain) was out of action, other issues during this period included single wagons could not be sold due to scheduling problems with the chemical wagons.

The average number of wagons carried per train per month are summarised in Figure 3 below. Overall the highest no of wagons was 46, the lowest 1 and the average for 7 months 23. The data indicates a peak in average wagon numbers in May, in line with the addition of chemical wagons to the service. This is followed by a decrease from June- September as the lack of grain cargo impacted on the average wagons carried.

Figure 3 Average number of wagons per train per month.



During initial operations, issues with commercialisation included cost coverage, as grain cargo could only cover half the overall costs even with an additional 35% subsidy this can be explained through a large number of empty wagons being carried on return trips and because grain is a seasonal commodity. This is clearly illustrated through the data, shown in Figure 4 as during the months when only grain traffic was transported February-April no more than 48% of costs were covered. Another issue during this period was the apparent unwillingness of rail partners to devise a model of operations and co-operation. Any replication of privately operated services should recognise the need for some form of collaboration or consortium, this was discussed but not adopted and it can be argued that this contributed to the delay in the start up of services.

Concerns were raised during this period regarding train utilisation by gross weight see Figure 5, it seems this followed a similar pattern to cost coverage, in that as grain wagons failed train utilisation fluctuated reaching its lowest point in August in line with chemical wagon scheduling problems.

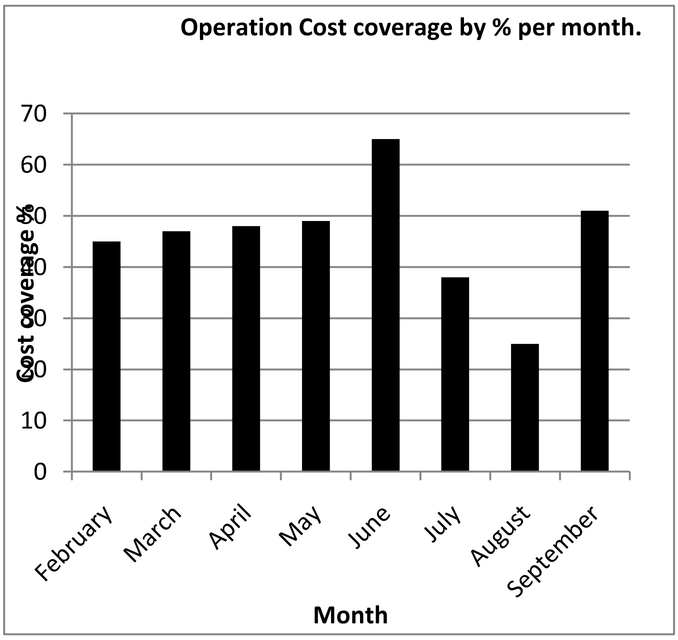


Fig 4 Operation Cost coverage by % per month

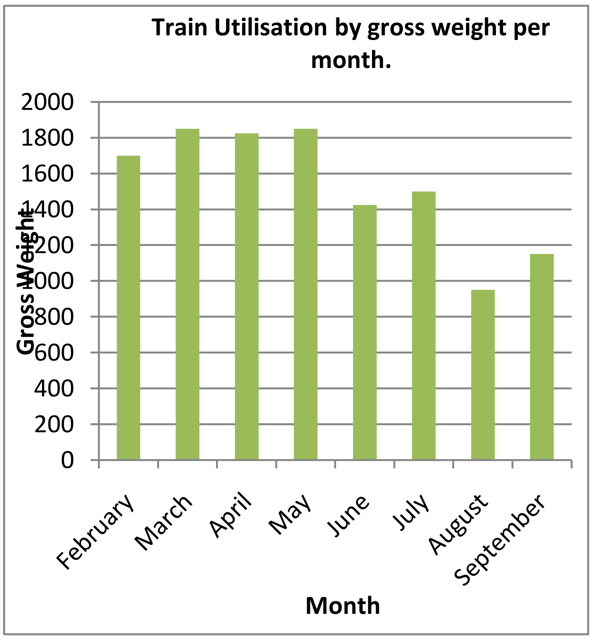


Fig 5 Train Utilisation by gross weight per month

4.2- Present Operations Analysis.

