Management Information and Management Practices: Freight Train Operation in Inter-War Britain

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ABSTRACT

This thesis seeks to explore how management practices developed in the U.K. using three of the big four railway companies as case studies. It will be argued that the managers in the UK, whilst aware of the debates on "Systematic" management and US practices, pioneered their own approach. Many of these practices were begun before amalgamation in 1923, but were only fully developed afterwards.

We begin by exploring the history of management with an outline in Chapter Two on management ideas from the turn of the 20th century to 1939. This is followed by an analysis of management practices from circa 1900 to the amalgamation of 1923 in Chapter Three. Chapter Four introduces the railway companies within the context of their commercial environment.

Chapter Five addresses the problem of achieving control of conveyance operations was addressed using similar methods by all companies. The key difference lay in the extent to which techniques were applied: the LMS developed centralised Train Control which enabled a systematic analysis of information to be made. The GWR and LNER introduced localised Traffic Control which did not allow such systematic analysis.

In Chapter Six we see how the LMS employed management consultants to study terminal work using Time and Motion studies. Both the GWR and LNER emulated LMS practice by 1939. However these techniques were not the only solution. The LMS identified particular problems after amalgamation which it was felt could be solved by such analysis. The GWR on the other had concentrated on the transhipment freight, with encouraging results.

Chapter Seven examines how railways perceived and interacted with their external business environment. New services were offered on the basis of research directed at identifying customers and the services they required. Agents of all companies would investigate opportunities for business and advise customers on their best options. The LMS and GWR had sophisticated Research Departments dedicated to the collection of commercial and economic information regarding the traffic available.

If we take the essence of what these were trying to achieve: a rational and scientific approach to management problems, then the railway companies appear in a favourable light. Whatever criticisms are made of the railways, it was not a failure to adopt new management methods.

TABLE OF CONTENTS

Chapter Five The Conveyance of Traffic and Management Control

Chapter Six The Control of Throughput: Managing Terminal Operations

Chapter Seven Managing Commercial Policy

TABLES AND ILLUSTRATIONS

ABBREVIATIONS

C&D..... Collection and Delivery
GCR..... Great Central Railway
GWR..... Great Western Railway
L&YR..... Lancashire and Yorkshire Railway
LMS..... London Midland and Scottish Railway
LNER..... London and North Eastern Railway
L&NWR..... London & North Western Railway
MR..... Midland Railway
NER..... North Eastern Railway
RCH..... Railway Clearing House
RRT..... Railway Rates Tribunal
S to S..... Station to Station

Chapter One

The Analysis of Management Practices

The role of management in generating competitive advantage is not often addressed explicitly. Relatively little is known about how management methods fit within the overall structure of company activity. Some analysis of business institutions has involved a historical approach, whilst theory such as that of Principal Agent models has stressed modelling the firm's behaviour. In such analysis the objective is to examine how management functions in terms of various attributes such as information, contracting, transactions costs, as well as minimising and maximising activity.[1]

This thesis examines the role of ideas and techniques combining to form management practices. It then examines their influence in the shaping of business policy. We will consider the analysis of management ideas within the context of their adoption by companies. It is an attempt to develop some understanding of how management techniques affected firms: how did management respond firstly to the technological and operational constraints imposed by their industry and secondly to the commercial environment? The collection and utilisation of management information forms an important part of our study. Management information will be analysed as a means to achieve management control over the commercial and operating aspects of the firm's business.

Three railway companies form the basis of this study; the London and North Eastern Railway, the London Midland and Scottish Railway and the Great Western Railway.[2] The period under consideration, from 1923 to 1939, covers most of their history. The reasons for the choice of companies reflect the task in hand: firstly they were large, complex organisations that required a great deal of management information. The environment in which they operated presented a severe test of management skills with competition from new technology, extensive regulation and

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1 See M.Rickets (1994) *The Economics of Business Enterprise*, (Second Edition) Harvester Wheatsheaf, for a discussion of these concepts as they relate to organisations. The comments of Bengt Holmstrom on JoAnne Yates paper in P.Temin (ed.) (1991) also relate to the interaction of theory and empirical studies. *Inside the Business Enterprise: Historical Perspectives on the Use of Information*, University of Chicago Press.

2 Henceforth known by their initials LNER, LMS and GWR respectively.

declining markets. Secondly, despite their size and importance relatively little has been written on how they conducted their business. The technical and engineering literature is extensive, but the business material has not been well covered, with some notable exceptions. What has been written concerning their performance has left us with the view that these businesses were generally moribund with little innovation.[3] This thesis will demonstrate that in several key aspects this was not the case. Managerial innovation was present in many areas of policy in all three companies.

The development of information systems from ad hoc to systematic to scientific management ideas in association with the problems of controlling large scale,complex operations has been addressed in several works.[4] This chapter begins with a review of how the internal operations of firms has been viewed by a variety of scholars, followed by a historiographical review of management history. Then it is possible to view the development of railway management in the wider context of how management developed in Great Britain from the Industrial Revolution to the turn of the twentieth century. We can then place railway management within the context of the wider development of management ideas such as the so-called "scientific" and "systematic" management movements. The historical analysis of management reflects the divide between the two approaches of the United States and Britain: the later develops mainly accounting based information, whilst the former involves much broader categories of information. Before we can examine management history, we first need to be clear about what is being addressed. That is we need a model of management.

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3 For a story of management failure see D.H.Aldcroft (1968) "The Efficiency and Enterprise of British Railways, 1870-1914" *Explorations in Economic History*, Vol. V, and for the inter-war period, *British Railways in Transition: The Economic Problems of Britain's Railways since 1914*, Macmillan; R.J.Irving (1976) *The North Eastern Railway Company, 1870-1914*, Leicester University Press, presents the case of the NER as an exception in pursuing "best practice."

4 Most histories of management focus either on the development of factory organisation or the growth of labour relations within firms. See for example D.Wren (1972) *The Evolution of Management Thought*, John Wiley and Sons, New York; D.Nelson (1975) *Managers and Workers: Origins of the New Factory System in the United States, 1880-1920*, Madison: University of Wisconsin Press.

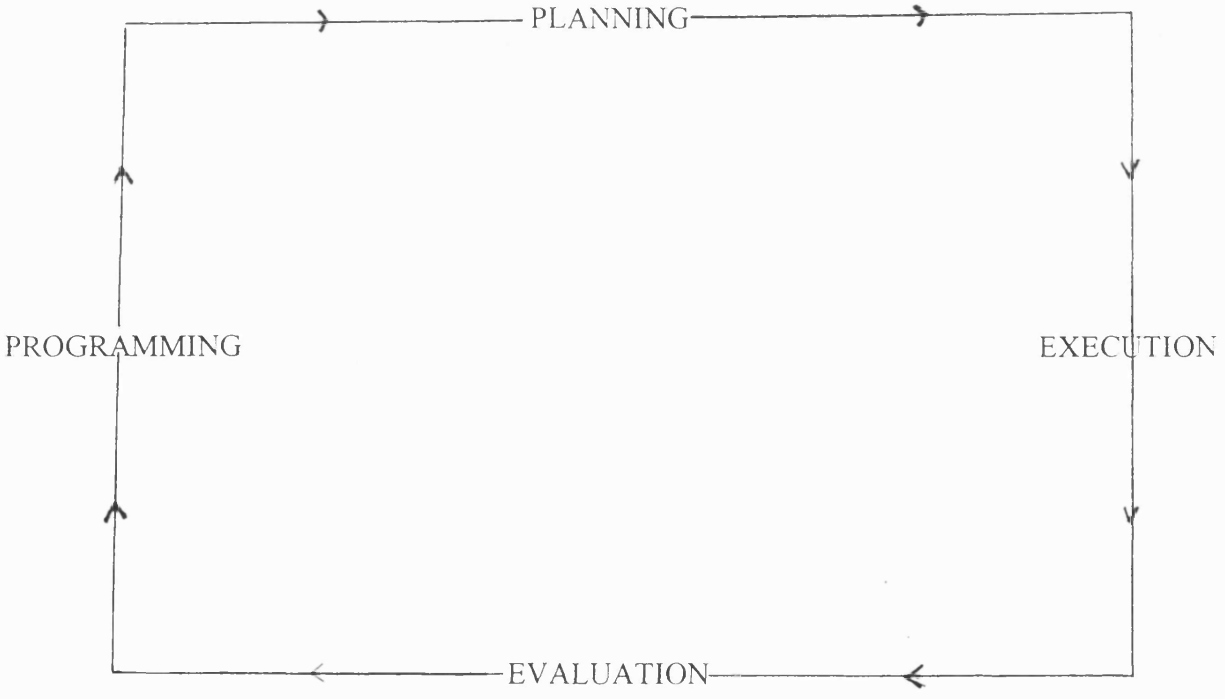

Figure 1 Model of Management Control

A Model of Management Control

There have been many systems of management which address different questions of management and organisation. In this thesis, one particular element will be examined, that of management control. By focusing on management control and defining what exactly we mean by control, we will be in a position to assess how management functioned within organisations.

At its most basic, control can be seen as the means by which objectives are achieved. Management practices are then the tools with which to achieve this, but do not guarantee that events will proceed as expected, that is they do not automatically give control. Control compared performance to given indicators, and adjusted behaviour accordingly.[5] Management practices interact with the element that was being targeted for control providing information about the "reality" in which business operated. The overall process of management control can be described by a circular process of "programming," planning, execution and evaluation [see Figure One]. Programming, defined as "the major programs that the organisation will undertake and the approximate amount of resources that will be allocated to each," is informed by the strategy determined by management.[6] Thus strategy is exogenous to this thesis: it is how such plans were implemented by managers that interests us here.

Feedback and the achieving of control within firms have been analysed by some economists.[7] Firms use control "variables" to achieve targets, determined by their chosen strategy. They also need to "..learn something about the world in which it [the firm] operates."[8] Feedback from the process provides information on performance. According to this model control helps firms deal with limited knowledge, uncertainty and multiple objectives.

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5 R.N.Anthony (1988) *The Management Control Function*, Harvard Business School Press, p7. The main definitions of management control are taken from Anthony.

6 Anthony *The Management Control Function,* p15 and p119.

7 See R.M.Cyert and J.G.March (1992) *A Behavioral Theory of the Firm*, Second Edition, London: Blackwells.

8 Cyert and March *A Behavioral Theory of the Firm*, pp217-218.

The process by which management techniques were turned into practices will be used to examine how control was achieved within the railway companies. The notion of control was used explicitly in the use of Train/Traffic Control for the solution of Conveyance problems. In Terminal activity, Time and Motion Studies and Transhipment analysis provided information so as allow for planning and standardisation of routines. Commercial control was found in the market research of the companies, which created the service.

However we have to be clear about what exactly it was that was being controlled. That is, what was the relationship between inputs and outputs, and how could they be altered? For manufacturing the Systematic Management movement was clearly defined, as we shall see in Chapter Two. It involved integrating the processes of production, materials handling, purchasing, within an overall "model" which could then be used to conduct the business. For the railways, the Terminal and Conveyance functions of transport could adopt a similar approach. However, as a service industry, with emphasis on maintaining and attracting clients, we have to define more clearly what it was that was being supplied. Therefore we need to consider what exactly the service provided by the railway was.

The Business of Transportation

For a transport service to be considered effective, several elements have to be combined: loads have to be delivered on time, in a good condition and at the right price. Whilst this is a basic requirement, to improve the service a schedule of arrivals and departures needs to be in place to match the needs of customers. Speed will be an important variable to control as related by the time it takes a load to traverse a given distance. Additional services such as delivery from terminal and storage will be important particularly if there is competition. On the railways in our period, the type of loads on offer also influenced the nature of the service. Some were in bulk which made investment in task specific equipment viable. Other loads were sent in batches using several wagons. Custom loads were also dealt with and these often involved the use of specialist crews, wagons and schedules. Transport had to be provided at once, so no inventory could be made and stored. This meant that an

important control variable would be the maximising of existing capacity. The fixed costs of the transport infrastructure were high and the capacity of lines and terminals had to be maximised.

The purpose of transportation was to add value to the commodities being carried, but in doing so a great deal of what could be characterised as "fabrication" was done by the companies. This ranged from the construction of private sidings to the packaging of products. In addition there was the loading of wagons which often involved more than just the placing of a load. Much thought was given to the design of packaging, especially if the commodity was dangerous. Careful loading was ensured by experimentation, before procedures were standardised. Regulations and working instructions were issued both by individual companies and the Railway Clearing House,(or RCH). It was important that all staff knew the labels pertaining to chemicals and realised the limitations of the commodity when loading.

Before we outline exactly what systems were used to attract revenue, we need to address the role of costs in shaping management control. As we shall see in Chapter Three, costs were studied under the rubric of railway statistics. These costs reflected a problem which has dogged the railways throughout their existence. Clearly there was a relatively high ratio of fixed to variable costs, although more correctly the fixed costs should be seen in part as sunk costs. However, what these were, and their relationship to the marginal cost of providing an extra wagon or train was largely unknown. We shall see in Chapters Five and Six how physical measures were available to offset the lack of financial estimates, but the problem still remained. The nature of the business meant that what we might call conventional cost analysis was extremely difficult. How, for example, were joint costs to be distributed between passenger and freight working, never mind between the many commodities carried on a freight train. The huge variety of consignments offered for transport made operations complex in the extreme, and this was reflected in the pricing of the service. This led the railways to develop systems by which they could collect and interpret commercial information.

The railways were not slow in attempting to develop traffic to enhance their revenue position. Commercial management practices consisted of three stages: finding

traffic, determining the services required, and quoting the rate required to attract the custom. The rail network offered services from within a given market area, full of both traders and competitors, especially in our period, road hauliers. They had to assess both the nature and quantity of traffic on offer, subject to competition. The nature of the information gathering process and the decisions to offer specific services will be discussed in the main body of the text.

The task of the commercial arm of the firm was to link the operating department of the railway to the trading customers. Control of commercial activity involved the monitoring of objectives such as revenue maximisation and the minimisation of costs. Commercial control was the ability to set prices and deliver specified services. These would be set according to the market research and targeted toward customer needs. This necessitated linking the control of the operating process to that of the commercial. This was achieved by regular meetings of Goods' Conferences and Superintendents' Committees. The Railway Clearing House decided on network wide price and service according to the inputs from company research and decisions. Companies would determine the transport requirements of customers and then calculate the price. In the initial stages of a rate offering, this would be referred to the Railway Clearing House for discussion. Then application would be made to the Railway Rates Tribunal for authorisation. Management control was vital because of the complex pricing of services. The market place was dynamic due to changing competitive conditions and level of services offered. Whilst there was a strong link between these, new technology also drove what was available. All this activity required information concerning the marketplace and the requirements of individual customers.

The business environment surrounding the railways affected what management practices were developed. The standard rate was used as just that: a standard.[9] From the nature of the carriage conditions and the competition within the region, prices would be determined. Using a standard as a starting point it functioned through the use of a commodity classification which determined the charges according principally

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[9] For more on the pricing system see Chapter Seven.

to "what the traffic could bear." This implicitly required a knowledge of how demand fluctuated as price changed: that is the elasticity of demand for transport. The basis for charging was related to a belief in transport as adding value.[10] This involved the cross subsidy of traffic and was a source of much criticism from those outside the industry, especially those carrying high valued products. Given that the whole purpose of transport was to add value to the products carried it does not seem so outrageous that the companies should base their charges on the proportion of a good's value. Transport extended the market for products, helping to realise economies of scale and specialisation in production. This was to create problems for the railways in that they would be seen as a public good largely because of this.

The operational aspects of rail transport were less capricious but equally complex. Terminal activity required the movement of loads through depots using vast amounts of manpower and /or many types of machine. Packaging and storage became increasingly accepted as part of the railways' job. The growth of road competition combined with the depression in several key trades made it important for the railways to offer these services. This meant combining operational and commercial aspects of their business to reflect the changing environment.

The problems of management control faced by the railways can only be appreciated if we have a wider appreciation of how other businesses had addressed such difficulties. This leads us to consider the history of British management.

The Development of British Management

Any discussion of the history of British management history has to begin with the analysis offered by S.Pollard's *The Genesis of Modern Management* (1965). It remains the only comprehensive guide to how business was carried on during the Industrial Revolution and has provoked responses from accounting historians in recent

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[10] Perhaps the best known text on this is W.M.Acworth (1905) *The Elements of Railway Economics*, Clarenden Press, Oxford, although almost all texts discuss the principles involved. What follows is drawn largely from the second edition of Acworth, revised in 1924 by W.T.Stephenson.

years.[11] First we need to define what exactly we mean by management and to distinguish it from entrepreneurship, a task that is made easier by using the formulation adopted by Pollard. He borrows from F.Redlich to distinguish between what entrepreneurs do and the process of management.[12] The former takes strategic decisions, the latter the tactical ones. So entrepreneurs will take decisions concerning the objectives of the company whilst the management ensures that the task is done. Similarly, M.Casson views the entrepreneur as "someone who specialises in taking judgemental decisions about the co-ordination of scarce resources".[13] A.Chandler reflects all the above definitions when he splits his categories into formulation and implementation, entrepreneurial and operating; the entrepreneur decides on resource allocation whilst operation is left to managers.[14]

Sometimes the managerial function may offer scope for entrepreneurial behaviour and the two often interact. Usually the key difference is that the manager's recommendations have to be vetted by the entrepreneur, as in the case of a Board of Directors. Managers can have a great deal of influence on how businesses objectives are formulated but it is where the final decision is made that may be said to count for most. Delegation to management is in itself a strategy that can reap huge rewards or signal failure. But for the purpose of this thesis, the formulation of strategy is taken as being exogenous to the management practices under discussion.

For the purpose of this thesis the managers will be seen as developing and implementing management controls to maximise revenue and minimise costs. Whilst they provided reports to the Board of Directors, it was the former two objectives that dominated much of their time.

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11 S.Pollard (1965) *Genesis of Modern Management*, Edward Arnold See J.R.Edwards and E.Newell (1991) "The Development of Industrial Cost Management Accounting Before 1850: A Survey of the Evidence" *Business History*, 33, and R.K.Fleishman and T.N.Tyson (1993) "Cost Accounting during the Industrial Revolution: the Present State of Historical Knowledge" *Economic History Review*, XLVI, 3, for the most recent surveys.

12 Pollard *Genesis*, p3.

13 M.Casson (1982) *The Entrepreneur: An Economic Theory*, Oxford: Martin Robinson, p27.

14 A.D.Chandler (1962) *Strategy and Structure*, London: The MIT Press, p11.

Early Management Practices

The above definition of management allows us to place the development of management within a context. The Industrial Revolution created some new industries and extended many others. Some of the key elements associated with industrialisation were the result of management decisions. This changed the nature of the management information required.

The onset of industrialisation required greater control of many processes. To produce steel, mine coal and make steam engines, the engineering became more complex. This then had an impact on the business decisions being made. The business environment was made more complex, necessitating more information upon which to base management decisions. Temperature, weight, bulk and speed all had to be monitored to enable control to be maintained. The market which these products were sold into was also becoming more complex. Economies of scale and scope could only be captured if the right products were produced on time and of sufficient quality. New products and markets focused attention on understanding what clients wanted.

All this made management practices a vital ingredient of industrialisation. In the first instance it was measures designed for internal accounting that were then used to inform managers of their environment. The lack of published material on cost accounting such as instructional texts, references in journals etc., has led to the conclusion that cost accounting was not well developed.[15] According to this view, it was not until Garcke and Fells' "Factory Accounts" in 1895 that cost accounting developed. However this confuses the process of diffusion through education with that of practice: the widespread secrecy surrounding many industrial processes would have militated against such diffusion.[16] Instead of assuming that costing was not done we might look for a substitute and this we might find in the information required for

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[15] See D.Solomons "The Historical Development of Costing" in Solomons (ed.) (1968) *Studies in Cost Analysis*, Homewood: R.D.Irwin. H.T.Johnson and R.Kaplan *Relevance Lost: The Rise and Fall of Management Accounting*, Boston: Harvard University Press summarises similar ideas.

[16] Fleiscman and Tyson "Cost Accounting during the Industrial Revolution" *Economic History Review*, XLVI, 3, p507.

costing as used by engineers who were by definition involved in operations and often in commercial activity. Indeed we may argue that the defining characteristic of an engineer is someone "..who does for one pound what any fool can do for two."[17] Thus performance details could always be used for management calculations. If such costing systems did exist, it should be of no surprise that many early records of such analysis have not survived, given their informal nature. Also the existence of cost and financial accounts as a unified whole should not necessarily be taken as the only indicator of managerial sophistication. Despite Pollard's extensive use of company archives his conclusion that "..entrepreneurship in the industrial revolution did not develop to any significant extent the use of accounts in guiding management decisions,"[18] can no longer be sustained.

Although Pollard did consider the broader management methods recent scholarship has focused almost entirely on cost/management accounting: there is very little regarding the training of managers and foremen, industrial relations, purchasing, factory layout etc. Thus the issues that, it will be argued, concern management as it has developed in the 20th. century - control, organisations etc. - have not been addressed in the context of the Industrial Revolution. Given the size of such institutions as the Royal dockyards and landed estates, it is doubtful whether another of Pollard's conclusions that "..there could be no precedents for modern management problems before..1750..because the whole economic environment [was] different" will be sustained after further research.[19]

The organisations that seem to show most knowledge of cost accounting methods, whether by virtue of operational size or survival of records is unclear, are metal working, textiles and mines. What they all have in common is that the

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17 E.Sargent "Frederic Duckham and the Millwall Docks 1868-1909" *Transactions of the Newcomen Society*, 1988-89 Vol. 60, p67.

18 S.Pollard (1965) *Genesis*, p248.

19 Pollard *Genesis*, p51.

complexity of operation was increasing and for many this meant more information for controlling business.[20]

The textile industry moved from the putting out process to more centralised production in mills. The centralisation of work and use of machinery on a large scale meant that co-ordination had to be effective. Whilst it was true that control was important for combining the activity of domestic producers under the old putting out system, the constraints were different. Large amounts of fixed capital were invested in the mills which had to be justified as factory owners attempted to capture economies of scale and scope. Some of the calculations demonstrated considerable attention to detail: the Strutt archive reveals expenses measured down to one-thousandth of a pence, and the allocation of costs to activities where the process performance may be measured via quarterly cost comparison. The exact value of such precise allocations of expenditure is a moot point but it does demonstrate an interest in the minutia of the production process. Nor was this the only example: the Marshall mill records indicate that forty different categories of expense were calculated for the biannual accounts. Depreciation was allocated to the department which was incurring the cost, a practice not always followed by others. This seems to be a function of the increasing complexity of the production process and the need to monitor the various aspects for errors if not inefficiency.

Similar evidence is found in the metal working industry: the Carron company provided monthly reports of costs per ton with an explanation for any fluctuations and weekly evaluation of blast furnace performance.[21] In 1768 there was even a "time and motion" study conducted of coal extraction and the 1770's saw the adoption of transfer pricing.[22] Carron was not alone either, in use of such tools. The Darby company used weekly accounts to examine the fuel efficiency and maintenance record of each steam

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20 For what follows see J.R.Edwards (1989) "Industrial Cost Accounting Developments in Britain to 1830: A Review Article" *Accounting and Business Research*, Vol.19. No 76 and R.K.Fleischman and L.D.Parker (1991)"British Entrepreneurs and Pre-Industrial Revolution Evidence of Cost Management", *The Accounting Review* , April 1991.

21 See in addition Fleishman and Parker, "British Entrepreneurs,"*The Accounting Review*, April 1991.

22 Edwards "Industrial Cost Accounting," *Accounting and Business Research.*

engine, allocated overheads and used extensive analysis for making decisions on investment, technology use and vertical integration.

Evidence of quite advanced accounting methods has also been described in the pottery factories of Josiah Wedgwood and the engineering firm of Boulton and Watt.[23] Wedgwood broke down his expenses into fourteen categories and used cost data to help him price products in line with what we might call a marketing policy which included very clear notions of fashion and consumer behaviour. Again we see great attention to detail with, in 1794, estimates of the cost of crests and cyphers painted on his products and records of "..the cost of enamelling seven different patterns on 36 different products, and then the cost per inch of different sizes".[24] Indeed it appears that there were many of the features associated with modern enterprises present such as a policy of product differentiation, a clocking-in scheme, the use of science and advertising, all supported by what might be described as a system of management accounting.

The management of Boulton and Watt used an approach akin to what we might now call production engineering. Stock had to be controlled in order to ensure adequate throughput and the layout of the machine shops was ordered to aid the flow of work. The increased specialisation and division of labour that often accompanied factory organisation implied increased planning if output was to be maximised. Power sources, machine layout, storage of stock and raw materials had to be co-ordinated if operations were to proceed smoothly. Time could all too easily be wasted if there was no attempt to reduce handling and maximise throughput. In many cases this was not an option. For example a blast furnace could not be said to work if it was not possible to adequately load the coal and ore of sufficient quantity into the retort. Proper control/co-ordination was required as part of the system as a whole, before attempts could then be made to fine tune its performance.

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23 See N.McKendrick (1970) "Josiah Wedgwood and Cost Accounting in the Industrial Revolution" *Economic History Review* XXIII and E.Roll (1930) *An Early Experiment in Industrial Organisation*, Longmans, respectively.

24 McKendrick (1970) "Josiah Wedgwood," *Economic History Review*, XXIII, p58.

Perhaps the most important question concerning the above case studies is the degree to which they were typical. Given the paucity of information about so much of the internal decision making of large, let alone medium and small sized businesses, it is that these techniques were used at all that is important. Indeed it might also be argued that the very existence of factory organisation was limited and so management was not very important to the economy as a whole.[25] The existence, in certain firms, of quite advanced methods of managing show that the business community was well aware of the need to monitor their operations and plan for the future. This was part and parcel of the technological organisation necessary for such production: as Edwards and Newell have phrased it, accounting was a "social technology".[26]

To summarise this brief review of management practices, we can identify several areas where companies used what we might call modern techniques: basic costing led to comparisons between alternative projects and included the calculation of overheads. The change in profits as a result of capital investment was also noted in a calculation reminiscent of modern return-on-investment calculations.[27] Whilst all the above examples imply that there were calculations made to enhance company performance, it was the arrival of the railways that led engineers, politicians and company officials to devise new methods of control. This was particularly so in the United States.

Management Information and the Firm in the United States

This section attempts to bring together the business and management history literature. It is largely focused on the United States because the history of management practice is more developed in the US literature. Studies of how strategy and structure interact have been published, but little has so far been written on the role

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25 See M.Berg (1985) *The Age of Manufactures* London: Fontana and R.Samuel (1977) "The Workshop of the World" *History Workshop*, 3, for evidence that small scale, hand manufactures persisted long into the 19th. century.

26 Edwards and Newell "Development of Industrial Cost Management Accounting," *Business History*, 33, p35.

27 Edwards "Industrial Cost Accounting Developments," *Accounting and Business Research*, Vol. 19, No. 76, p311.

of information in the firm. The work of Alfred Chandler on how strategy and structure function can be extended by the analysis of management information.[28] The work of JoAnne Yates and others has begun to do that.[29] We begin with a review of Chandler, followed by the work of those concerned with the history of business information.

The work of Chandler that most concerns us here is that contained in *Strategy and Structure*. Chandler describes the growth of the multi-divisional firm with reference to the market and industrial structure of the firm. So in the case of the railroads in the US, long distances created a need for divisions based upon geography to cope with the complexity of operations. Other firms, such as steelworks, would be organised on functional lines between processes or on product lines. The more that firms integrated vertically, the greater the need to create viable units of management. What Chandler concluded was that the changing administration of the company and its pattern of growth were closely related.[30] This process of administration was broken down into Strategic and Tactical decisions. Strategy was long term and based upon views about the appropriate industry for the firm: "..the determination of the basic long term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals." Tactical decisions involved the day to day running of operations given that strategy. From this structure developed, the "..organisation through which the enterprise is administered." This included "..the lines of authority and communication" between offices and "..the information and data that flow through these lines.."[31] This view of business

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28 A.D.Chandler (1962) *The Visible Hand: The Managerial Revolution in American Business*, London: Harvard University Press and (1990) *Scale and Scope: The Dynamics of Industrial Capitalism*, London: Harvard University Press.

29 JoAnne Yates (1989) *Control Through Communication: The Rise of System in American Management*, Baltimore: The Johns Hopkins University Press; P.Temin (ed.) (1991) *Inside the Business Enterprise: Historical Perspectives on the Use of Information*; N.R.Lamoreaux and D.Raff (ed.) (1995) *Coordination and Information: Historical Perspectives on the Organisation of Enterprise*, University of Chicago Press; H.T.Johnson and R.S.Kaplan (1987) *Relevance Lost: The Rise and Fall of Management Accounting*, Harvard Business School Press; Boston Mass.

30 Chandler *Strategy*, p3.

31 Chandler *Strategy*, p13 and p14.

administration tends to merge the role of entrepreneurs and managers. However it does not detract from the central message of the analysis: strategy and structure are closely related. New demands created a need for new equipment which in turn led to a drive for more efficiency. According to Chandler's model this lead to a change in business structure: the original structure reached a point at which it could not continue to function efficiently.[32] As business responded to changing technology and expanding markets, it was necessary to formalise the previously informal means of communication. As Chandler put it, "Channels of communication and authority as well as the information flowing through these channels grew more and more inadequate."[33] It is this change that Yates explicitly addresses.

JoAnne Yates describes the nature of internal communications which helped form the strategies and structures sought by business. Communication was used in order to achieve control which Yates defines as: "Managerial control - over employees (both workers and other managers), processes, and flows of materials - is the mechanism through which the operations of an organisation are coordinated to achieve desired results." At the end of the nineteenth century "..formal internal communications emerged as a major tool of management, exerted toward the goal of achieving system and thus efficiency."[34] However it was not "..growth per se that required the development of the internal communication system, but the managerial philosophy that evolved in response to growth."[35] Thus the development of management ideas and techniques into practices was from the supply side. People recognised the increasing complexity of business and began to think about it. However without a model of management control it is very difficult to assess which way round the causality works.

In Yates' analysis the notion that systematic management was a precursor to scientific management is rejected. The latter was part of the former, as it dealt

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32 Chandler *Strategy*, pp384-86.

33 Chandler *Strategy*, p393.

34 Yates *Control*, pxvi.

35 Yates *Control*, p2.

specifically with shop-floor activity. "Scientific management" was promoted by those critical of US railroads, such as Judge Louis Brandeis in the Eastern Rates case of 1911.[36] Systematic management was more concerned with the overall application of method to the running of business. The main elements of this were the replacing of individual knowledge with that of the organisation. That is, it was codified by the writing of organisation manuals and books of working practices. Managers at the top of the hierarchy made decisions rather than those on the spot, although there would have been some allowance for decisions which were either relatively unimportant or which could not be transposed to management. Also the levels of management were responsible for those below, creating a hierarchy where authority was even more rigorously defined and enforced. It was this diminishing of the individual's role which has been most commented upon by both critics of such methods, and those seeking to explain how complexity was dealt with in organisations.[37] As Yates has said, systematic management "..contributed to the decline of ad hoc, word-of-mouth management and to the rise of formal internal communication."[38] In another work this is elaborated on by introducing the concept of "ideology."[39] This is not used in the political sense but in the context of a belief system: ideologies "..shape both the environment in which people understand situations and define options, and the decisions they make."[40] Thus Yates notes the interaction of information and management ideas that help the firm perceive its environment and act accordingly to

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36 Yates *control*, p15. The Eastern Rates Case was famous because Brandis noted that if the railway companies wanted to increase their rates, they should first improve their efficiency by using scientific management.

37 See M.Jelinek (1980) "Towards Systematic Management: Alexander Hamilton Church" *Business History Review*, 54; and J.Litterer (1963) "Systematic Management: Design for Organisational Recoupling in American Manufacturing Firms" *Business History Review*, 27.

38 Yates *Control*, p11.

39 JoAnne Yates (1994) "Evolving Information Use in Firms, 1850-1920" in L.Bud-Frierman *Information Acumen*, London: Routledge.

40 Yates (1994) "Evolving Information Use in Firms," *Information Accumen*, p27.

what it sees. Thus "..publications, associations, consultants and contacts, serv[ed] as a template for managerial strategy and practice."[41]

For *Control Through Communication* Yates draws from three US companies - the Illinois Central Railroad, Scovill Manufacturing and E.I.DuPont de Nemours and Company, (chemicals), - to map the development of management methods and in particular the use of information technologies. On the Illinois Central the story told is one of managerial reform in the face of regulatory pressure. Under Stuyvesant Fish in the 1880's and 1890's, the company reformed its management practices. From the concerns of finishing construction and ensuring safe operating, the company had to monitor its operations and ensure that the hierarchy functioned smoothly. As Chandler has noted, the railroads in the US pioneered management technology in overcoming the problems of long distance coordination and control. Regulations and circulars were produced on the Illinois Central from its inception, but under Fish they took on a new meaning as part of the company's corporate memory. The key to Yates' argument is that this replaced the individual: "Rule books were introduced to provide a more complete and permanent organisational memory that transcended the individual."[42] This was the route to the systemisation of information: no longer would performance be related to the individual. With the setting of standards for performance and the creation of organisational memory, it was possible for "best practice" methods to be diffused through the organisation.

In Scovill Manufacturing the transition toward more systematic management began with incorporation in the 1850's.[43] Prior to this it seems that oral communication dominated internal communications. The move to open a New York store in the 1850's provided the impetus to change how operations were managed. The changing technology of communications, and associated cost reductions, led a gradual change. This was presided over by C.P.Goss and M.L.Sperry who as Secretary and Treasurer helped devise many of the management systems. Chief among these was

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41 Yates (1994) "Evolving Information Use," *Information Accumen*, p27.

42 Yates *Control*, p157.

43 Yates *Control*, Chapter 6, pp159-200.

an improved book keeping system and adoption of communication technologies such as the telegraph and internal telephone. However company growth, from a thousand employees in the 1890's to four thousand in 1914, prompted further more far reaching changes.[44] The problem lay in how to coordinate the activity of the many foremen; the use of the circular and written instructions was seen as an important element in achieving management control. Reports were commissioned to inform management of the needs of foremen and workers. This in turn lead to the creation of an infrastructure for collecting, collating and analysing information. Efficient means of information retrieval and storage then became important.

Communication between managers grew laterally as the telephone encouraged communication. Any decisions were usually confirmed in writing and the growth in the number of operating divisions increased such contacts. By 1919 the number of reports generated had risen to over two hundred a year, leading to the setting up of a statistical office.[45] The primary task of this office was to standardise reporting and the design of forms: it was to act as a "clearing house of reference" for the company.[46]

Finally Yates describes the activities of Du Pont.[47] As with Scovell Manufacturing, early management was oral with occasional written reports and letters. The growth of a systematic approach to management came only after a split in the family in the 1880's. Lamont Du Pont left, frustrated at the conservative management practices, to found his own company, the Rapauno Chemical Company. These techniques were then transferred back into Du Pont at the turn of the century. Sales and production data were collated using the telegraph and standardised reporting formats.

It was the use of Committees to manage that marked the change between the old order and the new. The most important of these was the High Explosives Operating Department, or HEOD. It coordinated plant working by standardising

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44 Yates *Control*, p169.

45 Yates *Control*, p187.

46 Yates *Control*, p190.

47 Yates *Control*, Chapters 7 and 8, pp201-270.

procedures and equipment. This was accomplished by the instillation of communications throughout the organisation. Of all the techniques developed by Du Pont it is probably the Return on Investment,ROI, calculation that is most famous.[48] This was a financial measure to assess performance across divisions and over time. Such summary information was also provided by a chart room where diagrams and charts were displayed on hangers in front of managers.

Yates concludes by noting that it was neither changing technology nor size that determined the use of systematic management. Other railroad companies were smaller than the Illinois Central, yet had more systematic management. Scovill was innovative in management organisation as it grew, and when it stopped doing so problems of control arose. The implications from Yates' study are that management reform was necessary for sustained growth and successful performance. We come back to the problem that there is no measure of performance that enables a clear conclusion one way or the other as to the role of information systems in company performance. What we can say is that the case studies reveal the importance of management information in shaping strategy and structure. For example the Du Pont Committees, a change in structure, were a response to the need to control the organisation as it grew more complex. The information received by managers would then go on to influence strategy.

Similarly in studying Dow Chemicals' use of information, M.Levenstein defines the role of information within the firm in terms of monitoring and planning.[49] The former distinguishes between the monitoring of both internal processes and that of people's honesty and effort. The planning function is spilt into two - the long and the short term. The type of information required by these categories differs: monitoring information requires rapid collection and use. Planning information also requires that some data be collected before a decision is reached, to supplement that gathered from the monitoring functions.

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48 Yates *Control*, pp265-266. This was calculated from various statistics but was basically turnover divided by earnings as a percentage of sales.

49 See M.Levenstein "The Use of Cost Measures: The Dow Chemical Company, 1890-1914." in P.Temin ed. *Inside the Business Enterprise: Historical Perspectives on the Use of Information.*

Why should the late 19th century see such changes in how firms were run? In Yates' view it was the interaction of the supply and demand of information technology and the size/structure of the firm and market, as well as the ideology. She suggests that fashion and fads might cause firms to adopt given systems as it imparts a certain kudos. Citing evidence from Scovill Manufacturing, where "several" reports instigated earlier under attempts at systemisation were discontinued, Yates concludes that at least part of the technologies were taken up as a "fad" and had no real use.[50] However it is clear from reading some of the literature, such as *System*, from the early part of this century that the introduction of office techniques required a learning process, and perhaps this accounts for the process Yates observes.

Taking the source material first, L.Jenks discussed the growth of management ideas in the late 19th and early 20th centuries.[51] He distinguished between three phases in the growth of management ideas: the "ad hoc" use of ideas developed out of individual company requirements, uncodified by publications or professional examinations. Secondly, there was a structured approach to management with "little clusters of socially sustained norms and concepts whose communication beyond the individual firm was rare." The third approach was when "In making decisions about organisation and procedures it became the norm for firms to take account of what others were doing.." That is the development of a "professional" approach to management through journals, texts, etc and research establishments in the transmission of specific management skills. We propose to use material such as Jenks suggests. As he notes: "It is quite possible, by diligent scrutiny of handbooks, textbooks and public relations releases to characterise certain states of opinion as "prevalent" and to state what have been widely regarded as "standards" both as to procedures and goals."[52]

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50 Yates (1994) "Evolving Information Use in Firms," *Information Accumen*, p45.

51 L.H.Jenks (1960) "Early phases of the Management Movement" *Administrative Science Quarterly*, V.

52 Jenks "Early Phases of the Management Movement," *Administrative Science Quarterly*, pp423-424.

Apart from Yates' general analysis there have been more specialised studies that cover various aspects of management and information. These can be split into those that examine what we may define as techniques, and those that describe ideas.

S.Dolman described how firms developed Discounted Cash Flow (DCF) in an attempt to relate their net earnings to the capital invested.[53] As technology developed, high capital costs became common in many areas of industry, such as railways and chemical plants. Tracing the origins of DCF via Du Pont's Return on Investment (ROI) calculations the study stresses the importance of journals, professional associations and texts in the diffusion of ideas.

The role of the business school also appears to have been important: "The relationship between academic researchers and industrial managers was also a fundamental element in the history of the utilisation and diffusion of modern capital budgeting methods."[54] DCF develops from the needs of engineers to monitor capital investment. The solution builds on the work of others, especially in the field of railroad engineering. By 1952, ATT were encouraging the use of such methods through the medium of their manual *Engineering Economy*. This coincided with the rise of the management consultancy and demand for textbooks. For example, Joel Dean published *Capital Budgeting*, in 1951 and he was both consultant and academic.

Conformation of this is also provided in another quarter by a study of the progress function by Dutton et al.[55] This technique related the effect of cumulative production on the cost structure of a given product at the level of the firm (ie they are not experience curves that tend to do the same task for a whole industry). In the first instance it was aircraft production that provided most of the empirical data. Once again trying to make sense of complexity was the motivation for this development as "Progress Functions provided management with a relatively simple technology for

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53 S.P.Dulman (1989) "The Development of Discounted Cash Flow Techniques in US Industry" *Business History Review*, 63.

54 Dulman (1989) "The Development of Discounted Cash Flow Techniques," *Business History Review*, 63, p584.

55 J.M.Dutton, A.Thomas & J.E.Butler (1984) "The History of Progress Functions as a Managerial Technology" *Business History Review*, 58.

dealing with a phenomenon of great underlying complexity."[56] Here again it was the communication between the engineers and academics which helped lead the way. In addition there was also an important role for government. Early research and development efforts had not resulted in the expected quality or quantity of aircraft. As in Yates' study, individuals are important carriers of management reform. T.P.Wright of the Civil Aeronautics Administration is singled out as an early champion of the Progress Function.

Although the nature of the technique is important it may only be properly understood if placed within the context of the organisation within which it is applied. Studies of how management information developed within institutions have proved useful. A study of accounting information within the US Interstate Commerce Commission (ICC) is a good example.[57] The 1887 Act of Congress demanded that there should be comparability of accounts between railroad companies as information asymmetry was a major problem for investors and legislators. With rate control, the other key element of the act came a requirement for data. Annual statistical compendiums on railway performance were collated and published and more readily comparable balance sheets produced.

Estimates of the cost of railway services became important as part of the rate control function. Railway companies started using cost studies which could be produced in courts as evidence. These would become important especially as the average ton mile was rejected as a unit of cost measurement. Instead special studies were produced on a per case basis. Eventually the ICC approached the issue of rate regulation by using long run marginal cost estimates. This was developed by Max Lorenz at the Bureau of Transportation Economics in Washington. Many variables were taken into consideration, including traffic density, price levels, trainweight, cargoes and even including operating practices and conditions of loading.

Although the special studies did provide some guide as to rate setting the key problem was how to arrive at the legislated notion of a "fair return" on assets. This

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56 Dutton et al (1984) "The History of Progress Functions," *Business History Review* 58, p204.