The present phase of operations began in October 2010, with three rotations per week continuing to run single wagon load operations on a hub and spoke structure. This was as a result of additional customers and grain traffic which had previously been out of action restarting. Currently there are twelve customers, some of which are container services, which unlike grain and chemical cargo, is time wise very demanding, with extra operational costs.

Table 2 below summarises the average number of days per trip per month, where the data clearly indicates little variation between months. This is surprising as during the winter months several incidences of delays and failures were reported due to weather conditions, these are not obvious here due to the use of averages.

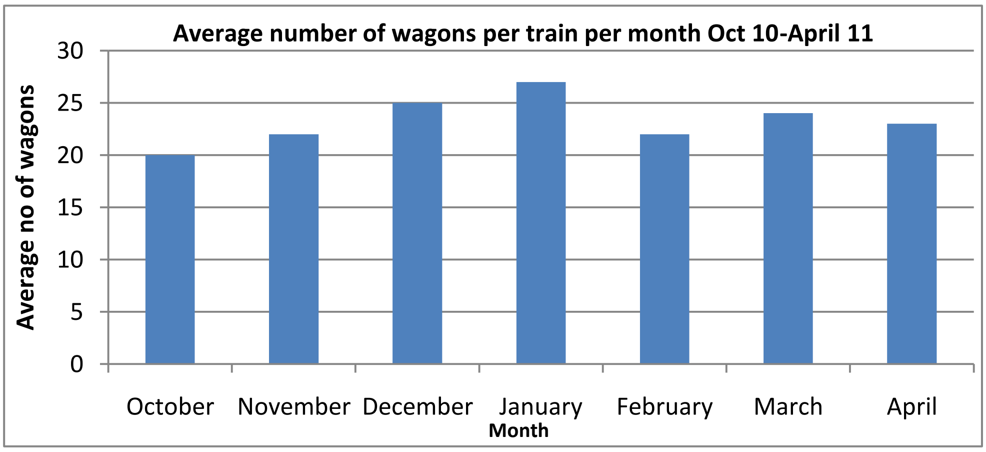
Table 2 Average no of days per trip per month.

Month	Average days per trip.
October 2010	2
November	2
December	3
January	3
February	2
March	2
April	2

As with initial operations, operational issues also occurred during this period. Technical problems with grain wagons have been diagnosed as an issue with brake blocks. The blocks are being worn at a higher frequency than expected; reasons for this are yet to be diagnosed, which has lead to the main fleet of grain wagons being sent for inspection in a Hungarian workshop. From April 2011 grain was once again out of action due to wagon problems.

The average number of wagons per train per month are displayed in Figure 6. A peak in January can be explained through the addition of new customers to the service during October-December. The other months indicate little variation; overall the highest number of wagons carried was 40, the minimum 1 with an average of 23.

Fig 6 Average number of wagons per train per month.



Cost coverage during this period had increased from a low of 35% during initial operations to a peak of almost 80% in March 2011. From October- April the average cost coverage was 65%, the data (displayed in Fig 7) indicates that the overall loss is decreasing month on month. This can be explained through a number of factors, including the number of rotations per week, the number of customers for the service and the cargo type. Cargo type is influential as grain equates to many empty runs, whereas chemicals or containers can run loaded each way leading to greater cost coverage.

Figure 7 Operation Cost coverage by % per month

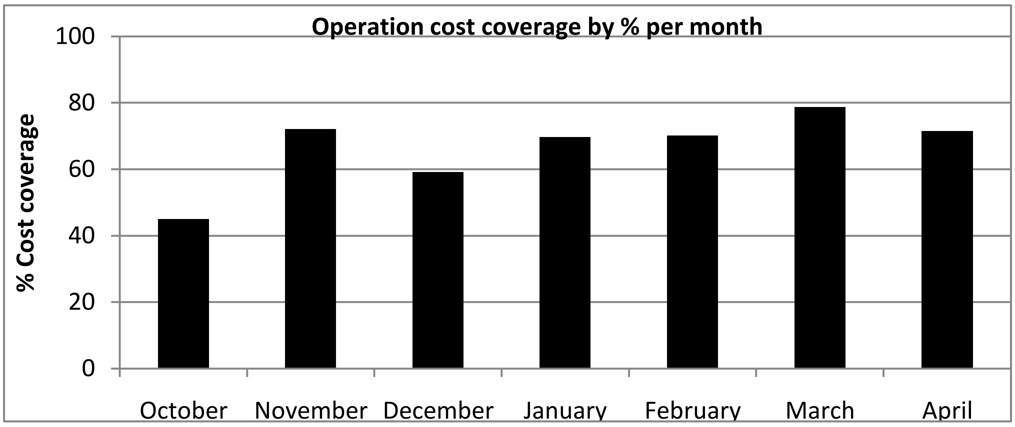
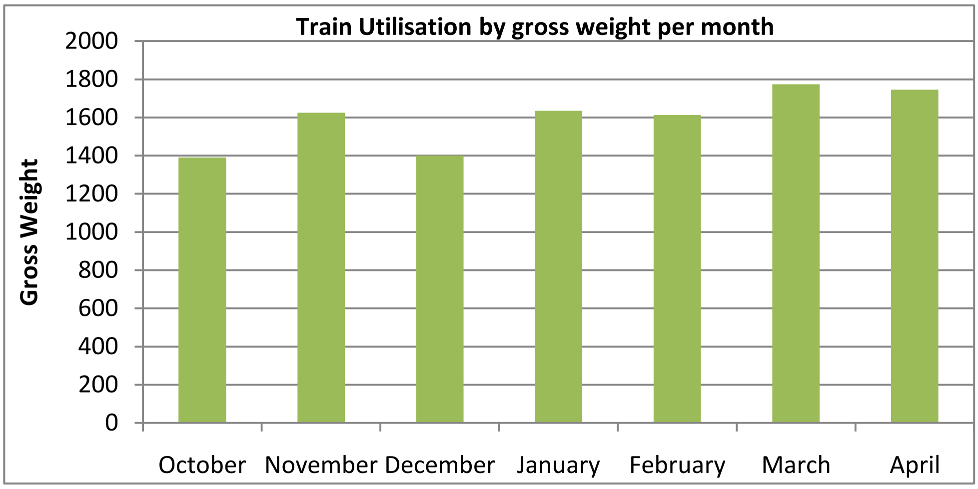


Fig 8 illustrates the train utilisation by gross weight during this period; a decline in December can be explained as stated previously through numerous issues with weather conditions and failures. Limited variation is shown throughout the rest of the period.

Figure 8 Train Utilisation by gross weight per month



4.3- Comparisons Initial & Present Operations

Comparisons between data from the two operational phases will be drawn, to determine and explain any key trends. These will be used in the prediction of future operations and in the evaluation of the services as a viable concept.

Data for average duration per trip in days indicates a clear pattern during present operations (shown in Table 1), with few fluctuations. This differs from initial operations, where no clear trend can be determined, this could be indicative that the issues which occurred during initial operations such as the use of the wrong wagon and locomotive failures, were addressed during the second phase of operations resulting in a clear average journey time.

Trends in data for the average number of wagons per train per month demonstrated in Figures 3 and 6 follow a similar pattern during both operational phases. In both cases, a peak in the average number of wagons is clear in the fourth month of operations. In both phases, this can be explained through the addition of customers to the service. For future operations one possible solution could be to add new customers earlier in the operational phases, in order to view an increase in the average number of wagons carried more quickly.

A comparison of operation cost coverage by percentage per month indicates a large difference in trends between operational periods. As explained, data for initial operations has several fluctuations with one large decrease in August. Present data demonstrates an improvement overall; where many months during initial operations indicate a 40-50% cost coverage, the majority of months during present operations show a cost coverage of 60-70% indicating steady progress between the two periods.

Data indicate an improvement in train punctuality between initial and present operations. Currently 80% of trains achieve their handover time with the inclusion of an hour lag time, whereas during initial operations the percentage of trains achieving their handover time was significantly less. As with the average number of days per trip, this increase in percentage of achievement of handover time indicates previous issues within operations are being addressed.

An assessment of initial and present operations train utilisation data, demonstrates a lower overall utilisation in present operations, however a more stable pattern can be observed with less fluctuations. This may be explained through the replacement of grain wagons from initial operations as issues with these lead to a decrease in train utilisation.

4.4- Future Analysis.