57 See P.J.Miranti (1989) "The Mind's Eye of Reform: The ICC's Bureau of Statistics and Accounts and a Vision of Regulation, 1887-1940" *Business History Review*, 63.

was a difficulty that plagued not only the railways but all regulated utilities. In 1913 railway assets were valued but this took some time and the criteria were not clear: should assets be valued at cost when purchased or at "reproduction" costs? The valuation reports were intended to aid the ICC in their decisions on mergers. The valuation reports were not suitable for this as the key variable for this decision was identified as discounted future earnings rather than the asset value. The basis upon which the information was collected differed enough to ensure that it was not suitable for use in other areas of management or regulation.

This study of information use within the ICC draws an interesting parallel with Yates' analysis, except here the agent of change is the regulating body rather than an individual such as Fish or Du Pont. However both acted to change management practices. The effect of war on management may have a similar effect. Robert Cuff's description of the Central Bureau of Planning and Statistics in the US supports this.[58] The expert concerned in this case was one Edwin Gay from the Harvard Business School who established data gathering to provide information for planners in World War One. He aimed to provide information which would enable the government to more effectively control resources vital to the pursuit of the war. The initial analysis was to coordinate shipping so activity was split between the Shipping Board and War Trade Board. The Shipping Committee collected data on size, draft, carrying capacity and speed of each ship. From this initial success a War Industries Board was established.

Gay was able to build upon a wide range of both formal and informal contacts. He was the first Dean of the Harvard Business School, and he aimed to install notions of "more professional business practices" to businessmen. In this he had the assistance of A.W.Shaw, a publisher of *System* magazine, who had also pioneered the use of the case study as a teaching aid at Harvard. Shaw used his influence to help codify business practice and eventually took up a post as head of the Commercial Economy Board, to which some Harvard faculty followed.

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58 R.D.Cuff (1989) "Creating Control Systems: Edwin F. Gay and the Central Bureau of Planning and Statistics, 1917-1919." *Business History Review*, 63.

The use of accounting information to achieve management control has been an important subject. This was highlighted in a historical context by the study by H.T.Johnson and R.S.Kaplan in their discussion of management accounting and its use in industry.[59] This has engendered a debate on the role of management accounting information and the influence of ideas in the business world.

The main thesis of the book is that accounting information has lost its relevance since the early part of this century: "Today's management accounting information..is too late, too aggregated, and too distorted to be relevant for managers' planning and control decisions."[60] Managers lost the ability to understand their business because they were recruited from the ranks of those involved in administering rather than producing. Academics do not escape blame either. Since the 1920's at least, the work of academics is seen as generally lacking relevance in many areas. While it is conceded that most of the literature on management accounting was being written by academics, it is claimed that the models developed, such as agency theory, information economics and operations research, were simplified in the extreme.[61] This is contrasted with the advances made in 19th century management accounting which came from practitioners such as Andrew Carnegie and Pierre Du Pont. Between 1925 and 1980 It is claimed that "..virtually no new ideas have affected the design and use of cost management systems," between 1925 and 1980.[62] Financial information was, and is, driving internal management decisions. Accurate product costing is not possible with all the potential problems that involves in deciding product mix. The need to produce data to a "financial accounting" timetable shifts the focus from management, ie operational, decisions. This forms the basis for the authors to conduct a wide ranging historical survey over the history of mainly US management accounting. The key to whether this thesis is accepted or not depends crucially on

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59 Johnson and Kaplan, *Relevance Lost*.

60 Johnson and Kaplan *Relevance*, p1. This criticism forms part of a wider debate on Activity Based Costing, Kaplan in particular was offering as a solution to the need to obtain better information for product costing.

61 Johnson and Kaplan *Relevance Lost*, pp175-176.

62 Johnson and Kaplan *Relevance Lost*, p176.

how management accounting is defined. As we shall see in discussing the growth on management in the industrial revolution, this has important consequences. The source material accounting historians use has influenced the conclusions drawn. Instead of examining the internal mechanisms of the firm the focus has been on the development of codified practices and professional standing rather than what managers and engineers were doing at the time.

Whilst Johnson and Kaplan have used history as a framework with which to criticise present management, their analysis has been applied in a historical context by Gregory Thompson.[63] Drawing explicitly on the premise that management accounting had failed to deliver information on product costs, the experience of the Southern Pacific railroad is used as a case study. This study's conclusions agree with those of Johnson and Kaplan: because of the regulated environment, there was less pressure to develop accurate cost estimates. The use of economic theory and accounting information is described, with an emphasis on understanding how ideas described reality. Many cost calculations were revealed as inadequate because they failed to reflect the behaviour of the activity under consideration or because information was misused in some way. For example it was not until 1915 that passenger and freight costs were separated, thereby enabling managers to assess the contribution such operations were making to profits. Cost calculations via regression analysis were attempted in the 1920's but it was not until the 1930's that they were regularly used in cases before the ICC.

This thesis aims to prove that given the operating and commercial constraints of the time, the British railways did attempt to manage using systematic methods of management. However the thesis also endeavours to examine how in general management control in large organisations works, using the railways as a case study. It describes how the railway companies achieved management control of the conveyance, terminal and commercial functions. Beginning with a review of the ideas

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63 See G.L.Thompson (1993) *The Passenger Train in the Auto Age: California's Rail and Bus Industries 1910-1941*, Columbus Ohio State University Press; (1989) "Misused Product Costing in the American Railroad Industry: Southern Pacific Passenger Service Between the Wars" *Business History Review*, 63; (1995) "How Cost Ignorance Derailed the Pennsylvania Railroad's Efforts to Save its Passenger Service, 1929-61." *Journal of Transport History*, Third Series, Volume 16, No. 2.

that were being discussed at the turn of the century by writers on scientific and systematic management, we consider what general approaches to management control were available to railway managers. Then the pre-amalgamation management activity of the railway companies is examined. We then go on to discuss the specific approaches to management control for conveyance, terminal and commercial activity.

Chapter Two

The Development of Management Practices

The increasing complexity of tasks in business toward the end of the 19th. century led to the development of practices designed to support managers. This meant more than just a new accounting system: it was engineers who devised many of the measures and tests which enabled complex tasks to be performed in a manner which did not bankrupt the company. Their concern was the internal production process rather than the post-hoc results of financial performance required for external use. It was this that created the environment within which "scientific management" could flourish. H.Johnson and R.Kaplan place this movement in the years 1880-1910, for the US, as it did not become accepted in Britain until after the First World War.[1] Then the move toward the "Rationalisation" of British industry involved discussing the issues arising out of the scientific approach to management. As Hannah has observed "What is clear is that within their varied management structures of the 1920's and 1930's, British manufacturing companies were directing a good deal more resources to management problems than previously."[2]

This chapter explores some of these ideas by drawing on the literature developed by British and American authors. This anglo-american approach is necessary because the latter influenced the former.[3] Despite the lack of widespread acceptance initially, there was a continuing trans-atlantic debate on new methods of management. Both sets of authors will be discussed as their work comprised what was, in effect, a single coherent literature. We will see how the scientific approach to management developed and how its were ideas implemented according to some of the consultants involved. The planning and monitoring of operations will be described as

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1 See Kaplan and Johnson,*Relevance* p47. Also S.Kreis "The Diffusion of Scientific Management: The Bedaux Company in America and Britain, 1926-1945" in D.Nelson (1992) (ed.) *A Mental Revolution: Scientific Management Since Taylor*, Columbus: Ohio State University Press which discusses how one particular consultancy used scientific management.

2 Hannah *Corporate Economy*, p86.

3 See Chapter 3 "The Rationalisation Movement" in Hannah *The Rise of the Corporate Economy*.

they were related in general to the implementation of management control. Operations were carried out according to information collected and analysed by managers shaping the future of the company. This will be extended to include the role of scientific management in the office, as even here there were economies to be realised in part by the adoption of the scientific model.

The Scientific Approach to Management

How were people thinking about the problems of management at the turn if the century? The answer to this question requires that we define more clearly concepts of standardisation, system and efficiency. These were seen as a way for managers to achieve better control over the business environment. We will see how management was seen as a hybrid art/science with implications for the setting up of management practices.

However, a word of caution is necessary. The implementation of these management practices was not always a panacea. For example, a trenchant critic of the whole scientific management movement was J.J.Gillespie, who in 1938 published *The Principles of Rational Industrial Management*. His main criticism is worth quoting in full:

> The assumption that the search for exact knowledge, by the use of scientific method, plus the instruments of that method, make management scientific, is, to be blunt, plainly ridiculous. Scientific method is only a tool of management, an important one no doubt; there is, however, no virtue in scientific management as such; its virtue and its vice is a reflection of the ability and the character bearer. The further assumption that because management uses codified knowledge, management is therefore scientific, is in much the same category as calling a poet a scientist because he used codified knowledge of the principles of versification."[4]

However this re-enforced the notion of what was seen as scientific; it was not mere codification of knowledge although undoubtedly this was more important than Gillespie

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[4] J.J.Gillespie (1938) *The Principles of Rational Management*, London: Sir Isaac Pitman and Son, pvii.

suggests. It was the method of approaching management in a scientific manner that was recognised, the subordination of scientific management to what we might call the personal qualities of a manager that Gillespie suggests would be of greater value.

It was important to ensure that information could be made useful to managers. What information could be collected and how should it be used? A.H.Church, writing in 1914, recognised this in defining what led to "executive success." He stated that it "Depends upon three elements: 1) recognition of what facts are truly significant; 2) accurate record and convenient presentation of these facts; 3) judicious action based on a study of the facts."[5] However, Church was also aware of the pitfalls in using scientific management as a panacea. In 1914 he stated that both the words "scientific management" and "efficiency" had been "the stock-in-trade of numberless amateurs and pretenders" such that "the value of the movement was magnified beyond all reason.."[6]

Harrington Emerson used the term "high efficiency." This was not financial or social "..but an engineering problem; and to the engineering profession, rather than any other, must we look for salvation."[7] The scientific method was stressed even more by others: "Just as the scientist in the laboratory tears apart a complex substance...so the man who would practice "scientific management" analyses his problems."[8] If science was to be made to reveal the secrets of production it needed expertise which at the same time reflected "specialised common sense," something that experts were not always endowed with.[9] That is to say both the method and the results could be codified according to the scientific approach. This view relied on the ascertaining of certain facts that would then form the basis of such analysis; the management process was seen as something which was susceptible to the reductionism of science. Thus to most

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5 A.H.Church (1914) *The Science and Practice of Management*, New York: The Efficiency Magazine Co. p347. Church was a British electrical engineer who moved to the USA in 1900.

6 Church *The Science*, piv.

7 H.Emerson (1919) (4th. edition) *Efficiency as a Basis for Operation and Wages*, New York: The Engineering Magazine Co. Emerson was a consultant who is perhaps best remembered for giving evidence in the Eastern Rates Case, before Judge Brandeis, in 1914.

8 Anon. (1922) *Scientific Management Applied*, London: A.W.Shaw and Co. p8.

9 Anon. (1922) *Scientific Management Applied*, p11.

commentators the term scientific meant "..the gathering and organisation of facts.."[10]

These ideas formed the basis for the implementation of new management plans. That is to say they had to offer something to businessmen otherwise there was no point in using them. The scientific approach to management offered the means to increase "efficiency" however it was measured. This need not have been just increasing productivity: Church saw it in terms of accuracy of work and speed of throughput.[11] A leading British practitioner put it like this in 1918: "You can put your business squarely on these facts. You can make your plans and do your work in accordance with facts, and not in a muddling or arbitrary way. That is what Efficiency means."[12] There was a direct association between the scientific method and efficiency; it was "Replacing opinion with facts.." Some confusion did exist in the conclusion that efficiency did not equal system; one could be in place without the other.[13] Presumably this meant system did not necessarily produce efficient working. What "system" offered was the possibility of achieving efficiency via organisation and method in approaching management control.

If scientific management delivered efficiency, how did this translate to the workplace? The standardisation of procedures after a scientific approach to the process under examination, seems to have been the key. In operational terms this meant the setting up of a planning framework, usually an office, that would do the necessary initial investigation and then monitor the process once it was running.

The scientific approach to management , and scientific management in particular, was cited in attempts to rationalise industry. The Rationalisation movement as it was called, was the British attempt at putting management and business organisation on a more scientific footing. Rationalisation was defined as:

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10 H.N.Casson (1918) (2nd. Edition) *Factory Efficiency*, London: The Efficiency Magazine, p32 & 52.

11 See Emerson *Efficiency*, p86 and Church *Science*, p201.

12 Casson *Factory*, pp17-18.

13 H.N.Casson (1918)(2nd. Edition) *Factory Efficiency*,London: The Efficiency Magazine, p13, 67-69 & 75.

> "Rationalisation, by which we understand the methods of technique and of organisation designed to secure the minimum waste of either effort or material. They include the scientific organisation of labour, standardisation of both materials and products, simplification of processes, and improvements in the system of transport and marketing"[14]

Rationalisation recognised the role of the scientific approach to management: economic progress was to be realised by using "the mechanism of thought evolved by the physical sciences ... applied to the solution of business problems with far reaching results."[15] This process was framed in terms of observation, collection and analysis of data which utilised the scientific method: "..the man who has ceased to talk about my experience and is beginning to talk about my experiments, is at least beginning to understand the full significance of the scientific approach."[16] Rationalisation was "that movement towards a new approach to the general task of direction and control which is described as scientific management."[17]

In a sense Rationalisation was more than a management concept; one economist described it thus: "The aim of the rationalisation movement is to eliminate waste and inefficiency 'scientifically and logically' by some sort of joint action between all the firms within one industry."[18] This view is confirmed in a more recent view of the inter-war period: Rationalisation described the "..solution to the problems of [those] industries which entailed elimination of excess capacity and reduction of costs through

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[14] Appendix B, p154 of L.Urwick (1927) *The Meaning of Rationalisation*, Commissioned by a Committee consisting of, amongst others, the Professor of Accountancy and Business Organisation, the London School of Economics; the honourary secretary of the Management Research Groups and Directors of the Federation of British Industry.

[15] L.Urwick (1929) *The Meaning of Rationalisation*, London: Nisbet and Co. pp17-18.

[16] Urwick (1929) *The Meaning of Rationalisation*, p32.

[17] Urwick (1929) *The Meaning of Rationalisation*, p27 and p58.

[18] P.Sargent Florence (1933) *The Logic of Industrial Organisation*,London: Kegan Paul, Trench Trebner & Co, p87. See also E.A.G.Robinson (1935) *The Structure of Competitive Industry*, London: Nisbet & Co. p169.

reorganisation into larger production and marketing units."[19] As we shall see in Chapter Three, the railways were amalgamated for similar reasons. Being a network industry meant that the railways were always likely to be the subject of amalgamation. The Rationalisation movement had a wider economic, social and political context which does not concern this thesis. However, the task of railway management after 1923 was to ensure that the broad principles of rationalisation and scientific management were carried out. In addition we will see in the next chapter how individual companies were responding to claims that they were not managing according to scientific principles. For the moment we need to develop further what we mean by management control.

Management Control

The implementation of a new set of management practices was often preceded by the introduction of a Planning Office. For manufacturing the task was simple: to set up the management practices in conjunction with the engineers in charge of the process. The form of management control here was very much the establishing of a Programme [see figure 1]. Their task was to collect, collate and analyses information to ensure proper coordination of operations. The scheduling of material was part of this planning process as it concerned the timing of material as it flowed through the plant. The dispatching of material was not just the point at which the work process began, but also the function of monitoring the progress of material. The overall control function may then be seen to be embodied in the Planning office and with this planning came, it was hoped, control.

For Church, control was one of five factors that made up the manufacturing process. In order these were design, equipment, control, comparison and operation. These encapsulated the functions of the Planning Department with monitoring carried out by the comparison of variables. Thus experience was guiding management actions while at the same time many were denying the "rule of thumb" techniques that utilised such experience: the difference was in how that experience was perceived and utilised.

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[19] S.Howsen and D.Winch (1977) *The Economic Advisory Council 1930-1939*, London: Cambridge University Press.

The basis for comparison was time, quantity and "number" in addition to the monetary value: "Control is the central brain which receives information from comparison.." Indeed Church placed control at the centre of management when he said that "Systems of control are, at present, the battleground of the different schools of management.."[20] Control was exercised by communicating information from the workplace to the Planning office and then distributing the resulting decisions. To achieve this degree of control required the detailed knowledge of the analysis of processes provided by the setting of standards. Whilst Church saw control as just one of the factors in the manufacturing process we will see it as far more than this.

Management Control and The Planning Process

Many contemporary general management texts offered an insight into the effects of Scientific Management on business.[21] We will focus on one example, F.M.Atkins' *Factory Management,* that covered many aspects of scientific management applicable to manufacturing.[22] We will then be better able to see how such broad notions of efficiency, standardisation and planning were applied in practice. He began with the setting up of the business itself: the construction or purchase of the buildings, plant and machinery and the selection of staff. Then he examined the various procedures recommended to lead to the best results: the setting of specifications and standards and the control of processes by information collected from documentation.

In designing how operations were to be carried out there had to be due consideration to be given to the product ie what sort of production process was involved - continuous or "jobbing". In defining a product in terms of its design and

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20 Church *The Science and Practice of Management*, p89-91 & p362.

21 See W.O.Lichter (1924) *Planned Control in Manufacturing*, New York: The Ronald Press Company; F.A.Parkhurst (1917) (2nd. Edition) *Applied Methods of Scientific Management*, London: Chapman Hall; C.Day (1918) *Industrial Plants*, New York: The Engineering Magazine, and Various Anonymous authors (1915) *The Library of Factory Management*, London: A.W.Shaw & Co. For what developed in the inter-war period as a whole see L.P.Alford and J.R.Bangs (1944) *Production Handbook*, New York: The Ronald Press Company.

22 P.M.Atkins (1926) *Factory Management*, New York: Prentice Hall. Atkins had some experience as a consulting engineer and was an instructor in Commerce and Engineering at the University of Chicago.

specification it was important to determine ultimately how the various parts of the process interacted. If we begin with the two key inputs of labour and materials we may understand more of this process.

Starting with labour the employers normally knew what type of person was suitable for the task in hand and recruited appropriately. As one text put it "Since the raising of efficiency is the first purpose and final aim of scientific management, it follows that the training of workers is the pivotal task.."[23] The workers may have had some special skill when they arrived or they might be trained to the firm's need. Materials were ordered in the same way but with more explicit documentation. The physical quality of inputs had to be set at a suitable level to ensure that the output would appear with sufficient quality. The selection of materials was the province of the engineer but once selected a specification was drawn up that reflected minimum engineering requirements. This was a trade-off between the technical requirements of the final product and the economics of price and supply. The specification was then embodied on a specification card for the use of the Planning Department and this ensured that the details would not change from delivery to delivery.

The purchasing of materials had to be maintained so that the plant could run at capacity: any delay would prove costly given the tight margins factories were running on. A requisition was issued for the material and depending whether the work was categorised as stores, which were brought in, or "worked materials" that were partly fabricated within the plant, the order would be placed with suppliers. The purchase order then acted as the means of monitoring the order, doubling as the contract between the vendor and the factory, other copies going to the Accounts, Purchasing and Receiving Departments. Thus the relevant parts of the organisation had the information they needed to watch the progress of material inputs. Once the materials were in place production could beginning by their being "dispatched" through the production process. The control and co-ordination of these disparate elements was a major problem for the management process solved by the Planning Department.

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[23] Anon (1922) *Scientific Management Applied*, London: A.W.Shaw & Co. p73.

Management Control: Planning and Standardisation

Once the business procedures were understood from a technical point of view, standards could be developed. Seen as the "..exercise of foresight," it was to this office that the reports from time and motion studies came and the technical product specifications, as did the routing of material.[24] The use of standards rendered the task of foresight easier, decreasing the uncertainty as to the outcome of future operations. The "duty" of the Planning Department was "..to compile and keep the official records of the standard practice instructions, the rules governing the policy of the business, and those concerning and defining the duties of employees." Books of Standards, Directions and Policy were the means to this end.[25]

The time and motion study was important in setting standards for scientific management. Its function was, according to those who lauded its virtues, to ascertain the performance of the process as a whole not just to intimidate the workforce. This included the paying of piece rates to the workers which depended on the productivity of labour relative to capital. There were allowances made for "personal necessities" and tool changes which demonstrate how precise these studies were supposed to be. The alleviation of fatigue could also be aided by such tests although there were specific tests designed (and marketed) for this. According to to one author "It is really a kind of analysis plus a definite measurement of the result of that analysis in terms of at least one unit, time."[26] The factors that had to be considered when assessing such analysis both influence the setting of, and are influenced by, standards. That is to say, in, for example, steel machining, the conditions under which a study was conducted should as far as possible allow for differences in the material or machine used. Thus there could be an allowance for variance around what might be called the average piece of steel which was independent of the operator's performance. Ideally the standard was then set which reflected this and should these not be reached questions were asked of the

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[24] A.H.Church (1914) *The Science and Practice of Management*, New York: The Efficiency Magazine, p485. For what follows see also Anon (1922) *Scientific Management Applied.*

[25] Anon (1922) *Scientific Management Applied*, p162.

[26] Anon. (1922) *Scientific Management Applied*, p175.

operator and/or his tools. The study could be located in a laboratory situation or in the workplace. The latter was the ideal spot, but in some cases the laboratory offered superior testing facilities as the elements of the process were more easily isolated.

Once the standard was agreed upon, it had to be made part of the working instructions of the shop-floor. The "instruction card" carried the information required to complete a given task with the agreed methods. It included both technical details and the time it should take to do, leaving "..nothing to the imagination". The workers' perception of these tasks was not left to chance: evening lecture courses were recommended and indeed the instruction cards were seen as "textbooks for the benefit of workers.."[27] So with standard instructions in place, the manufacture of products could commence.

In describing a "typical" re-organisation of an engineering works in Manchester, the extent of pre-planning is revealed.[28] The original system was described and a scale model of the works constructed and data collected on the operations within the plant. Restructuring was not meant to end after the initial introduction of scientific management, but to continue. Indeed the system once in place was designed to inform managers just when they should amend the organisation. Information was gathered in most systems monthly, weekly and daily, with regular meetings recommended. These depended on both the company's managerial needs and those of the process. Emerson suggested five categories deserved monitoring, those of materials purchasing, maintenance and operation , standardisation, standard costing and dispatch.[29]

These were "..standard methods for the control of the manufacturing process" that led to the "..acquisition of habits."[30] Standards formed the basis of what we now call Budgeting, but then was only just being formulated explicitly as such. By the 1930's the notion of a formal budget was already well established in many plants. In one account published in the "British Management Review" the Chief Accountant of

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27 Anon. (1922) *Scientific Management Applied*, p205.

28 See Anon (1922) *Scientific Management Applied*, p121-22.

29 Emerson (1919) *Efficiency*, p121

30 Atkins(1928) *Factory Management*, p158.

Dunlop Rubber Company describes his experience.[31] Clearly budgeting was more than just comparing standards although the two were related. It represented an attempt to look into the future by an "..exact and rigorous analysis of the past.." The relating of the expenditures from different departments made coordination easier and explicitly used past experience: "By setting up such a system we learn by our mistakes, thus gaining experience and attaining increased control over our affairs." This was an explicit attempt to integrate the functions of planning and monitoring into a single unit of administration.

In general, then, standards implied predetermining the results and this was described as "..the main characteristic of the modern method." Indeed they were seen as "scientific certainties modified by experience."[32] Operating standards were first written for the finished product and then extrapolated back to the material requirements. These were in many respects the centre of the scientific approach to management and the creation of a company memory: "The establishment of standards for operation and methods is simply one way of carrying over from one person to another and from one period to another, the results of careful scientific investigation to determine the procedure for the performance of the daily tasks about the plant."[33] Just as in science the task of setting standards came from classifying circumstances so that managers and operatives would know what to expect.

Thus it made other workers about the plant implicitly more aware of other tasks on the shop floor. It was an attempt to codify best practice within the company with standard machinery completing a task in a standardised time lessening the doubt associated with business. However once this was in place there could be no relaxation of managers. Inherent to the whole concept of a scientific approach to management was the need to monitor operations, thereby improving them.

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31 F.R.M.DePaula (1936) "The Principles of Budgeting in Modern Business" *British Management Review*, Vol. 1, No. 2.

32 Emerson (1919) *Efficiency as a Basis for Operations*, p152.

33 Emerson (1919) *Efficiency as a Basis of Operations*, p158; Church (1914) *The Science and Practice of Management*, p115.

Monitoring: Execution and Evaluation

For continuous processes like a steel works monitoring was easy enough as the output could be recorded and compared to a standard rate. For "jobbing" tasks it was more complex: the equipment needed to be set up and any specialised parts ordered. Workers were allocated by "time tickets" and materials by "material issues". According to Atkins once a part was completed it was inspected under the authority of an "inspection ticket" and then moved to the next phase by a "move ticket". A "dispatch board" monitored the movement of material around the shop-floor and a "schedule card" the progress of the order itself. Given that so many of the operations were controlled by forms and other documentation their design was of some importance as we will see in the use of scientific management in the office. Suffice it to say that they provided the basis for "serviceable aid in the utilization of standard methods of procedure."[34]

The overall movement and co-ordination of assembly and sub-assembly was achieved by the "master schedule" using the pre-determined standards to estimate how the final product would eventually come together. This involved forecasting the level of sales and combining these with the productive capacity of the factory. Sales estimates were prepared based on past experience and the expected level of activity in the economy. Schedules for labour and materials were also completed to co-ordinate the workforce and others were compiled for tools, advertising etc. In fact most of the company's operations would be outlined in this way to ensure minimal wastage. The financial schedule would reconcile the income and expenditure of the plant as a whole thereby checking profitability as a whole. The master schedule was distinguished by Atkins as not being a budget because of its connotations with the comparing of receipts with expenditure. In other words it was a purely physical measure of throughput, not a financial instrument of control.[35] In addition, all through the process it was considered essential to inspect the work to ensure that the standards were being maintained in terms of both quantity and quality. So these various forms and

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34 Atkins (1926) *Factory Management*, p180.

35 Atkins (1926) *Factory Management*, p262.

documents acted as the agents of control for management on a day to day, job to job basis, with the managers and foremen working to the standards established by the Planning Department. The means by which the movement of jobs through the factory were controlled appear in the literature as Routing.

This involved "The arrangement of the operations into orderly and systematic sequences.."[36] and had to take into consideration the nature of the equipment design and working procedures to be effective. For a continuous process the arrangement of the route was crucial but obvious; in most cases one operation clearly followed another. However it also meant that any failure on the part of the management could be catastrophic: for example the steel making process requires that rolling mills be in a certain position in the batch and that the steel be of the correct temperature. If it was not, a major problem could arise. In jobbing the setting up of a routine is far more complex because of the individual nature of the product. The construction of the factory should ideally have taken account of the routing problem in its design. The likely progression of work from one machine to another was assessed so that handling was minimised. Allowance had to be made for any future expansion of facilities to minimise costs. The installation of mechanised handling methods made plant layout an issue of growing importance, as we shall see. The key problem was to integrate the process with the site, workforce and existing infrastructure. The direction in which material was to move, whether in bulk or batches, its weight and strength were considered as part of the initial design in companies following scientific management. In addition "Routine" itself was described as "..the nerves of business..", as "..standardised procedure; standing orders...that become second nature - partially sub-conscious or automatic."[37] An "operation route card" ensured that time and handling were minimised by standardising how items moved through the factory.

Once the product was completed it could either be stored or shipped immediately, so there would often be a warehouse alongside the loading bay. This was subject to detailed analysis of the best location of storage areas relative to loading and

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36 Atkins (1926) *Factory Management*, p166

37 R.E.Simpson "Routine - The Nerves of Business" *System*, September 1925.

the packaging of products involved "research and experimental work.." and this included such minutiae as the testing of package strength in a revolving drum. Whether a product was disassembled for shipment or sent complete depended both on the loading gauge of the transportation mode and the criteria for charging ie was it by cubic capacity or weight.

Overall, then, the texts advised that the key to implementing a programme of scientific management was the establishment of a Planning Department to oversee the reorganisation of the work by measuring what each employee was capable of, and ensure that his value to the business was maximised. As with the shop-floor this was to be achieved both by studying the behaviour of costs and by time and motion studies. One example refers to the planning department as the repository of standard practice instructions and the responsibility of each employees. Books of standards and details of the company strategy and objectives were recommended for consultation within the planning department.

Implicit in much of the above discussion is the role of information processing: the decisions on standards and specifications had to be made by the managers on the basis of their experience and the information presented by reports collated from forms. The process by which data was collected and processed was also subjected to the scientific approach to management. For manufacturing this was the planning office and other offices supporting production. For the railways it will be important when we come to consider the establishing of centralised control mechanisms.

Systematic Management In The Office

However, it is not so much the changes of documentation that is the focus of this thesis, as to understanding how they reflected changing management ideas. The role of scientific management in the office will be discussed in the context of the collection, collation and analysis of information, corresponding to the functions of forms, reports, memos, letters and the visual display of information. Forms were the principle source of data collection, and storage. Once these have been defined and their place in the management process established, the place of the office will be considered. The collection of information will be examined in the discussion of Forms, whilst the

collation and analysis of information are looked at within the wider context of the office itself.

The number of staff in manufacturing industry involved in the generation of management information and its analysis rose in Britain from about 8 per cent pre World War One to nearer 15 per cent in the mid 1930's.[38] Whilst the shop-floor organisation dealt with just one aspect of the tactical decisions to be made, the notion that scientific method could just as well be introduced into the actual decision making process was soon realised. The office was, indeed is, where the information was collated and analysed. One recent definition is as follows and serves just as well for the office of the past:

> "An office is a place where people read, think, write and communicate; where proposals are considered and plans are made; where money is collected and spent; where businesses and other organisations are managed."[39]

To take the definition of the office a stage further, its function can be seen as the collection, collation and analysis of information. This would both determine and be determined by management practice. It was, according to a writer in the inter- war period, a source of goodwill acting "..as a clearing house for all incoming and outgoing documents..and preserves the records which make up the firm's daily history and which become the basis of all future planning."[40] Office communication with other parts of the company and the outside world were by means which included forms, memos, letters, manuals, visual displays of information, meetings and committees. Scientific management changed the way in which the collection of information was accomplished and technology the environment it which it was used. Where previously management had relied on experience and relatively simple calculations now the data had to be collected and collated according to, once again, a "system": the increased complexity of production saw to this. The development of mechanical aids to accounting and the

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38 Hannah (1983) *The Rise of the Corporate Economy*, pp71-72.

39 V.E.Guilicano (1982) "The Mechanisation of Office Work" *Scientific American*, July 1984, pp125-134, (quote p25).

40 W.Attwood "8 Incentives Which Stimulate Office Workers" *Business*, January 1931.

telephone are just two examples of this radical transformation in the information technologies used to process data from ever more complex processes. The insertion of aids such as tabulating machines, calculating machines and copiers was often regarded as an opportunity to reform the office as a whole.

In the case of the railways statistics were collected on the basis of forms known as Returns. Forms were also used to display information as part of the Train Control process. A wider consideration of their role within organisations enables us to appreciate how developed the railway Train Control systems were. However, an appreciation of the extent of Systematic Management practices in British business in general during our period is difficult to gauge.

Collecting Information: The Form

Starting with the collection of information, the form is the main unit of analysis. What the origins of the form were is unclear, although it appears to be derived from legal documents. Administrative requirements led to the development of office forms, and in the late 19th., early 20th. centuries the design and use of forms was becoming ever more sophisticated.

Because the nature of data collection varied from department to department and firm to firm, early commentators discussed the broad criteria of design as well as the particular aspects that they found useful. The form was clearly recognised as a vital part of almost every office by the 1920's as the following definition suggests: "Forms are for getting orders set down and necessary facts recorded in such a uniform manner as to be readily interpreted and quickly usable."[41]

At the heart of any analysis of management techniques, the form functioned to collect information and communicate it to the office. Once data was collected the form provided a storage function within a filing system after the information had been transferred to other documents and uses. The movement of the form itself around the organisation was a function of where the data was entered, who received the form in its "raw" state and who needed a copy of the form and which section needed the

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41 "Do Your Printed Forms Pass This Test" J.M.Shappert, Director Metal Stamping Company *System*, March 1924.

processed information. In general, form design reflected the route through the organisation it took and the functions expected of it, for example as confirmation of delivery to set specifications, an invoice, or a record of events such as a railway return.

The basic description of any form is that it contains areas of space delineated for information entry. It was suggested in one text that the spaces provided were laid out according to how the form would be filled in ie the spaces would appear on the form in the same order as the information was appearing to the operative thus taking into consideration the very hand movements made each time a form was entered up.[42] Invariably instructions were printed, with room for the date and/or reference numbers. The size and type of print used could indicate special instructions or draw attention to important points; colour could fulfil a similar function. The type of paper and the number of copies required also influence design. Whether the form was intended for long or short term storage effected the quality of paper used and maybe the filing system used for retrieval. The process by which designs evolved depended on the perception by management of the task in hand ie what would be the form's ultimate destination. To take one example, a commentator noted the design of an invoice, describing how "..the infinite variety of styles, shapes and sizes.." [43] created much unnecessary work. The specification of the form was standardised for both goods inward and outward and colour coding introduced with, for example, pink outward copies going to the accounts department, white and yellow to the requisitioning department and the yellow form stored in the originating departments files; standardised design enabled the files and associated cabinets to be made to a given specification. The elimination of writing was made possible by printing instructions on the form.

The form, properly designed, could speed up work not only by regularising filling them out, but as part of a mechanised system of data processing. At the beginning of our period mechanical accounting machines were just being introduced: by the end of the thirties they were common in many organisations. Integrating the

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42 Atkins (1926) *Factory Management*, pp235-36.

43 "Why we use a Standardised Invoice" R.B.Hobson, *System*, August 1924.

form into a mechanical accounting system had always been of some concern to works managers. As an article in *Business* from 1938 states, three main points in the planning of forms should be considered: 1) How are they going to be filled in ie by machine or hand; 2) Can continuous stationary be used (presumably in conjunction with a mechanised machine feeding system) and 3) Will the forms be duplicated by a machine.[44] This particular commentator saw well made forms being as important as tools, being able to increase the output and provide an effective means of direction and control. Another article suggested that forms should be standardised in the same way that engineering specifications were.[45] The use of the typewriter or calculating machine usually meant that a review of past form design was desirable. The introduction of machines into the office prompted, in many, cases the old methods to be modified in order to achieve increased efficiency. There were a number of machines on the market and although advice was available from the manufacturers it was often recommended that the company tested machine performance for itself.[46] Different companies had varying specifications for, on the face of it, the same tasks; experiment revealed which were the most suitable for the individual office. The measure most often used to indicate the savings possible was that of labour time saved. This implies that the more skilled an operator, the more specialised the division of labour, the greater the gains. One commentator noting this recommended that "labour minutes" should be calculated which would in turn lead to the "number of clerk minutes" required per day.[47] Once again the measurement of inputs and output was the key to effective systemisation and this required a thorough understanding of office routine.

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44 See "Planning the Office Forms so as to Speed Up Works Management" F.Lloyd Parsons *Business*, May 1938.

45 "Can we Standardise Business Documents" Anon, *Industry Illustrated*, November 1936.

46 Sir Woodman Burbridge, Chairman and Managing Director of Harrods Ltd. in "Why we are Spending £25,000 on our Office" *System* March 1923; B.S.Trevor "How to get the Utmost from Your Office" ibid, February 1927 and C.E.Day "Mechanised Accounting to this Firm means Fitting Their Machines to Your Systems." *Business*, 1937.

47 C.G.Barstow "Are You Getting 100% Service From Your Calculating Machine" *System*, March 1922 and H.W.Simpson "The Day-to-Day, Hard Cash Savings of Modern Office Machinery" ibid, September 1927.

The reasons for mechanisation were neatly summarised by a member of the Accountant General's Office of the General Post Office: increased economy, ie decreasing labour cost, for the same (or more) output; increased office efficiency, meaning the accounts produced quicker and more accurately; more selling efficiency involving better sales and publicity and finally "..the need for improved control of works processes, more detailed or earlier statistics of output."[48] However, it is not proposed to discuss in detail the implications of mechanical aids to offices as there are several studies which address this.[49]

We may see the form as a formalised document for the collection of information on a regular basis. That is to say the process of collection had been standardised, within the rules set by individual organisations. The specialisation inherent in the use of a form implies a specialised division of information within the firm in departments that need such data. In order to be made so, the data collected had to be presented in a form in which it could be made usable and this is revealed in the documents produced as a result of the collation of information.

Collating Information: The Report

Information was of little use unless it was collated and used in the formulation of policy. The report can be seen as a result of analysis of either a group of people such as a committee, or by an individual processing information. There were many different types of report depending on the individual organisation's requirements. These were rarely discussed in the management literature in material form probably because they were a mixture of extended memos and in some cases, short books. Clear writing was stressed in all books on business correspondence and the use of writing had

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48 F.W.Fox "Office Machinery: An Examination From First Principles" *Industry Illustrated*,October 1933.

49 A.L.Norberg (1990) "High Technology calculation in the Early 20th Century: Punched Card Machinery in Business and Government" *Technology and Culture*, 31; JoAnne Yates (1993) "Co-evolution of Information-Processing Technology and Use: Interaction between Life Insurance and Tabulating Industries." *Business History Review*, 67; M.Campbell-Kelly (1992) "Large Scale Data Processing in the Prudential 1850-1930" *Accounting Business and Financial History*, Vol.2 No. 2, and (1994) "The Railway Clearing House and Victorian Data Processing" in L.Bud-Frierman (1994) *Information Acumen*.

long been the province of the clerk. Diagrams and graphs representing processes and statistical analysis also began to appear. The use of graphs to present information had been for long the preserve of the engineer, and they were soon introduced in the discussion of management problems. According to an "office routine consultant" in 1925, "Few businessmen today could control their enterprises... without the aid of graphic charts."[50] This does not mean that information was necessarily made clearer by the employment of visual information. Some flow charts, in their depiction of a process, seem to confuse more than they enlighten.[51] Statistical knowledge was becoming important and many engineers would have had a knowledge of such techniques. However it would often need interpretation for the businessman or manager untutored in the ways of the "efficiency engineer" or consultant.

The use of visual display was not confined to simple statistical calculations or graphs. The display of information in the Planning Department was seen as a crucial component of its overall activity. Illustrations of such boards appear in many texts and articles showing some very sophisticated examples.[52]

A report once completed became an input into the decision making process by being read and discussed by the relevant managers. The formal forum for this was the meeting with a structured agenda and contributions entered into the record as minutes. The degree of formality and structure depended on the type of functions under discussion. A works meeting would be relatively informal compared to a meeting of the Board of Directors. It is likely that many decisions had been reached before the actual meeting through informal consultation, the meeting serving to authorise the decision. However the meeting also acted as a means to air grievances and resolve disputes as well as occasionally causing them.

The above description has provided some of the background to how information was analysed using reports and forms. By describing what was perceived as being the

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50 "Business Charts that make Figures Talk in Percentages" *System*, March 1925.

51 See C.E.Knoeppel (1918) *Installing Efficiency Methods*, New York: The Engineering Magazine, especially p42,44-46.

52 For example, see Knoeppel *Installing*,p132.

function of these documents we can approach their application in a specific context without having to return each time to the criteria underlying their design. The thesis is not concerned with the specific design of forms, more what they can tell us of what management practices were.

This chapter has outlined how the scientific approach to management was developed. Planning and standardisation were important in the establishing of a "System" of management. The process would then be monitored by the office acting as a filter for flows of information from the business process to the managers. In terms of our model of management control, the Execution and Evaluation functions were important parts of the office task. They provided the inputs for the Programming and the Planning functions.

The main task of the later chapters is to consider how management developed on the railways after amalgamation in 1923. To appreciate the process of change and to understand the context of operations we need to know how they were managed just prior to amalgamation from the turn of the century to 1923. The absence from this chapter of any mention of "scientific management" on the railway is not an accident. In Britain the railway sector maintained a literature, and a debate, all of their own. This chapter has provided the wider background: it is now time to examine more specifically the management practices of companies prior to 1923.

Chapter Three

Railways and Management

This chapter provides an introduction to the development of railway management practices. As we have seen in Chapter One, the provision of a fast, reliable transportation service required formidable technical skills. It outlines the debate on how railway management was performing which occurred as a prelude to amalgamation. This reveals differences in how a scientific approach to management was perceived. Important evidence for this comes from the debate over the use of the ton mile statistic as against systems of what came to be known as Train Control. It will be argued that one was a measure of output, and the other an instrument of control, and that this itself illustrates how varied conceptions of a scientific approach to management were. In addition, for the Conveyance function, the introduction of Train Control was an important development. Its rise on the Midland Railway, (MR), will be discussed here as an introduction to its growth on the LMS, described in Chapter Four. Finally we will introduce the structure of the railway companies as they were after the amalgamation of 1923, placing them within the context of the market environment they faced.

Early Railway Management

In his discussion of 19th century American railroads, Alfred Chandler stated that:

> "Because the cost of constructing and equipping railroads was so much higher than that of all previous business ventures, railroad transportation became the first modern high-fixed cost business, and so the first in which continuous capacity utilisation became a major concern...In order to achieve the traffic necessary to maintain profitability .. a road's traffic department had to set rates and to schedule flows in ways that would come close to assuring the continuous use of equipment."[1]

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[1] A.D.Chandler(1990) *Scale and Scope: The Dynamics of Industrial Capitalism*, p55.

This well describes the experience of railways in Britain, but with some important qualifications, as Chandler points out. Whilst admitting that the railways were the largest enterprises in the economy, with a higher density of traffic than in the US, he says that "..British railroad managers were less challenged to pioneer new methods of organisation and of internal control than .. in the United States..". Hence Britain's railways "..did not provide models for industrial management as did the US railways."[2] This assertion will be examined here.

The development of the railways can be split into two phases: construction and operation. Railway construction required the construction of earthworks on an unprecedented scale throughout the country. Although the canals had left a legacy of management skills and a workforce, the navvies, well used to such work, the scale and speed of construction was unique up until that time. It was not just the management of the permanent way and buildings that was important. Before any work could begin an Act of Parliament was required. This stated the terms upon which the railway could operate. This necessitated often quite substantial legal fees. For example the Great Western Railway spent £88,710 before construction, most of which went on securing Parliamentary approval.[3] This process was an opportunity for the state to examine the effects of a proposed route, to hear any objections and to set the initial scale of rates: it was also an opportunity for other railway companies to try and block competing routes. The purchasing of land and settlement of compensation claims together with representing the company before parliament was more than an overhead on the expense sheet as it could affect the future performance of the business. The legal process itself would become an important forum for many aspects of the company's business and as such part of the management process, with the drawing up of siding agreements and negotiations before the Railway and Canal Commission.

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2 Chandler *Scale and Scope*, p253; For details on the initial phase of railway development and how the companies developed management practices see T.Gourvish (1972) *Mark Huish and the London and North Western Railway: A Study of Management*; G.Channon (1972) "A Nineteenth-Century Investment Decision: The Midland's London Extension" *Economic History Review*, Vol 25, and P.Bagwell (1968) *The Railway Clearing House in the British Economy 1842-1922*, Unwins.

3 E.T.Macdermot (1982) *History of the Great Western Railway*, Volume One, Revised by C.R.Clinker, Ian Allen, p15.

The next stage involved the bringing together of the construction gangs which required the co-ordination of the builders, the accountants and lawyers to ensure that the project was completed on time - an early example of project management. There were materials to purchase and transport to the required site, the employing of hundreds if not thousands, of "navvy" labourers gangs involved in the work and the construction of huge works of civil engineering.

However, it was the operation of the railway that presented the greatest challenge and one that became more difficult as the network expanded.[4] Once steam traction was the norm, investment in such machines was necessary, and there was no model for such operations suitable to railway management: certainly turnpikes and canals gave some clues, but they were not as complex and did not have the engineering constraints railways did. Speed in particular led to the possibility of accidents and required rapid communication between sections of line. The level of investment and amount of cash flow could not be adequately served by existing accounting methods. Fraud and "railway manias" were so damaging to all concerned that legislation was eventually passed in 1868.[5]

Railway management can be split into two periods, covering what we might call Primary and Secondary management tasks: the first period of the nineteenth century reflected the need to run the railway to minimum standards of safety and involved the use of standardised operating procedures regarding signalling, brakes, plus division of revenue between competing lines and the like. The second began from the turn of the century and is what we are concerned with here: the growth of systems to improve the performance of the company. That is to say moving from a concern with running trains safely to increasing their speed, punctuality and loading.

The earliest attempts to control the movement of trains came with the use of the telegraph in the 1840's.[6] At this point we can also draw a distinction between control

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4 This section is based upon Gourvish *Mark Huish and the LNWR*, Chapter 1.

5 See H.Pollins "Aspects of Railway Accounting before 1868" in M.C.Reed (ed.) (1969) *Railways in the Victorian Economy*, Newton Abbot: David and Charles.

6 P.J.G.Ransom (1990) *The Victorian Railway and How it Evolved*, London:Heinemann pp145-154.

as a Primary function in the signalling process and in the Train Control process. Information about the position of trains was clearly necessary if safe operating, a primary function, was to be achieved. From this more general information could be derived: as one commentator put it in 1867, in addition to signalling the telegraph could give "..directions connected with the management of the concern, as to the engine, carriages, passengers, goods, luggage etc.."[7] He went on "..wherever a demand for extra conveyance arises , the conversing telegraph.... convey[s] the intelligence to headquarters or the nearest depot."[8] These can be seen as early attempts at co-ordination and it was from such indicators that more general train control developed.

Control across companies in a network industry could not be achieved without coordination. For many journeys, freight and passengers had to be able to move from one company to another. This required some degree of cooperation. This was also true of such technical components as signals, brakes and rolling stock standards. There was also the need to distribute the earnings from through ticketing and consignment arrangements to those involved. Co-operation was necessary for the benefit, and profitability, of all. As the rail network expanded there were difficulties over the movement of goods and people between networks owned by separate companies. On the freight side there was added expense of transhipment for the customer and extra warehouses, yards etc. at every point of intersection. Also many loads would be carried across the lines of more than one company. So called "running agreements" were no solution as freight rolling stock, complete with tarpaulins and ropes had to be returned to the originating network, whether full or not. In addition tickets and goods invoices had to be economically processed.

The Railway Clearing House began to operate on January 2 1842.[9] The initial aim was to provide through ticket facilities with both goods and passenger tickets being

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7 D.Lardner (As revised by E.B.Bright) (1867) *The Electric Telegraph*, London: James Walton, p206.

8 Lardner *The Electric Telegraph*, p206.

9 See Bagwell *Railway Clearing House* for much of what follows.

sent to the RCH for crediting to a company account. The rates were set at a proportion of the mileage, with a fixed rate per mile for through wagons and a set demurrage charge. Standard forms for the reporting of monthly statistics arose out of the need for information to monitor this activity. However, it was not compulsory to belong to the RCH and operating and charging practices remained a problem. The task of carrying freight was in these early years left to independent carriers such as Pickfords, creating the need to charge separately for terminal facilities. This added to the general confusion over the pricing policy.

Although the RCH was only a partial solution to the commercial problems of network operations there were advances in other areas such as safety and in particular the gradual standardisation of signalling and telegraph practices. According to P.Bagwell the regular freight operations were made easier by various guidelines established between 1847 and 1853, and which "..continued to be applied until the railways were nationalised in 1948.."[10]

In addition to the distribution of monies and the setting of technical standards the RCH gradually assumed more responsibility for pricing. In Chapters Six and Seven, we will discuss in more detail the nature of pricing and the role of the RCH. For the moment we need to address the debate on railway management that was taking place at the turn of the century.

The Debate on Management

The eventual amalgamation of the railway companies by the 1921 Act was prompted by concerns over management performance in previous years. As the railways had developed, mergers had forced more complex organisational structures into existence. This was coupled with concern that the performance of individual companies was not what it should be. This, together with the experience of government control prompted the eventual grouping.

Perhaps the most useful starting point for the management debate is the collection of articles, reprinted by Sir George Paish, from the journal, *The Statist*. The

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10 Bagwell *Railway Clearing House*, pp72-73.

foreword was written by the NER General Manager Sir George Gibb and reflected criticisms of the management methods as practised by British railway managers. R.J.Irving's study of the NER argues that the introduction of statistical measures "..meant that what Paish liked to call "scientific management" had replaced rule-of-thumb on the North Eastern Railway."[11] By this he meant that sophisticated statistical measures were in place as part of the organisation. These measures of ton mileage, wagon loading, average receipts per ton mile etc were being used to plan and monitor operations. The use of such figures would, in theory, negate the need to per supervise personally a large geographically dispersed organisation. However, there were more general ways in which railways could use the scientific approach to management. In particular this view ignores the specialised Train and Traffic Control systems. It was the use of the ton mile that was seen as being indicative of good management practice by critics of the railways. The NER was viewed as an example of model management practice because it collected ton mile statistics. Irving includes details of this debate on management reform.[12] However, too much emphasis has been placed on the NER both in terms of best practice and the conclusions to be drawn as regards later management performance.

The debate has affected the way in which railway management was subsequently portrayed. It seems as if all railway managers up until nationalisation have been tarred with the same historical brush. The debate has always been framed in terms of the criticisms made by Paish and a Departmental Committee of the Board of Trade. This Committee was set up in 1907, and reported in 1910.[13] The Final Report of the Committee was split, as we shall see, between those who supported compulsory collection of statistics and those against. This has formed the basis for a number of criticisms: D.Aldcroft, for example, admonished the railways for not paying "sufficient attention" to improving techniques arguing that they had "..little conception of the

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11 R.J.Irving (1976) *The North Eastern Railway*, p219.

12 See Irving *The North Eastern Railway*, Chapter 11, pp250-266.

13 *Departmental Committee on Railway Accounts and Statistical Returns* Parliamentary Papers, Vol. LVI 1910.

economic science of transportation."[14] He concludes that as regards ton-mileage, "If the railways were to be run scientifically and economically it was essential that it was possible for such data should be collected."[15]

The central critique by Paish was that compared to US performance, British trains and wagons were poorly loaded. This problem was compounded by the failure to account sufficiently for their activity. That is, most railways did not collect ton mile statistics. The ton mile was seen both by historians and contemporaries alike, as a measure of "scientific management." This view has influenced historians to conclude that railways were not being run well. Yet few have considered what was meant by scientific in the context of this debate, nor what the ton mile was and was not capable of. We need to consider the debate over the ton mile in a little more depth. Only then can later developments in management practices be placed in the proper context. The question we have to ask is whether the debate reflected fairly on the railway companies? Was this ton mile the only measure of management success or were there other more valid claims? Then we can extend this analysis further into the practices of the amalgamated companies after 1923.

The Ton-Mile and the Departmental Committee

The ton-mile was a physical measure of output quantifying how much was carried a given distance: for example one ton carried ten miles and ten tons carried one mile would equate to ten ton miles.[16] It did not reflect the cubic capacity of a load so that 10 tons of hay would take up more space, and hence require more wagons, than 10 tons of coal. It was therefore important to bear in mind the operating conditions.[17]

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14 D.Aldcroft (1968) "The Efficiency and Enterprise of British Railways" *Explorations in Economic History*, Vol. 5 No. 2, p160 and p172.

15 Aldcroft (1968) "The Efficiency and Enterprise of British Railways," p172.

16 For an introduction to railway statistics see C.P.Mossop (1923) *Railway Operating Statistics*, London: The Railway Gazette; A.E.Kirkus (1927) *Railway Statistics:Their Compilation and Use*, London: Sir Isaac Pitman and Sons.

17 This was stressed by several witnesses, see for example C.E.Grassman of the London, North Western Railway (LNWR) p110 paragraph 17 of Memorandum of Evidence, *Departmental Committee on Railway Accounts and Statistics*, Parliamentary Papers, 1910 Volume LVI.

In an attempt to examine the issues of statistical collection the Board of Trade appointed a Committee to investigate their use within Britain's railways. This was prompted by pressure from the shareholding and trading interests who believed, rightly or wrongly, that the railway companies were being poorly managed. The result was a report recommending new statutory forms of returns and accounts, but falling short of compulsory collection and publication of the ton-mile statistic. The final report of the Committee had two reservations, one calling for the collection and publication of the ton-mile, the other rejecting even the competence of the Committee in dealing with such questions of internal railway management. The evidence presented to the Committee was in general against, at least the compulsory, collection of the ton-mile and reservations were expressed as to the measure's usefulness. Yard-masters and Superintendents were expected to check running and observe yard activity in person, not rely on statistics collected by others.

The North Eastern Railway had introduced management reforms at the turn of the century which have been described elsewhere.[18] The evidence of Philip Burtt, Goods Manager of the NER supported the adoption of ton-miles as well as more detailed statistics: "[Railways] cannot be administered efficiently without efficient information with which to administer and with which to govern, and amongst that efficient information I should put knowledge of tons and miles amongst the very first.."[19] However in his evidence, the Chief Goods Manager of the NER ,George Gibb, found difficulty in giving any specific examples of ton-miles improving performance. All he could do was "..point to the whole of my experience. Supervision has been totally different more searching, more intelligent, and more fruitful in result than it ever was before."[20] When questioned further Gibb referred simply to "the daily

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18 See Chapter 9 "Reform" in Irving *The North Eastern Railway Company*.

19 *Departmental Committee on Railway Accounts*, Question 5806. For details of the wider reforms see R.J.Irving (1976) *The North Eastern Railway 1870-1914*

20 Q9723 *Departmental Committee on Railway Accounts and Statistics*.

and monthly business" before finally giving engine movement as an example where ton-miles could be of use.[21]

The management reforms introduced at the turn of the century on the NER made its officers important witnesses for the committee. In his memorandum of evidence, Burtt indicated that the ton-mile was a useful indicator of work done, with ton-miles per engine hour giving the overall measure of operating efficiency. The train load as a ratio of the ton-mile and the train mile was used by District Superintendents as a measure of weight carried and that of wagon to train miles for the load in terms of wagons. The wagon load at the starting point indicated to District Superintendents the efficiency of wagon loading at each terminal point.

Data collected was said by Burtt to enable the future to be forecast by producing a profile of the past.[22] Perhaps the most interesting facet of Burtt's evidence was his attempt to link the gains made by introducing large capacity wagons, in which the NER was a pioneer, to the use of improved statistical method. This seems tenuous at best and there was not any evidence of causation in Burtt's evidence. He also suggested that in some way the collecting of statistics could help determine rates, something that even many of their supporters would not claim for those particular figures.[23]

The London and North Western Railway (LNWR) had qualms about some of the Committee's views on statistics. However, they did collect much data which was of use in running train operations. In a Memorandum of evidence, they stated their objections to the collection of the ton-mile as being that it was too slow in its preparation (about 2 months), that different units were combined and that the result was misleading at best. Furthermore the task they were supposed to fulfil could be achieved with the statistics that they already had.[24] However the LNWR was not rejecting statistical analysis outright, rather questioning the specific value of certain measures.

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21 Q9724, Q9727 *Departmental Committee on Railway Accounts.*

22 *Departmental Committee on Railway Accounts and Statistics*, Q.5108.

23 *Departmental Committee on Railway Accounts*, Q.5081 & Q.5141. See also the question disputing Burtt's claims regarding large wagons, Q.5739.

24 *Departmental Committee on Railway Accounts and Statistics*, p111 paragraph 13.

They reported that more useful data was the "..hourly, daily and weekly statistics of the loading of every train and wagon." which it appeared the company took.[25] Information from the guard's journal was copied into "train books" for the use of the District Superintendent. This was processed every morning for the preceding day's traffic in his office and divided into several categories: Mineral and "less important" traffic was the first category with the express and regular transhipment trains (ie pick-up goods trains), which had to run regardless, forming the other. Any light loading was reported to the District office and thence to headquarters. The average train load was sampled "spasmodically from the guard's journal in number of vehicles rather than actual tonnage either gross or net. The wagon load was taken from each individual wagon return. Light loading was also checked by the "loading books" kept at each stop where loads were exchanged and these could be regularly inspected by the District Superintendent's travelling inspectors.

Comparison of results was made "..man with man, section with section, station with station, District with District."[26] Large stations furnished daily returns and the smaller stations monthly and half yearly. The loading of wagons was reported weekly and monthly to the District Goods manager, who also received notice of light loading once a week. The performance of engines was monitored in daily or weekly returns depending on the size of station, large or small respectively. A daily statement from the goods "agent" to a district officer contained details of how many wagons were dealt with and how quickly they were dealt with, thus providing an indicator of shunting performance. Larger stations gave returns on how foremen, inspectors and other officials spent their time and on the "power" expended in yard operations viz capstans, cartage etc.[27] More general reports were also submitted to headquarters by the District Goods Managers and District Superintendents.

These figures are an indication that despite the LNWR's broad opposition to that object of the "reformers" affection, the ton-mile, the LNWR was collecting much data.

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25 *Departmental Committee on Railway Accounts*, p112 paragraph 19.

26 *Departmental Committee on Railway Accounts*, p114, paragraph 60.

27 *Departmental Committee on Railway Accounts*, p115, paragraphs 78,79 & 80.

The question is to what use did they put it? The Committee heard that "Experts attached to the district offices and headquarters are sent from place to place, wherever...it is considered the best is not being done.."[28] To conclude their memorandum, the LNWR stated that they dealt "..day by day in detail by means of useful statistics."[29] So the LNWR was not averse to using considerable amounts of data for management purposes, but they rejected the ton-mile. The use of an average negated the value, so they thought, and this was a common criticism. It was not possible to intervene in operations using an average as conditions were so variable. So the ton mile could not be used to enhance management control. The GWR memorandum of evidence stated this by drawing attention to the myriad operating conditions - different traffics over different sections of line, and there was no consideration of the terminal cost.

On the GWR similar use was made of the guard's journal but with a monthly return instead collated in the District Superintendent's Office and then to the Superintendent of the Line. These showed average loading and the average number of minutes late. Poor loading was then discussed in a monthly meeting between the Divisional Superintendent and the Goods Manager. The Chief Manager's Office also monitored wagon loading on a quarterly basis via a sample of wagon loading for each station and inspectors could also, as on the LNWR, make surprise visits to the stations. The Board of Directors were also informed of poor loading by the presentation of such data as minutes.

As with the LNWR, what is revealed were quite sophisticated information gathering mechanisms. For example the average train load was not taken as a useful figure but the load of each individual wagon was known at each point. The measure of sophistication suggested by the GWR witness Mr T.H.Rendell was that of earnings per train mile, as they included terminal costs. As Rendell noted in a reply to George Paish, "I think the difference between us is that you are contending for averages, and

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28 *Departmental Committee on Railway Accounts*, p114, paragraph 70.

29 *Departmental Committee on Railway Accounts*, p116 paragraph 106.

I say we know the load, because we take it between every point."[30] The Great Central Railway (GCR) was represented by its General Manager Mr Sam Fay. His evidence reveals some of the problems in discussing the application of statistics. Like the GWR there seems to have been much "hands on" supervision of operations with inspectors from the Goods Manager's Office.[31] The wagon load was recorded and sent to the District Goods Manager where an average was compiled before going on to the Chief Goods Manager. Monthly meetings between the Goods and Traffic Offices ensured that poor loading could be checked. Returns were similarly received from the Train, ie the guard's journal, to the District Superintendent's Office for daily analysis. A weekly report was submitted to the Superintendent of the Line, and the General Manager had a monthly return of train loading sheets which he would take to a meeting of the Goods and Traffic Offices. Comparative statements of expenditure incurred were made every fortnight which were scrutinised by the finance committee.

Given the time taken to produce the data, it is difficult to see how the ton mile could be used to monitor performance, since the conditions were so dissimilar. The ton-mile can be seen as an "official" cost accounting system producing "..information too late and at too aggregate a level to be helpful for operational control."[32] The evidence presented to the Committee and its Report reveal that there was some confusion about which issues should be addressed in the field of statistical collection. This was probably a reflection of the debate which the Committee was attempting to clarify: ie were railways being managed properly?

The problem was that it was not clear whether the measures used should reflect physical or financial conditions. There was a clear demarcation between operational control and the financial implications of such control. The proxy used by the Committee for efficient management seems to have been whether ton-mile statistics were collected or not. Hence, both the members of the Committee and the witnesses

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30 *Departmental Committee on Railway Accounts*, Q.4469. Rendell was the Chief Goods Manager and former Assistant General Manager of the GWR.

31 *Departmental Committee on Railway Accounts*, Memorandum of Evidence, p281.

32 H.T.Johnson and R.S Kaplan (1987) *Relevance Lost: The Rise and Fall of Management Accounting*, p194.

were sometimes talking at cross purposes. The ton-mile was an average measure which reflected the load carried per mile and could not take account of differing loads and operating conditions. At best it was an imperfect measure of performance. Railway managers were concerned with day to day operations, whilst those supporting the ton-mile saw uses beyond that of those internal to the company, in Annual reports and as evidence to government. Indeed the thrust of the reformers' argument was that the railway industry had been mismanaged and hence needed measures which government, shareholders and directors could use. Thus to the reformers it did not matter that the information was too late to be of use to managers as they were not the audience at which it was aimed. The final report recognised the distinction between the analyses of statistics, which, as noted above, was not always clear from the evidence presented:

> "In considering the practical advantage of statistics to those actually responsible for the working of a railway, it is necessary to draw a distinction between the working returns taken out at short intervals, merely embodying detached information for the use of subordinate officers in the daily conduct of the business, and the more generalised figure prepared for the use of higher officials and directors"[33]

This sums up the differing views of the protagonists. As we have seen, the railways pursued the aim of combining such experience with a knowledge of management ideas in general.[34]

Most managers felt that they had enough data and experience of railway working to interpret such information as was available without the difficulty of using and interpreting an average. The regulations the railways were placed under by Parliament were many: they could not refuse freight since they were considered common carriers, prices were fixed, as were charges for facilities. It was this climate which prompted Samuel Fay of the GCR to comment under questioning as to the value of the ton-mile: "I think you have got to deal with all sorts of peculiar people in this

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33 Final Report, paragraph 53, *Departmental Committee on Railway Accounts and Statistics*, Parliamentary Papers Vol. LVI, 1910.

34 See Chapter Two. The work of R.Kaplan and H.Johnson *Relevance Lost*, also deals with this issue.

country. You have got to deal with Committees of Parliament and I should be afraid of anything a Committee of Parliament did, from my experience of some of them."[35]

The Report of the Departmental Committee reflected the conflicting evidence of the witnesses. However the Committee recognised the value of the ton-mile statistic even if its collection was not recommended as compulsory. The main body of the report was endorsed by all members but three were reserved in their comments. Sir Charles Owen and two others rejected the endorsement of such statistics. Citing the terms of reference of the Committee, these three did not believe that such a body was competent enough to deal with such questions. William Acworth, H.Fountains and George Paish offered further reservations, this time backing the compulsory collection of statistics.

The forum of the Committee, both the report and its evidence, demonstrates the confusion surrounding discussions of management reform. By the time of the 1921 Act the question of what statistics to collect had been resolved, largely in favour of Paish and Acworth rather than Owens. As we shall see the Act recognised implicitly that measurement and analysis were important in the running of large scale organisation, but did little to encourage it.

What the Committee left was a useful summing up of what management and its critics thought they needed from a more "scientific approach" to management. As the representative of the Railway Shareholders' Committee stated, "It is a lamentable fact, widely recognised, that for many years this country has lagged behind others in scientific organisation."[36] The views of the Committee mostly reflected this and laid the foundations for the inter-war system of Returns.

The evidence put before the Committee neglected key aspects concerning the use of office machinery and in particular the telephone. Yet as we shall see, at the very time the Committee was convening its investigation, the Midland Railway was starting to employ Train Control with the telephone as its central component. No mention was made of the telephone in the evidence given, nor were questions asked of its value.

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35 *Departmental Committee on Railway Accounts*, Question 7960. Whether he was referring specifically to this Committee is not clear.

36 *Departmental Committee on Railway Accounts*, p327.

Indeed it was explicitly rejected by some commentators as being of no value. The next section discusses the systems of Train Control that were being established on companies from 1907 onward. It shows that there were attempts being made to utilise a scientific approach to management. It also provides some background to the development of centralised Train Control under the LMS which we will discuss in Chapter Four.

Train Control

Train control was tried on the lines of several companies including the LNWR, L&Y, NER, GWR and MR. It extended the use of the telegraph and the telephone into a system of management control. The process of conveyance could be monitored and information extracted for use by management. In enabled managers to, in the language of our model, Evaluate and Execute plans agreed upon in the form of schedules and routes.

It was the MR that led they way, being the most comprehensive and long lasting: forms designed before the First World War were still being used after the Second. It formed the basis of the LMS system that lasted well into nationalisation. The significance of these systems is that they represented at least a partial solution to the problems arising out of the debate on management. We will describe the MR Train Control system in some depth before describing the L&Y and NER systems. This then helps interpret the debate on management practices and provides background for the discussion on conveyance in Chapter Five.

When it reported on the Midland's Train Control in 1921 the *Railway Gazette* described it thus: "The train control system is undoubtedly the most ambitious scheme conceived with the object of determining the utilisation of track capacity and plant, and of securing a more efficient and economic user.."[37] The origins of such a system on the Midland stemmed from the need to relieve congestion and improve the relief of guards, firemen and drivers. According to a Midland report written in 1914, there was a general need to improve overall working "..without increasing the capital expenditure

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37 Anon. "The Train Control System of the Midland Railway" *Railway Gazette*, July 8, 1921.

out of all proportion to the expected addition of revenue."[38] The problem of congestion was particularly acute. Even building additional running lines was ineffective since the stocks of wagons from private sidings spilled into the surrounding depots, interfering with main line freight operations. In addition there were 24,760 cases of firemen and drivers working more than 15 hours a day, resulting in increased fatigue and payments for longer shifts.[39] Train Control was the response to both of these problems.

The initial installation of Train Control on the MR was on a 10 mile stretch of line in commencing in 1907. The purpose was to control coal train working in the Masboro' area.[40] The General Superintendent reported to the General Manager in June 1908 about its performance. On the basis of this the MR Directors gave the go ahead to extend the system.[41] Approval was sought for "..up to £5,000 in the provision of a control office at Derby.." together with telephone links between Cudworth and Toton for the purpose of establishing "..the first instalment of the improved system of control of the working of goods and mineral trains."[42] This was agree in 1908.

The Train Control office supervised local workings. On the other hand, "..matters of principle are discussed and controlled by the Superintendent of Freight Trains.." who represented the General Superintendent at Headquarters.[43] The District Controllers reported to the Superintendent of Freight Trains and in addition they discussed the previous 24 hours' working.

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38 RAIL 491/815 Midland Railway Train Control no author, p2 (An internal document published by the Control Office, Derby in May 1914.)

39 RAIL/491/815 Midland Railway Train Control, p2. It would appear that this calculation was for the period immediately before the introduction of Control in 1906.

40 RAIL/2804/8 Train and Traffic Control Arrangements - Re-organisation of Areas and De-centralisation of Staff. September, 1944, p2.

41 RAIL/491/165 Midland Railway Traffic Committee Minutes, Minutes 35134 and 35163 "Report on Traffic Control," 1914.

42 RAIL/491/165 Midland Railway Traffic Committee Minute 35163, 1914.

43 RAIL/491/815 Midland Railway Train Control, p9.

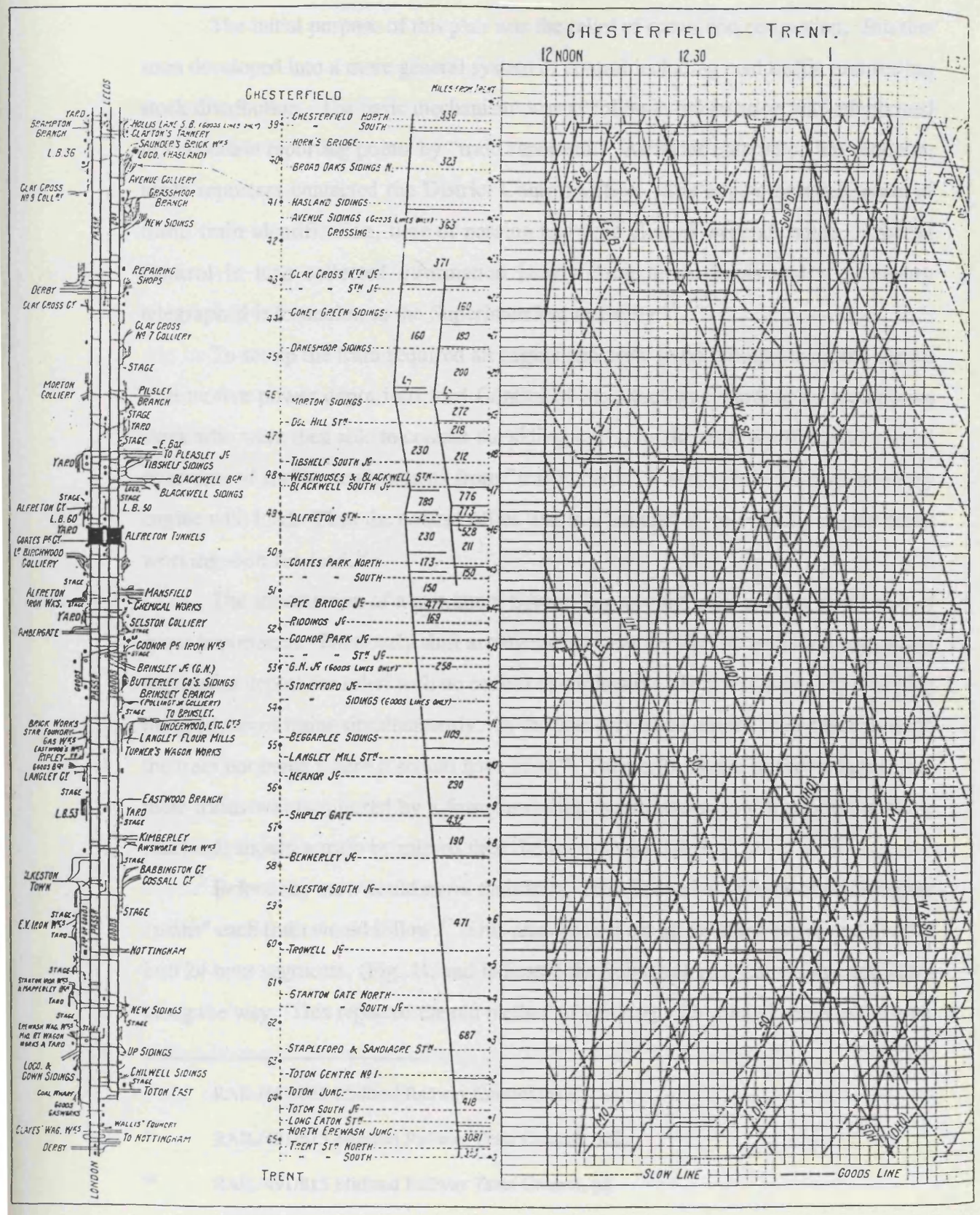

FIGURE ONE: The MR Train Diagram
Source: Anon "Traffic Control on the LMS" Railway Gazette, February 22, 1929.

The initial purpose of this plan was the relief of crews and congestion. But this soon developed into a more general system of control including coal traffic and rolling stock distribution. The basic mechanism was as follows: information was telephoned in via certain reporting points by "train reporters." As trains entered or left sections, these reporters contacted the District Control Office. The engine number, class of train, train identification, time of passing and time cleared were all noted. District Control in turn collected information hourly from these points and if necessary telegraphed information to the Superintendent at Derby.[44]

To set up the train required an engine and crew to be brought from the depot. The motive power depot informed Control of the situation regarding its locomotive stock who were then able to contact the siding staff. As the control office had a good overview of traffic requirements from "traffic cards" it was relatively easy to marry engine with load. Thus the control office was in a position to co-ordinate engine depot working with the load.[45]

The introduction of a maximum 8-hour day meant that providing relief was of some importance. Previously shift arrangements were decided by trainmen contacting the nearest depots for relief with no central co-ordination. This was solved by knowing the progress of trains simultaneously. In the past crews had missed their relief through the train not being where it should have been.[46] The performance of crews in meeting their trains was monitored by a form recording details and signed by the crew being received: should a train be missed then the reason was noted.

Before any crew could move their train, there had to be a means of planning the "paths" each train would follow.[47] This plan was drawn up on graph paper and divided into 24 hour segments, (Fig. 1), and indicated the important stations, sidings and yards along the way. This replaced the old method of working with printed pages and forms.

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44 RAIL/491/815 Midland Railway Control, p12.

45 RAIL/491/815 Midland Railway Train Control, p22.

46 RAIL/491/815 Midland Railway Train Control, p5.

47 For what follows see "The Train Control System of the Midland Railway" *Railway Gazette*, July 8, 1921. As the running of Passenger trains was by a public timetable, changes could not easily be made. Hence freight movements were fitted in around this public timetable.

Also shown were cranes, staff stations and water troughs, whilst slow and goods lines were shown colour coded red and green. The steeper the diagonal lines the faster the train with horizontal lines indicating where and for how long stops were scheduled. For any *one* track none of the lines should meet as this would indicate two trains on one track at the same time. Alterations in working could be planned around this. Additional paths could be entered on the diagram if the capacity was so desired. This system of "diagramming" enabled controllers to co-ordinate freight train movements by showing how special workings could be slotted into the overall traffic position. This was important in measuring the "workable running capacity" of the line which would determine traffic density and associated train movement.[48] Once the diagrams had been agreed they were written up in the "Midland Railway Freight Train Working Time Book," which showed all the times in different type according to the times of passing, starting or stopping.

In its description of these diagrams, the *Railway Gazette* was clearly impressed: "The amount of work involved in the diagramming of all the trains for the whole Midland system must have been colossal..," clearly the company thought it was worth it.[49]

The movement of the train was monitored by a Train Card which contained the name of the crew, the time they started duty, the number of wagons and the destination. Also included was an identifying engine number. This card was placed on a Train Board and the card moved according to the location of the train. The information required for the Train Card was telephoned in from the motive power depot and any further details telephoned from reporting points along the route. In addition, notice of traffic was provided by the Traffic Card, again displayed on the Train Board, this time to the left hand side. Reports every two hours from "..sidings, Inspectors, Foremen Siding Porters etc who are stationed at the point where traffic originates.." formed the basis for this display.[50] This enabled the controller to rapidly assess the wagon

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48 ibid.

49 ibid.

50 RAIL/491/815 Midland Railway Train Control, p21.

distribution within a district and to speed up the re-allocation of wagons as soon as they became available.

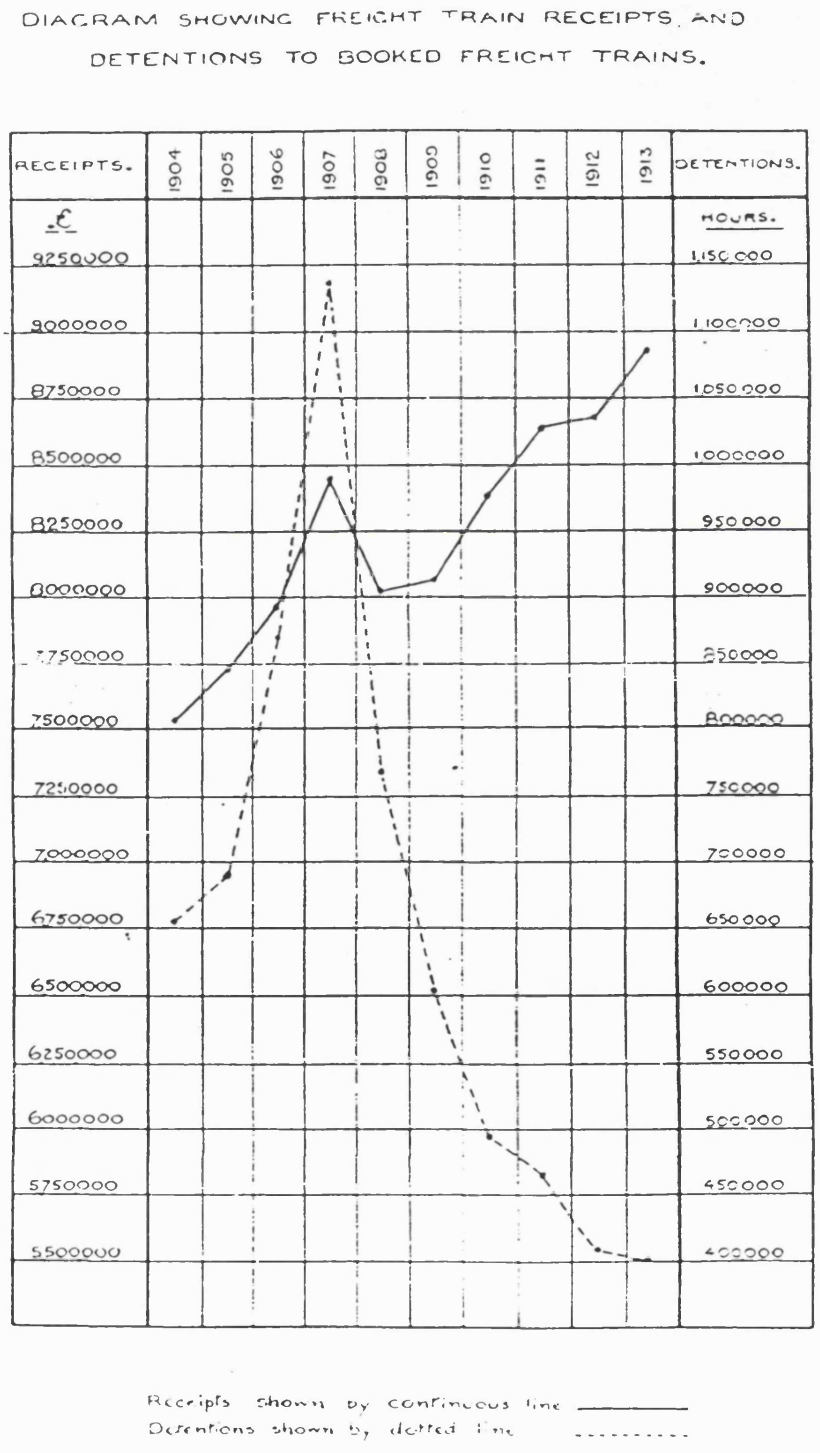

FIGURE TWO: MR Results of Train Contol in Operation
Source: RAIL/491/815 Midland Railway Train Control, p69.

The Stopped Traffic Card was used if there was a build up of traffic "..owing to an abnormal run of traffic, or other cause, a consignee is unable to receive his traffic it becomes necessary to stop or restrict its despatch from the stating point."[51] Any depot could request such authority from the District Control Office, who would inform the consigning station. If the traffic originated outside the District, then the Central Control Office at Derby was consulted. Whether at the District level or at Derby, the Card was completed and information on the type of traffic and number of wagons was given to the stations, yards etc involved. As long as the station/yard card was held at source, it acted as the authority to restrict the traffic.

The information received by District control was updated every two hours on the "Traffic Sheet," by telephone, regarding the traffic on hand at sidings. Every morning at 8.0am this was compiled for the coming day's working, and altered as was necessary. This showed the number of wagons available/required and where, details of which were communicated to Central control at Derby.

The *Railway Gazette* gave an example of how Control officers were able to analyse workings.[52] Study of the train diagrams revealed that it would be possible to improve the performance of heavy coal trains to London by retiming them. The success of this was gauged by punctuality with 258 out of a sampled 428 trains arriving on time and 148 less than 10 minutes late. Unfortunately no comparative figures were provided as to punctuality before this.

This review of Train Control on the Midland Railway shows in outline how trains were monitored by the use of telephone communication from selected reporting points within the District. The changing traffic situation could be recorded and displayed on the control board. The management at the Midland Railway were satisfied with the system: "The Train Control System has produced an inseparable link between the Central Control Offices and the District Controllers, the daily conferences establishing an equitable distribution of working difficulties and harmony which is most

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51 RAIL/491/815 Midland Railway Train Control, p23.

52 "The Train Control System of the Midland Railway," *Railway Gazette*.

healthy to work amongst."[53] The same report noted improvements in reducing congestion, after Train Control was introduced in 1907 (See Figure 2). There were 2,830 Goods Guards and Brakemen in 1907 giving a wage bill of £240,368. By 1910 it was £176,124 with 2,200 men.[54] Similar effects were experienced by engine crews: in 1907 there were 5,936 drivers and crew which fell to 5,780 in 1910. The wage bill for the Midland fell from £783,237 to £698,971.[55] The full potential of the MR system was revealed after the amalgamation in 1923, when it was adopted throughout the London, Midland and Scottish Railway.[56]

The MR had the most systematic application of Train Control. However there were other company schemes which utilised some form of control. These schemes were not as unified as the MR but did offer some degree of coordination.

The Lancashire and Yorkshire

In January 1912, the L&Y established its first sections under Train Control at Wigan and Wakefield.[57] This was followed in 1913 by an office at Wakefield. By 1915 the use of such offices resulted in the establishing of a central control at Manchester. The Superintendent of the Line was in overall control, with an Assistant responsible for implementation below this.[58]

The objectives of control were similar to the MR. Engine power, crew and rolling stock use was to be maximised along with route capacity. In addition loads

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53 RAIL/491/815 Midland Railway Train Control, p62.

54 RAIL/491/815 *Midland Railway Train Control*, p71; *Parliamentary Papers*, 1908 XCV, 1909 LXXVI Returns on Hours Worked.

55 RAIL/491/815, Midland Railway Train Control, p71; *Railway Returns*, Parliamentary Papers, 1908 XCV, 1911 LXX.

56 See Anon. "Traffic Control on the LMS" *Railway Gazette*, February 22, 1929.

57 What follows is based on G.Seddon "The Advantages of a Train Control System Embracing all Stations" *Great Western Railway (London) Lecture and Debating Society*, Meeting 9th. December, 1920. Seddon was Chief Superintendent of the Line for the L and Y. See also Burtt *Control*, Chapter XI pp130-143.

58 In this position was Ashton Davies who, as we shall see, rose to prominence on the LMS. He later became Superintendent of the L and Y.

were coordinated with trains with, it was hoped, an increase in the speed of service. Train control was also explicitly seen as a means of reporting on proposed investment decisions. How much traffic was passing a point and with what delays? Could new sidings or loops reduce such congestion? These were the sorts of questions Train Control was designed to answer.

As with the MR, emphasis was placed on the graphical representation of the route, but with more sophistication. The Central Control Office consisted of an inner and outer circle, the latter being Section Controllers, the former the Chief and Deputy Chief Controllers. Spread around the circumference of the room was a complete map of the L and Y system. All running lines, junctions, sidings loops and refuge sidings were depicted in different colours. Central controllers could see at a glance how the entire network was functioning. The Sectional Controllers could also view this but in addition had in front of them their own particular section. On these boards "pegging" would monitor the movement of trains through the company. Information for this was collected by regular telephone reports from signalmen, shunting cabins, stations etc.

The North Eastern Railway

The NER differed from the MR and L and Y in that control was not centralised.[59] Nor was it universal, as passenger control was only introduced in 1922, at York.[60] Only Districts with specific traffic problems or areas of congestion were included. As with others the maximisation of engine power, crew availability and capacity of the route were the stated objectives.

There were 59 reporting points within the Newcastle District linked by telephone, plus points such as signal boxes and shunting yards. At Middlesborough a display of metal carriers moved around a schematic diagram at the behest of the Controller. Details of load, crew, times etc were placed within the carrier. At

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59 See Abstract of Lecture by G.Robinson "Freight Train Control, North Eastern Railway" *Railway Gazette*, February 7, 1913; Anon "Traffic Control, Newcastle, North Eastern Railway" *Railway Gazette*, April 5, 1918.