To determine whether services by the private sector could be viable and reliable in the future was one of the main aims of this paper, to do this future trends will be forecast using data from present operations. This is of significant use as it will allow the flaws in current trends to be analysed in order to improve the services in the future.

The current average number of days per trip indicates a clear trend of 2 days per trip, with few fluctuations. This suggests the trend will continue into the future with potential for the average to decrease further as it did between initial and present operations. This is positive for the reliability of the services in the future as it indicates it is possible to run these types of services efficiently on a trans-European corridor.

Operational cost coverage per month currently indicates a stable trend, as stated in comparisons this is greatly improved from the pattern in initial operations. This evidence suggests that cost coverage will continue to increase in the future if current service demand can also be replicated. If the service is to remain viable in the future, a continuing trend of increasing cost coverage is of high importance.

Present operations data for average number of wagons per train per month as indicated in comparisons demonstrates a similar trend to initial operations. For this reason it is expected that this trend will be replicated again in the future. As this pattern has appeared alongside an increase in cost coverage by percentage it would appear that it does not have a negative influence on the viability of the services.

As with the average number of wagons per train per month, present data for train utilisation (gross tonnes) does not indicate a clear trend. It is expected that this will continue in the future. As stated in comparisons a higher overall utilisation is visible during initial operations; recommendations and improvements to the service may lead to this pattern being reproduced in the future. This may in turn lead to, an increase in the viability and reliability of the service.

Based on current trends the percentage of trains achieving their handover time is expected to continue to increase. This forecast based on initial and present operations; indicates an improvement in the reliability of the service.

Section 5

5.1- Conclusion

In this paper we studied rail freight services provided by the rail private sector in Europe. Specifically, time series of analysis of initial operations, present operations, comparisons between initial and present operations were presented; based on these data future operations were forecast.

The comparisons between initial and present operations indicate the trend in data for the average duration per trip has moved towards a clear pattern of 2 days per trip on average. A comparison in data for the average number of wagons per train per month indicates a similar pattern during both operational periods. Cost coverage data indicates differing trends across both operational periods, with a move from 40-50% cost coverage during initial operations to 60-70% during present operations. Analysis of train utilisation data demonstrates an unstable pattern in initial operations with a move towards a more stable pattern with a lower overall utilisation in present operations.

Data for average duration per trip indicate that in the coming future a clear pattern of 2 days per trip on average will continue. Trends in data for the average number of wagons per train per month, suggest it is likely this trend will be replicated going forward. Operation cost coverage data demonstrates a clear trend which it seems will continue in the coming future, as there is a clear increase in cost coverage between operational periods. To increase operations cost coverage further, the operator may consider a change in cargo type, to replace less profitable cargo which require many empty runs, such as grain to more profitable cargo including chemicals. Issues which may be encountered as a result of this include, a need for investment in a new wagon fleet, as substituting grain for chemicals would require a change in wagons.

Data for train utilisation in gross tonnes indicate a move towards a stable pattern, which it seems, will continue in the near future. To ensure a stable pattern continues the development of a new business model may be considered, as this could ensure a steady demand more frequently than during present operations. This would in turn lead to an increase in train utilisation and impact on operation cost coverage.

Based on the results obtained, the following conclusions can be drawn; these types of services provided by the private sector operating across trans-European corridors, under new EU policy directives can be considered a viable and reliable concept in the future. This indicates that the revitalisation of single wagon load services and hub and spoke operations is required, as the results have demonstrated that the market in central Europe appears to be driven by a demand for single wagon load services. A viable service will be guaranteed through the increase of cost coverage of operations per month, along with a steady number of average wagons per train and train utilisation in gross tonnes.

5.2- Future Research

This paper has raised a number of issues regarding a trans-European freight corridor and services provided by the private sector, which require further research. It has been proposed that the data produced through the pilot services could be analysed further through event simulation modelling this will allow analysis in greater detail of; payload, lag time, resource utilisation and performance evaluation through measures of system performance. Modelling data analysed in this paper, along with additional data would provide a further indication as to whether this type of private sector services can be profitable in the future.

To carry out event simulation modelling, an adaptation of a systems approach mesoscopic methodology (Marinov & Viegas 2011) will be employed, containing four steps: formulation, modelling, evaluation and a decision, along with a decomposition approach, wherein the network is divided into different parts to allow more detailed analysis of individual components.

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