60 Anon "New Headquarters Main Line Control, North Eastern Railway," *Railway Gazette*, December 1, 1922.

Newcastle a more conventional diagram was used, not unlike a signalman's display. Information on train movement was sent via telephone and recorded on sheets at the Control office. At Newcastle, in place of the carrier, tickets were placed on the display board. Rolling stock was monitored via reports every six hours. Any out of the ordinary events were recorded in a Report book. Carbon copies of each entry were sent to the Divisional and District Superintendents.

Although not a comprehensive centralised system, these examples from the NER indicate that they too could appreciate that telephones had a role to play in operational management. What they did not do was develop it further to deal with specific routes and traffics. This would have led to bottlenecks occurring outside of the route under control, thereby negating the overall benefits. The LNER was later to rue the fact that the NER had only a partial system, comprising Traffic, as opposed to Train, Control. The key differences between these two systems will be examined in Chapter Five.

The Reformers' Response

That there was confusion over what constituted a scientific approach to management is clear. *The Statist*, whose editorials and letters formed the basis of the influential book, *The British Railway Position*, was still claiming in 1914, seven years after the introduction of Train Control that "..scientific material about British railways is neither compiled nor permitted to be compiled, except by the North Eastern Railway."[61] This did not go unchallenged, prompting an anonymous reply by "A Traffic Manager" who in the ensuing weeks pointed out that there was more to a scientific approach to railway management than the ton-mile. He went on to quote the advantages of Train Control noting that it was"..infinitely more useful as a guiding or saving factor than any amount of ton-mile statistics can possibly be to the operating officer."[62] The next letter from the anonymous traffic manager pointed to the variety of traffic and conditions involved in rail transport and rejected the use of "meaningless

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61 *The Statist*, February 21, 1914, p363.

62 *The Statist*, February 28, 1914, p421.

averages."[63] *The Statist* replied with not a little hostility. It noted that such criticism proved that managers were not following "scientific management."[64] Another anonymous letter appeared from "A Railway Director" supporting the stance of *The Statist*. Here once again the issue of personal supervision was rejected:"The truth is that your correspondent is not and cannot be in close touch from day to day and from hour to hour with the working of his railway."[65] Clearly the Director did not comprehend the function of Train Control and the role of the telephone in it. As we have seen above, even that bastion of the ton mile, the NER, had realised some value to such a system.

Many of the reformers were concerned with people outside railway operation - shareholders, government and traders. For example there was the evidence of the Railway Shareholders Committee, from a Mr W.Burdett-Coutts MP. He noted that shareholders had "..no means of gauging the competence of those who control and manage the enterprise other than by the dividend paid."[66] In other words they were concerned with monitoring overall performance, rather than particular issues of management. What the correspondence in *The Statist* reveals is that the ton-mile was, in a sense, a fashionable stick with which to beat railway managers. Writers on Scientific Management did in general see that "scientific management" was more than a measure of output: data needed to be "systematically collected" so as to be "instantly available."[67] The function of Scientific Management was "..to bring together, analyse

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63 *The Statist*, March 7, 1914, p486. See also P.N.Norton (1902) *Statistical Studies in the New York Money Market* New York: Macmillan, p15, for similar criticism of averages in the context of money markets.

64 *The Statist*, March 7, 1914, p486.

65 *The Statist* March 4, 1914, p486.

66 *The Statist* March 7, 1914, p326.

67 F.E.Cardullo "Industrial Administration and Scientific Management" in C.B.Thompson (ed.) (1922) *Scientific Management*, London: Harvard University Press, p62.

and prove the vast amount of knowledge making up the trade..This must be classified, tabulated, and made available..to all men; whereas formerly it was scattered."[68]

Terminal Services

In addition to the debate on statistics and management conducted by Paish, there was a comprehensive critique of terminal services developed by a businessman, A.W. Gattie. The so-called "Gattie System" is interesting for several reasons, for it was not just another case of "railway bashing," although to many managers it seemed so at the time.[69] It contained within it the seeds of Containerisation. Such Containerisation would become one of the railways' more enduring innovations in the late twenties and early thirties. As such it is an interesting reflection on how railway management dealt with terminal operations. This also illuminates a little known precursor of containerisation, the commercial implications of which are examined in a later chapter.

To a modern observer the similarities between the Gattie Clearing House system and a modern container Depot are striking. Through the use of a Central Goods Clearing House located in London and other important provincial centres, Gattie proposed to radically alter how terminals were worked. Containers would be used to minimise handling and aid transhipment via the Clearing Houses. Given that Containerisation and transhipment were to form important strands of railway strategy in the inter-war period, we might view railway managers' reactions as conservative to say the least. David Lamb a later editor of *Modern Transport*, was at the time a railway employee. He remembered how his superiors had requested reports with which to demolish Gattie's arguments.[70] Whilst we may conclude that this was failure on the part of management to comprehend new management practices, we should remember

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68 H.K.Hathaway "The Planning Department, Its Organisation and Function."in Thompson (1922)*Scientific Management*, p369.

69 For details of Gattie's scheme, and the difficulties he had pursuing it, see R.Horniman (1919, Third Edition) *How to Make the Railways Pay for the War*, London: George Routledge and Sons; Horniman refers to Paish and *The Statist* on p74. It should be noted that Horniman was himself a supporter of Gattie. F.W.West (1912) *The Railway Goods Station*, London: E. and F.Spon Ltd Appendix pp180-186 gives the not too favourable impressions of a Manager. West was London District Goods Superintendent of the South East and Chatham Railway.

70 See Bonavia *Railway Policy Between the Wars*, p135.

the problem of redeveloping existing sites within urban areas. Just as conventional terminals could not expand, there was little realistic hope of being able to develop massive Clearing Houses. Gattie's case was also hindered in his approach to his critics. His New Transport Company was strident to say the least in its dealings with those of a different opinion.[71]

Gattie did not offer a solution for the basic problems facing the railway companies. The capacity at yards was limited as traffic had increased beyond that originally catered for and problems were being experienced. Benches were crowded with goods awaiting transfer, or collection. Contemporary criticism of terminal working can be, if not entirely refuted, then tempered by the evidence. Sources demonstrate that new methods of working were being considered. Solutions to these problems usually centred on rearranging the organisations of the shed. In addition, as with train control it seems that the 8 Hour Day influenced working patterns. This encouraged changes to be made thereby maintaining operations by monitoring the hours worked.[72] The MR studied conditions in some depth, noting arrivals and departures of wagons and speed of handling.[73] The relationship between incoming and outgoing wagons was noted in chart form. The average wagon load was extracted as an indicator of the scheme's success. Bonus payments were based on analysis of speed of handling and "average ton." The variance between that and the actual tons handled was minimised as each ton reflected only the conditions pertaining to that shed, as opposed to a system wide measure. Further examples were noted in the trade press, albeit post World War One. In London, the MR had extended notions of control to terminals via cartage operations.[74] The telephone was once more used to facilitate communication between the various operations. The objective was to maximise the use of labour whilst minimising empty haulage. Regular reporting

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71 See Horniman *How to Make the Railways Pay for the War*, for evidence of this; especially Appendix 4, the Correspondence with the Board of Trade.

72 Anon "Goods Station Working on the Midland Railway" *Railway Gazette*, December 29, 1922.

73 See the series of articles T.E.Argile "The Operation of a Goods Shed" *Railway Gazette*, March 19, March 26, and April 2 1915.

74 Anon "Midland Railway's New Cartage System" *Railway Gazette*, November 1, 1918.

between drays and the yard coordinated delivery. It also monitored the position of the dray relative to the pickup puts in the delivery area by using charts and diagrams.

Yard working itself was brought under telephone control on the eve of amalgamation.[75] The yards in question, at Nottingham and Leicester, were integrated within the telephone cartage systems described above. Forms were used to collate information from the telephoned reports. The status of wagons and their loads, and the position of drays was noted on an hourly basis. A series of diagrams displayed some of this information to controllers who then diverted traffic to the relevant positions. Standards were set governing the performance of each part of the process. According to the District General Manager of the area, improved speed of handling, delivery time and throughput were achieved, although unfortunately we have no figures to support the specific claims being made. However what is important is not so much the results of individual schemes but the methods that were being employed. It is clear that a scientific approach to the analysis of information was being pursued in this area of operations. The point is that it was not limited to Train Control. These methods were not limited to the MR either. For example in 1922 the LNWR at Curzon Street, Birmingham was introducing electric trucks for internal movement.[76] To facilitate this, the company had to understand how the various elements of terminal working interacted. Special reports on shunting and wagon accommodation were commissioned to this end. It was recognised that the process of mechanisation required "Systematic" analysis if it was to be sucessful.

We have seen in Chapter Two how the scientific approach to management was embodied in the writings of commentators and academics. The debates on management outlined above were important in shaping the thinking behind the plans for amalgamation drawn up after World War One. That, and the experience of government control, focused attention on what economies would be possible from the amalgamation of railways. The next task is to outline the structure of the railway companies as they were constituted after 1923, with the focus on those aspects that affected the control of

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75 Anon "Goods Station Working on the Midland Railway" *Railway Gazette*, December 29, 1922.

76 Anon "Electric Trucks in Goods Terminal Work" *Railway Gazette*, June 16, 1922.

freight operations. In addition we need also to place the railway operations within the commercial environment they faced between 1923 and 1939.

Chapter Four

The Post Amalgamation Railway Companies

The amalgamation of the railway companies under the 1921 Act was essentially a stop gap for nationalisation. For almost all of their existence, railway companies had been regarded as almost a public service. They owed their existence to private Acts of Parliament and government had always maintained a close interest in their working. This, combined with a belief that centralised administration was a means by which economies could be achieved, gave rise to thoughts concerning nationalisation. This was supported by the experience of the government in running the railways through the Railway Executive Committee during World War One. It was also the "logical" conclusion of the trend toward merger that had taken place prior to the First World War.[1]

The pre 1914 merger movement had continued after the war, with the MR and L&Y combining prior to the 1921 Act, in 1920. The railways became in effect a form of cartel, with information sharing, the pooling of receipts and joint working. Under the 1921 Act, prices were set under the auspices of the RCH and confirmed by the Railway Rates Tribunal, of which more will be said later.

From the late twenties and early thirties, there were moves toward pooling railway receipts on certain routes between companies.[2] This was to avoid duplication of resources, which also extended to such aspects of operations as canvassing and the provision of road services. The "Pools" were established between the LMS, LNER and GWR for various traffics, based upon the net receipts on competitive routes for the years 1928 through to 1930. Pooling was the most visible financial consequence of cooperation. The sharing of commercial and operating information was just less visible.

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1 See Chapter 8, H.Pollins (1971) *Britain's Railways: An Industrial History*, David and Charles: Newton Abbot; W.A.Robertson (1912) *Combination Among the Railway Companies*, Constable and Company. Many of the arguments were rehearsed in the *Report and Evidence of the Departmental Committee on Railway Agreements and Amalgamation* Parliamentary Papers, XXIX.

2 Bonavia *The Four Great Railways*, pp171-174.

The two most important factors for the railways in the inter-war period were the regulatory implications of increasing road transport and the decline in key traffics due to depression. Government regulation implicitly assumed that railway companies were in competition with each other, but this was increasingly not the case. By far the most important source of competition was from road vehicles. The nature of this competition influenced how the companies cooperated through the RCH. Past decisions on price and service had to be considered when evaluating current policy.

This chapter sets the scene for the analysis of the companies' management that follows. We will examine briefly the regulatory framework in place after the 1921 Act. Then we will profile each of the companies, relating the organisational structure to some of the flows of information which concern us, the Goods Conferences and Committees. We will also review the business background to the railways in terms of road competition and the depression in the "old" heavy industries. It should be stressed that this is not meant to be an all encompassing narrative of the period 1921 to 1939: this is available elsewhere.[3] What is intended here is to produce a background to the use of commercial and operating information.

The 1921 Railway Act, Amalgamation and its Legacy

The task of managing a railway from 1914 onwards, cannot have been an attractive proposition. Government control restricted management just at a time when traffic was increasing due to the demands of war. Granted, the power vested in the Railway Executive Council would have made some tasks easier, but overall the business of railways would become increasingly complicated.[4]

The costs of conducting business were increasing, again due in part to government regulation. Wages were increasing at a time when revenues would be insufficient to meet them. An 8 hour day was finally to be introduced in 1919. By contrast a Rate and fare increase was permitted only in 1917 and 1920. The Select Committee on Railway Transportation of 1918 and the formation of the Ministry of

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3 See M.R.Bonavia (1981) *Railway Policy Between the Wars*, Manchester University Press. for details of investment and financial performance in this period.

4 See E.A.Pratt (1921) *British Railways and the Great War*, Selwyn and Blount.

Transport helped shape post World War One policy. It was against this background that reorganisation of the railways took place.

The basis for the 1921 Act was presented in a White Paper of 1920, *Outline of Proposals as to the Future Organisation of Transport Undertakings in Great Britain and their Relation to the State.* This developed the notion of a grouping with representatives from the workers having a voice in the management of the companies. It also suggested that revenue gains be limited by appropriating them for the wider development of the transport infrastructure.[5] Despite, or perhaps because of, the radical nature of the proposals, many were dropped. For example, the proposal that workers should be represented on the Boards of Directors was not implemented. However other limits on management control were in place: the wages and conditions of service were determined by statutory bodies further limiting the freedom of management.

For the issues of management control addressed in this thesis it was the restraints placed upon pricing that had the most impact. The ability of the railways to price had always been limited by Government: this was to be further extended into the ability to make profits. The Act limited the railways to a Standard Net Revenue, which, once reached, would then lead to additional monies being used to reduce rates. This formalised revenue maximisation as an objective.

From the point of view of management control the most important aspect of the 1921 Act, was the phrase "efficient and economical working." This was to be the criteria by which the performance of the railways was to be judged. The RRT, (Railway Rates Tribunal), was established to monitor operations and report to the Minister of Transport. Each year it would hold hearings which heard evidence from the railway companies and traders as to the efficiency or otherwise of operations.

Unfortunately we cannot look to this for any detailed assessment of railway operations as the all important phrase "efficient and economical" working was never defined in any clear sense. No measures were devised or reports ordered to investigate aspects of working. Clearly policy had not been well thought through: one of the main

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5 Pollins *Britain's Railways*, p147.

recommendations of the 1918 Select Committee on Transport had been the unified ownership of the railways, as only then would it be possible to achieve the required economies. How this was to be achieved in the absence of such information was not made clear. It is apparent that there was no vision behind regulation: how such economies were to be obtained was left to the discretion of railway managers and the officials of the RRT. This had an impact on the operation of individual companies as the government was unaware of the difficulties posed to the railways by the changing business environment. They had no idea of the constraints under which every day management was operating. To be fair the management of the companies would probably have objected to detailed regulation, but more detailed statistical material and formal reports of specific criticisms would have helped both sides. It was not just that the regulatory institutions were defective per se: without such guidance as to what "efficient and economical working" meant, there was little hope of the objectives of legislation being attained. Be that as it may, to appreciate the effects of government policy we need to examine the inter-war operating environment in a little more depth. Then we are better able to discuss other government initiatives.

Once the Act of amalgamation was passed, there was naturally a period when companies and government alike adjusted to the new situation. This was inevitable in such a large undertaking, but it soon became clear that the business situation was not improving. By 1928 the new Classification and associated rate structure was in place and this focused attention on what rates were actually being charged and for what service. By now the growth in road competition was clearly identified as a major bone of contention by the railway companies, who brought this to the attention of the government. This prompted some important changes in legislation.

From 1928 new legislation allowed the railway to operate road transport other than C&D. and the 1933 Road and Rail Traffic Act placed the Agreed Charge on the statute book. We will consider what the implications of this were in Chapter Seven. For the moment it is sufficient to note that whilst government perceived a difficulty for the railways with road transport, it was not willing to alleviate it. This was compounded by the general economic climate in the thirties especially, as we have seen above.

The means by which government acted can be seen in the reports of the various Committees investigating the railway industry. In fact they mirrored the concerns regarding the development of the railways after the 1923 merger and the growth of road competition. In 1932 the likely consequences of pooling railway receipts was investigated and allowed to proceed.[6] This was perhaps an admission that the railways should have been nationalised in the first place.

Meanwhile the railways were attempting to influence government in a variety of ways. The RRT hearings and evidence before the Royal Commission on Transport was one way.[7] By the late thirties, realising that even when agreement could be reached with government on some aspect of policy, there was very little will to do anything, the railways established the "Square Deal" campaign. Through this, and probably as a result of the continuing information being gathered by government through the RRT and previous Committees, the Transport Advisory Council was established. The Royal Commission on Transport had recommended that such a body should be set up but only late in the thirties was it finally operative.

This anticipated some of the problems that would shape post 1945 railway policy, as well as confirming some already existing ideas about past performance.[8]

The Inter-War Business Environment

Road transport developed out of the demobilisation of men and vehicles that occurred after World War One. By the time of the 1933 Road and Rail Traffic Act, a system of licences was in place which reflected the predominant types of haulage business. The "C" Licence was held by private business such as retailers which carried their own goods. "A" and "B" licences were those businesses that also carried goods

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6 See Ministry of Transport, Railways Act 1921 *Report of the Railway Pool Committee* and *Proceedings of the Railway Pool Committee*, both 1932, HMSO.

7 *Royal Commission on Transport - Final Report: The Co-ordination and Development of Transport*, HMSO Cmnd. 3751, 1931.

8 See T.R.Gourvish (1986) *British Railways, 1948-1973: A Business History*, Cambridge University Press, especially Part 1, "The British Transport Commission and the Railway Executive, 1948-53," pp29-91.

other than their own or which were dedicated general hauliers.The extent of road competition can be seen from the figures in Table 1:

Table 1: Number of Goods Vehicles Licensed	
1929	326,207
1932	366,178
1938	478,115

SOURCE:RAIL/418/209 Review of the LMS Commercial Organisation, 1940, p34.

It was not just the number of vehicles: what they were capable of doing was as important. We have figures, also from the LMS on the estimated number of specific types of road vehicle available. In 1926 there were 197,378 lorries of up to 3 tons capacity; by 1928 this was 241,862 and by 1931 299,927. However the number of vehicles above 3 tons remained fairly static over this period at about 55 to 58,000. What concerned the LMS was the growth in 6x8 wheelers which could carry far greater loads. These increased from 407 in 1926 to 858 in 1928 and 3391 in 1931. It has to be remembered that they would in all likelihood carry loads above those proscribed by law. This growth was further reflected in estimates of the traffic which had been lost to road competition:

Table 2: Rail Traffic Lost to Road Transport - LMS Estimated Tonnage			
	Class 1-6	**Class 7-21**	**Total**
1934	13,074	121,386	134,460
1935	44,726	158,694	203,456
1936	110,562	91,323	201,885
1937	131,335	87,927	219,262
1938	566,481	153,610	720,090

SOURCE: RAIL/418/209 Review of the LMS Commercial Organisation, 1940, p35.[9]

[9] The Classes 1-6 included some merchandise and mineral traffic. Class 7-21, the remainder.

The increase in Class 1-6 road traffic, from 131,000 to 566,000 tons in 1938, was thought to reflect the purchase of "Motor fleets" by the London Brick Company and the Manton Brick Company. The relative decline in the rate of traffic transfer between 1935 and 1937 was seen as a result of the Road and Rail Traffic Act of 1933. Elsewhere the company had noted that " no doubt we are only retaining today a considerable quantity of traffic...on sufferance."[10] Furthermore it noted in regard to claims "the annoyance caused to customers and the inconvenience to the manufacturer in sending replacements, results in some cases in diversion to road."[11] Whilst these figures reflect LMS experience they indicate the trend across industry: road was replacing rail. Road competition was eating away at sources of traffic, and the railways had better improve their performance or face severe financial problems.

The GWR noted the "serious character" of road transport and the LMS how their financial position was "increasingly prejudiced" by the same.[12] The collection of commercial information and its use within specialised departments was encouraged by the view that the commercial department was the lens through which the railway perceived the customer and vice versa: it was "the means of conserving and augmenting revenue."[13] The competition from road was not the only problem. From the turn of the thirties a depression in several categories of traffic caused problems. Although it is difficult to follow the effect of this directly using the official statistics, we shall see in the Chapter concerning terminal working how individual traffics were monitored. For a more general picture we can see how some proxy measures changed over time,

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10 RAIL/421/146 Freight Transportation in Container Trucks, 1926, paragraph 79.

11 RAIL/421/146 Freight Transportation in Container Truck, paragraph 192.

12 RAIL/250/767 GWR Goods Conference Minutes, "Road Motor Competition" February 17 1921; RAIL/418/209 Review of the LMS Commercial Organisation and its Achievements, p6.

13 RAIL/418/162 LMS Chief Goods Managers Conference, "Organisation of the Commercial Department" Minute 1, 17 January 1923.

with what implications for the railway. It is also important to note the different proportions of the key traffic categories carried by each company.

Table 3: GWR Percentage of Traffic			
	MERC.	**MERC. & MIN.**	**COAL etc.**
1928	15.52	15.44	68.04
1934	16.59	14.08	69.33
1938	16.82	12.83	70.35

SOURCE: Railway Returns[14]

Table 4: LMS Percentage of Traffic			
	MERC.	**MERC. & MIN.**	**COAL etc.**
1928	18.88	22.88	58.24
1934	17.52	21.52	60.96
1938	17.19	21.16	61.65

SOURCE: Railway Returns.

Table 5: LNER Percentage of Traffic			
	MERC.	**MERC. & MIN.**	**COAL etc.**
1928	17.6	19.5	62.9
1934	14.9	18.58	67.13
1938	14.45	17.66	67.89

SOURCE: Railway Returns.

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[14] Merc. & Min. Category was Class 1-6 Merchandise and Mineral Traffic. Coal etc. included Coal, Coke and Patent fuel. This applies for the following tables seven and eight.

Tables 3, 4 and 5 show that for much of the time the proportions of traffic carried were stable. All show an increase in the proportion of coal carried, but this reflects the inroads of road transport on the transport of merchandise. The years chosen represent the beginning of operations under the new classification to the end of our period, plus 1934 for comparison.

The industries most heavily hit were the "traditional" heavy industries of iron, steel, shipbuilding and coalmining. All these were intensive in their use of railways as a means of transportation. However, the picture was not one of unmitigated disaster: there were new industries which could utilise rail transport. We need to see how far the railways were making inroads into these markets. The motor industry needed petrol, or motor spirit, which was carried by rail, as was roadstone for the construction of roads. The construction of houses provided traffic as well. For each of these categories we can use official figures indicating receipts and tonnage. We have to acknowledge that because the statistics relate to the classes of traffic being carried in the General Classification, we do not know how much in total the railways were carrying. Traffic would be double counted if it was transported in a raw form and then processed. It was likely to be more, but how much so is unclear. What they can do is indicate the level of traffic the railways were carrying in this period and the effect of depression and road competition on overall levels. This places the use of business information within the context of the operating environment.

The decline in the heavy industries can be seen in the statistics relating to ship launches, coal output and steel production.

Table 6: Heavy Industry Output, 1928-1938 (all units in millions of tons)			
	SHIPPING	COAL	STEEL
1928	1.4	237.5	n.a.
1929	1.5	257.9	10.4
1930	1.5	243.8	9.1
1931	0.5	219.4	6.6
1932	0.2	208.7	3.6
1933	0.1	207.1	4.9
1934	0.5	220.7	7.2
1935	0.9	222.2	7.5
1936	0.9	228.4	9.1
1937	1.0	240.4	10.5
1938	0.9	227.0	n.a.

SOURCE: Shipping, Buxton and Aldcroft, *British Industry Between the Wars*; Coal: (1940) Mines Department *Eighteenth Annual Report of the Secretary for Mines*, HMSO; Steel British Iron and Steel Federation *Statistical Bulletin*, December 1931 Vol. XII, No. 12; December 1934, Vol. XV, No. 12; December 1935, Vol. XVI No. 12; December 1937, Vol. XVIII, No. 12.

Coal and Iron show an upturn towards the end of this period, which is to be expected given that the former is required to make the latter. Shipbuilding however remained depressed. To see how this affected the railway companies we need to compare the total amounts of coal iron and steel carried by Britain's railways.[15]

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[15] Including the SR in this figure does not effect our interpretation as we are concerned with the overall market conditions. Indeed the SR carried much less of these commodities because they were located outside of SR territory.

Table 7: Coal, Iron and Steel (millions of tons)		
	COAL	IRON & STEEL
1928	181.1	8.33
1929	199.8	19.3
1930	186.0	15.4
1931	167.5	11.0
1932	161.3	10.6
1933	159.5	12.8
1934	167.8	15.9
1935	168.5	16.7
1936	170.8	19.3
1937	181.1	21.9
1938	166.0	16.4

SOURCE: *Railway Returns*, Coal includes coke and patent fuel. Iron and steel includes Pig Iron, Scrap, Class 6, and lists K,L and M under the General Classification of Merchandise.

Here we see one of the major problems in using railway commodity statistics. The tonnage carried in most cases was far greater than the imports and domestic production of the industry combined. This is because the railway figures were based upon items carried. That is to say that loads were carried from a steelworks to a stockyard to an engineering works. Each of these may have involved rail transport and would figure in the statistics. Steel would also be transformed into products that would then be transferred once more by rail. Similarly some coal traffic would go by sea. The degree to which this happened is impossible to calculate, but does not detract from their value here, as it is only to highlight the problems faced by the industry that they are used.

Each company was affected in a different way and the old traffic has to be contrasted with the new emerging at that time. Motor fuel, cement and bricks are examples of these. Again we can see how much of this traffic was going by rail. However it is difficult to give any precise estimate of the proportions of the total available traffic as road competition would almost certainly be making inroads into this traffic.

Table 8: Tonnage of "New" Traffics (millions)

	CEMENT	BRICKS etc.	REFINED LIQUIDS
1928	1.8	5.5	1.6
1929	1.8	5.5	1.7
1930	1.8	5.5	1.7
1931	1.7	5.1	1.7
1932	1.6	4.1	1.6
1933	1.4	4.9	1.1
1934	1.5	5.4	1.6
1935	1.5	5.4	1.7
1936	1.7	5.2	1.9
1937	1.7	4.8	1.9
1938	1.6	3.6	1.9

SOURCE: Railway Returns, 1928 - 1935.

From this both cement and bricks show an overall decline. This shows how the railways were losing traffic as there were increasing numbers of houses being built in this period, just over 166,000 in 1928, to 339,538 in 1936.[16] Refined liquids, on the other hand, increased which is not surprising. This would be explained by the growth in motor traffic requiring petrol which would be transported to local distribution depots

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16 *The Building Industries Survey*, Vol. II, No. 10 1936, p445, December 1936; Vol. IV, No. 9, December 1938, p373.

from the refineries. This, using the oil companies' own tank wagons would in most cases be more economical sent by rail in bulk than by motor vehicle.

The receipts received by the railways were also declining in some of these traffics. For cement it fell from an average receipt of 9s 8d per ton in 1928 to 8s 2d in 1938, in refined chemicals from 19s to 11s 2d. However in bricks and tiles the receipts went up from 7s 2d per ton to 8s 8d per ton.

Not all companies were affected equally by the decline in traffic. For example the LNER was carrying over 700,000 tons of cement in 1928 for which it received nearly £415,000. By 1938 this was down to 430,000 tons at £198,000. The GWR by contrast had increased its tonnage, but this was at the expense of revenue. From 405,000 tons and receipts of £154,000 in 1928 to 412,000 tons and £147,592 in 1938.

As we shall see in Chapter Seven the reasons for such changes were many and complex. Conditions of conveyance differed from place to place, contract to contract so it is difficult to explain in detail the reasons for differing receipts between companies. However we do now have a general picture of how selected traffics were responding to the service railways were operating.

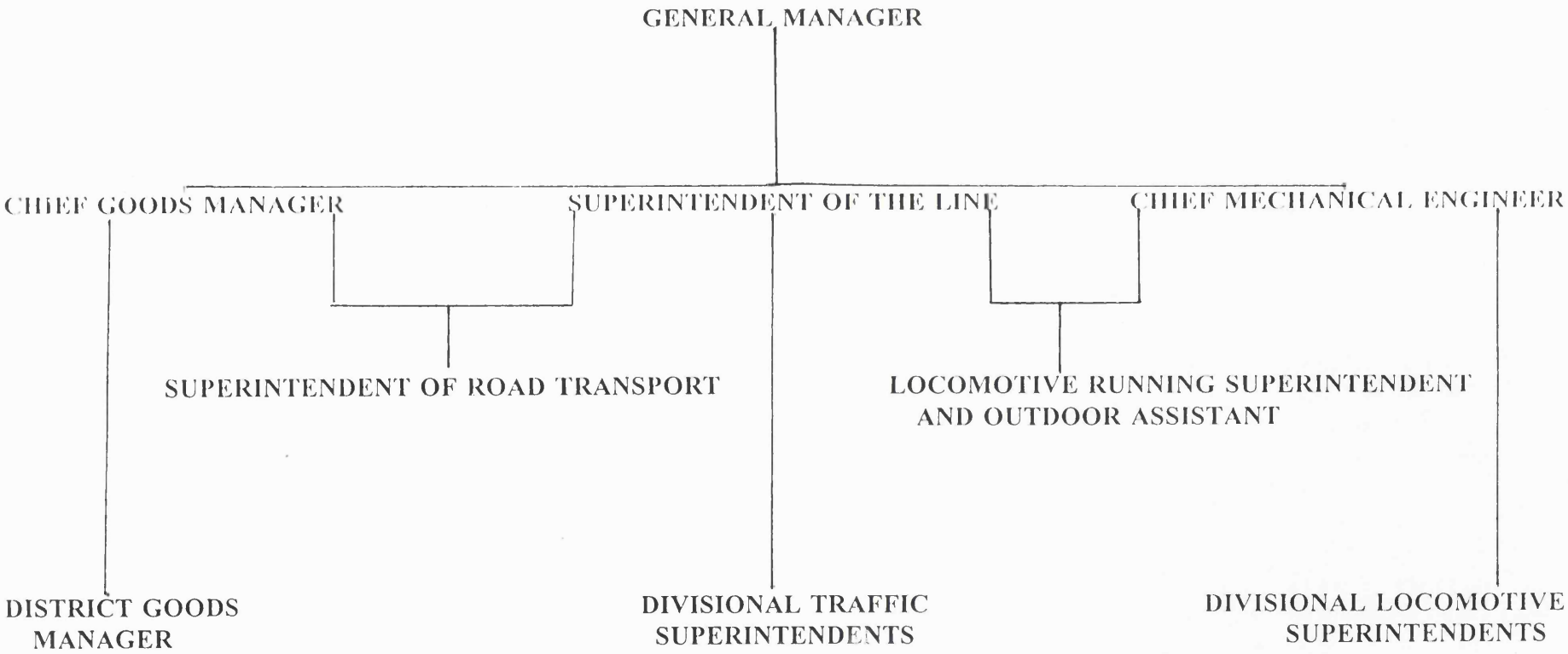

CHART ONE: THE GWR ORGANISATIONAL DIAGRAM CIRCA 1938

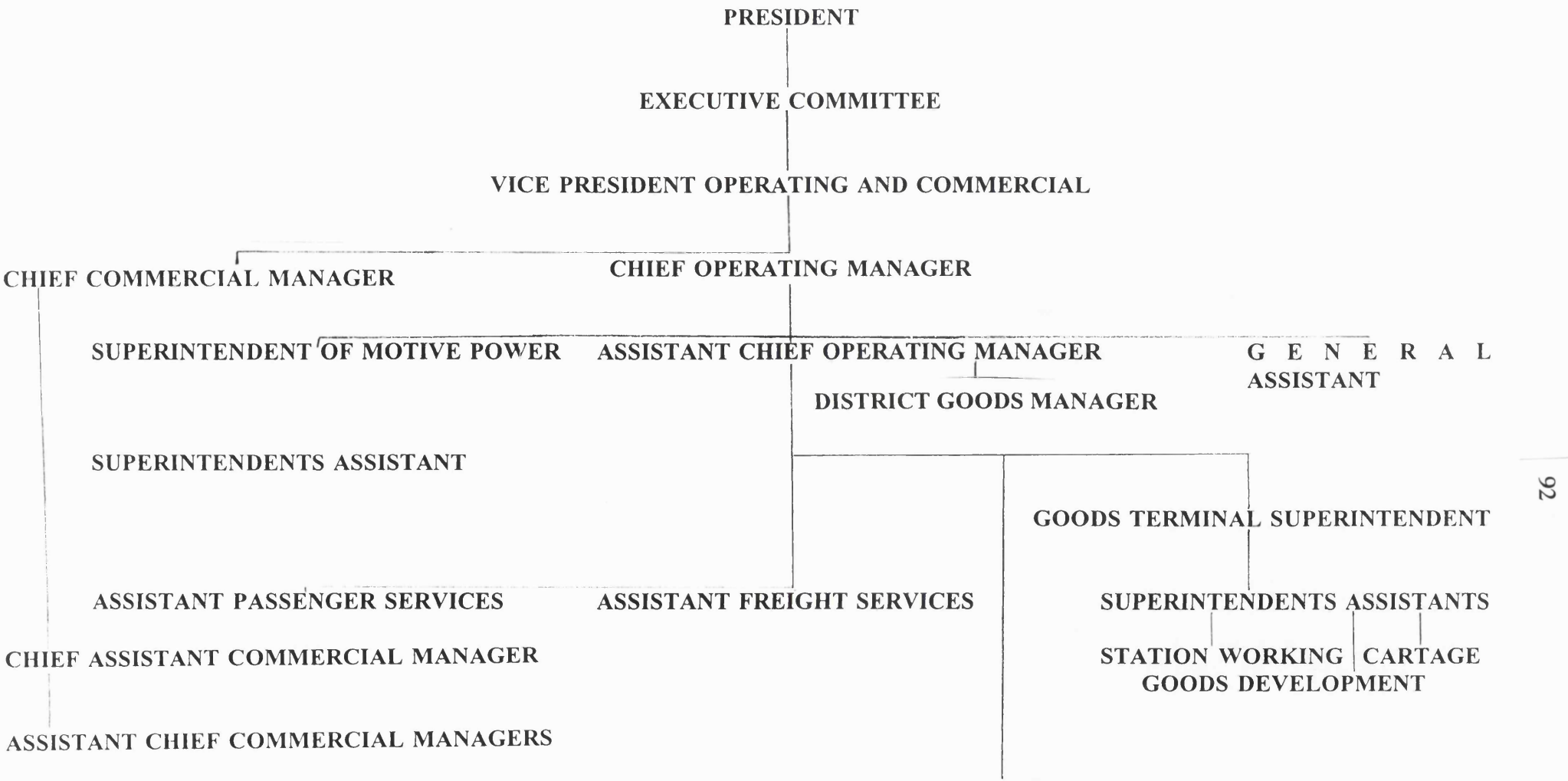

CHART TWO: THE LMS ORGANISATIONAL DIAGRAM CIRCA 1938

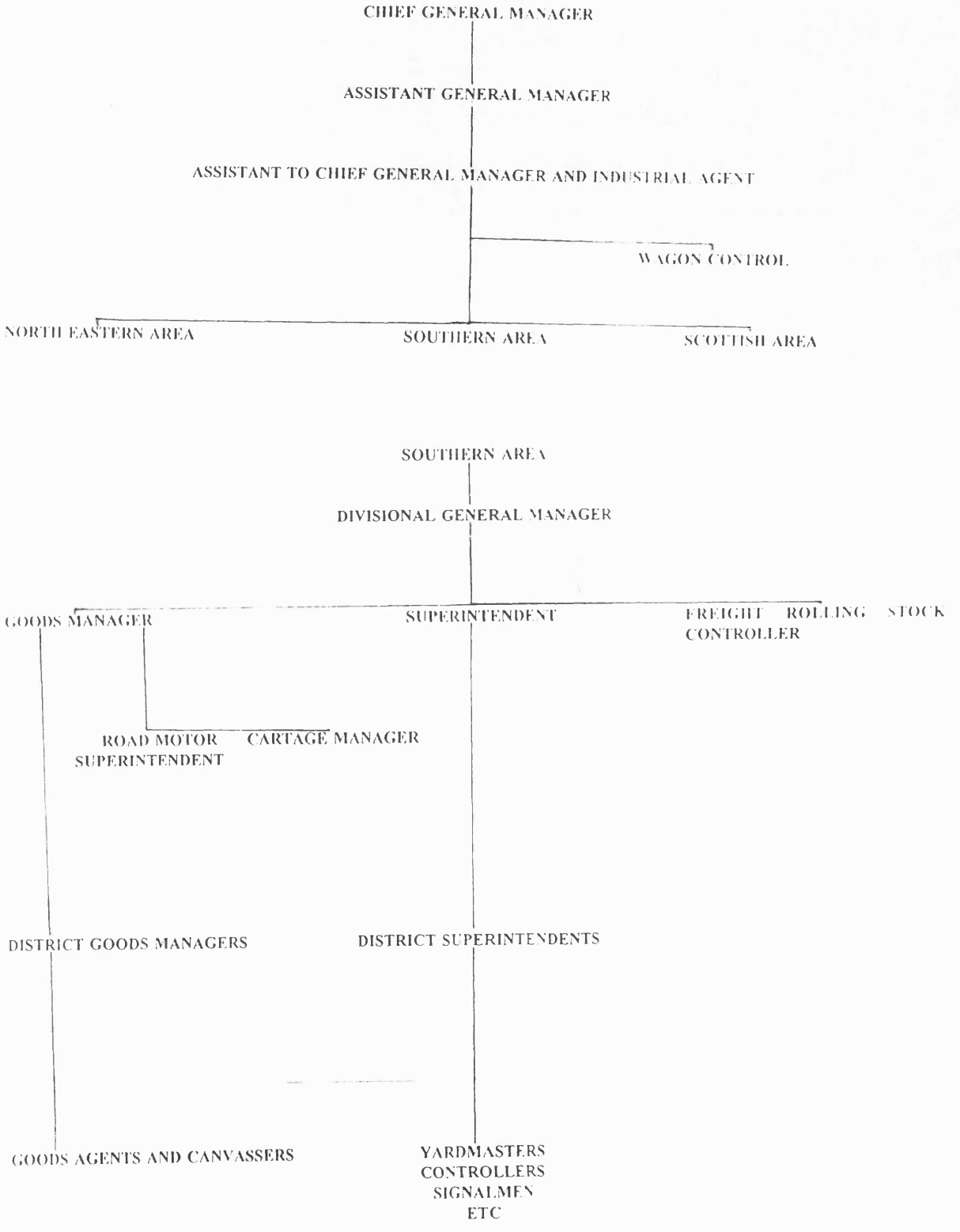

CHART THREE: THE LNER ORGANISATIONAL DIAGRAM CIRCA 1938

Organisational structure and the Use of Business Information

The organisational charts for all of our companies covered many areas of activity, from accounts and estates to hotels and engineering.[17] For our purposes, the organisational structure of the railway companies is of only marginal interest. We shall not look at the entire diagram of each, only those that relate to the commercial and operating aspects that concern the thesis. (See Charts 1, 2 and 3.)

The organisational chart can only provide a limited perspective on the utilisation of commercial and operating information. Our concern here will be to outline the internal organisation of the companies as a background to the specific issues of management control. We are concerned with the basic organisational structure involved in the operating and selling of transport. It is important that we place management control within some context and this requires a rudimentary understanding of how business was organised. Although the geographical areas of amalgamation were determined by government, the Directors and senior managers were able to structure companies according to their wishes.

Clear differences emerge in the three companies we discuss. The LMS and LNER each had to cope with amalgamating former competitors, with their own distinctive operating styles. In the LMS it was the L&Y, LNWR and MR; on the LNER the GCR, NER and GER. The magnitude of this task should not be understated: managers had to be found places in the new organisation and working practices agreed upon. No doubt the perception of the railways as a "profession" crossing company boundaries helped this process. However, there remained problems some of which we will identify in the following chapters. The GWR did not suffer from the amalgamation process as much as the LNER and LMS, as it was the only company to retain its identity after 1923. The few lines that were added were already known to the company who had relatively little trouble in assimilating them.

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[17] See Appendix after the index,(no reference) Sherrington *The Economics of Rail Transport*, Volume Two, for organisational diagrams of the LMS and LNER. For the GWR the diagram is on p21.

The LMS began under the former MR Chairman, Sir Guy Granet. It was he who invited Josiah Stamp to become Chairman, and later President of the company. Stamp's role in the railway sector was unique. He had experience of the chemical industry, government and was widely regarded as an influential figure in the industrial world.[18] More importantly for our purposes he was aware of the debates in management practices in both Britain and America. The reforms initiated by Stamp require more explanation than on the LNER and GWR. These companies' re-organisation was, in terms of administrative structures straightforward. Under Stamp, the LMS would adopt Vice Presidents and an Executive Committee, with provision for employing many of the latest notions of management and administration.

This contrasted with the GWR, who retained the Departmental system. This involved the General Manager being responsible to the Chairman of the Board through the hierarchy of each department. The LNER operated on a Divisional system with a Southern, North Eastern and Scottish Area, under Divisional General Managers. Instead of detailing all of the organisational chart, we will concentrate just on those sections that apply directly to management practices and their role in control.

The LMS and Organisational Reform

The LMS embarked on a reorganisation of its Commercial Department in 1932 which altered the organisational structure, depicted above. A Chief Operating Manager was appointed, responsible to the Vice President Operating and Commercial with Passenger and Freight Commercial policy combined under the post of Chief Commercial Manager. The purpose of reform was to ensure a means of decentralisation, giving district officers more power.[19] As we can see from the organisational chart, District organisation dominated the operational aspects of freight

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18 See Chapter 1, M.R.Bonavia (1981) *Railway Policy Between the Wars*, Manchester University Press. See also *Dictionary of Business Biography*, Volume 5, (1986), M.Bywater "Josiah Joseph Stamp," pp260-273.

19 A.Davies "The Application of Modern Commercial Practice to Railways" *Journal of the Institute of Transport*, April 1934.

working. The Commercial Department interacted with the Goods terminal operations via the Development Agents under the Goods Terminal Superintendent.

The Executive Research Office reported directly to the Executive Committee. Whether the centralisation of detailed operational matters was desirable featured in many debates at the time. At the centre was the headquarters which was allocated the task of setting policy and surveying the network for traffic. District offices had local control, conveying the policy to outlying areas, but headquarters provided specialists who were able to advise District offices on aspects of policy, or any special problems that might arise. The stations, or "nerve-endings" as Ashton Davies called them, had the task of "interpreting the policy" under the guidance of the district office. The relationship with the customer was seen as being most important. The function of the Chief Commercial Manager was to act as a "Public Relations officer" as well, thus ensuring a high profile to his activities both within and outside the company.

The stated objectives for this reorganised structure seemed to relate to the need to be able to respond to changing circumstances. There was a need to "..revitalise and strengthen.." contact between the trading community, general public and the company. Its policy was to "..meet the transport requirements of the company's customers."[20]

This referred not just to rail transport but to a more widespread notion of haulage, related to a concept of transport as a commodity in itself. The objective of the LMS was to maximise revenue: "[transport] should be marketed at a price which would attract the greatest number of purchases, and be so related to costs as to enable the maximum amount of net revenue to accrue."[21]

This reorganisation was followed in October 1933 by the establishment of a Commercial Research Section designed to pursue revenue generating ideas. In 1935, the publicity and advertising side was reorganised. The most important rearrangement of local organisation came in 1933 as part of a wider assessment of the market.[22] It

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20 RAIL/418/209 Review of LMS Commercial Organisation, 1940, p10.

21 RAIL/418/209 Review of LMS Commercial Organisation, 1940, p10.

22 This was covered in RAIL/421/119 Statement of the Area, Population, Industries, Principle Traders' Payments and Sales Organisation, September 1933. See below with reference to the collection of commercial information.

provided a "measure of competitive elements" within districts and "facilities for making commercial contacts," including details of the number of road hauliers within the area.[23] District Canvassers were appointed to passenger and freight operations, with volume sometimes necessitating special canvassers for specific traffics. Such representatives could also be allocated to back up the permanent local teams.[24] Each District kept records of the firms in their areas, their names, dates and time visited. Total monthly accounts were kept as part of a centralised system of reference.[25]

To ensure that these notions of service and policy were pursued at every level within the organisation, a scheme was introduced setting targets for each District and station. Introduced by Ashton Davies, the Chief Commercial Manager, this was known as the "Quota" system and its purpose was to measure and encourage effort. An initial survey provided a standard quota to be set "on a reasonable expectation of traffic, taking all things into consideration - state of trade, national conditions, local conditions and the prospects in their districts."[26] It utilised a publication called "Quota News" to disseminate news and instill a competitive spirit amongst the staff. This included over 60 "leagues" with positions being noted in each edition of "Quota News." The targets were set daily, weekly, monthly and quarterly, with prizes going to the best performers. It was a means of encouragement, designed to bring all parts of the network into the task of selling transportation. This was a response in part to the problems created by what was widely thought to be the "overcentralisation" of the LMS. Some mechanisms were needed to ensure that the intangible commercial, as opposed to operational/engineering, department functioned properly. The latter were more constrained by the nature of the technical work they were involved with. Commercial activity was more open to interpretation of fact with attendant effects on performance.

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23 RAIL/418/209 Review of the LMS Commercial Organisation, p14.

24 Bonavia *Railway Policy*, p55.

25 RAIL/421/119 Statement of the Area...Manchester District, p9.

26 Davies "Modern Commercial Methods" *Journal of the Institute of Transport*, April 1934.

The GWR: Continuity without change

The District Goods Managers were responsible to the Chief Goods Manager, with some liaison between the road operations. Conspicuous by their absence were Train Control Offices at a District and Divisional level. Divisional control was not a priority on a system the size of the GWR. The Chief Goods Manager headed 14 Districts within which the agents and station masters were expected to develop traffic.

The Goods managers were occasionally aided by "Local Traders Conferences" designed to bring together the company and traders. Their task was not only to increase the amount of business, but also to help monitor expenses. As with the LMS Quota Scheme there seemed to be an attempt to bring the outlying stations closer to the management's objectives. It was noted that "Results which cannot readily be expected to accrue in tangible form should, however, be carefully watched."[27]

The most important commercial element of the GWR organisation was the existence of the Traffic Research Committees. We shall examine their role when discussing commercial research. However they were not the only sources of information within the goods organisation. The Rates Section collected information on the nature of and rates charged, by the competition.[28] The operating and commercial elements came together within the offices of the Superintendent of the Line. We shall see exactly how when examining the role of the Goods Conferences.

Overall the organisation of the GWR was less complicated than that of the LMS. This was partly because the Directors seemed satisfied that the limited amalgamation could be contained under existing methods of organisation, but there was also a conservatism in relation to applying new management ideas when compared with the LMS. However this is not to say that this was necessarily inefficient per se, but it needs to be recognised.

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27 RAIL/250/743 GWR Goods Conference Minutes, Minute 7346 12 April 1929, Appendix A "Local Railway and Traders Conference."

28 For a general overview of the GWR Goods Department see H.W.Payne (1934) "Keeping Abreast of the Times in the Goods Department" *Great Western Railway (London) Lecture and Debating Society*, meeting 11 January 1934.

The LNER: Area and District

The LNER had the same problem of size and conflicting company loyalty as the LMS. However, like the GWR, it remained conservative in its approach to organisational structure. Its response was to divide operations into three: the Scottish, North Eastern and Southern Areas, each with a different Goods organisation.[29] According to the former Superintendent and General Manager of the North Eastern Area the advantages of area organisation overcame "..the otherwise inevitable remoteness of headquarters from many parts of the Area served."[30] District officers were readily able to communicate with their General Mangers and other departmental officers. This had to be balanced against the need to coordinate activity and communicate instructions throughout the network. This was achieved by the "inter area departmental committees" of which the LNER had several including the Superintendents, Goods Managers and Locomotive Running Superintendents.[31]

The North Eastern Area had the District Goods manager responsible to the Area Goods Manager, whilst the Southern Area had both specialised Goods Managers and combined Passenger and Goods Managers. The Southern Area thus had its local staff responsible to both the District Passenger and District Goods Managers.

The Wagon Control Office was separate from the Areas. Instead it acted to coordinate the various locations independent of the Area managers. According to Jenkin Jones this was an example of organisational adaptability as the Rolling Stock Controller was responsible not to the General Manager but to the three Area General Managers.[32] The Wagon Control offices made reports on the usage of wagons and attempted to use such information to inform decisions as to the commercial viability of the investments in stock. These meetings were supplemented by special reports from districts and regions that monitored not just the company's performance but the state

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29 These were broadly in line with the pre 1921 boundaries of constituent companies.

30 C.M. Jenkin Jones "The Organisation of the London and North Eastern Railway," *British Transport Review*, Vol. II, No. 6, December 1953, p484.

31 Jenkin Jones "The Organisation of the London North Eastern Railway," p485.

32 Jenkin Jones "The Organisation of the London North Eastern Railway," p487.

of trade in each area. Differences existed between the detailed Area arrangements for Goods operations, but these reflected local conditions rather than any major difference in operating philosophy.

Relating Revenue to Expenditure: Operating and Commercial Decision Making

If the organisational structures of the companies differed, the basic structures by which the "indoor" and "outdoor" operations were conducted were remarkably similar. The Goods Conference task was to monitor traffic and liaise between the operating and commercial aspects of the company.[33] For now we can note that its task involved monitoring traffic: the one off special consignment, such as an out of gauge load, or a seasonal traffic such as that in agricultural districts. Any differences between the amounts carried with that of previous years would have to be accounted for. Was it because the crop was smaller or was road haulage claiming a greater proportion? This was where the knowledge from Goods' Agents and those "on the ground" was of most use. Reviews of performance usually included a discussion of the improvements that could be offered to traders in the future. If road competition was the cause, then price reductions in the form of special rates were always possible provide they were approved by the Rates Tribunal. Equipment performance would come under scrutiny: was it possible to introduce special wagons or handling machinery? It may also have been the case that the service had not been adequate in some way. In all of this the interaction of operating and commercial aspects of railway working were often at the forefront of managers' minds.

The LMS Goods Conference

The Goods Conference was used as the main point at which policy could be discussed, at least in the beginning.[34] The review of "Revenue and Expenditure" was

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33 The terms indoor and outdoor refer to the commercial and operating aspects of the business respectively. For the respective companies the references are LNER RAIL/390/249; for the LMS RAIL/418/162 & 163; and the GWR RAIL/250/742 745, 767 & 768.

34 It is unclear how long the Conference lasted as the bulk of the records do not appear to have survived.

used to monitor practice and performance so that instructions could be issued relating to operating and commercial decisions. For example in 1925, experiments in traffic concentration were noted at the Oldham goods depot, and District officers were instructed to investigate the traffics that could employ such methods.[35] The efficiency of transhipment arrangements were closely followed as it seems that the proportion of tranship to general traffic was increasing at the same time as the cost of transhipment was increasing. The meeting recommended that the basis for analysis shift from the cost and hours per ton to wider considerations such as an analysis of traffic flows.[36]

New traffic was under review in the form of monthly commercial reports. The production of "artificial silk," as it was known, prompted an investigation into how rail transport could best serve the industry. It was not just the output and location that was recorded, but details of the production process and type of raw materials,(wood and cotton pulp in this case), giving a view of all activity that influenced the demand for transportation. From this a calculation of the total revenue which it was possible to achieve was made. The minute noted that "Our relationship with the manufacturers is extremely friendly and we are in constant touch with them with the object of anticipating their transport requirements."[37] These reports also reveal the existence of liaison officers from companies at the LMS Headquarters, similar to the GWR's Development Officers.[38] This shows how important it was for the railway to understand the business of the trader.

An important part of keeping expenditure and receipts in line was the monitoring of how capital stock was being used. Only then was it possible for managers to know whether they were making the right investments. From late 1923 to

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35 RAIL/418/163 LMS Chief Goods Managers Conference, Minute 1414, April 21 1925 "Revenue and Expenditure."

36 RAIL/418/163 LMS Chief Goods Managers Conference, Minute 1414, Minute 1457 May 13 1925 "Revenue and Expenditure."

37 RAIL/418/163 LMS Chief Goods Managers Conference, May 1925 "Monthly Report on Commercial Subjects for April 1925 - The Artificial Silk Industry." In this case a revenue of £175,000 was estimated.

38 RAIL/418/163 LMS Chief Goods Managers Conference, July 1925, Monthly Report on Commercial Subjects for June 1925 "LMS Relationship with Large Oil Companies."

mid 1924 minutes appear which noted the performance of stock and its use across the network.[39] In the case of fitted wagons, Divisional officers were asked to investigate whether supplies of such vehicles were adequate given increased running of fitted trains. The practices of other railway companies in this regard were also reviewed. Although the resulting reports noted that there was no need for further investment, the Chief Goods Manager overruled them and ordered further investigations. As a result the 1923/24 Wagon building programme included some more of these wagons.

The commercial needs were not always in accordance with operating practice, but given the complexity of working this is not surprising. By 1925 an Advisory Committee had been set up whose task it was to ascertain "ways and means of overcoming or removing obstacles which arise from time to time in carrying out Goods Department operations."[40] This brought together members of the operating and commercial departments with a view to sorting out such problems that arose. Train services were investigated as to how best they could be suited to a region's needs with the LMS canvasing various parts of the trading community. For example potato growers were asked to outline their requirements for the forthcoming harvest.[41] The names and addresses of farmers, the amounts forwarded and the destinations were collected. Local road haulage and the potential size of the crop were noted as a means of establishing the size of the market. Some 52 growers were visited as a result and a "middleman" merchant was employed by the company to ease the selling process.

The GWR Goods Conference

Similarly the GWR had a Goods Conference which reported on road competition, special traffic, transhipment arrangements and aspects of train operation such as containerisation and high capacity wagons. As with the LMS there was also

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39 RAIL/418/162 LMS Chief Goods Managers Conference, Minutes 757 10 December 1923, 813 8/9 January 1924, 877 18/19 February 1924 and 1019 15/16 and 20 May 1924, "Pipe Fitted Stock."

40 RAIL/418/163 LMS Chief Goods Managers Conference, Minute 1623 November 17 1925 "Appointment of Advisory Committee."

41 RAIL/418/162 LMS Chief Goods Managers Conference, Minute 1192 "Appendix G Canvassing Special Trades or Streams of Traffic Passing Between Competitive Points" 14 October 1924.

a review of "Receipts and Expenditure," so comparison of traffic receipts were linked with any increases in operating costs. Details of the hours per ton, wages and cost per ton were noted together with details on the wider trade position. The use of containers, registered transhipment and railhead distribution were collected regularly.[42] Similar questions of the interaction of operations and service were discussed, as on the LMS. In the early 'twenties complaints were received concerning the late arrival of consignments due to "bad working of the trains."[43] This was attributable to late starting and depot problems, and illustrates how complaints on service were transmitted to the relevant operating department. The distribution of rolling stock was part of the overall procedure and there appears to have been some problems with traders over the service being offered over and above the local complaints.

The introduction of high capacity wagons was discussed and representations made to the company from traders as to the advantages of these. Engineering considerations necessitated a more detailed examination of the issues involved.[44] Once they were introduced it was the Conference that discussed rate reductions for their use.[45] In 1925 a shortage of specially constructed wagons prompted a debate on wagon usage. This appeared to be causing a backlog of loads that was unacceptable if traffic was not to be moved to the roads.[46] It seems that the receiving depots were often not told when loads were arriving, extending the delay further.

The bulk carriage of grain in specialised wagons featured in a calculation of cost analysis: potential gains from their introduction were set alongside the costs with close

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42 RAIL/250/743 GWR Goods Conference Minutes, For example see Minute 7641 2 July 1931 "Receipts and Expenditure."

43 RAIL/250/767 GWR Goods Conference Minutes, Minute 6476 January 11 1923 "Delays to Traffic in Transit."

44 RAIL/250/767 GWR Goods Conference Minutes, Minute 6616 and Appendix D, November 1 1923 "High Capacity Wagons."

45 RAIL/250/767 GWR Goods Conference, Minute 6723 November 14 1924, "High Capacity Wagon." It was in bulk minerals such as Roadstone, Tar-Macadam and Limestone for blast furnaces that rates were reduced.

46 RAIL/250/767 GWR Goods Conference,[46] Minute 6870 July 23 1925 "Shortage of Specially Constructed Wagons."

attention paid to the impact on the operating aspects.[47] Objections were noted as extra shunting was involved, coupled with its limited use as a special wagon. Specialist terminal facilities further limited their use to ports and other such locations such as large mills. This was not just a question of ascertaining the economies of scale available. Concern was expressed that the GWR might be accused of undue preference by smaller milling operations. However it was eventually agreed to experiment with such wagons and they were introduced throughout the network.

The LNER Goods and Mineral Managers Conference

On the LNER, operations were monitored via meetings of Goods Officers on a district by district basis. Given the organisational structure this made more sense than a company wide body. Here once again we see concern over road competition, although there was reference to other elements such as transhipment and the use of special wagons. The Goods and Mineral Managers Conference was a forum for examining traffic working much like the Goods Conference.

The concern over inroads by both road and sea competition led to close examination of the services offered by the company and subjects for analysis similar to the other two companies. For example in 1925 it was noted that the increase in water traffic from Newcastle to London should be countered by the running of extra "braked services," ie fitted trains. Of most interest here was the speed of transit and the minimum wagon loading permitted.[48] These issues were interlinked as any decrease in minimum loading would free up terminal space and relieve bottlenecks. It would also help retain traffic which would otherwise go my road. After some discussion loads below 2 tons were accepted with special emphasis on perishable goods. Where possible, the "bulking" of orders was encouraged. Any implications for the loading

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47 RAIL/250/767 GWR Goods Conference, Minute 6565 "Conveyance of Grain in Bulk" November 1, 1923.

48 RAIL/390/2035 LNER Minutes of Meetings of Goods Officers, Minute 2632 6 October 1925 "Braked Services for Goods Traffic to London," RAIL/390/2035 LNER Rail Officers Meetings at York, Minute 2600 24 March 1925 "Minimum Wagon Load."

procedure, cubic capacity and rate charged were calculated.[49] For example the potential loss of revenue from running loads of 2 tons was offset against the cost of losing the traffic to road competition. Presumably this was based on the known loss of income from already calculated rates, including those on an exceptional basis.

By the late 'thirties the District officers were providing regular "tonnage estimates" of the wagon requirements if excess demand was expected.[50] As with the GWR and LMS this information enabled commercial needs to be reflected in how the company was operated. Not only was wagon supply and demand equated, but the right equipment would be on hand for the job required and the use of specialist equipment could be maximised.

The construction of such equipment was discussed by the Conference, although it was not automatically entitled to at the beginning.[51] It appears that the Superintendents thought it was a matter for them and the relevant engineering departments only. Goods managers were only to be bothered if the load was likely to be damaged. This alarmed the General Manager, who called a special meeting after which all those involved were included.

In general it is difficult to determine the "sense" of the meetings on the LNER. The records do not reveal the detail that they do for the GWR and LNER. The Goods Conference structure may not have been as useful in organisations arranged on an area by area basis. However the task of securing a coordinated approach to operating and commercial activity remained.

A Summary of Railway Performance

We will outline the micro foundations which helped the companies do their business. Whether any one specific management system was more efficient than the

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49 RAIL/390/2035 LNER Minutes of Meetings of Goods Officers, Minute 2757 26 April, 1925. "Provision of Double Bolster Wagons for Hay Traffic."

50 RAIL/390/2035 LNER Meetings of Goods Officers at York, Minute 2930 21 January 1937 "Supply of Wagons."

51 RAIL/390/249 Eastern Group Goods and Mineral Managers Conference, Minute A298 6 February, "Design of Freight Rolling Stock."

other can only be hinted at using measures of physical efficiency, and even here we have to be careful. The railways were amongst the largest companies and faced a dynamic commercial environment combined with complex operating processes. Through seeing how they responded to changes in this environment through such processes we will gain more knowledge concerning their performance. However we also learn a great deal as to how large organisations in general go about their business. We have seen how ideas on systematic management had developed in Chapter 2. The management practices of railways prior to 1923 have been discussed in Chapter 3. We now need to relate the approach, if not the specific ideas of the former to the latter. Did the railways develop a systematic approach to management problems or were they "unscientific?" Our main task is to examine the use of management practices and information in the development of management control.

A discussion of railway performance at this stage serves to highlight the narrative of management control and the development of management practices. This thesis is not about explaining the performance of the railways in the light of such indicators as the operating ratio or calculations of profitability. Nevertheless we can quote the historian of the nationalised industry as to the overall state of the railway sector in our period:

> The net "standard revenue" envisaged for the "Big Four" companies under the 1921 Act - £51,395,095 per annum - was never matched in practice; and in the years 1934-8 the average was some 35 per cent lower at £33,404,092. For Britain's railways as a whole (excluding London Transport) the operating ratio stood at 81 in the same period, 30 per cent higher than before the war.[52]

What this thesis sets out to do is explain the background to this: what did managers know, and how did they know it?[53]

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[52] Gourvish *British Railways*, p2. The operating ratio was the proportion of working expenditure to gross revenue. See Irving *The North Eastern Railway Company*, Appendix I pp285-287, for details of the use and difficulty of this measure.

[53] This is a shameless rephrasing of Walter Vincenti's (1990) *What Engineers Know and How They Know It: Analytical Studies from Aeronautical History*, The Johns Hopkins University Press.

The Operational aspects will be examined in Chapters Five and Six, the Commercial aspects in Chapter Seven. Chapter Five looks at how the Conveyance function was monitored using system of Train and Traffic Control. Chapter Six views the operation of terminals through the use of Time and Motion Studies and studies of transhipment. Chapter Seven deals with commercial research, and pricing. It is limited to the consideration of merchandise, rather than mineral traffic. Much of the material in the archive, and indeed the debate surrounding railway management, focuses on this. Heavy mineral traffic was basically a captured market for the railways, so commercial policy was dominated by the need to prevent losing business to competition. Terminal operations were dominated by questions relating to general merchandising. This was generally high value, and its loading presented problems to the management of depots. In addition, coal was loaded and unloaded mostly at private sidings. It was not as demanding as general merchandising in its handling requirements.

Chapter Five

The Conveyance of Traffic and Management Control

We begin our analysis of the railway companies by considering how freight was moved from location to location. This is dealt with because it was the core business in which the railways were engaged. Consideration will then be given to the terminal services in the next chapter. Once we understand the procedures by which operations were carried out, the use of commercial information can be considered. The setting of prices and determining of service will be left to the final Chapter.

The operating problems of conveyance may be dealt with in one of two ways. One is a process function, moving trains and coordinating traffic, the other one of routeing. By conveyance we mean the scheduling and routing of trains subject to the traffic needs of customers. This involved the bringing together of rolling stock, locomotive and freight to make up the train, our "unit" of conveyance. If uncertainty could be reduced and the process of movement eased, then day to day operations could be improved. Train and Traffic Control, to varying degrees, were seen as being a solution to this. As we shall see, Train Control dominated the debate on control systems during the period after amalgamation. When we discuss conveyance, the analysis is dominated by the Train Control systems in place on the different companies.

Using the model introduced in Chapter 1, Train Control can be seen as enabling the Plans to be Executed whilst at the same time providing the means with which to Evaluate performance. This would then feed back into the development and modification of services via the Programming of objectives. Through this process costs could be minimised, and by improving the service, revenue maximised. This chapter describes the use of Train and Traffic Control systems in the monitoring of conveyance. Using Rolling Stock Control as an example we see how management practices were developed to deal with the problems of Execution and Evaluation.

Historically, the means to the above ends were devised when concerns over congestion and crew relief grew in the pre 1914 period. As we have seen the MR initially developed this system with other companies facing the same constraints

developing similar control solutions.[1] These were able to maximise track capacity and ensure punctual running. Locomotive use could also be monitored so as to minimise poor running and mileage, subject to maximum loading.[2] Rolling stock distribution also became part of the general system of control on the LMS and LNER. As we have seen in Chapter Three, there were by 1923 several systems of Train and Traffic Control in operation. Whilst the distinction between the two had not been immediately apparent, by 1923 clear differences were emerging. Train Control was involved with control of movement, Traffic Control just that of traffic. However there was some confusion as to where the boundaries should be drawn. According to Philip Burtt, the LNER distinguished between the two. A Traffic control office duties were described as "the obtaining and concentrating of information as to traffic to be moved..." This was slightly different to Train Control where the movement of traffic was planned. That is to say Train Control was proactive in moving the traffic, rather than just monitoring its progress. However, as Burtt pointed out, "If the control office, having obtained information as to traffic requiring conveyance, merely passes on such information to the separate superintendent's trains' office, the control office (so called) hardly seems to justify its name."[3] If no control was being offered, then the "control office" was just a clearing house for information regarding the whereabouts of freight. Even rudimentary Train Control did more than this. In practice what it meant was that the signalman retained control over movement rather than acting in a controller role.[4] For example, instead of delaying trains because they were not sure of the situation further down the line they were now in a position to minimise clearance margins with no extra risk. This expanded the capacity of the line. The LNER maintained the distinction in some of its control areas, and this influenced the approach of that

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1 See Chapter 3 for details.

2 A later BR document noted that the objectives of Train Control should be punctual working, minimal use of engines, maximum loading, minimal light running and reduction of crew hours. See AN/94/173 Procedure to be Adopted and Standard Instructions in Connection with Train and Traffic Control, April 1950, p1.

3 Burtt *Control on the Railways*, p108.

4 Burtt *Control*, p117.

company to control. However, systematic Train Control became increasingly important, but it was not as systematic or widespread as on the LMS.

The LMS adopted the most centralised control system after 1923. Whilst the District Control Office remained at the heart of the Control System, there was an extra layer added to the hierarchy by the introduction of Divisional Control Offices. The use of Divisional control on the LMS will be highlighted as a key difference in the systematic application of Train Control as a management practice. By such systems Train Control was able to develop its full potential for coordinating all aspects of railway operation, including links with the Commercial and Mechanical Engineering Departments. Whilst adding a level of bureaucracy to the hierarchy it ensured that information relevant to coordinating activity was used by managers.

The GWR had systems of telephone communication and district control in place but did not systematise its Train Control to nearly the same extent, if at all. As we shall see, the GWR was criticised in the first year of the Second World War for not having sufficient control to avoid congestion.

Whatever means of control was adopted, it had to be accomplished while maintaining a sense of responsibility among the staff. Initiative was important and encouraged by trying to bring staff "on the ground" into making operating decisions: "..assistance must be given to the District Control Office by explaining clearly and frequently the current position and by making suggestions how to overcome any difficulties."[5] However there had to be instructions laid down centrally governing the reporting procedures which enabled decisions to be made.

The problem was recognised after many years of using Train Control. It was noted in 1950 that "The danger in the past has been the tendency for the Control organisation to degenerate into a recording agency and insufficient time has been given to the study of the train service and its regulation both from the train and traffic viewpoint."[6] Nevertheless we may see such systematic management of information as

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5 RAIL/421/85 Operating Control Organisation, 1939, p6.

6 AN/94/173 Procedure to be Adopted and Standard Instructions in Connection with Train and Traffic Control, April 1950, p1.

being of some importance in operating the railway. The key problem for any network industry, is the co-ordination of operations.

Centralised Train Control: The LMS

As we have noted in Chapter 3, there were several control systems for the LMS to choose from. The MR system was adopted largely because of its success in improving punctuality and minimising congestion.[7] Changes had to be made because of the size of the LMS: it covered over 6,000 miles of track, 10,000 plus steam locomotives and more than 200,000 wagons. The solution was to develop a system of Divisional Control Offices to coordinate the activity of the District Control Offices. This section will describe the general Train Control structure as it developed after 1923. Then we shall look in more detail at the Divisional Control Office and examine its role in monitoring and planning operations.

The main features of MR Train Control remained: details of traffic, locations, and train movement within the control area were displayed on the Train Board. Information as to the amount of traffic being offered was noted on the "Traffic Position." This was collated into the "Traffic Position - Daily Summary" return which contained details on the previous 24 hours working. Each month "Traffic Position - Monthly Summary" was returned to the Divisional Control Office from which information could be used to plan traffic needs. Traffic on a regular or even semi-regular basis, such as for seasonal vegetables, was checked for efficient working. So-called Special traffic was recorded in a Logbook, presumably including perishable and out of gauge loads. The movement of large loads was monitored by the Special Wagon cards.

As with the MR, movement was monitored by cards with details of traffic to be moved. These noted the details at the yards/sidings, and were updated at two hourly intervals. Departure and passing times were noted on the appropriate pegs with shunting engine details also placed at the relevant stations. At the Divisional level the Control Office utilised summary forms for the important (ie inter-district) freight trains

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7 Bonavia *The Four Great Railways*, p26.

rather than physical display.[8] If for any reason the train left the running section then it was removed from the time section of the board and placed on the side. A train leaving the District would be communicated on to the next.[9] Thus a complete record of running was maintained at the District Control Office so that actual and booked running could be compared.

At Division the key trains monitored were Up/Down Important Freight Trains and Up/Down Important Cross Country Freight Trains. Division was then in a position to note any problems and could take them up with the District Control office. This is an example of how the Chief General Superintendent received information: a daily summary of late running and such information could be used to adjust working. For example the time spent by a Pick-up Goods train at roadside stations was not uniform, so the flows of traffic were analysed with a view to ensuring loads would be picked up in one direction only. This meant that the number of trains traversing a given route could be minimised. Train control was able to deliver the information for this kind of study and ensure that the resulting working was carried out.[10]

The distribution of rolling stock is considered later as an example of control in action. However we need to briefly consider its use in the movement of trains and the implications for loading. Each morning "Traffic Advices to District Offices" collated reports on the number and location of wagons in an area and the number awaiting unloading by the consignee. This was updated on a two hourly basis so that the traffic and trip services could readily be coordinated. It was at this stage that any special clearances of traffic could be arranged or trains cancelled if loads were not available.[11] Divisional control compiled a General Position and Traffic Statement reviewing the area covering the state of marshalling yards and weather conditions. A summary of the traffic position was presented covering that which was on hand, due from foreign lines

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8 RAIL/421/83 LMS Train Control, p29; RAIL/421/85 Operating Control Organisation, 1939, p17.

9 RAIL/421/83 LMS Train Control, pp31-32.

10 Anon. "Traffic Control on the LMS," *Railway Gazette*, February 22, 1929.

11 RAIL/421/231 Appendix to Paper on Traffic Control, J.H.Follows Institute of Transport Congress, May 1927, Section Two.

and a general traffic summary. Traffic flows to specific stations could therefore be monitored.[12] From this the rolling stock organisation could then be informed as to the commercial needs and operating limitations for the day's work.

The mechanism by which congestion was prevented remained the same as it had under the MR: a series of forms and communications stopping trains arriving at terminals where capacity was reaching its maximum. The only difference was that the Divisional Control office coordinated those loads that were to be stopped out of district. The LMS encouraged traders to inform them if they were unable to take delivery of loads. Divisional Control had to be informed stating who requested the stop (ie the District), where it was and the time/date.[13] Control was able to influence operations by regulating the flow of trains leaving, as opposed to between, terminals.

The LMS had retained and built upon the features developed by the MR. However it was the extension of control on a Divisional basis, that was the most important development in the inter-war period. The size of the LMS compared with the MR required that information was collated and decisions made at an intermediate level between District and Central Control at Derby.[14] Each Division covered the area of a former company, although it is not clear why this should have been the case. There is no indication that this was somehow an optimal arrangement, although it may have been necessary to reconcile the other operating systems whose control methods were rejected. The Midland was at Derby (MR), the Western at Crewe (LNWR) and the Central at Manchester (L and YR). Each carried a Divisional Superintendent of Operation who oversaw the work of the District Controllers through the Divisional Control Office.

District Control was able to arrange operations between Districts only subject to the authority of the Division.[15] However it appears that Division would not

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12 RAIL/421/83 LMS Train Control, p43 and p55.

13 LMS Train Control, p44.

14 See RAIL/421/85 Operating Control Organisation - General Instruction, January 1939. The terms Division and District will be used to denote the Divisional Control Office and District Control Office respectively.

15 Operating Control Organisation - General Information, January 1939, pp1-3.

habitually "interfere" with District working. It was limited to particular tasks such as the use of additional diagram paths. The running of extra capacity affected other districts within the Division, so co-ordination was vital. Similarly departures from booked working were authorised divisionally.[16] Notification was required of traffics requiring special facilities, such as perishable items or those running under special services such as the "Green Arrow" service.[17]

However, what makes Divisional Control interesting from our point of view is the role it played in planning and coordinating activity. It will be argued that the use of a Divisional Trains Office acted as the "Planning Department" for conveyance. The allocation of rolling stock, locomotives and the diagramming of trains were coordinated by this office in conjunction with the District and Divisional Control offices. This was an important difference compared to the other companies: as will become clear it meant that most elements of the service were coordinated at some stage in the process, from motive power allocation, the Commercial Department and the Control Offices.

In addition to the operational aspects of control, it was necessary in some cases for the Commercial Agent to be involved. An example of this was the carriage of "out of gauge loads." These were defined as those which "exceed the prescribed measurements of the standard loading gauge, or which present some other exceptional feature necessitating special arrangements being made for working."[18] The acceptance of such loads was not covered by "common carrier" legislation, but the railways often seemed keen to take on such loads. This reflected the perceived need to maximise revenue and attract custom. The Goods agent who secured the load communicated to the District Goods Manager giving the dimensions and weight of the load. This had to be approved by the Chief Mechanical Engineer who would determine the type of vehicle to be used, loading arrangements and any speed restrictions. Then the Chief

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16 RAIL/421/83 London, Midland and Scottish Railway Train Control System, c.1930, p42.

17 Operating Control Organisation, p6. The "Green Arrow" service provided rapid goods transit for an extra fee.

18 LMS Train Control, p121. The actual dimensions were Width 9 foot, Length not more than 60 foot and Height 31.5 foot at loads centre. The axle weight could not exceed 14 tons with rail clearance of 6 foot.

Civil Engineer would have to establish the route to be taken. Extra supervision was sometimes provided by inspectors riding with the load. Most loads under these circumstance had to travel on a Sunday so as not interfere with working.[19] Close working between departments had to occur otherwise loads would be lost and damage done to the rail infrastructure, not to say the reputation of the company.

The Divisional Trains Office

The role of Train Control on the LMS and its relationship with systems in use on other companies can best be appreciated by examining the role of the Divisional Trains Office and the associated Divisional control. The task of the Divisional Trains Office was to "..primarily plan in advance."[20] In this it acted like any planning office under a regime of "scientific management." Planning, monitoring and co-ordination were brought together so that the aim of more "efficient and economical working" could be pursued. It was noted that "The object of "planning in advance" is to give due care and consideration to the requirements to ensure the most satisfactory and economical arrangements being laid down for the working of the line as regards both suitability for traffic offering, and economy from the point of view of Engines, Enginemen, Guards...having regard to conditions of service of train crews."[21] It was the existence of the Divisional Trains Office that separated the LMS from the other two companies under consideration.

The Divisional Trains Office acted as a conduit between the Chief Operating Manager at Euston and the rest of the network, to ensure that a "common policy " as regards operating was maintained. Links existed between District and Divisional control offices, as well as the Divisional Motive Power Office.[22] The Commercial

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19 LMS Train Control, p122.

20 RAIL/421/81 Work of The Divisional Trains Office, p1.

21 Appendix to Paper on Traffic Control, p1.

22 The main source for this section is RAIL/421/81 Work of Divisional Trains Office, and Other Sections of Divisional Headquarters who are Concerned with the Preparation of Schedules, (1939). This seems to have been part of a greater work as the title is actually "Manual of Traffic Operating Chapter V - Planning."

Department was seen as "..the liaison between the public and the trains office."[23] So some contact was maintained between the District Goods Manager and the District Control Office as regards freight trains.[24] Division was able to pass on to the Divisional Trains Office recommendations as to alterations. Decisions of "major importance" such as requests for accelerated services were dealt with by the Chief Commercial Manager liaising with the Chief Operating Manager.[25] This meant that there was a link between the process of moving the freight and the service being offered to the customer. According to the operating instructions in force, it was commercial information from either the Divisional or District Freight Control Office that formed the basis for re-timing. Fluctuations in traffic and seasonal variation were particularly important. District Controllers were in daily contact with the Commercial Department. Any suggestions as to timetabling alterations were sent for approval to the Divisional Controller.

Train diagramming was part of the planning process within the Divisional Trains Office. Timetables were set and modified using these train diagrams, co-ordinating what had been done previously on a District basis. There were four categories in diagramming trains, in descending order of importance: passenger, "important" freight trains, "ordinary" freight trains and "trip" services. Similar constraints as to working were considered here as on the MR system: the number of running lines, type of train being run, position of sidings and their capacity, gradients and even the signalling methods in use.[26] The basic structure of the diagrams remained the same as they had developed under the MR. Special, relief and excursion trains (denoted as Q trains), were diagrammed in terms of geographical location and time. From this the Timing Clerks passed alterations to the "Notice Section." The "Engine

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23 Work of the Divisional Trains Office, p2.

24 Work of Divisional Trains Office, p9.

25 Work of the Divisional Trains Office, p9.

26 RAIL/421/83 London Midland and Scottish Railway Train Control System, c1930, p16. See Chapter 3 for details of the MR practice.

Workings Section" was then consulted so that crewing could be arranged.[27] This was important in aiming to maximise loading subject to the capacity of the engine over a given stretch of line. Complete sets of these diagrams resided at Divisional offices, whilst District offices held only those sections under its geographical control. As part of the diagramming process, publications were issued relating to standard operating procedures embodying these plans. Once routes were decided, the allocation of engines, crews and train guards could be finalised. These were brought together in working instructions as it had implications for the diagrams already established.

The Trains Office was a repository of information concerning timings, and acted to issue any changes. Each spring and winter the "Working Timetable of Freight Trains" , was produced. This was supplemented by the "Working Timetable of Freight Train Notice," issued three times a year in February, July and November. Short run alterations were announced in the "Fortnightly Notices." These included train alterations, "Miscellaneous Instructions" and details of engineering works. It was designed to "..regularise the working and avoid the cancellation of trains and the running of special trains brought about by the altered flows of traffic."[28] Even more up to date information was provided by the "Supplements to Fortnightly Notices." Further information was given in notices concerning the loading of trains, special working and even "Margins for Freight Trains in Advance of Express Passenger Trains". The "General Appendix to the Working Timetables and Selected Appendices", carried much general working information, dominated by issues regarding motive power.[29] "The Classification on Marshalling of Freight Trains" outlined the long distance train arrangements for inter-control area working. Instructions were given to Yardmasters as to the position of vehicles within the trains as regards destination. These documents represent the operating instructions for the process of transportation. Whilst all companies had such documents, it was the degree

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27 Work of Divisional Trains Office, p6.

28 Work of Divisional Trains Office, p49.

29 Work of Divisional Trains Office, 16.

to which the LMS had integrated these into the Control structure via the Trains Office that was important.

The key elements of the ability to preplan the routes and schedules lay in the monitoring of speed which in turn could be used to determine the capacity of various parts of the network. This was not just an extension of signalling but an important shift to being able to actively shape the transportation process. The role of the signalling staff was, of course, important to the smooth operation of Train Control in general.[30] Each signalman would have knowledge of the local conditions at the time of making a decision. Most would also have considerable experience of the line. Royle of the LMS stated that "Signalmen will receive instructions from the District Control Office as to the ultimate requirements, thus assisting them in carrying out detailed regulation."[31] This shows once more the difference between Train and Traffic Control.

The LMS standardised its output of trains within the framework of this diagramming process. To illustrate how this process worked, we shall examine how freight trains were categorised. The example of the fast "Fitted Train" services will demonstrate this. These were categorised according to engineering criteria. A "Fitted Freight Number One" with a Class 1 locomotive could run 20 wagons at 55 mph.[32] There were six categories in total, separated on the basis of speed.[33] The load of each train was set on a per wagon basis calculated as an average tonnage of the various classes of traffic. So 3.5 loaded wagons or 5 empties were equated to 2 loaded mineral wagons.[34] The loading of Mineral trains was thus expressed in terms of a standard and expressed per engine type, per line. These were published in a pamphlet entitled "Loading of All Passenger and Freight Trains," which contained details of "..the

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30 See Burtt *Control on the Railways*, Chapter XIX "Responsibility."

31 RAIL/421/85 Operating Control Organisation, p7.

32 RAIL/418/196 Progress and Development in the Chief Operating Manager's Department in the Years Prior to the War, p22. In addition what defined these trains was the proportion of wagons fitted with brake pipes. In the case of a Fitted Freight Number 1 the train had to have one half fitted.

33 These were Fully Fitted Number 1 and 2; the Express Freight-Maltese Cross, Express Freight, Through Freight and Mineral.

34 Work of Divisional Trains Office, p21.

number of wagons authorised to be conveyed between various points.." per engine. This made allowances for differing gradients and line conditions in relationship to the particular load being carried, as calculated from the diagrams.[35] To correlate loads with particular times meant that "point to point" running had to be ascertained. This was based on information from Control Offices being used to calculate average speeds. From this it was then possible to monitor the performance of engines and their crews.[36] So not only could engines be allocated more efficiently, but the system of control would monitor performance as well.

An example of this in practice was the "Engine Co-ordination and Research Section," established to give further information as to locomotive capability. A graph of engine working was prepared, giving "..a visual picture for each department of the time each booked engine is occupied, and shows where opportunities exist for absorbing availability, and effecting savings."[37] The number of engine failures was noted, especially when due to the use of an inappropriate locomotive. The "cycle of working" was monitored to assess any failure to complete the allocated roster. The daily analysis of the "Engines in Use" return enabled locomotive supply and demand to be monitored.[38] Thus the LMS was able to bring together operating and commercial information into the decision making process.

However, information from Train Control did not replace the documents used by the crews. If the Divisional Trains Office was working effectively, how could this be the case? This might cast doubt on the ability of this Office to effect control. This was not the case: the point is not that the Divisional Control Office was replacing the Motive Power Depot as an institution, but that it was supplementing it. The forms and journals provided a means of providing crews with distinct, formal links to the Motive Power Depot and their foremen. Not only would there have been internal conflicts

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35 Work of the Divisional Trains Office, p21.

36 Work of Divisional Trains Office, p32.

37 Work of Divisional Trains Office, p99. Thus departments would be in a position to "absorb" engine time from, say, standing in yards awaiting revenue earning work.

38 Work of Divisional Trains Office, p100.

over any attempt to centralise the entire process, there were grounds to believe that it would not be effective. The information required by engineers was different to that wanted by Controllers. The Control system was able to supplement operating information on locomotive performance. The journals dealt more with the information required to maintain the locomotives.

Several statements and forms provided this: Engines were allocated on the basis of the Guards Journal and Drivers Report which provided details of "Train and Engine Hours - Daily Summary," sent from the Motive Power Depot to Central control every week. "Hours of Detention to Freight Trains" recorded the instances of bad timing, compiled once more from the Drivers journal. The use to which locomotives were put was monitored by "Analysis of Engines in Use" issued daily from the MPD. From this it was possible to tell which locomotives delivered the best results for given routes and loads.[39] Even in the short term this was able to deliver information which could be used to improve operating conditions and feed back into wider issues of maintenance and design.

The task of the Divisional Trains Office was to act as a liaison between the various aspects of the Control organisation, the Motive Power Department and the Commercial Department. This concerned the classification and standardisation of trains, achieved by equating the locomotive with its load and route. The speed and class of train, mileage to be worked, fuel capacity and line restrictions were all important.[40] It was also a case of equating the crew with route and type of engine on the weekly roster. Complicated sections of line often required specialised knowledge to work: the position of water supplies, particularly difficult stretches of line, complex junction layouts all made the task more difficult for inexperienced crews. Allocation was therefore not only a function of the depot's location but also of the skill of crews: thus physical capital was not the only element of operations to be covered by Control.[41]

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39 Appendix to Paper on Traffic Control, p2.

40 Appendix to Paper on Traffic Control, 81.

41 Appendix to Paper on Traffic Control, p84.

District, Divisional and Central Control worked with these departments to ensure operations were effectively planned, coordinated and monitored.

The Divisional Trains Office seems to have extended the MR scheme far beyond the monitoring of relief and prevention of congestion. This was important in coordinating operations over great distances and also, as we shall see, enabled the marketing function to be extended into the field of control as traffic could be allocated to the train service and vice versa. The operating requirements could be combined with the needs of the commercial departments. This was in line with objectives of the re-organisation of the LMS in 1932. The various constituent parts of the company had to be combined more effectively, and this involved analysing the methods employed throughout the company with regard to the different operating conditions. This task was made easier by having centralised control: "Comparative examinations of practices and methods must be made , so that standards may be laid down for the whole or for parts of the undertaking."[42] Then "..having instituted standard practices, greater decentralisation of certain activities becomes possible."[43] Because standards were known network wide, each area was aware of what the others meant. They could therefore be left on their own to operate. That is to say decisions could eventually be decentralised. It should be emphasised that the telephone combined with regularised information flows and reporting procedures, gave an ability to monitor in real time the interaction between traffic, trains and depots throughout the network. The extension of Train Control to a Divisional level gave management the ability to coordinate the operating and commercial aspects of the company.

Decentralised Train Control: The LNER

The LNER's attempt to introduce systematic analysis was hampered by several problems. It always seemed to be short of liquid funds which limited the ability to fully develop the communications infrastructure required for control. Perhaps of more importance was the problem of integrating the many different methods of operating

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42 RAIL/1057/2804/5 Memo, no page numbers, Organisation, 21 June 1932.

43 Organisation, 21 June 1932.

practice on the amalgamated companies.[44] Like the LMS, the LNER was of considerable size, and sought to reconcile several operating traditions. How the LNER viewed the process of conveyance, and hence control, also differed across these distinct areas. The LNER's Superintendent of the Line, M.Barrington-Ward, served with Cecil Paget when the latter introduced the Train Control system on the MR. This provided the LNER with a figure of authority versed in the principles of a centralised control system. On the LNER, areas were split into Districts which in turn were divided into Sections. Rolling stock control was separated from the main Train and Traffic Control system with the Wagon Control Offices being developed especially for this task. District Control was provided by the District Superintendent acting as Chief Controller. Operational details were left to the Deputy Chief Controller. The control District was further broken down into Sections, each covered by a Sectional Controller. Thus the chain of command ran from these Sectional Controllers through to the District Control. Timetables were at first compiled by the District Superintendent's staff. This was followed by a centralised Timetables office whose task it was to produce the working timetable for the Operating Superintendent. There was need to improve the reliability of timings which separate passenger and freight sections were unable to deliver. Coordination was vital to this process if trains were to run unimpeded

Control does not appear to have been unified under a particular structure. For example, the office at Sheffield was part of the Manchester District, the Manchester Control being cut in half along the north and south. Leicester Control Office was part of the District Superintendent at Marylebone, 103 miles away even though it was the same line! This was eventually remedied in the re-organisation of 1929 when they were combined into one office under the District Superintendent at Manchester. For the rest of the Control Offices they were part of the District Superintendent's Office. The action under the re-organisation would suggest that these difficulties were recognised as a problem and remedies sought soon after. There were problems of amalgamating such a wide variety of operating practices given the physical and financial operating constraints the company found itself under.

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[44] See Bonavia *The Four Great Railways*, Chapter 4 for details of the problems faced by the LNER.

As we have already indicated, there was a perceived difference in Train and Traffic control on the LNER. This can be illustrated by the development of control at Middlesborough. Whilst at Middlesborough the functions of Train Control were clear, the regulation of trainmen's hours, the movement of trains and traffic coordination, the organisation of the office differed. Train running was determined in the Superintendent's office, so the Control Office "marshals the information as to trains and traffic, and the superintendent's trains' office then manipulates the trains in conjunction with the controllers."[45] So the Middlesborough Office was a combination of Train and Traffic Control, but as Burtt noted in effect the outcome was similar to the methods of Train Control on the LMS. That is to say the movement of traffic was monitored as well as its location.

By contrast, at Hull, the LNER had a District that was Traffic control only. The distinction was more clearly drawn here, as the traffic was monitored without the ability to "instruct the signalman on train working matters."[46] This clearly differs from Train Control: the task was to coordinate "facts and information, and using such judiciously for traffic regulation."[47] In the main this involved regulating the coal traffic from collieries to the port of Hull. The function of such control was to inform the company as to when the ship was ready to receive coal. There could, however, be no direct influence on the train once it was underway.

What was lacking on the LNER was a network wide system of Train Control that covered in all cases the movement of trains and the location of traffic. In any event it did not prevent the adoption of Train and Traffic control over various parts of the network in our period. The Western District of the LNER developed the traffic density of the Midland Section of the LMS.[48] District Control Offices were provided at Manchester, (1924) Sheffield, (1924) Kings Cross,(1927) Leicester, (1928) and

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45 Burtt *Control on the Railways*, p111.

46 Burtt *Control on the Railways*, p116.

47 Burtt *Control on the Railways*, p118.

48 Anon "Reorganisation of Train Operating Arrangements, Western Section, Southern Area, LNER" *Railway Gazette*, May 13, 1932.

Lincoln, (1928). Calculations were made to justify the expenditure on the introduction of Control schemes. These were calculated on the basis of an estimate of the number of hours lost through delay. As with the MR earlier, congestion was driving the search for improved control. A monetary value was then allocated to this, although on what basis is unclear.[49] Such calculations revealed extensive savings: for example, the establishment of a Control Office at Lincoln would save an estimated £2,664 if only 10 per cent of delays were prevented. This was put against a recommended £12,486 expenditure. The installation of control at Leicester would give an estimated yield of 130% return on investment.[50]

By 1932 there was more reorganisation of the control system, due to the problems of localised working. That is, the control systems had intensified local working with less regard to inter-district working. This meant that the areas with control systems pushed the problems of congestion etc into areas without such systems: this problem was soon recognised: "The full advantage arising from the establishment of Train Controls cannot be realised owing to the controls being violated.."[51] Train Control had to be network wide to realise its true value. Headquarters could only be consulted by "clerical offices" by telephone and telegraph. Conferencing was impossible and it seems that the telephone lines were overtaxed by the work. "This often resulted in voluminous correspondence and the lapse of considerable time before new arrangements could be put into operation."[52] This was in clear contrast to the LMS where Centralised control and attendant Divisional structures were able to minimise correspondence by immediate telephonic communication. Nonetheless, the LNER did have the office infrastructure in place to facilitate the display and communication of information. Although not as developed as the LMS, they enabled a broad view of operations to be maintained.

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49 RAIL/390/678 Extension of Train Control System, Southern Area, p1 2 June 1927.

50 Extension of Train Control, p1 and p3.

51 RAIL/390/1680 LNER Sessional Papers relating to the Board: 1928-1929 Train and Traffic Controls, p2.

52 Anon. "Reorganisation of Train Operating Arrangements, Western Section, Southern Area, LNER," *Railway Gazette*, May 13, 1932.

Information and Display on the LNER

The means by which information as regards train movement was displayed differed considerably from that on the LMS. In some cases, the LNER used an endless belt moving train indicators along a "model of the line." [53] All signal boxes and additional reporting points were connected by telephone. Information was thus available on a real time basis with the carriers moving in direct relationship with the movement of the train automatically.[54] Trains were divided into categories: No 1, No 2, Class A, B, C and D, plus those form other companies. Colour coded pegs were used to depict the information, so that for example an Express Goods would be numbered and placed on a red peg. In most other cases a Train Board was used showing a schematic view of the line, but this time using pegs placed by hand. The details provided on these Boards was similar to that given on LMS Train Diagrams. It included sidings, their capacity and centres of traffic generation such as factories and wharfs.[55]

A "Working Book" of train schedules was used to note the running of expected trains. Telephone communication enabled emergency working and more general problems to be addressed by conferences when required. A Log was kept by the Deputy Chief Controller for the Superintendent which gave a picture of the previous 24 hours working and provided the basis for the morning conference with the District Superintendents. Sections recorded the movement of trains and traffic "..by a system of regular advices received from signalmen and station and yard staffs," with a weekly card kept to monitor inter-district movement.[56] "More important" freight trains were also reviewed.

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53 See Burtt (1926) *Control On the Railways*, Chapter 10 "Experiments on the LNER" for details.

54 The complexity of the machinery required would indicate that it was perhaps over engineered for the task in hand. See "Main Line Control, North Eastern Area, London and North Eastern Railway" *Railway Gazette*, March 2, 1923.

55 See "Reorganisation of Train Operating Arrangements, Western Section, Southern Area, LNER" *Railway Gazette*, May 13, 1932.

56 Anon. "Reorganisation of Train Operating Arrangements" *The Railway Gazette*, May 13, 1932.

Information regarding train movement was also entered on forms covering up/down passenger and up/down freight. Trains passing through sections of the Assistant Controllers were recorded on colour coded cards. The number of wagons, timing and tonnage were noted. Provision was made also for "Remarks" where details concerning, late running etc could be noted. From the "close watching" of train movement, the loading of wagons could be coordinated with those available for carriage. The information available from these cards was available to the General Superintendent's Office to check on performance. The hours of train crews were monitored enabling relief crews to be allocated more effectively.

Terminal working was aided by the reports as to traffic and rolling stock on hand. At 6am information was received as a Traffic Statement from the Districts regarding the freight on offer. Points of congestion could then be identified along with any points that were likely to become so, enabling loading points and marshalling yards to be kept clear. The stock of wagons and their loads was monitored every 6 to 8 hours and the supply of locomotives and crews allocated. This also had implications for the distribution of locomotives and crew around the network. The *Railway Gazette* noted that there were "Adequate arrangements..in force to provide for the best use of any additional locomotive power, while relief advices can be passed forward rapidly and efficiently."[57] These reports came not just from the marshalling and goods yards but from factories, collieries and ironworks. Indeed anywhere a large quantity of traffic was likely to be offered. This also helped in equating the supply and demand for wagons. Information from goods yards and sidings was reported to sectional controllers. Reports to District as to traffic on hand, stopped and awaiting clearance were made at 6am, 12 noon, 6pm and midnight.

The LNER's Control mechanisms did have some features we might easily associate with a systematic approach to management. Standards were set for routes and speeds according to a categorisation of the variables affecting movement. Selected trains were singled out as being important and monitored separately, based upon their speed. Decisions could be made rapidly and transmitted to the relevant points by

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57 Anon "Main Line Control," *The Railway Gazette* March 2, 1923.

telephone. What may have prompted the differentiation between Traffic and Train Control was the doubts expressed on the value of centralising decision making. What the LNER might have been attempting was "control on the cheap." Given the very real limitations of finance, Traffic Control was not so all encompassing and would offer a less expensive solution to problems of congestion. According to one of its officers, the LNER "..had to try and skimp and save money where they could."[58] It was not that they did not recognise an important management tool. The LNER was limited by financial considerations rather than a belief that Train Control was not useful. This is confirmed by the views of an LNER officer after reviewing the GWR approach to control during the Second World War. C.M.Jenkin Jones was Divisional General Manager of the North Eastern Area of the LNER and headed the investigation into GWR control practices. He favoured the LMS approach to Train Control as we shall see.[59]

The GWR: Ad Hoc Control?

The planning of routes and arrangement of schedules does not appear to have been systematically integrated throughout the network. The main textbook on train control did not mention the GWR when it was published in 1926, nor did the trade press carry many articles about it.[60] What control existed reflected more elements of Traffic Control, rather than those of Train Control. No mention is made in the histories of the GWR regarding the use of train control except as an aid to local working. Evidence on the existence and performance of Train Control is therefore sketchy. However we do learn something from the criticisms made of the GWR during World War Two.

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58 M.A.Cameron in Bonavia *Railway Policy Between the Wars*, p85.

59 See Bonavia *The Four Great Railways*, p51.

60 Anon "The Bristol Division of the Great Western Railway" *Railway Gazette*, May 23, 1924; and more generally, Burtt *Control On the Railways*. This text, and indeed the article, was aimed at those engaged in degree level study of railway operations.

A Committee of Enquiry on Traffic Congestion was established in 1940.[61] It noted how centralised control of operations was rejected by the GWR and with what consequences. Severe delay had been experienced in dock areas that was put down to the "..failure in manipulation of the wagons rather than by a real shortage."[62] By contrast the MR system of Train Control used on the LMS was singled out for praise, being described as "specially conspicuous." The reason was the degree to which control had been made part of a system: District and Inter-District co-ordination of trains linked by telephone lines with a Central Control office.[63] From the report the GWR was seen as having a different strategy toward train control. It is worth quoting in full the Committee's view of this approach:

> The Great Western divisional or district controls are connected by telephone with the signal boxes on the line controlled and thus provide the facilities for exchange of information between the controls and the signal boxes. In some controls the running of important trains is recorded on daily sheets, but in others the record is confined to a train card which is placed in different slots to indicate the geographical position of the train. To a certain extent the relief of trainmen is indicated by the controls, but the system still continues by which trainmen ask for their own relief.Our investigations led us to the conclusion that too much reliance is placed on clearing yards by special trains. There is no specific Headquarters Control except insofar as the Superintendent's Freight Trains Section performs this function. The Locomotive Running Department is under the supervision of the Chief Mechanical Engineer and is not represented in the divisional or headquarters controls, although there is at

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61 RAIL/267/346 Report of the Committee of Enquiry on Traffic Congestion, November 1940. This was set up by the Railway Executive to investigate charges from the Ministry of Transport that there had been delays in the turn around of shipping at ports due to the supply of wagons. Two documents exist under this classmark, one the actual report the other the response by the GWR'S General Manager.

62 Report of the Committee of Enquiry on Traffic Congestion, p29.

63 Report of the Committee of Enquiry on Traffic Congestion, p72.

Swindon a Headquarters Running Superintendent who is jointly responsible to the Chief Mechanical Engineer and the Superintendent of the Line."[64]

Several points of interest emerge from this. The GWR did have a policy which concentrated on the running of special trains, and the use of diagramming was seen as a solution to this problem. The GWR had problems with Wagon distribution from an early date, which necessitated the running of specially designated "Empty Trains."[65] It appears that these were part of the problem being described in 1940. The lack of Divisional control, such as that developed on the LMS, prevented network wide supervision of all aspects of train movement.

The response of the GWR to these criticisms shows just how different their view of control was. First they commented that "..it is quite incorrect to say that the system on the Great Western Railway has been less highly developed than those of the Northern companies when regard is had to the requirements."[66] What is less clear is what the differences in requirements were. The GWR had set up control areas around congested valley and port areas similar to those on the LMS and LNER. Why had they not seen the value of integrating a network wide control system? One clue is that the senior managers, at least, did not appreciate what was meant by having an integrated control system. In their defence they stated that £200,000 had been spent on installing telephone/telegraph equipment. This included the fact that 90% of Passenger Stations were equipped with Post Office Telephones.[67]

Thus they associated investment in telephones with Train Control. So although telephones were used to help control movement via signalboxes, there was no appreciation at the top of the organisation of what was going on. This implied that systematic collection, collation and analysis of information were not being carried out.

The Committee's recommendation that the GWR should have officials from the

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64 Report of the Committee of Enquiry on Traffic Congestion, p74.

65 This will be examined in more detail when we come to consider Rolling Stock Distribution on the GWR.

66 RAIL/267/346 Report of the Committee of Enquiry on Traffic Congestion, 19 December 1940, p17.

67 Report of the Committee of Enquiry on Traffic Congestion, p17.

LMS/LNER to instruct these companies in Train Control. This was seen as the best way to co-ordinate operations. "Strong Headquarters Control" between divisions "..giving them knowledge of the position in neighbouring divisions and preventing them from working in watertight compartments."[68] In addition statistical information was seen as being used best in the environment of control. Standard practices were codified more easily by using Centralised Control which could relate statistical measures with the work being measured. The GWR was clearly indignant at having its operating methods questioned, but does not seemed to have produced convincing evidence that it was maximising rolling stock utilisation.

Indeed evidence on the collection of statistical information suggests support for the Committee's views. It took about six weeks to obtain reliable information on train running from the Guards' Journal with a four weekly summary prepared on a regular basis. The timetable acted as an implicit standard around which performance could be assessed. Divisional officers received details as to the time keeping of trains weighted for the conditions of carriage and loading.

Information display was provided in the District Control Offices but not as part of a "planning office" approach. Train movement was indicated by a small carrier which sat in front of the Controller. In each carrier a slip gave details of the train working, recording the train destinations and times of arrival. A cardboard clock indicted when information was last received. Occupation of any stretch of line, the location of trains and time of last report were clearly displayed. On moving out of the control area the slip was removed and filed away. In addition geographical train boards were provided to monitor trains. What control the GWR had, was used to monitor train movements, enginemen hours and traffic.[69] Any departures from running had to be cleared by Control, and loading checked by this central control. This approach was more akin to signalling than Train Control.

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68 Report of the Committee of Enquiry on Traffic Co-ordination, p75.

69 For details see Anon. "Train Control Developments on the Great Western Railway" *Railway Gazette*, July 2, 1915.

The monitoring of punctuality was of great importance because the GWR offered high speed vacuum fitted train services.[70] These trains usually ran at night so as to maximise available line capacity. Fast General Merchandise trains were booked to run at speeds of 30 mph, whereas most normal freight trains ran at 25mph. Figures on the timing of these trains were included in the General Managers' Reports and regularly reported to the Superintendent of the Line at Paddington: the number of trains run and the train miles per train hour were noted. Such trains were classified according to the number of wagons and the speed of running expected.[71] Starting, intermediate and arrival times were charted so that the working could be discussed at a 9.0am meeting. In addition entries from the Guards' Journals were used to calculate figures for the average timing.

Information flows within the hierarchy reflected the older departmental structures rather than the divisional organisation of the LMS. Thus the company remained conservative in its approach to monitoring and planning its operations. It had kept its corporate identity after amalgamation and so lacked the need to integrate other operating practices within its organisation. Areas of South Wales had coal traffic intended for export that produced congestion and required much movement of empty wagon stock, but action was limited. As with the LNER, there were "knock-on effects" of having just limited control. Localised control would in most cases just serve to push the problem outside of the area where congestion was initially located. It was the lack of a co-ordinating organisation that produced the problems outlined in the report of 1940. That and the failure of the GWR to control its rolling stock distribution.

Control in Action: Rolling Stock Distribution

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70 See Anon. "The Freight Train Services of the Great Western Railway" *Railway Gazette*, September 1, 1922 for details of these services. The use of vacuum pipes on a proportion of wagons increased the braking power available. This was the main constraint to running fast services.

71 See RAIL/250/450 General Managers Reports. The categories changed in these figures from "fast freight" and "vacuum" to categories such as "fitted D" and "fitted C."

We have seen so far how Train and Traffic Control was used to monitor movement and traffic on each of our companies. An important aspect of these operations was the distribution of rolling stock. The movement of rolling stock and its coordination with the flow of freight was a key component to the Execution and Evaluation of the management control process. Ultimately it was how the company was able to offer a service: by bringing wagons of the specified type to the location required, at the right time.

The LNER separated this function from the overall Control process and the GWR lacked any centralised Rolling stock control. These represented different solutions to similar operating problems and as such offer us a glimpse into the differing organisational structures. Rolling stock distribution extends our analysis of Train Control as it provides an example of how control was able to help minimise the costs of working whilst maximising the use of capital. Ensuring that rolling stock was in the right place at the right time also improved the service the companies were able to offer the customers. It helped execute the routine instructions regarding Train operating, and evaluated the performance of terminals in the service they were offering. The not inconsiderable numbers of privately owned wagons were not under the purview of Rolling Stock Distribution systems and so will not be addressed here. In any event, this particular problem would not be solved until the nationalisation of the railways.[72]

Centralised Rolling Stock Distribution on the LMS

For the LMS, movement of rolling stock was centralised at Derby and utilised the same infrastructure as Train Control. Procedures were outlined in the company publication, "Instructions Relating to the Control and Distribution of Freight Rolling Stock." A Daily Freight Rolling Stock Return was telephoned from each station or reporting point indicating the number of empties on hand and the number required for loading. The District Control office then telephoned the "Daily Freight Rolling Stock

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[72] The problem of demurrage, the payments made to railways by traders for the use of wagons, ropes etc, was long considered a problem. The Royal Commission on Transport addressed the problem without reaching any firm conclusion as to how to deal with it.

Position" to the Divisional Office. A summary was prepared at Divisional Control and then sent on to Central Control. "Movement Orders" were issued by telephone each morning and again in the afternoon, giving stations, yards etc their instructions. District Office contacted the Division at 4.0pm as a check on developments since the 12 noon report. As a check on the efficiency of this process, selected stations were monitored by the "Daily Freight Rolling Stock Return" which was balanced against previous working.[73] A key problem for any such system of distribution lay in the honesty with which managers reported the actual figures. Clearly there was an incentive to either over-order stock or alternatively under-report the number of empties available.

Control increased the utilisation of assets, as many wagons could not be filled with just any load. Some required special arrangements ranging from wagons devoted to specific loads to regulations governing the loading of given commodities. Chemicals had to be transported under specified safety conditions, and care had to be taken not to damage the wagon for future use. In some cases this necessitated the use of separate control arrangements. For example, the number of Fitted or partially Fitted trains in each District over the previous 24 hours were checked against those that should have been their from the information regarding traffic on offer. The District Control Office was able to impose "van levies" on stations where there was a "regular deficiency."[74] How effective these were is unclear.

Special wagons were extracted and summarised separately under "Special Wagons Requirements and Supply." Movement of such specialised equipment was monitored through the use of "Special Vehicle Cabinets." These were colour coded according to the status of each wagon with details of date, movement, destination, whether loaded or empty were noted. The cards were arranged as per the type and

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73 RAIL/421/83 LMS Train Control, p19.

74 RAIL/421/231 Appendix to Paper on Train Control, p21. The degree to which these levies were actually used and how effective they were is debatable. No clear records of this exist in the LMS archive but the LNER experience suggests that they were not that successful. See R.T.Munn *Milk Churns to Merry-go Round* Newton Abbot: David and Charles, p92.

location of wagon. As they progressed around the network they would be moved accordingly.[75]

The LMS developed a clear hierarchical reporting procedure for the distribution of rolling stock which acted to maximise the use of assets whilst attempting to minimise movement. Again we see the advantages of having a Divisional Office to co-ordinate working on an inter-district basis. The Central Control Office was able to allocate, network wide, stock between divisions as well as those special wagons.

Departmental Wagon Control on the LNER

The LNER was faced with more serious problems of co-ordination. Not only did it have a surfeit of systems to choose from but it had to deal with the differing perspectives on operations inherent in all of them. Under pre-grouping arrangements there were several systems covering different aspects of distribution. For example the Great Central Railway had refrigerated vans worked by the District Traffic Manager whilst fish vans were under the control of the Superintendent of the Line. A Rolling Stock Controller dealt with all other stock.[76] Similarly the GER had the "Superintendent of Operation,(B)", and the Commercial Superintendent in charge of "fitted covered vans during the fruit season" and all other stock respectively! This suggests that early developments were piecemeal rather than planned.

Amalgamation highlighted the need for a new wagon control system. It was imperative that each of the separate systems were brought under one set of rules. Perfection may not have been achieved but it was important to make a start to the process.[77] In October 1921 initial contacts were made and by April 1923 a new system was decided upon. A representative from the North Eastern and the Great Central investigated the possibilities as it was anticipated that there would be problems, perhaps even old rivalries, in allocating wagons between districts. Centralised control offered several advantages which would help minimise such problems. Old company loyalties

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75 RAIL/421/83 LMS Train Control, pp97-98.

76 Anon. "Increasing the Mobility of Freight Rolling Stock" *Railway Gazette*, March 14, 1924.

77 RAIL/390/35 LNER Organisation Committee Minutes, Minute 92, 11 April 1923,.

had to be replaced by a new "corporate culture" where co-operation should be carried out "unselfishly." For the LNER, the problems of amalgamation gave rise to problems that were not just related to designing and investing in an information system. Attitudes within the workforce to the re-organisation were addressed as well. To encourage proper working, a circular was issued stressing the need to maximise the use of wagon stock. Staff were encouraged personally to watch wagon movements and compile accurate reports. If they could not speed up the process, to "..tell someone who can."[78] All members of the organisation were being encouraged to become part of the control system. Strictures about avoiding delay, increasing wagon loading and wagon miles were also given. Under central control special traffics could be catered for, with more flexible wagon supply and minimal shunting. It was also envisaged that capital spending could be saved if existing wagon stocks were used more extensively. A centralised structure was duly agreed and put under the charge of the Operating Department.

These were the Wagon Control offices, extended to 120 stations where greater account could be kept of the stock. They were responsible for "correlating and synchronising" information from the local stations. The unit of control was seen as the "loading point," from which a standardised scheme of returns was developed. Working instructions were issued to stations, rolling stock control offices and District Superintendent's offices. The system adopted was based upon 24 districts under the control of the Superintendent's office. Wagon Control Offices were established to deal with specific stations per Superintendents district. Reports were made direct to the Central Control Office located at York. Traders were asked to bring their goods to the station before 12 noon. The station then completed a "Wagon Report" which was made out and sent to the relevant wagon control. This showed inward loaded wagons on hand, empty wagons available for loading the next day "available and wanted, additional or spare." A similar report was submitted by 2.30pm from the Wagon Control to the District Superintendent. This then became the "District Superintendent's Wagon Report," sent to the Central Control Office by 3.30pm Analysis of this

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78 Anon. "Increasing the Mobility of Freight Rolling Stock" *The Railway Gazette*, March 14, 1932.

information then resulted in instructions as to movement, normally issued by 6pm. This flow of information through the hierarchy enabled local commercial and operating conditions to be factored into the decisions on stock distribution and use. Future requirements could be noted via the "Stock Report" recording the inward loading at noon, the number of wagons required next day, empties available for loading tomorrow, and spare. A "Weekly Summary Card" noted the previous day's wagons on hand, received and forwarded, those on hand at 9.0am that day and the number of requisitioned wagons. The time spent in the terminals was monitored with separate summaries created for private sidings and works. This further extended control to the operations of the Company's customers. Demurrage time and any inefficiencies in customer behaviour could be made clear. Communications were passed on by the Urgent Train Message, a variant of the Telegram. These included Special Wagon requirements and Railway Owned Containers. Mineral wagons also had their own forms distributed to the District Superintendent and the Mineral Manager. Distribution whilst carried out from York, relied on staff brought in from the local areas with detailed knowledge of local operating conditions. The District Superintendents Office used information received to assess the overall stock on the system. By 6pm, instructions were sent by telephone to the District Superintendent's, to be confirmed later by telegram. Between 3.30pm and 5pm the Freight Rolling Stock Controller was in a position to set up the supply of wagons. Once the Wagon Control Offices had analysed the data and issued instructions to the stations, a message was sent to the station from which authority was passed to the Guard.

For Special wagons an "Urgent Train Message" was used to communicate information as to each stations requirements as to Special wagons. Details of received, on hand and forwarded wagons was then entered from these reports onto "Special Vehicle Cards." These recorded the movement and loading details. These were displayed in trays which enabled the information to be seen at a glance. Other wagon records were kept in a cabinet: wagons on hand - spare,on hand - required, on hand - inward loaded, to arrive - loaded, and to arrive - spare.

The LNER also utilised the services of a Traffic Statistics Office. Daily records were kept of wagon movements, and these were combined into a monthly "Record of

the Average Terminal User."[79] The control offices had access to these statistics on an informal basis as required. For example, the Central Wagon Control received a monthly statement for each terminal point on a district by district, section by section basis. Through this system the "Terminal Wagon Time" was monitored with a view to minimising how long wagons spent at terminals. This was undoubtedly a legacy of the NER management reforms which stressed the use of statistical measures. Information was collected and used by all control systems. However, the collection of statistics as a separate function from the monitoring of Train and Traffic control reflects a different approach to management.[80]

The LNER also used the wagon control system to check the value of wagons within the Wagon Building Program. The reports of the Wagon Control Organisation stressed different variables to the LMS. The reports of the former related the movement of wagons to the commercial environment, rather than the operating aspects. The Rolling Stock distribution system delivered information which could help the problems of the LNER in assessing just what their wagon needs were.

Decentralised Rolling Stock Control: the GWR

On the GWR, Rolling stock control was not integrated within either a train control system or a special wagon control office, as the 1940 report on congestion noted.[81] Rolling stock was distributed according to the Office of the Superintendent of the Line. It seems that the problem with distribution was not new. Just after the amalgamation, the GWR Goods Conference Minutes reported that there were complaints concerning a shortage of wagons, when in fact there should have been sufficient. It noted that whilst there was co-operation between the Divisional

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79 4,000 stations returned these cards which were sent by the first available passenger train after 9.0am.

80 The records of this office do not appear to have survived. See Chapter 3 for details of the NER and statistical analysis.

81 See "Wagons and Their Ways" *GWR Lecture and Debating Society* Meeting of 16 December 1926, Number 200.

Superintendent and the District Goods managers "..for some reasons that were not quite clear, the wishes of the latter were not always being carried out." It was also noted that there was a "lack of knowledge" as to the areas "producing" wagons and those requiring them.[82] Train or Traffic Control systems should have been able to deal with these problems if introduced widely enough. Telephone reports and centralised instructions would enable wagons to be located and their movement monitored.

A report was commissioned from the Goods Conference to investigate the causes of these delays. This identified specific organisational problems, as this report noted that there were a series of "misunderstandings" which had now been cleared up. To prevent problems arising in the future it was suggested that the shortages were spread around the network. The supply of wagons was to be based on the "average number of wagons loaded out by each district during a given period." This was the origin of the special empty trains which were criticised by the 1940 Committee on Congestion. A follow-up minute noted that "Consideration is being given to a proposal to run empty stock trains between certain parts of the line, picking up empty wagons and converging on places where wagons are required for loading.[83] Tests were carried out from time to time to monitor the efficiency of the turn around of stock. The problem with the system as it was established was the split in responsibility. Traders' needs were met by the Chief Goods Manager. However it was the operating departments that controlled day to day distribution. This made it less certain that the needs of commercial and operating aspects of operations would be met. The District Goods Managers coordinated the supply of wagons with the Divisional Superintendents.

The Superintendent of the Line received a stock taking report from all stations and depots at 2pm every day. This was summarised by the Divisional Office who sent it on to Paddington to arrive first thing the next day. Thus the Divisional Office was in a position to co-ordinate the supply and demand of wagons per district. Urgent

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82 RAIL/250/767 GWR Goods Conference Minutes, November1, 1923 Minute 6579 "Distribution of Goods Rolling Stock,".

83 February 16, 1924, Minute 6617 "Distribution of Goods Rolling Stock" Appendix, and June 12 1924 Minute 6656 "Distribution of Goods Rolling Stock," RAIL/250/767 *GWR Goods Managers Conference.*

requests for wagons were made by telephone and telegram, as on the LNER. The Goods Department also collected over the same area, the same information except for that on "purely traffic yards and sidings."[84] This Summary form reached Paddington the next day and gave details of any other requisitioning of empty stock, retention of stock from the previous day and the number of wagons "under load" from the previous day. Thus both departments had their own sources of information, from which in theory they could co-ordinate working. There was of course some doubt as to whether honest reporting was taking place and it was the Chief Goods Manager's job to monitor this. It is not clear what, if any sanctions were used in the event that reporting was dishonest. A check was made on the number of empties on hand at 8.0am and the number awaiting unloading. Presumably these need not strictly be included as being on hand but they might become available during the day. This could be checked with the previous days (un)loading figures as an indication of the true worth of the figures. As it was this information was used to reconcile the needs of the two departments, Commercial and the Operating. The overall position regarding freight was graphed according to the daily averages over all districts. The categories of analysis were: loaded and empty wagons on hand at 8.0am, and the number of wagons unloaded and loaded out per day. Wagons made empty by unloading were more important to smooth running than those created in general by yards. This was a measure of each individual terminal's ability, or not, to generate the wagons required for the traffic on hand.

The Divisional Superintendents each had a Rolling Stock Inspector in charge of wagon allocation. Empties were brought back "on line" by Inspectors based within the District Goods Managers Office. It was by actually visiting the yards, depots and sidings that a check was kept. A report was then sent to the Chief Goods Managers Office, to be considered with the Summary.

It is not clear that the GWR's overall control of rolling stock was able to deal with the requirements of traffic. The Committee on Traffic Congestion from 1940 was critical of this aspect of operations in particular. Extracting information for special studies would be not be as easy and might mean special information gathering

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84 Payne, "Wagons and their Ways" Number 200, *GWR Lecture and Debating Society*, p8.

mechanisms being set up. The details as regards the position and status of stock do not appear to have been as integrated as on either the LMS or LNER. Whilst the Goods Department was involved details seemed to have been sent, at least in part, by train rather than communication by telephone. As such there would have been a lack of "real time control." It appears that the company relied on personal supervision with the difficulty in coordinating individual observations which was the problem. Without a systematic means of processing information, the planning and execution of services could not be optimised. The GWR had no clear idea of where their stock was at any one time, and could not easily bring it to where traffic was located. This caused the problems that the Committee identified in 1940.

Conclusion

Network coordination was vital for the successful running of a railway. Trains were able to flow smoothly between points and traffic could be brought to the required depot for collection. Train Control was better able to deliver this as it could control the movement of trains in "real time." Traffic Control, whilst useful, could only bring traffic and trains together.

For the LMS the Divisional Trains Office had extended the mechanisms of Train Control into the Commercial and Operating departments as never before. The size of the newly amalgamated company had provided the initial impetus for this but it was soon apparent that much more could be achieved at all levels of operations. The planning function of the Trains Office at a divisional level enabled the Control Office to implement such regulations and commercial schemes as were devised. The costs of over-centralisation were deemed to be outweighed by the benefits. Managers and workers alike had access to the decision making process through the telephone, conferences and reporting mechanisms. The evidence of the Committee on Traffic Congestion suggests that the LMS was the most effective in controlling movement.

The LNER utilised control somewhat less effectively but nonetheless was able to coordinate activity more effectively that the GWR. The distinction between Train and Traffic control need not necessarily have made a difference if decisions regarding train movement were somehow incorporated. Bringing trains to traffic was a major

problem for congested areas, and train movement could be implicitly monitored in the process. It was borne out of a need to monitor and plan traffic movements without the infrastructure of Train Control. This was a reasonable response to the financial constraints faced by the company.

By contrast the GWR did not have adequate train control for clearing its network. This may have been reasonable given that it took the traffic levels of the war to create a problem. This is unlikely however: the capacity of track can still remain a problem even in a declining market for rail transport. The LMS found that even with a slump in freight traffic, increased passenger mileage and speed would create a shortage.[85] In addition there was always the need to use the assets more effectively. This was also recognised by the LNER, who had more reason than most to watch their assets closely. Unfortunately for them there was not enough money to completely introduce such schemes as quickly as they would have liked.

Train Control was a means of interacting with the process of conveyance. The process of Execution and Evaluation, as outlined in Chapter One, were part of a unified system only on the LMS. The willingness of the LNER to adopt such practices and the problems caused by their absence on the GWR, indicate that such a system did confer benefits. The improved utilisation of rolling stock and the maximisation of route capacity could be achieved using these methods. Only a systematic approach to management could deliver these benefits, requiring as it did the standardisation of trains, schedules and routes. For successful operation, it was important that any gains in efficiency of conveyance were not cancelled out by delays in the Terminal operations. It is to this that we now turn.

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[85] RAIL/418/196 Progress and Development in the Chief Operating Managers Department, p23.

Chapter Six

The Control of Throughput: Managing Terminal Operations

By the time of amalgamation, several problems were combining to make the topic of terminal design important. The facilities afforded to traders were in many cases both insufficient and outdated for the post World War One market. Sites once surrounded by open spaces were now built up, and space at a premium. Any alterations had to be made within the old 19th century structures, with a few notable exceptions. Increasing road competition made it more important than ever that loads should not be lost or damaged in transit. Decreased handling reduced the number of damaged loads, which although a small proportion of traffic would not encourage Traders to use the railway.[1] If the turn around time could be increased better earlier deliveries to customers were possible. Better use could also be made of rolling stock. This was particularly important for more specialised wagons such as those involved in the container traffic. If shunting could be reduced with improved yard layout not only would cost be reduced in terms of locomotive power but work would be speeded up.

These problems were approached on the LMS by the use of Time and Motion studies, whilst the GWR restructured its transhipment operations. These two approaches should not be seen as perfect substitutes, as the former certainly examined the problem as part of a more specific examination of terminal operations. They were more complements to each other stressing different aspects of the operation. The LNER borrowed from both these approaches as it co-operated with the GWR on reforming transhipment practices and eventually would adopt Time and Motion studies. There were also reports regarding the use of mechanical handling equipment that fell short of a systematic analysis of the Terminal function.

Both Time and Motion analysis and studies of Transhipment were a response to the widely differing operating conditions and standards which since amalgamation

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1 RAIL/418/209 *Review of the LMS Commercial Organisation and its Achievements 1932-1939*, February 1940, p69. For example, in 1929 £318,510 was paid in compensation on Traffic receipts of £29.6 million, or 1.08%. By 1938 this figure was down to 0.93%, £214,309 on just over £23 million.

had been seen as presenting problems. The new technology of road transport came to require a different terminal infrastructure for efficient operation.

When we examined Train and Traffic Control the Execution and Evaluation components of our model are important. In this chapter the emphasis will be different. The analysis here was of how to Plan, Execute and Evaluate. As the nature of the product was determined in the Planning process of our model, the re-organisation of terminal working involved linking the service with its execution. By improved terminal operations, movement could be expedited and new services, such as Containers and Railhead Distribution, introduced. We see here how information was used to shape decisions regarding the best approach to conducting business. Management control needed to be articulated toward cost minimisation, whilst maximising the gains from investment.

It was by sampling and experimentation that the companies hoped to be able to establish the foundations for better performance. Monitoring and Evaluation would fall to statistical summaries rather than real time information and telephone conferences. The task was to examine what terminals did, what they should do, and how they might achieve it. This chapter places the emphasis on how two different aspects of terminal operation were chosen for analysis. Each seems to have reflected the operational concerns of each company: for the LMS it was the throughput of large Goods Terminals, for the GWR the Transhipment of products.

Time and Motion studies were seen as an attempt to codify standards and "best practice" across the network for merchandise traffic. Such traffic was relatively expensive to handle, and came usually in relatively heterogenous loads. This was the main problem for the railways in minimising costs. The solution involved remodelling old termini and placing new designs on a foundation of systematic analysis. In this respect railway companies were no different from any other, as materials handling was undergoing change throughout industry.[2]

Several changes occurred on the railways: Containerisation was a response to the need to improve handling times and minimise damage to goods. The growth of

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[2] For example see Anon. (1931) *Morris Conveyors*, Book 187, Herbert Morris Limited for details of equipment and customers for materials handling equipment.

road competition facilitated its growth as collection and delivery was made easier via the railway companies' own vehicles. This will be considered in Chapter Seven.

Several different aspects had to be addressed: how to charge for the service, to maximise use and to what extent should specialised handling equipment be provided? All companies extended their collection and delivery services and set up railhead distribution from selected stations. Efficiency in the terminal was achieved by minimising the amount of work done by men, both in terms of physical effort and the amount of time spent. This implied decreased handling, with attendant benefits in decreased claims for damaged goods. Increased clearance speed and wagon turn round times utilised equipment more effectively. Finally shunting could be reduced by adopting mechanical substitutes. This was easier said than done because of the constraints on working of station design. The choice of yard design in the early years of railway development re-enforced such constraints: "The governing point would seem to have been to get some place at a low capital cost and the question of annual working charges seems to have been treated as of a secondary character."[3] The monitoring of performance seems to have consisted of assessing the current cost of working with reference to monthly Returns on a year by year basis supplemented by daily and weekly data when required. This was no longer considered efficient. We begin with an outline of how terminals functioned in general. Then we will be in a position to examine the role of Time and Motion studies. LMS practice in developing such schemes will be contrasted with the experience of the GWR in rearranging their transhipment services.

Terminal Work

This section begins with a review of how the terminal functioned in general, beginning with the arrival of goods at the railway terminal.[4] To do this we need to

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3 E.Falconer "Goods Shed Operations" *Journal of the Institute of Transport*, Volume 16, No. 5, May 1935.

4 For what follows see Sherrington *The Economics of Rail Transport*, Edward Arnold and D.R.Lamb (1941) *Modern Railway Operation*,(2nd. edition) London:Sir Isaac Pitman & Sons. We shall not consider private siding management as this was in most cases entirely outside of railway control.

address the task of the terminal as regards the loading of wagons. Then we can describe the tasks within terminals.

The process of securing the load within the wagon could not be left to chance and this had important consequences for loading procedures. Wagon loading was one of the most important variables watched by managers. However the problem of aggregation is once more apparent. Analysis was most useful in train by train monitoring of specified commodities over specific routes. Much effort was put into determining the gains to be made from mechanised loading and ensuring that the cubic capacity of wagons was utilised to the full. Any improvement in transhipment was an important factor in increasing wagon loading for this reason. Costs were also increased because of the wide variety of wagons travelling around the network. Many had been inherited from the amalgamated companies, whilst others were dedicated to specific traffics. Specialist wagons existed for the conveyance of bulk liquids, powders, meat, fruit and vegetables, fish, coal, steel and many other products. Many of these also required special terminal arrangements. Indeed they were often associated with specialist terminals that would be located on private sidings and only sometimes appear at company administered terminals. We have already seen how Train Control monitored the use of such equipment. In terminals, rapid preparation and despatch took the form of specialist handling equipment such as overhead "goliath" cranes and conveyor systems.[5]

Railway company control over the stock of wagons was limited: Lamb estimated that out of 1.4 million wagons, 650,000 were owned privately.[6] Most were used to convey minerals and they served in many areas as storage areas for coal, and although demurrage was levied, these occupied valuable track space. Another problem was the empty running when return loads were lacking. Private stock had to be returned to the owners whether a load was available or not. For our purpose the issue was an

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5 See F.C.Warren "The Load Gauge and Some Exceptional Loads" Meeting Feb. 27th 1913 *GWR Debating Society Proceedings*, for details of such wagons and their place in operations from the point of view of GWR practice.

6 Lamb *Modern Railway*, p147.

exogenous variable, one which management really had to accept, whilst all the time attempting to maximise use.

Of more importance to managers was the question of wagon carrying capacity. This was most keenly felt in the coal and mineral carrying trade because of the possibilities for economies. To give an illustration, for a train of 600 tons "paying load" the figures in Table 1 apply:

Table 1

Wagon Capacity	Number Required	Train Length	Tare	Gross
10 tons	60	1,080 ft	369	969
12 tons	50	975 ft.	350	950
20 tons	30	735 ft.	288	888

SOURCE: D.R.Lamb *Modern Railway Operations*, page 151.

The tare weight was that of the wagon empty, and hence for the train was the "dead weight." Increasing the size of the wagon increased the net wagon load such that economies of bulk carriage were possible. The reduced length of train was also important in minimising the amount invested in sidings and increased the carrying capacity of the line. Wagons were designed with the needs not only of movement, but of loading: bulk, batch and customised loads gave rise to the design of specialist equipment both in terminals and wagons.

In many depots there was a distinction between shed and yard working, reflecting whether the railway service included Collection and Delivery. If it was not included then it was the duty of the receiver to unload in the yard. Whichever category of traffic was involved, there was usually a split between incoming and outgoing traffic. The act of loading and unloading wagons varied from site to site, and from traffic to traffic.

The underlying economics of the transport terminal were defined by the nature of the product. An item was packaged ready for handling, and then transportation. The distinction between the two is important: handling was required so that an item

could be transported. How products were packaged was a function of handling and vice versa. The elements that determined these were fragility, weight, bulk condition - liquid, solid, gas, hot or cold - and whether they were dangerous or not. The manner in which goods were sent was also influenced by the means of handling used. Care had to be taken with dangerous goods, combined with the techniques that were available to handle them. So, for example, acids could be carried in bulk tankers or carboys, subject to the terminal and size of consignment.

The size of the consignment was important in determining the economics of a terminal. Merchandise carried in bulk with uniform package size was easier to handle than in small lots. Large consignments would perhaps enable the purchase of special equipment. Some loads were almost customised by comparison and this was true of out-of-gauge loads and some dangerous products. Those loads carried in bulk were often despatched to dedicated terminals or private sidings and so do not concern us here. However the general principle still applies: bulk loads were more economical than batch or customised loading, and as such were encouraged by the railway companies.[7]

With each load there would be a consignment note which acted as the contract between the customer and the railway. Several checks were made on the load whilst it was in the terminal. Once the load had been weighed by the yard weighbridge it proceeded to the platform where it was to be loaded. There, it was weighed once more, this time by the checker who would indicate at the same time where the goods had to be taken and check what was arriving with the consignment note. This was then passed on to the office for the preparation of invoices. Each of these would have the weight, number and destination of the wagon into which goods are being loaded. Any discrepancies between the quoted rate and the condition of the merchandise was then noted. Lamb observed that if at all possible it should be the practice to make up the delivery sheets at the same time as the invoices, ready for the unloading at the receiving

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[7] For details of how a load was related to wagon design, see R.Tourret (1980) *Petroleum Rail Tank Wagons of Britain*, Tourret Publications: Abingdon, and D.Rowland (1985) *British Railways Wagons - The First Half Million*, Leopard Press: London. Whilst the latter deals only with post nationalisation types, the principles were the same.

terminal.[8] The invoices might then be dispatched, either with the goods or by post, to the receiving depot.

Another important duty of the checker was to examine the condition of the packaging and labelling. This was to prevent loss or damage in transit for which the company could be held liable. Also there was a relationship between how a load was packaged and the mechanical handling procedures that could be used. Very often a load had to be made part of the wagon. For example, carboys containing acid had to be made fast within the wagon and packed with straw. This involved extra cost and was reflected in the initial placing of the merchandise within the General Classification.[9]

The goods were then barrowed and loaded into the wagon. This was no mean task as the consignments were often not all destined for the same point. Transhipment was a major problem for all railways as it was time consuming and costly. Some consignments would have to be off-loaded first and this required the correct arrangement of the load within the wagon If the wagon was covered ie enclosed, then it was ready for dispatch, but if open then it was sheeted by tarpaulins. Once loaded and ready it was moved from the yard or shed by the use of a capstan or otherwise shunted to the dispatch sidings where it could be made up into a train. The number of wagons was noted by the number takers for the purposes of the settlements from the Railway Clearing House and the train then dispatched.

Care had to be taken in ascertaining the proper loading, and in some cases, correct positioning of the train.[10] This involved liaising between the Superintendent and the Goods Manager. Loading tables were a ready means to deciding the train load by the number of vehicles but this was not altogether satisfactory. The calculation of reasonably precise tonnage figures was to be preferred rather than the equating of loaded and empty wagons into equivalent units.

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8 Lamb *Modern Railway Operation*, p68.

9 Details of how packaging effects loads and materials handling, albeit at a later date can be found in W.F.Friedman and J.J.Kipnees (1960) *Industrial Packaging*, New York: Wiley and Sons.

10 For example gun powder would be located as far as possible away from the crew. Sometimes for particularly dangerous loads, special inspectors would travel with the trains.

The arrival of the train at its destination saw a similar process in reverse. The trains arrived in the reception yard and their numbers were "taken" by the staff of the Clearing House. A member of the yard staff might indicate, sometimes with just a chalk mark, which siding the wagon(s) should take. It was important that the yard remained clear at its entrance, no mean feat in some of the larger depots. To ensure this the yardmaster took regular "tours" to ensure that smooth running was maintained. Whole sections of the train were removed and placed either in the shed or yard to await unloading. When unloaded the invoices were checked with what arrived, and removed to the vehicle, loading point or warehouse as the case may be. The loading of the company road vehicles mirrored that of the rail vehicles with the loads placed per district or street within each truck or dray. Finally the whole load was weighed once more on leaving the yard by the weighbridge. The invoices would be received by the delivery office where they would be entered into a book and numbered. The rates levied would be checked and sorted according to whether they are to be delivered by the railway or await picking up by the customer. From the invoices it was usually the case that the delivery sheets still had to be made up. These were used by the company in the process of delivering merchandise. The invoices would be marked according to the delivery point and these would guide the checkers during unloading. Each sheet covered a single unit of freight with different coloured sheets indicating whether there was payment to be collected or not.

The performance of the Goods Yard was based on several factors. Burtt noted the daily reports of number of wagons forwarded and dispatched along with the total tonnage handled. Alongside this the number and cost of staff were seen as the key variables. The key problem was how to account for differing conditions and for this Burtt suggested cross sectional analysis be undertaken with Yards of similar condition.[11] The Time and Motion studies domininate our approach to terminal performance because they attempted to do just this.

Time and Motion Studies

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[11] P.Burtt (1926), *The Principal Factors in Freight Train Operating*, George Allen, p162.

It was the LMS who were the first to apply the techniques of Time and Motion study, or job analysis, to the problem of terminal organisation.[12] The LNER and GWR were followers in this regard. During 1944, the LNER sent officers to the LMS Goods Depot at Derby (St Mary's) to examine how the LMS was utilising Job Analysis to restructure Depots.[13] The work of the LMS in this field therefore dominates our discussion of Terminal redesign.

It was the amalgamation that prompted the LMS to review its operations. In 1923 the management conducted a survey of Goods facilities that revealed "..great variations in their design and operation."[14] It was not just the organisation and location, but the lack of suitable measures of performance, especially over time. Comparing costs over time, apart from neglecting differing operating conditions, "accepted as a standard of performance a comparison founded on the results obtained in the circumstances as they then existed."[15] The possible solutions to these problems were described in a series of special studies and reports. The most influential of these were the Time and Motion studies instigated by E.H.Lemon, one of the LMS Vice Presidents. It was early in 1930 that a committee was established to investigate the "mechanisation and modernisation" of goods terminals.[16] An outside consultant, Lewis

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12 During the war a number of reports were produced by the Railway Companies Association dealing with technical and operating matters. That on Goods Shed design strongly favoured both the approach and conclusions of the LMS. Whilst it is true that Ashton Davies of the LMS held the chair of this Committee, many other commentators also held this view. See RAIL/1098/38 *Railway Companies Association Commission Report on the Best Layout for Goods Terminals*, 1944. For other commentators views see Lamb *Modern Railway Operation*, especially Chapter VII "Modern Methods in Goods Handling." Further details of LMS experience by one of its officers appears in E.Falconer "Goods Shed Operations" *Journal of the Institute of Transport*, Vol. 16, No 5 May 1935.

13 This produced the following report: Brochure Prepared in Connection With the Visit of LNE (Southern Area) Officers to the LMS Modernised Goods Depot at Derby (St. Mary's), RAIL/421/153, 18 May 1944.

14 RAIL/1098/38 Railway Companies Association Commission Report on the Best Layout for Goods Terminals, Chaired by Ashton Davies, Dated february 1944, p11. This report was recommending future operational policy for after the war.

15 RAIL/421/153 Visit of LNE (Southern Area) Officers to the LMS Modernised Goods Depot at Derby (St. Marys) 18 May 1944, p1.

16 RAIL/1007/217 E.H.Lemon Mechanisation of Goods Depots Memo dated March 23rd, 1933. The Committee consisted of the Electrical Engineer, the Chief Civil and Mechanical Engineers,

C. Ord, was then appointed to investigate in more detail the layout and operation of terminals.[17] Issues of warehouse design, mechanical appliances and labour efficiency were discussed in the light of information gathered by these studies.

Time and Motion: Ord's Report

The nature of the problem was grounded in movement, in extending to the terminal the ability to keep the process of transportation moving. Road transport would deliver the goods for unloading to sheds, loading banks and yard sidings. Direct loading from dray to wagon minimised handling, but was constrained by the need for good wagon loading. Thus some packages would have to be kept awaiting suitable wagons, and their proper positioning within them. In already congested yards, this was a source of excessive barrowing as porters had to make their way around these loads. The function of the job analysis was to examine the handling of consignments (including cartage operations), reduce labour costs, improve conditions for the staff and "expedite the handling of goods" so that the standard of our service must compare with that of the Post Office ie a next day's delivery."[18]

The setting of standards and measurement of work was not easy because of the variety of different tasks to be integrated into the analysis. There were fluctuations in "size, shape and weight" of load as well as associated fluctuations in the reception of traffic from traders.

The stated objectives of Ord's study were to:

1) Eliminate trucking.
2) Reduce the amount of handling.
3) Expedite the clearance of traffic each morning so as to improve the percentage delivered each day and to assist a speeding up of transit.

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and the Operating Manager.

17 See Lemon Mechanisation. Ord was then engaged in a study of Crewe Transhipment Shed. His fees, including expenses , were £550 per month.

18 RAIL/421/153 Visit of LNE (Southern Area) Officers to LMS, p1.

4) Speeding up container transit.

5) Substitute locomotive shunting by mechanical tractors.

6) Quicker release of wagons under load.

7) Increase concentration of working to reduce walking and barrowing time of staff.

8) Minimise cartage costs.[19]

To encourage the co-operation of the workforce, no attempt was to be made to separate the gains of mechanisation and/or organisation from those that might have occurred otherwise. So long as workers applied themselves in the future there would be no repercussions about the past.[20] Previous comparisons were not based on any "yardstick" for the purpose of measuring the efficiency of the work. Ord's task was to provide information as to how existing yards could be improved and to prepare the framework for constructing new ones. Ord reported to Lemon's Committee in March 1934.

Three types of traffic were classified, Forwarded, Received and Transhipment. Most loads were found to be relatively homogeneous with little variance in handling needs. Ord quantified the type of savings that should be possible in terms of "..present average handling costs of the larger stations in England."[21] Any variation in efficiency was tested against the performance of "more efficient stations," defined as those with the lowest average costs. Several stations were taken as suitable candidates for analysis.[22]

To take Blackburn as an example of this analysis, three figures were used as "standards." One was the hours per ton, (hereafter referred to as hpt), after changes in organisation had been made, followed by what it was thought could be achieved compared with similar stations. In this particular case, Kettering for received and

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19 RAIL/1007/217 Report from L.C.Ord 3 March 1934 Mechanisation of Goods Sheds, p1.

20 Ord Mechanisation, p1. This implied some concern over union response, but no details on the response from the workers appear in the reports.

21 Ord Mechanisation, p2.

22 Ord Mechanisation, p2. The others recommended but not, it seems chosen, were Lancaster and Chesterfield.

Lancaster for Forwarded and Yard were used. This was combined with an estimate of what was achievable under existing conditions.

Table 2, Yard Analysis at Blackburn Depot.				
	Before	**After**	**Estimate**	**Forecast**
Received	1.85	1.45	1.35	0.8
Forwarded	2.0	1.1	0.65	0.35
Yard	0.95	0.95	0.75	0.4

SOURCE: PRO RAIL/1007/217 p4 and p14 Mechanisation of Goods Sheds. All figures are hours per ton.

There are several problems interpreting these figures, so their value is somewhat limited. It seems that the objective of the analysis, to improve terminal working, had somehow become lost. It is not clear how the forecast figure was arrived at. Measures of doubtful provenance could not change management practices. Similarly, how were the component parts of the terminal weighted? For instance, if the facilities were poorer elsewhere how would this impact upon performance? Nor is it altogether clear why Ord used two estimates in the first place given that they differed. The forecast seems to be a long run objective which would eventually be achieved once mechanisation was in place and the workforce used to new working practices. The estimate seems therefore to have been an interim measure of performance. In short it is not clear from this example that the LMS had moved away from "unscientific" comparisons. Terminals with differing conditions of work were still being used as indicators of efficiency.

There were also problems with the implementation of the plans from within the ranks of the railwaymen which became apparent at Blackburn. The received traffic figures "..did not drop until about a week ago when a discrepancy checker was dropped at our request.." This brought the figure down to 1.65 hpt (hours per ton); two more were replaced and the figure fell to 1.45 hpt. This suggests that Time and Motion studies could indicate those workers who were somehow failing to perform in line with expectations.

As well as new working practices, job analysis attempted to assess the effect of introducing new technology in the form of mechanised handling. A relatively unmechanised yard at Oldbury was chosen as a test. There was a ",,deep rooted objection.." to machinery here, for what reason was unclear.[23] By introducing equipment on a step by step basis it was hoped to prove and quantify the gains from mechanical handling. Road motors were introduced and an overhead crane installed to provide a best practice standard for future reference. No details of the exact results were mentioned in Ord's report as it appears to have been an on-going project.

By far the greatest problem for Ord was that the working arrangements did not deliver any financial economies. He stated that: "The results the Company obtained after two and a half months were working costs nearly double those obtained at other stations with older and poorer layouts." However he went on "This in no way implies that the layout was not successful or the facilities good...in fact they have been generally very much admired."[24] This must have been of great comfort to the shareholders! Mitigating circumstances were offered as an explanation. The study was rushed so that the cost structure of the facilities could not be adequately measured as a prelude to more widespread examination. Hence there was a "..lack of necessary knowledge and experience to know the figure at which the shed should work and the ability to plan and educate, and if necessary to enforce results.."[25]

Given that the study was rushed and failed to deliver economies, we must ask why it was pursued thereafter? The answer lies in the value of Ord's work in revealing the difficulties involved in obtaining the necessary information and in implementing the results of analysis. There was not wholesale support for Job Analysis: "The District Goods Managers, Agents and Foremen either did the best they knew, their failure being due to lack of knowledge, or on the other hand they knew what was wrong and how to put it right, but were too lazy or indifferent to do so. The former assumption is the

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23 Ord Mechanisation of Goods Sheds, p7.

24 Ord Mechanisation of Goods Sheds, p12.

25 Ord Mechanisation of Goods Sheds, p12.

only possible one for many obvious reasons."[26] This is not at all obvious given that Ord had seen fit to draw attention to this fact, suggesting hostility to his study. Support for this view also comes from Ord's comments on the terminal at Blackburn. There the District General Manger and Goods Agent informed him that they had received official thanks from the company for their "good work," implying that they were doing well.[27] There were other occasions, cited by Ord, where remarks on past performance had made the introduction of new working practices more difficult. His frustration was clear when he commented that "[T]here are very many more economies possible than the District Officers or Agents can see or understand."[28] Ord concluded that the task of job analysis was challenging to someone, such as himself, without the technical background. This was compounded by non-co-operation, and Ord found some difficulty where "..both seniors and men were putting up the worst performance we could find."[29] This suggests that as an outsider he was not seen as being aware of railway working practices and so did not command the respect of the terminal management and workforce. So whilst the senior management may have been keen on the modernisation of terminals, it is clear that not everyone in the company was so inclined.

Despite these problems, by November 1935, Lemon had issued a memo outlining the principles agreed under the guidance of Ord's report. Wagon and dray loading, along with barrowing were singled out for attention. Analysis, either already completed or about to be done, it is not clear which, would fix standards for each. Labour output was taken as being of equal quality throughout the network seemingly so that any gains could be ascribed to the new organisation. Whether this was an attempt to push further the perceived effectiveness of such studies is unclear. Either way, the assumption was not altogether valid: Ord had noted the poor physical

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26 Ord Mechanisation of Goods Sheds, p13.

27 Ord Mechanisation of Goods Sheds, p13.

28 Ord Mechanisation of Goods Sheds, p13.

29 Ord Mechanisation of Goods Sheds, p14.

condition of the workforce at Blackburn and intimated that this had detrimental effects on performance.[30]

The approach to be adopted was summed up as "..the work should be brought to the men rather than the men go to the work."[31] This involved both the introduction of mechanised handling and the redesign of the shed. Movement was aided by using conveyors and unloading machines. Wagons were to be unloaded directly onto electric trucks and thence to the waiting dray. To minimise shunting, electric capstans were recommended. These also gave foremen more control on the placing of wagons without having to call on locomotives and this had implications for minimising shunting costs. Direct loading from wagon to road, under covered accommodation, was recommended. Cartage was analysed to minimise movement within the yard and on delivery/pick-up rounds. The duties of cartage staff were extended to including helping shed and yard staff with their duties.[32]

Time and Motion: The Results

As a result of Ord's initial studies, a special office at Euston was established to examine shed design and mechanical equipment to conduct Time Studies. A District Committee was set up to take advice from the specialists at headquarters.[33] It is probable that these were members of the Executive Research Committee, introduced by the President of the LMS to coordinate Commercial and Operational Research.

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30 RAIL/IOO7/217 E.H.Lemon Mechanisation of Goods Depots, 1933, p1. So bad were some that reducing physical effort and walking became increasingly necessary just for this reason. RAIL/1007/217 Ord Mechanisation of Goods Depots, p11.

31 Lemon Mechanisation of Goods Depots, p1.

32 Lemon Mechanisation of Goods Depots, p1.

33 RAIL/418/196 Progress and Developments in the Chief Operating Managers Department, 1940, p72.

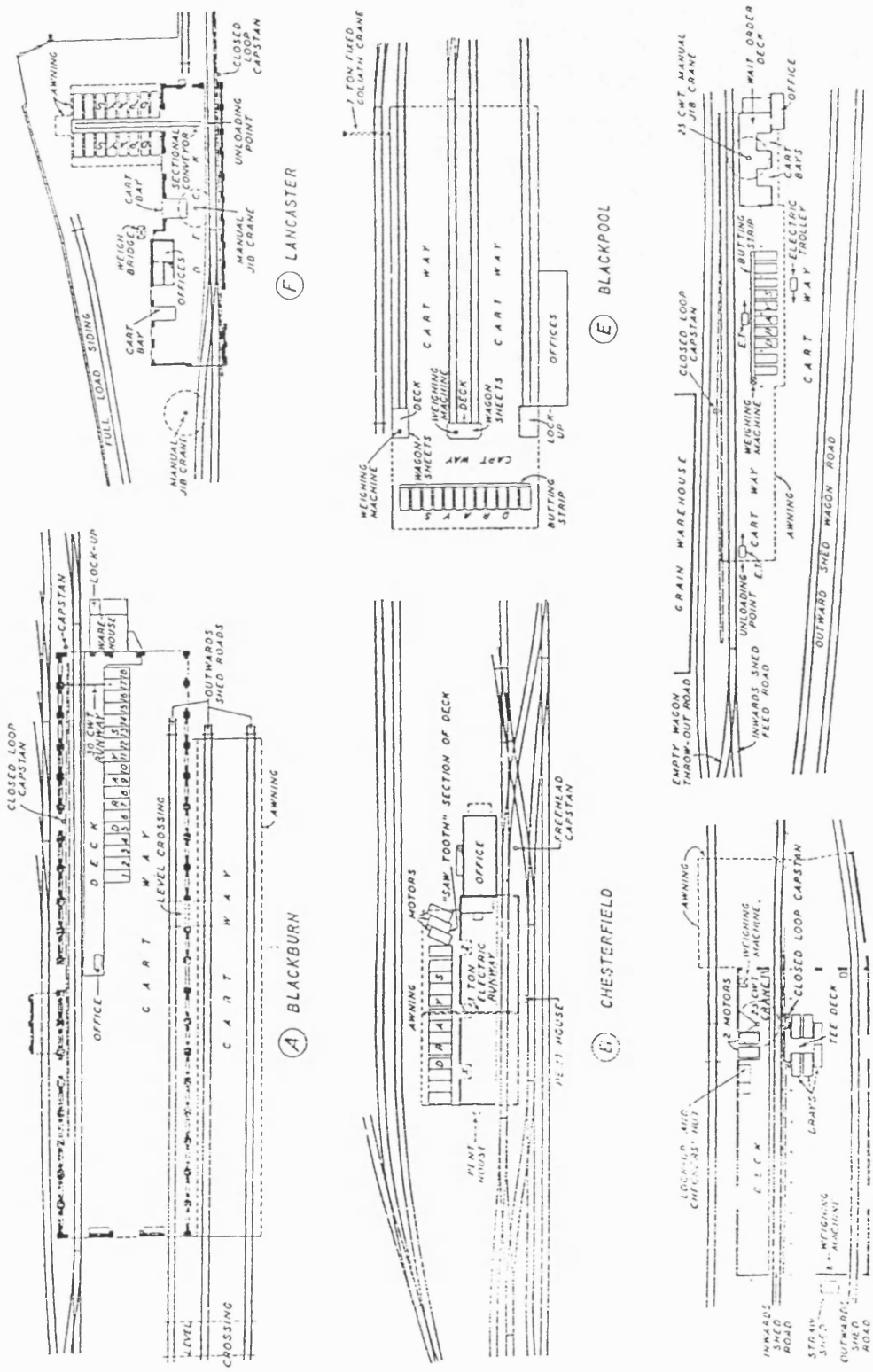

FIGURE ONE: LMS Goods Shed Design
Source: Lamb Railway Operations, p82.

An example of the type of analysis undertaken may be seen in the categories on Form ERO 29882 "Analysis of Goods Station Operation." This was used as a basis for the collection of information and embodied an implicit model of Terminal operations. It was divided into the following sections: Staff, Received Shed Traffic, Forwarded Shed Traffic, Yard, Warehouse and various summaries.[34] The Received/Forwarded tasks were split into Shed Wagon (Un)Loading and Shed Dray (Un)Loading respectively. Table Two shows how four medium sized stations performed:

Table 3

	Date	H.P.T. Before	H.P.T. After	% Decrease	Cost of Introduction in pounds
Lancaster	1934	0.71	0.45	36.6	4,400
Blackpool	1935	1.25	0.85	32.0	16,000
Burton	1935	1.33	0.73	45.0	3,600
Burnley	1936	1.45	1.07	26.0	6,300

SOURCE: Taken from RAIL/421/153 *Visit of LNE (Southern Area) Officers*, 1944.

Physical handling was reduced, per ton, which was the objective: what is less clear is the degree to which other factors had changed. What we can examine is the means by which modernisation can be seen to have influenced the outcome. Given that the speed of movement between wagons and drays was an important aspect of terminal working. We might usefully start there. The major changes appear in the movement of merchandise from the wagon. This is clear if we examine Figure One. These plans show the layout of modernised depots.[35] In each we can see how important the direct loading of drays has become, although how they were loaded varied: at Lancaster there was a single unloading point served by a capstan. This delivered wagons to a

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34 Section XIII "Goods Terminal Modernisation" RAIL/418/196 Progress and Developments in the Chief Operating Managers Department, 1940.

35 Unfortunately there is no similar illustration of the previous layout. However from Lamb's text it is clear that major changes had been made, as we shall see. See p82 facing Lamb *Modern Railway Operating*.

"Sectional Conveyor" where Electric "Mules" delivered slates of goods to the waiting drays. These were arranged in order, so facilitating delivery.[36] The only problem with this lay in the fact that the gang had to be limited to a single worker - any more and they were in each other's way. The solution to this was the Wagon Unloading Machine, that enabled both to work at once.[37] At Blackpool and Burton, the stations dealt with forwarded traffic by unloading straight to the wagon. For received sundries, electric trucks were loaded from the wagons and then proceeded to "butting" strips for transfer to the required dray. Once the wagon was empty it could remain in place awaiting a load. Direct unloading as the inward wagons acted as an "..ample reservoir.." of work and hence spread work over shifts.[38]

Differences in performance reflected these alternative appliances: Burton was of the "Through" type and Blackpool designed as a "Grid." The Burton terminal used capstans to move wagons to a fixed unloading point. Blackpool had no fixed points, with the electric trucks able to move around the sidings. Whilst Blackpool had performed a little better than before the modifications, afterwards the position was reversed, but still economies had been made.

All these alterations were modifications of existing small to medium sheds rather than completely new sites. The true value of Job Analysis lay in building new sheds on a large scale. The sheds at Derby St Mary's and Birmingham Lawley Street were the first to embody fully the "fundamental ideas" on shed design gleaned from Job Analysis.[39]

The shed at Derby was begun in 1936 with an authorised expenditure of £164,000.[40] It was designed to discharge 790 tons and load 765 tons at any one time,

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36 "Lancaster (Castle)," RAIL/421/153 Visit of LNE(Southern Area) Officers to the LMS, 1944, p1.

37 Lamb *Modern Railway Operation*, p88-90. This was a development of the Sectional Conveyor, this time operated from within the wagon.

38 "Blackpool (Talbot Road)" RAIL/421/153 Visit of LNE (Southern) Area to the LMS 1944, p1.

39 RAIL/421/153 Visit of LNE(Southern Area) Officers to the LMS, "Derby St Mary's," 1944, p1.

40 "Derby St Mary's" Visit of LNE(Southern Area) Officers to the LMS, pp2-4.

with wagon standage space of 256 and provision for 100 empties.[41] Unloading was carried out in two stages. There was an initial sorting made as the wagons were unloaded, into three sections for town deliveries and five for transhipment. Heavy crane and "wait order" traffic was also separated. A second "Sort" took place at the dray loading point, to individual delivery vehicles. Transhipment traffic was allocated to the appropriate wagons. Forwarded traffic was loaded straight from the road vehicle to the wagon. Such direct loading eliminated the need to barrow goods, an activity that had been identified as wasteful at the outset of the job analysis. The task of loading and checking was spread throughout the shed staff. This utilised cartage staff for the former and eliminated the need for porters to have to report to the checkers.[42] That this was achieved without having to build decks within the shed lead to savings of £14,000.[43] Operations around the depot were coordinated by a telephone network. This linked agents, chief foremen, delivery office, dray loaders and the "indoor" commercial offices.[44]

Birmingham (Lawley Street), was designed differently as the proportions of Forwarded and Received goods were greater than Transhipment. Mechanical equipment was fully integrated into shed design.[45] In this design, hand trucking was much reduced with the employment of cart roads for direct transfer of loads. Mobile, instead of static, cranes were provided which increased flexibility of working. Conveyors and traverser helped move material along the axis of the shed so that loads for road delivery could easily be made up. This was combined with more general analysis of working conditions so that in at least one case, that of the Sheffield Yard, traffic was regulated "..to the daily capacity which the firm can except."[46] That is to

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41 Visit of LNE(Southern Area) Officers to the LMS, p6.

42 Visit of LNE(Southern Area) Officers, p4.

43 Visit of LNE (Southern Area) Officers to the LMS, p3.

44 Visit of LNE(Southern Area) Officers to the LMS, Appendix D Telephone Arrangements.

45 For details on the technical working of this shed see pp174-180 T.W. Royle "Modern Methods of Handling Goods at Railway Stations" *Journal of the Institute of Transport*, November-December 1945.

46 RAIL/418/196 Progress and Developments in the Chief Operating Manager's Department, p29.

say that the working of traffic from traders to the Yard was being regulated prevent congestion. This formed part of the Train Control system we have described in Chapter Five.

From 1931, the analysis of Sheds was applied to the task of shunting and traffic movement in general within Yards.[47] The "Analysis of Freight Shunting" noted the number of staff on duty and their cost. The task of shunting was broken down into "primary sorting," "sub-sectionalising," "pushing roads down" and "shunting out wrong wagons." The Chief Operating Manager's Head Quarters coordinated the shunting analysis with proposals for terminal redesign. The task was "To study problems in all forms and create and disseminate new ideas for reducing costs and increasing efficiency." A small unit of the Divisional Superintendent's staff started in 1931 to carry out regular analysis of shunting methods and performance. Its remit was extended in 1937 to include modernisation proposals and additional monitoring.[48] The Divisional Superintendent of Operations was able to analysis traffic to provide information on flows of traffic so that train working could be adjusted accordingly.

By the beginning of the War in 1939, District Committees had been established, under the guidance of HQ specialists. Over 230 stations had been examined and of these 141 benefited from such review without making any structural alterations, that is to say solely by reorganisation. The estimated savings were estimated at amounting to a total of £50,973. Of those schemes already carried out, 44 stations had realised economies totalling £28,964.[49]

As we have noted above, the Time and Motion studies were conducted by specialist teams able to utilise the experience of senior officers at the Euston Headquarters. Although there was likely to be many different departments providing advice, the most important would have been the Executive Research Office. Whilst the detailed papers of this office do not appear to survive, some of their reports do. Of particular interest are those describing the system of "back checking" on investment.

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47 Progress and Development in the Chief Operating Manager's Department, p32.

48 Progress and Developments in the Chief Operating Manager's Department, p35.

49 Progress and Developments in the Chief Operating Manager's Department, pp72-73.

In the context of terminal operations this provided more information on the modernisation programme. The next section chronicles the use of this method in evaluating the mechanisation of movement within the terminals.

The Executive Research Office and Terminal Mechanisation

So far we have seen how mechanisation impacted upon physical measures of performance. The process of "back-checking" involved calculating the gains, financial as well as physical, that had been made from investments. As an example of how this worked, a report from their Executive Research Committee will be considered.[50]

This report examined the performance of 25 light tractors and the conversion of horse trailers, amounting to an investment of £6,260. The objective of the back-checking was "..to produce conclusive evidence of the economy, or otherwise.." in a given investment.[51] Such tractors were seen as a means of reducing costs which had been increased by changing work patterns.

The estimated outlay was first compared with that which was actually spent. The conclusions of the experimental use of the equipment were given, with detailed evidence in an Appendix.[52] The results of working under old and new conditions were presented under the headings of variable and non variable cost. Figures relating to interest, wages,provender, fuel etc were noted so that the overall increase, or not, could be discerned.

Given this information it was then possible to make decisions as to the future course of the programme. In this case it was noted that one area of experimentation, at Nottingham, was particularly suited to motor working, implying that due allowance would have to be made for this. More general conclusions were drawn by expressing in terms of "equivalent horses" the displacement required. For example in terminals

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50 RAIL/418/107 "Back Checking of New Works Report. Light tractors authorised for experimental purposes," 1934 Further information can also be found in E.Falconer "The Mechanisation of Goods Depots," *Journal of the Institute of Transport*, Feb 1936; H.W.Faircloth Address read to the Commercial Motor Transport Exhibition "Railway Cartage and Mechanical Transport" published in *Railway Gazette*, November 19, 1937.

51 RAIL/418/107 "Back-checking of New Works," p1

52 See RAIL/418/107 Statement No 4 to Appendix A, "Back-checking of New Works Report."

where there was mixed horse and motor vehicle working, 1 and 3/5 horses equivalent per tractor were needed before economies resulted. If a complete change was made then the figure was 1 and 1/4. Total variable costs differed from an increase of £42 to a decrease of £138, per year.[53]

The process of back-checking ideally required creating as far as possible standardised conditions of work, but without losing the essence of the task.[54] Efforts were made to present before and after figures in a format which made comparison easy. Cost comparisons of the various types of vehicle were made under the old and new conditions. Details were then given explaining the reasons for this.

Appendix C of the Report related the experiment to future practice.[55] Further cost comparisons were made and calculations as to the ratio of horses to mechanical vehicles required for equivalent tasks. This related the experiment to the wider considerations of the company, extrapolating what had been learnt to the rest of the network. In this case it involved noting the implications for the companies motor building programme and a comparison of how the LMS stood in relation to the other railway companies. It was noted that Railhead Distribution schemes had over-extended existing facilities.

Such analysis was important in revealing aspects of LMS organisation as it was being changed. By the 1940's the analysis of Goods operations and consequent back checking would be regarded as forcing "a complete reorientation of all past ideas in regard to the working of Goods stations."[56] The LMS was widely credited with the first use of systematic analysis of freight handing in terms of Time and Motion studies.[57] The approach adopted was eventually adopted by the GWR and LNER, but

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53 Appendix C, "Back-Checking of New Works," p6.

54 For details see Appendix A of Back-checking of New Works Report.

55 See Back-Checking of New Works Report, Appendix C, Results of Experiments in Relation to Future Policy.

56 RAIL/421/153 *Visit of LNE (Southern Area) Officers to the LMS Modernised Goods Depot at Derby (St. Marys)*, May 1944, p1.

57 See Lamb *Railway Operating*, Chapter VII "Modern Methods in Goods Handling."

only after the Second World War could it be fully implemented. It is to these two companies that we now turn, staring with the LNER.

Terminal Working: The LNER

If the other companies were not yet using Job Analysis, they were aware of the need to innovate in the handling of traffic. Most of the time this was seen as an issue involving the use of aids to mechanical handling. Early on, the LNER considered the use of electric trucks within depots.[58] These early experiments were not altogether successful as the narrowness and congestion within terminals limited their usefulness. This suggests that the LNER was not at this stage considering terminal operation in its entirety. It was not analysing the wider picture and relating the design of shed to the introduction of new techniques of handling. The report did recognise that design entered into the equation as it recommended the use of such trucks in warehouse accommodation, as opposed to terminals, used by the Company. A considerable saving was expressed in terms of 1 electric truck, with "lad", being equal to 6 *men* with handbarrows. A total daily reduction in the wages bill was calculated at £22-8-0.[59] Given that this was some considerable saving it would have been logical for the LNER to begin a review of Goods Shed operations. There is not much evidence that they did. The next mention of Goods Shed operation comes once more from the perspective of mechanical handling.

In 1929, a Lieutenant Colonel Carey reported on a scheme to improve mechanical transhipment.[60] This was another scheme to homogenise the carriage of freight, in this case by the use of wheeled containers on flat topped wagons.[61] This would result in the scrapping of all Goods Yards and no marshalling would be required. In the first place, containers were sorted at the terminal by destination. Although this

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58 RAIL/390/233 LNER Superintendents Committee, Minute s170 1 October 1923 "Goods Handling by Electric Trucks" Appendix B.

59 RAIL/390/233 Superintendents Committee, Minute S170.

60 RAIL/390/234 *LNER Superintendents Committee*, Minute 1594 22 October 1929. "Lt. Col. Carey's Scheme for Mechanical Transhipment."

61 The other was the abortive Gattie scheme, for which see Chapter 3.

did not find favour with the LNER management, they did appear to be considering such schemes seriously. The reason for rejection lay in the cost of writing off old plant and of introducing new. An estimated £10,000 was thought to be needed just to test the system, so it was shelved.[62]

Methods of mechanical handling as found on other companies were also considered. The early LMS use of conveyors and movable platforms at Huddersfield was noted in 1932, with a visit to the site.[63] Other references were made to the alterations at Burnley, but the introduction of conveyors was rejected as the LMS had not yet tried them at their large stations! The LNER was awaiting the results of the LMS studies before committing itself. The fact that large stations had not yet been altered was explained by the experimental nature of the LMS's analysis. Thus the LNER lost an early chance to re-organise working by failing to recognise the significance of reforming the *organisation* of shed working. Given that information was shared in the post amalgamation industry, this was a rational approach.

A review of LMS Time and Motion studies prompted a letter from the General Manager of the LNER in 1935 that prompted a further review of LMS Time and Motion Studies.[64] A follow up report on progress was requested, as well as a Superintendent's report on LNER working in relation to "LNER technology."[65] In due course the LNER would fully embrace such analysis, including several shed visits.[66] The eventual form of analysis was undertaken late in World War Two by the District Operating Superintendent's office. In addition to the Superintendent there were the

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62 It is interesting to note, however, that the Port of London Authority was approached as to the value of this system and was reported to be "strongly in favour." Clearly the transport industry as a whole recognised the value of Containerisation long before it was carried out.

63 RAIL/390/234 LNER Superintendents Committee, Minute S2136 15 June 1932 "Movable Platforms in Goods Warehouses."

64 RAIL/390/234 LNER Superintendents Committee, Minute s2727 April 9 1935 "Methods of Working in Goods Warehouses."

65 RAIL/390/234 LNER Superintendents Committee. Minute s2826 5 October 1935 "Methods of Working Goods Warehouses," Unfortunately no record of the report remains but it was suggested that comparisons with one LMS site, Lancaster (Castle), were favourable.

66 See RAIL/421/153 *Visit of LNE (Southern Area) Officers to the LMS Modernised Goods Depot*, 18th. May, 1944.

District Goods Manager and Cartage Manager along with representatives of the Superintendent and Goods Manager. The layout, staff organisation and facilities would form the basis of such analysis with the amount and type of traffic used to balance actual performance against expectation. Then the District Committee would visit the site. From the account given by Lamb, significant similarities in objectives of both the LMS and LNER existed. That is the amount of hand cartage was to be reduced and direct loading from wagon to road increased.[67] The fact that the LNER took some time to realise that a more systematic approach to depot design might be useful did not mean that no reorganisations were carried out. Meanwhile the trade press reported on some of the more extensive changes made to LNER depots, but detailed reports were sketchy..

In 1934 Farrington Goods station was mechanised as the old infrastructure was limiting the work that could be done.[68] How this was accomplished confirms the view that shed modernisation was seen largely in terms of mechanisation. Here the "biological" horse was replaced by the mechanical one: the latter could work in the narrow confines of the depot. This is not to say that such projects were ineffective: 60 of these mechanical tractors with 92 "carrying units" could do the work of 87 horse teams and 147 vehicles.

The reorganisation of Kings Cross in 1938 reflected the changing nature of both the service offered and the equipment used.[69] Rapid unloading was essential if the gains made by fast fitted freight trains were not to be lost in time spent unloading. Increasing use of containers also prompted changes in handing equipment. The new scheme changed cartage, receiving and forwarding activity. The result was increased wagon capacity and the provision of mobile crane equipment, including those for the unloading of containers.

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67 See Lamb *Modern Railway Operating*, p91 and 94. It seems that these studies only became of importance after the World War Two and that most were reorganisations before this time were unaffected by such studies.

68 See Anon. "A Mechanised City Goods Station" *Railway Gazette*, March 16, 1934.

69 See Anon. "King's Cross Goods Station Remodelling, LNER" *Railway Gazette*, July 22, 1938.

To summarise the LNER work, we can identify two periods in the approach to analysis of depot working. Firstly the identification of mechanisation with modernisation, seemingly without the systematic analysis of the LMS. Then we see a recognition of the value of such studies as carried out by the LMS. This does not mean to say that the remodelled depots were somehow ineffective. But it does suggest that best use was not perhaps being made of assets. Whilst the LNER invested in mechanical handling equipment such as cranes and mechanical horses, the LMS was apparently better able to see the advantages of such items as wagon unloading machines and conveyors. By understanding how such machinery had an impact on the working arrangements in the depots, a clearer picture of the costs and benefits could be obtained.

Terminal Working: The GWR

In many respects the GWR followed the LNER in its equation of depot modernisation with mechanisation. It was not until 1937 that Time and Motion studies were introduced. However the GWR had commissioned a Report into the use of mechanised appliances in 1918.[70] This explored some of the issues that had been raised by the earlier Gattie investigations conducted by both Government and railway companies.[71] The report noted that modern mechanical appliances were being introduced, but only at the largest stations. At large stations more use could be made of the machines, presumably ensuring that there was a reasonable return on the investment. However the main limiting factor was the wide variety of loads being handled, in particular with regard to the station to station traffic. This was the opposite conclusion to that reached by the initial enquiries by Ord on the LMS. There it was stated that variance in loads was not a major problem. The difference in findings could reflect the state of handling technology in 1918 to that in the early thirties, but it also depended on how homogeneity was defined.

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70 RAIL/267/375 *Final Report of Committee on Mechanical Appliances for Dealing with Goods Traffic*, 1920.

71 See Chapter Three.

Several schemes for the redesign of Paddington were shown in the report but there was no detailed analysis of the flow of material through the terminal. The conclusion of the report was that mechanical appliances could only be used "in a very limited way."[72] This was a reasonable conclusion if modernisation was to be introduced into existing depot structures. What was ignored was the ability to change such structures. A more rigorous approach to the problem might have identified where real savings could be made and improved the understanding of operations. For example, even at South Lambeth where a four road shed was built from new, the appliances within it only included two 20 cwt capacity travelling cranes. This despite the fact that direct loading from wagons to road had been recommended as early as 1918. At the remodelled Paddington and Bristol (Temple Meads) interior platforms remained.[73] This contrasts with the modified sheds on the LMS which utilised technology such as conveyors and unloading machines. Only by 1947 was the Chief Goods Manager of the GWR discussing introducing these within their sheds.[74]

The GWR only made the first steps toward Time and Motion studies in 1937. The Goods Conference noted that "..certain advantages had already emerged."[75] Small groups of experts had been sent by Headquarters throughout the network to examine the possibilities for such studies. Initial experimentation was to take place on medium sized stations nominated by District Managers. Three conditions were laid down as a basis for choosing these stations: Inwards shed traffic to be about 30 truck loads, handling costs of about 6s per ton and the number of delivery rounds "relatively" few.[76]

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72 p19, RAIL/267/375 *Committee on Mechanical Appliances*, Final Report.

73 See Lamb *Modern Railway Operation*, Chapter V "Freight Terminals."

74 D.Blee "The Transhipment of Goods Train Traffic: Its Development and its Future" *Journal of the Institute of Transport*, May-June 1947.

75 RAIL/250/745 Great Western Railway Goods Conference, 12 November 1937, Minute 8358 "Design, Equipment and Working of Goods Sheds and Improved Handling Methods."

76 The stations eventually chosen as suitable were Oxford, High Wycombe, Slough, and Shrewsbury. Unfortunately there does not appear to be a record of the progress made. RAIL/250/768 GWR Goods Conference, See Minute 8384 "Design, Equipment and Working of Goods Sheds and Improved Handling Methods" 25 February 1938.

The minute noted that "necessarily" there was limited scope for such studies on the GWR, but for what reason was not made clear. An important indicator of why policy differed lay in the perception of the problem as revealed in an article by the Chief Goods Manager of the GWR in 1947.[77] Whilst giving praise to the LMS for its research he stated that "studies have concurrently been conducted independently by the Great Western Company" and that although there were basic underlying principles the GWR studies did not "lead us to the same conclusions as to method."[78]

Quite clearly the work of the LMS broke new ground in attempting to improve service. Although both the LNER and GWR introduced mechanical handling equipment they did not systematically consider its effects. For the LMS, modernisation and mechanisation seemed synonymous, involving the organisation and operation of the scheme.[79] For the LNER, it was a question of learning from the LMS, whilst the GWR did not perceive immediately that Time and Motion studies were a solution to the problem of cost minimisation.

There were key differences in the circumstances surrounding how companies managed. The GWR was the least affected of all by the amalgamation. Thus it did not have to deal with the wide varieties of operating practices that both the LMS and LNER had to. On the LNER what modernisation of depots there was, was constrained by the uncertainty surrounding operations that seemed to permeate the entire organisation. The LMS, as we have noted, was more dominated by managers from one company, the MR, and had Josiah Stamp as a President who was willing to experiment with new ideas. But we must not forget that terminal performance could be improved in other ways as well. The GWR perceived the terminal problem in a different way: it was particularly active in developing a streamlined Transhipment organisation, at which the LNER would eventually look. Given the increasing competition from Road transport this was of no little importance.

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77 D.Blee "The Transhipment of Goods Train Traffic: Its Development and Future" *Journal of the Institute of Transport*, May-June 1947.

78 Blee "Transhipment" *Journal of the Institute of Transport*.

79 RAIL/418/196 Progress and Development in the Chief Operating Managers Department, p73.

Transhipment

In some sense then the GWR's attempts at reforming transhipment can be seen as a partial substitute for the LMS's job analysis. The GWR saw the movement of transhipment loads as a key part of improving service and cutting costs. All companies recognised that there were problems in such loads and had done for many years. The LNER set up a Committee to monitor these, but unfortunately no record of this seems to have survived.[80] LMS operations were covered to a large part by its work on Time and Motion studies. Indeed, Lewis Ord was initially engaged in a study of Crewe transhipment shed when he was appointed to the initial Time and Motion studies.[81]

The GWR in its reorganisation of transhipment targeted an area of operations which was increasingly important: that of the small consignment. By its very nature these loads were susceptible to road competition. The working of small loads comprised two problems: firstly there were many possible sources and destinations of traffic, secondly the size of each load restricted the full use of wagons. The criteria for what constituted a small load was one of weight. When analysis began this was anything under 1 ton. Part loads would be combined into full loads at points along the line: in short transhipments were "goods sent to one place but intended for another, the one place being part-way towards the other."[82] The problem, then, was to minimise the number of times a load had to be transferred. This was not as all encompassing as the LMS Time and Motion Studies, but was sufficient for the task in hand. It involved a systematic approach to the analysis of conveyance, loading and terminal service.

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80 The LNER Superintendents Conferences mention these meetings and their Minutes were read, but no record remains. See RAIL/390/233 *LNER Goods Superintendent Committee*, Minute S264 "Goods Transhipping Committee" 17 December 1923.

81 RAIL/1007/217 *Mechanisation of Goods Sheds*, 1933.

82 H.W.Payne (District Goods Manager, Newport GWR) "A Re-organisation of Goods Transhipment Operations - Great Western Railway" *Railway Students Association*, Meeting of December 10 1931.

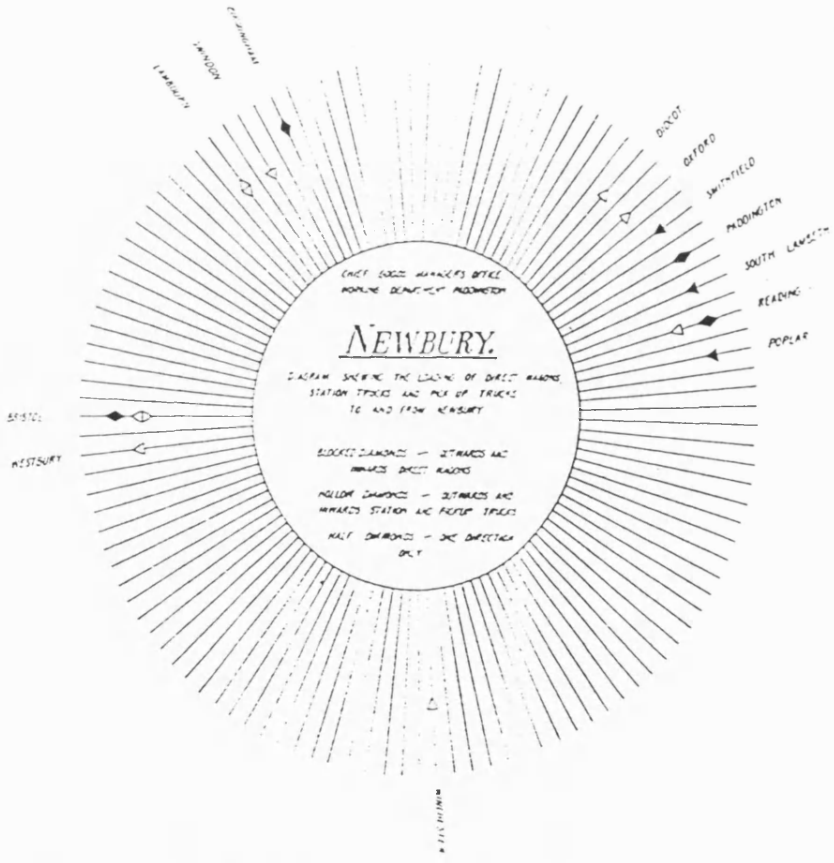

Chart B.—Loading of Direct Wagons, Station Trucks and Pick-Up Trucks to and from Newbury, shown Diagrammatically.

FIGURE TWO: GWR Transhipment Diagram
Source: Anon "Tranship Traffic" Railway Gazette, January 3 1930.

Transhipment up until the early thirties consisted of three types of wagon working.[83] The "Station Truck" was worked over a given route with forwarded and received goods placed in along the way. These were all listed in a station Truck Book, and ran to some 553 in all.[84] The "Pick-Up" wagon was used to relieve Station Truck working. Several loads were picked up and conveyed direct to their destination, and these numbered about 205. Finally the "Composite" wagon combined two loads less than one ton. To take an example: two loads, for destination A and B were combined and sent to A. When the wagon reached A, the load was removed creating space for loading from A to B. Thus one load had direct loading whilst the second was Transhipped.

The aim of the study was to minimise the number of transhipments and increase the speed of carriage. "Transhipment Maps" were produced giving details of the "spheres of influence" of each station within its region (See Figure 2).[85] These were produced so that the destination of transhipment wagons could be readily associated with individual stations. Our example states that Newbury had connections with the specified stations shown, and indicates the direction of the flow of each category of truck. Traffic could be readily directed to the relevant transfer point for a particular station. Hopefully a number of loads would arrive for inclusion in a full load, subject to a limit on the number of miles to be run. The problem with this lay in the fact that there were too many junction points, 52 in all. The working principle behind transhipment had always been that it was not mileage that dominated but the direction of travel. For example putting a load onto a fast train which passes the ultimate destination without stopping may in the long run be quicker. It would negate handling and speed up the overall process of shifting the good from one area to another. A wagon may then be sent back when full to that station.

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83 H.W.Payne (Chief Goods Manager, Paddington) "Wagons and Their Ways" *Great Western Railway Lecture and Debating Society*, Meeting 16 December 1926.

84 Although by 1935 this figure had risen to over 600. Anon "Station Truck Working on the GWR" *Railway Gazette*, July 19 1935.

85 For what follows regarding the early analysis of transhipment working see Payne "A Re-organisation of Goods Transhipment Operations" *Railway Students Association.*

As a first step in re-organisation, a record of traffic passing through the station was taken over the period of a week. This included the truck number, sending station, number of previous transhipment, and final destination (ie further transhipment or straight to destination). The study seems to have relied heavily on the graphing of information both as a means of seeing where changes could be made, and to communicating them within the organisation.[86] Loading charts were produced which depicted transhipping working, so that the range of services could be graphed and the locations noted. Details as to the tonnage received were collated into charts. By measuring traffic density, transfer points could be correlated with the maximum flows. The key factors were originating traffic, geographical location and position on the network. Probably the most important part of this review was the development of road services as a substitute to rail working. Given the attachment of railwaymen, in certain quarters, to keeping traffic "on the rails" this was remarkable. It was, of course only recognising what would soon become inevitable. Road transport was better at the tasks of delivering small loads from a variety of different, but close by, locations: "The new principle of transport to be inferred is the direct loading to the largest possible extent with a final dispersal of small lots by road.." The Station truck could be eliminated and transit improved by a day. At the same time it was possible to see if less than one ton loads could be excepted; ie would traffic be lost to road competition? Long distance station trucks were not yet replaced but were kept under review. What emerged was a policy of concentrating traffic which required co-operation with the other companies to be successful. This is an important point, as systematic analysis could reveal the limits of transportation modes.

In deciding what stations to focus transhipment on, the GWR was fully aware of the commercial environment within which they were operating. This included maximising facilities left idle by the changes such analysis wrought. It was noted that sheds that were closed for transhipment traffic could be used as warehouses for the growing railhead traffic.[87] Once the decision to extend transhipment work to a given

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86 See H.W.Payne "Transhipping Traffic" *Railway Gazette*, January 3, and February 7 1930.

87 See Payne "Transhipping Traffic" *Railway Gazette*, February 7 1930. The development of railhead services will be described in Chapter Seven.

station was made, on the basis of traffic flow data, enquiries as to facilities were made. Road services, siding accommodation, town traffic and accountancy operations were all considered.

The result of the analysis led in 1932 to the 52 transhipment points being reduced to just 9. Savings of £32,370 were identified, including additional outlay of £11,010 for road vehicles.[88] From 1934 the times of transhipment were monitored by a series of "time tests." These showed that through wagons were achieving a next day delivery rate between 86 and 88 percent. Small consignments were consistently being delivered over 90 percent by the second day.[89]

Finally we need to account for the Statistical Returns published by the Ministry of Transport which provided figures for hpt, transfers, average weight and tonnage.[90] These were published as a result of the 1921 Railway Act, with a view to opening up the operating of railways to more public scrutiny. However there is no evidence that such information was used explicitly, even by the RRT where we would most likely find. Given that any detailed requests for operating information could be obtained directly from the company at the annual reviews of operation it would seem unnecessary for government to collect such statistics. Indeed it would seem to be the case that, not for the first time, that the government was responding to the pre 1914 concerns regarding the conduct of railway management.

There were also reasons to suspect the validity of the figures themselves. We do not know enough about the conditions of operation to be able to use these figures: depots varied enormously in their traffic and design. Across the sample the proportion of transfers, amount of labour and capital employed differed. Also, the number of stations sampled varied between companies: the GWR had 20, the LNER 32, the LMS 51. The figures were aggregated across several categories including private siding traffic merchandise and minerals. We lack information as to the type of traffic being

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88 RAIL/250/744 GWR Goods Conference, "Re-organisation of Transhipments" Minute 7814 14 October 1932.

89 RAIL/250/745 *GWR Goods Conference*, "Transit Time Tests" Minute 8268 6 November 1936.

90 These are found in the Monthly *Railway Returns* HMSO published by the Ministry of Transport from 1923 to 1939.

handled: what was the proportion of bulk, batch and customised consignments, and were there specialist facilities employed? Without such information it is impossible to interpret the statistics provided. The terminals listed were very different and over time traffic flows were changing.

Similarly with the LMS Time and Motion studies. Only two of the sheds that were at the beginning being redesigned by Time and Motion studies appear in the LMS sample: Coventry in 1937 and Manchester (Ancoats) in 1935. In Coventry's case we see a decrease in hpt from 1.25, in 1937, to 0.97 in 1938. This was despite an increase in tonnage handled from 15,904 to 17,316 tons. In the case of Manchester in 1935 the hpt went from 1.43 to 1.27 in 1936 and 1937. It then increased to 1.28 in 1938. Over this period, the tonnage handled went from 24,468 to 23,947. The problem is whether this can be clearly attributed to the Time and Motion studies. Many sheds on the LMS saw increasing hpt over the period 1928 to 1938. However the large sites, such as Birmingham and London were gradually decreasing. This was where the Time and Motion studies were yet to be applied so that they can hardly be credited for improving performance. Clearer evidence exists on the GWR that there was a decline in the number of transhipment in some depots and an increase at others which possibly reflected the new system of transhipment. The most spectacular decline was that of Neath, where the 1928 figure of nearly 68 percent fell to just under 4 percent.

Conclusion

We have seen two different approaches to the improvement of terminal service working. The LMS utilised Time and Motion studies to review completely the workings of freight operations. The GWR chose those loads which were most troublesome and likely to be lost to road transport. Both demonstrated a willingness to apply systematic analysis to these problems. The LMS seems to have adopted a technique for redesigning its terminals because it had problems securing operating efficiency. That the LNER and GWR would eventually follow the LMS approach indicates that the method was seen to offer some promise. In addition it won the Railway Companies Association recommendation as "best practice." The LNER was a follower in all this. We know that they were monitoring transhipment, but quite

how is not clear, although we do know they followed GWR practice explicitly.[91] The LNER visits to the LMS modernised terminals is backed by the comments of T.F.Cameron, then acting Divisional General Manager of the Scottish Area, in 1946. He stated in the context of the LMS analysis, that, in terminal design, progress was "..a matter of attention to detail and of unceasing striving for improved methods."[92] A more measured approach to the design and operation of terminals and their facilities was eventually to be justified by the gains made. The LNER was able to capitalise on the LMS developments and may well have benefited from their experience as first movers in applying these management practices. The GWR reduced operating costs and the number of transhipment points to its advantage; the LMS saved money by reorganising work more effectively. In tandem with the more specialist Time and Motion studies it is clear that the LMS must have had a reasonable grasp on how costs behaved within terminals. The information so gathered would also inform the construction of new terminals. More precise measures of the effectiveness of each approach are difficult to come by.

However, there is enough specific evidence from the companies that these studies were useful. Given the climate of the time such systematic analysis of operations was vital if the railways were to pursue cost minimisation within the context of "efficient and economical working." Even if they were not at first successful, it was important to understand how operations were carried out.

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91 RAIL/390/233 LNER Superintendents Committee "Goods Transhipping Committee" Minutes s1191 20 March 1928 and s1895 24 March 1931.

92 Cameron *An Outline of Railway Traffic Operation*, p135.

Chapter Seven
Managing Commercial Policy

The objective of all three companies, in the period from 1923 to 1939, was to attract traffic onto the railways, subject to the maximising of net revenue. This had to be done in the face of increasing competition from the roads and a continuing depression in the heavy industry that provided so much of the rail revenue. To combat this, the companies needed to know what traffic was available and what type of service was required. Once this was known the company had then to decide on the price to be quoted. The latter was especially important as, by law, rates had to be published, enabling road hauliers to undercut the railway rate. This chapter concerns the collection and analysis of commercial information and its use in the setting of prices and developing of services. That is, how information was used to determine the market and sell successfully in that market will be discussed.[1]

Commercial information was used to determine under what conditions the firm would be operating. As such it relied on financial measures far more than the operating sections, whose analysis was mainly undertaken using physical indicators. Using the model of management control developed in Chapter One, we can identify Planning as being used to implement the Programme. It was then left to the operating departments to Execute and Evaluate these services. How the service was developed and the response of the trading community was of some importance if traffic was to be retained. We have already seen in Chapter Five how information from traders was used by the LMS to halt traffic in the event of congestion. Here we will be concerned with how, once the operating parameters were clearly identified, the task of doing business could proceed.

The means by which management obtained information relied on tests and samples obtained from traffic flows. This involved the examination of specific services and commodities with a view to answering predetermined questions. Depending on the questions being asked, this may or may not have been a means of monitoring

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[1] For a discussion of railroad information gathering and marketing see R.V.Scott (1985) *Railroad Development Programs in the Twentieth Century*, Ames: Iowa State University Press.

operations. As we shall see, a request for a new rate could prompt such studies, but only then would the performance of that traffic be noted. Thereafter monitoring might take place, but this was not automatic.

We begin with how prices were determined and then examine the means by which information was collected. This provided the basis for an approach to approach traders with price quotations. The setting of rates was an iterative process: because of the nature of the regulatory framework, the RCH was used as a forum for liaising between companies and negotiating with traders. In addition, the nature of the rates process, with its Exceptional rates required that all railways keep track of what others were charging. The coordination facilitated by the RCH, will be demonstrated by the consideration of two examples: the use of containers and the development of road services.

Setting Railway Rates: Traffic Costing

The setting of railway rates had long been bedeviled by disputes over how charges should be fixed. In the following sections we will see how the basis for pricing developed after 1923. We will also examine attempts at costing devised to determine at what point road transport became more economical than rail. Whilst such analysis was not aimed directly at using cost data to set rates, it was an attempt to discover the limits to rates in the face of road competition. As such, it had implications for railway pricing.

This development of government regulation of price and service in the 19th. and early 20th. century has been analysed by P.Cain.[2] To understand the post amalgamation legislation relating to pricing, it is helpful to review what had preceeded the Railway Rates Tribunal deliberations on the new Classification and associated rates structure.

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2 See the following "Railway Combination and Government, 1900-1914" *Economic History Review*, XXV (1972); "Traders versus Railways: The Genesis of the Railway and Canal Traffic Act of 1894" *The Journal of Transport History*, New Series Vol. II No. 2 (1973); "Railways and Price Discrimination: The Case of Agriculture, 1880-1914" *Business History* Vol. XVIII No. 2, (1976) and "The British Railway Rates Problem 1894-1913" *Business History* Vol XX No. 1 (1978).

The fear was that the resulting monopoly power would drive up the costs of the wider business community to the detriment of the economy as a whole. As Cain points out this worry was exaggerated: coastal shipping helped to drive down rates for many parts of the country and some inter-company rivalry was still apparent.[3]

One of the main problems facing businesses was the fact that so many classifications of goods existed. Action to bring these under one classification was begun with the passing of the 1884 Railways Act. Because of the difficulties in physically changing the administration of the system, along with suspicion on both sides of the other's intent, problems arose. These led to the 1894 Act which curtailed the ability of the railway companies to charge the maximum rates which had been agreed. They had put all of their rates up to the maximum permissable on January 1 1893 causing uproar among the traders.

The body responsible for regulating facilities and rates was the Railway and Canal Commission. The decisions reached here further weakened the railways' autonomy in management. According to the regulations regarding "undue preference," the granting of preferential treatment to individual companies for "similar services" was prohibited. This meant that the railway had to show that the services were indeed different to avoid charges of undue preference.

As we have seen in Chapter 3, since the late 19th century the railways had been accused of not relating their charges more explicitly to the costs incurred. In the Chapters on Conveyance and Terminal operations we have seen how physical measures of performance were used for management control, which could on occasion be calculated in monetary terms. In addition, at the instigation of an outside body, the railway companies began costing studies under the auspices of the RCH in 1935.[4]

These began after the Chairman of the Transport Advisory Council suggested that the railways ascertain at what point does rail become more economical than road? We will see in the following sections how important a problem road competition was for the railways. Ascertaining the relative cost of each mode would be most useful.

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3 Cain "Railways and Price Discrimination," p141.

4 RAIL/1080/672 General Managers' Representatives Meeting, "Transport Advisory Council - Coordination of Rail and Road Goods Transport" June 7, 1935.

The accountants of the companies were approached with the question in mind of whether high class traffic really did bear more of the cost than the low. This had been the assumption underlying the concept of charging "what the traffic will bear." The overall objective seemed to be one of planning which traffic should go by road and which by rail. That is it was information for regulating the mode of transport rather than rate setting.

An initial study was conducted which revealed differences in company approach as to how events should proceed. The LMS wanted "..an examination of comprehensive costs in relation to receipts."[5] Each was separated into variable and non-variable, conveyance and terminal operations, resulting in figures for all aspects of the transportation process. This would reflect the different commodities being carried and enable full consideration to be given to the differing conditions under which they were transported. The LNER and GWR thought this was too expensive and suggested that 24 trains carrying a variety of commodities be analysed.

Some means had also to be found of splitting passenger from freight cost. This was done according to the so-called "Beharrell Formula."[6] Whilst not a formula in a mathematical sense, it tried to identify what measures could be used to monitor which activity. So, for example, Locomotive running expenses were allocated to engine hours and maintenance to engine miles. However it did not provide for the separation of passenger and freight. Be that as it may, the suggestion was for cost comparison to be made from data on road vehicles, obtained from the railways' own road operations and from the specifications published in *Commercial Motor*. The task was then allocated to a "Special Committee on Freight Train Costs."

The data collected for rail transport was per freight train mile, per loaded wagon mile, per 100 net ton miles and per 100 gross ton miles. The traffic sample was coal, class 1 to 6 mineral and merchandise and merchandise 1 to 6. These were to be sampled over "short, medium and long distances." Over 160 trains were to be

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5 RAIL/1080/672 Goods Managers Representatives Meeting, "Report of Committee of General Managers Representatives" 9th. October 1935, p2.

6 For details of this see Chapter XIV of C.H.Newton (1930) *Railway Accounts*, London: Sir Isaac Pitman.

monitored in this fashion. [7] The Beharrell formula had to be modified as it did not make the distinction between variable and non variable cost. These were allocated as per abstract of official accounts so under Abstract b we have Locomotive and Wagons repairs and renewal categorised as variable.

Particular emphasis was to be placed on wagon turn round time, empty haulage and "additional shunting and transhipment." The latter category presumably meant unnecessary. Inspectors were to accompany the selected trains noting the following information:

i) Owner, number and tare of wagon.

ii) Weight of wagon and brake

iii) Destination of wagon

iv) Point at which wagon was detached

Commodity details were to be obtained from the invoices, Drivers Reports and Guards Journals. It was suggested that "hypothetical loads" be calculated by commercial officers for comparison between points, although it is unclear whether this was actually done or on what basis if it was.[8]

In further meetings it was noted precisely what sort of constraints had to be placed on interpreting the data. This reflects what we have seen in the design of Train Control systems and the debate on the validity of the ton-mile. For example, under conveyance several points were made regarding train load, speed, length of haul, empty haulage, wagon load, marshalling and special working.[9] So under train load seasonal fluctuations, the nature of the route and type of engine used were to be noted. Similar caveats were applied to terminals - layout of goods depots, mechanical equipment employed, traffic flows etc.[10]

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7 RAIL.1080/672 General Managers Representatives Meeting, "Preliminary Report, Appendix A"

8 RAIL/1080/672 General Managers Representatives Meeting, "Special Committee on Traffic Costs," p3.

9 "Preliminary Report of Committee of General Managers Representatives" (Minute 2617) no date, RAIL/1080/672 General Managers Representatives, pp 6-7.

10 This illustrates again the limitations of the Ministry of Transport statistics relating to Goods Stations. See Chapter Six, pp34-35.

Information concerning receipts was collected on the basis of average wagon load and receipts per ton. There was a problem perceived that it was not at all clear that the figures would be representative of each company's average receipts. There was a clearly defined cost/benefit calculation concerning the cost of acquiring this information.[11] The procedures adopted to collect the information seem to have been based on LMS designs and adopted by the others.[12] That they chose to do this was probably to do with the LMS experience in such matters, via its Executive Research Office.

Unfortunately, the records of what the experiment found do not appear to have survived. This does not detract from the fact that railways were beginning to engage in costing. Problems were noted in the interpretation of data and the basis for comparison with the motor industry seems tenuous at best: for example data published in the trade press was probably not representative of market conditions. The use to which such information was put is unclear but it does indicate that the railways were willing to engage in costing, provided the ratio between costs and benefits was favourable. That such practices were not more widespread, sooner reflects more on the regulatory environment and the competition from roads, than a failure to comprehend the value of costing as a technique. Under the RRT, there was little incentive to provide detailed costs, especially if cross subsidisation was required. If firm evidence was found for this it would have been another stick with which traders could beat the railways.

Railway Pricing: The General Railway Classification

The basis of railway pricing was the General Railway Classification of Goods. This was finally agreed after much discussion amongst legislators, traders and the railway companies, when the Rates Advisory Council submitted the proposal based on the older Classification. This was expanded from the piecemeal classification that had developed since the middle of the 19th century. It came into effect from "The

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11 RAIL/1080/672 General Managers Representatives Meetings, Preliminary Report p10.

12 RAIL/1080/672 General Managers Representatives Meeting, "Goods and Superintendents (Operating) Representatives Memorandum of Special Meeting," 12 June 1936.

Appointed Day" in 1928. There were several sections, the most important of which were: transit by Merchandise train, Livestock by Merchandise train, Perishable goods by Passenger train, goods other than Perishable, and Livestock. Dangerous goods and, later, Containers had their own classification. Part of the purpose for the re-classification was to remove the exceptional rate as a means of charging. It was viewed as an unwieldy means of charging as there were so many in operation. It was thought that a simplification was long overdue. This was unsuccessful as we shall see below. This revised classification shared similar features with the original: Class 1 was the lowest and Class 21 the highest, providing a "price list" for commodities based upon several criteria:

i) Value. This was the most important element, reflecting "What the traffic will bear" or what value was added by transporting a commodity to its destination.[13]

ii) How fragile the goods were and the amount of packaging required. This was used as an indicator of how much handling was needed and the likelihood of claims for damage being made. Additional insurance could be bought by charging extra for the service, so-called Owners Risk (OR) rates.

iii) Bulk to weight ratio. That is, a measure of cubic capacity. This again affected the amount of handling and whether there could be good loading of wagons.

iv) The degree to which shipments in bulk could afford economies. To give an example, wire rope that travelled in 5, 2 and less than 2 ton quantities would be allocated Classes 12, 14 and 16 respectively, without showing special favour to any one trader for the same service: that is, subject to the law regarding Undue Preference.

vi) The cost of handling. This depended on all the above criteria, in addition to the methods of handling employed.

According to the condition of an article of freight, be it packed, in bulk etc, a standard rate would be allocated based upon the General Classification. There were several standards applicable depending on the combination of services required. Charges could be made for returning empties, wagon hire, private owner wagons and insurance

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[13] For details of the economic thinking behind this, see W.Acworth (1904) *The Elements of Railway Economics*, Oxford: Clarenden Press.

premiums, amongst other things.[14] However it was the General Merchandise scale that was the most important.

The complexity of the Classification can be seen from the following examples. The carriage of "Grease, for lubricating purposes" had five main categories, with the following Classes:[15]

Casks or iron drums	-	11
Tins or lead tubes in cans	-	12
In cases	-	13
In pales	-	15
In tins protected by boards	-	15

In addition there was a category for Grease "Impregnated with disinfectant in casks" carried in Class 15. There were also separate classes for E.O.H.P categories. This stood for "except otherwise herein provided," a catchall phrase covering the remaining circumstances that might apply.

A clearer example of the value basis of rates was given by the classification of Vegetables. "Beetroot in bulk for sugar making" and "carrots, mangol wurzel or turnips in bulk for feeding livestock, 4 tons." being charged at different rates for a similar service. The E.O.H.P. category even distinguished new from old potatoes as "potatoes of the current seasons growth handed to the railway companies between 1st December and 15th of June inclusive."[16] Vegetables grown under hothouse conditions were accorded classification in high classes, given their higher value.

The Classification was also a source of information to traders as regards packaging requirements for goods. For dangerous goods this was clearly important. To prevent misunderstanding, details were given of the tests to be applied, thereby ensuring that consignees would be aware of the packaging requirements of their products. Petrol products had to be subjected to careful handling, which required

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[14] The full list included rolling stock, railway vehicles, carriages, caravans, live stock, small parcels, surcharges for heavy articles and deductions as regards owners risk carriage.

[15] See RAIL/1092/54 Classification of Merchandise, p52 submitted July 1927.

[16] RAIL/1092/54 Classification of Merchandise, p107.

specialised equipment. Therefore the Classification laid down the tests that would have to be carried out by the trader as a basis for packaging. Then the railways would know in theory that the trader fully understood the nature of the product being sent from a loading point of view.

The Basis for Pricing: the Standard Rate

The Rates Classification was used to allocate a standard rate for the service required. It was split into 20, 30, 50 and 50 miles and over for conveyance, with station terminal, loading, unloading, covering and uncovering charged according to the class of commodity. Not every class within the classification was afforded the same service. Classes 1 to 6 did not include service terminals, for example.

The calculation was thus based on the services offered for a given classification. From this a per ton mile figure was obtained and the relevant services added to the distance. For this system to function properly it required an immense amount of clerical work and predetermined information. Each station had its own distance book for destinations it was dispatching to, calculated over the "shortest working route." This need not have been the physical distance but one which provided the cheapest route, subject to operational constraints such as transhipment and marshalling points. The calculation of chargeable distances was standardised across the rail network by the RCH and published by them.

As far as C&D was concerned, the 1928 Classification quoted only Station to Station Rates. However during the inter-war period it became exceedingly important with the advent of door to door road services. From 1928 the companies had road powers and delivery services were considerably extended. As with the charging for rail transport there was enormous variation in rates. Minimum loads varied from station to station in some cases, with some items such as dangerous goods and loads exceeding 30 foot could be refused. The scales A to H for cartage were used to delineate the extent of areas within which the company would pick up loads.

The Basis for Pricing: Deviations from the Standard Rate

Most traffic had been, and continued to be, dealt with by Exceptional rates despite the fact that the 1928 Rates classification was designed explicitly to remove them. It was estimated that by 1939 there were 7 million exceptional rates covering 80 per cent of the traffic.[17] These provided the railways with a flexibility denied them by government in most areas of operation. Even so, care was necessary when quoting such rates, as we shall see when discussing the collection and analysis of commercial information.

The breakdown of charges that comprised the Exceptional rate were defined by the 1921 Act as Conveyance, Station Terminals and Accommodation (including services in connection with a private siding). These were calculated on the basis of a proportion of the standard rate. Application for rates not more than 40 per cent below standard and less than 5 per cent, were referred to the Rates Tribunal where any objections could be lodged.

The calculation of these rates in practice required much in the way of information regarding the commercial conditions of both the individual trader and their industry. Commercial information was required to successfully quote for the exceptional rate. It was not only that it could be used to offer new services: the very nature of the rating process dictated the need for information. This was especially true in testing the validity of the rates, which included:

i) The existence of competition, by road or sea, within commodity classification or location.

ii) Existing rates for similar commodities forwarding from other locations. These may or may not be being carried under similar circumstances, which would possibly lead to charges of "undue preference." This referred to the position in law that the railways could not discriminate between traders. Any commodities carried under *identical* conditions were required to be charged the same rate. This led to many court actions through the years, and we shall examine some examples of these later.

iii) The size of the consignment.

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17 Carey *Modern Railway Practice*, p49.

iv) Frequency of shipment.

v) The total traffic flow, both in magnitude and direction.

The above, combined with the underlying classification regarding bulk, loading etc mentioned above, formed the basis of the rate. Exceptional rates came to be grouped under several broad headings. Some were granted as a function of location, a rate covering a given area with a standard rate per mile for all within. For example import and export companies could be granted special rates for consignments to and from ports. These would usually fulfil all the main criteria of regularity and bulk loading associated with Exceptional rates. In such cases specialist rates for bulk loading were available. These offered operating economies to the railway company which could in turn be passed on to the trader. If the consignment comprised of more than one items that varied between categories, then composite rates would be calculated. The method usually assumed the rate being from the highest category item within the bundle.

If the basis for setting the rate was reasonably clear, there could be some debate over the specifics. It was this that the Hearings before the RRT were meant to clear up. For example the LMS was involved in the conveyance of Chocolate from Mangotsfield, near Bristol, to London.[18] The railway's position here was that the Exceptional charge should be one third of the Standard. Such a drastic decrease had to be justified to the RRT, and it was noted by counsel for the LMS that "Undoubtedly if these hundreds of tons of this traffic were going from Bristol to London by road, the lorries would not be coming back empty."[19] This would have meant opening up other areas of the market to road hauliers, as "backloads" would have been available. Thus the reduction was granted: not only was there evidence of competition but also the danger that the overall revenue position would suffer. That is, the damage would not be limited to just the chocolate traffic but to a wider erosion of the railway's position in the market for transport from the Bristol area to London.

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[18] Application 1936, Number 304 by the Railway Companies Re. Exceptional Rates in Railways Act 1921 *Proceedings of the Railway Rates Tribunal*, Year 1936, Number 34, Exceptional Rates held on Tuesday 14th. July, 1936.

[19] Application 1936, Number 304 *Proceedings of the Railway Rates Tribunal*, p506.

There also developed a system of Agreed Charges. These began as variants of the Exceptional rate until they were ruled illegal within the meaning of the 1921 Railways Act. It was not until the Road and Rail Traffic Act of 1933 that they were made legitimate. These enabled the cost of administering transportation to be minimised, both for the trader and the railway. They were a flat rate based on the Trader's traffic flow over a given period. An average rate per ton, per unit of consignment was used to negotiate a price. This involved sampling given periods of traffic with all the attendant difficulties. The question was, could the information provided by the firm be relied upon, and was the time period a reliable indicator of traffic flow? After a period of time the railway companies' own data would reveal whether they were being duped. A case involving the LNER and LMS illustrates the process.[20] Tests of traffic were taken in May and September 1935 which gave an average of 61 shillings, 11.23 pence per consignment. This was then used as a basis for the Agreed Charge, subject to regular flows of traffic. Bulk loading in this case was considered particularly important in maintaining economies. Even so it was noted that road rates were being quoted at 40 shillings per ton. The rationale for a company to use rail transport under such conditions depended on the additional facilities on offer. In addition there might have been more direct loading between points due to the existence of Private sidings.

We shall see later how road services came to be developed as a response to private road haulage. Within our period the railways also began to make use of other modes of transport in carriage. Competition from water borne transport had always figured in the calculation of rates. In the pricing process this was being reflected in the applications being made. The GWR and LMS negotiated a rate with one company that included sending some traffic by water.[21] In this example 8 per cent of the total traffic was to be sent by water at a rate of 21 shillings per ton. The reason for this was the existence of facilities and loading arrangements apparently dedicated to water transport.

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20 Application 1936, Number 29 Road and Rail Traffic 1933, *Proceedings of the Railway Rates Tribunal*, Year 1936, Number 9, Agreed Charges Wednesday 19th February 1936, p110.

21 Application 1936, Number 32, Road and Rail Traffic Act *Proceedings of the Railway Rates Tribunal* Year 1936, Number 9, Agreed Charges Wednesday 19th February 1936.

The final rate was again based upon samples and tests of movement taken over a two month period. The rate was agreed to by the RRT because it was estimated that 40 per cent more traffic would be carried, with a 25 per cent increase in revenue.

Once a figure had been agreed internally, it was put to the RCH to be ratified by all the companies. Then it was down to the Rates Tribunal to determine its legality. The hearings before the RRT concerning Exceptional rates would focus on any objections raised by Traders and the effect on the railways net revenue position the said rate would have to be assessed. Evidence to the RRT was obtained by sampling the traffic flows and then relating them to the competitive environment. Example of this appear in the published evidence of proceedings from the RRT.

Thus far we have defined the main categories of pricing: if the railways were to succeed in their aim of maximising revenue then they had to monitor the economy of the area in which they were operating so as to quote the best prices possible for this objective. Information was required concerning new business and changes in existing patterns of traffic. The Exceptional and Agreed charges needed information to determine their levels. To develop road services such as Railhead Distribution also needed considerable commercial research and information gathering. The rest of this chapter is devoted to how the companies achieved this. It will include an analysis of how business information was used to develop services as a response to increasing competition, and how a new transport technology, the motor vehicle was integrated into the rail network.

Commercial Research

Although the organisational structures dealing with freight operations were different, we can see that all of the companies discussed questions in broadly similar fashion. It was the bringing together of commercial needs with operational capability that was of the utmost importance to all these companies. Meetings and conferences often based their decisions on information provided by quite extensive surveys of both the economic environment and the traders within it. For the LMS, Ashton Davies noted that "Research is an excellent aid to business forecasting, but intuition is the

prime mover."[22] The information gained still relied on interpretation by skilled managers to be of use, and it was the function of such meetings to provide this. Information was seen as the foundation upon which decisions had to be made, although analysis was more systematic than Davies comments might suggest.

There were two main categories of information: that regarding the state of business within the area, and that dealing with the type of service and level of rate required to attract traffic to the railway. There was also research designed to test the viability of new concepts of operating. In this section we will examine all of these elements. It will include the role of the RCH in coordinating activity, and the Railway Research Service in providing general information on railway operations. These will be discussed within the specific context of the development of container traffic.

The GWR Traffic Research Committees

The GWR established "Traffic Research Committees" whose express purpose was to be used in the fight against road competition.[23] Attended by Development Officers and representatives of the Goods Manager's office, these were established on the basis of 30,000 census forms sent out by the company to businesses soliciting information on a district by district basis.[24] Throughout 1936, 70 meetings were held with each district visited at least four times. By early 1937, it was calculated that through this action an extra 124,590 tons worth £57,494 had been brought into the company, increasing to £165,927 by 1938.[25] To what extent this could be attributed to the Research Committees is not clear but there can be little doubt that without this road competition would have made further inroads into rail traffic. Such research at least helped the GWR to focus on their market and the needs of the customer.

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22 Davies "Modern Commercial Practice" *Journal of the Institute Transport*, April 1934.

23 RAIL/250/745 GWR Goods Conference Minutes, Minute 8233 12 June 1936 "District Traffic Research Committee."

24 RAIL/250/745 GWR Goods Conference Minutes, Minute 8199 28 February 1936 "District Traffic Research Committee."

25 RAIL/250/745 GWR Goods Conference Minutes, "District Traffic Research Committee," Minutes 8295 26 February 1937, 8319 21 May 1937 and 8478 5 May 1939.

In essence what these Research Committees were doing was coordinating information on the type of traffic being offered and under what conditions. Given the vagaries of the pricing system it was important that rates agreed as closely as possible with each other under the same conditions. The reaction of firms to rates quoted could be discussed and any further reductions considered. How much of the traffic was there travelling by rail at present and could it be increased? This information was gained both by local agents and the census forms.[26]

To illustrate how these Committees worked we can consider an example from the London District Traffic Committee concerning furniture.[27] Firstly, the number of manufacturers was determined at about 200. This helped to establish where the traffic was distributed. Then the extent of road competition was noted and in this case 59 hauliers were identified. However this was likely to include only those actively involved in the carriage of furniture, as obtained by the census.[28] The amount forwarded each day was estimated at 105 tons broken down into 31 private hauliers and 39 "owners vehicles" with 35 going by rail. This was compared with previous carryings by rail under the headings of collected, delivered and the two combined. It was revealed that the 13,880 tons carried in 1929 had fallen to 9,727 in 1935. The next step was to analyse what could be done about the situation. In this case the rates charged were already high, with charges calculated from class 20 of the Classification. Exceptional rates were quoted in some cases but these did not appear to be making much impact. The problem was that road hauliers had several means of charging, all of which were likely to render the railway in a poor light for much of the traffic. Prices per ton at or below the rail rate were common, as the road hauliers could always consult the local rail rates published by law. As a response, the railway quoted per

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26 RAIL/250/768 GWR Goods Conference Minutes, Minute 8370 25 February 1938 "District Traffic Research Committee,". The census forms were sorted into "trade groups" where they could be investigated by staff from the District offices. This also enabled input from Headquarters if any areas of general commercial policy were involved.

27 RAIL/250/717 *GWR Traffic Research Committee* - London District, Minutes 42 13 July 1936, 42 20 November 1936 and 144 4 March 1937 "Furniture: Ex. High Wycombe.

28 This was likely to include only those actively involved in the carriage of furniture as obtained by the census. Although it is likely that the local agents would be well aware of other hauliers who were potential carriers.

package or per load rates. From this analysis the GWR was able to formulate its plan of action. Door to door transit was an important advantage of road haulage. This could be offered through the use of the railway's own fleet of vehicles or through the use of containers. The problem here was the increased handling on the former, and the latter was subject to an extra charge.

In addition, the general level of costs were increasing. Other remedies suggested included the lowering of the minimum load and modifying the claims process in event of damage. In addition it was thought that "unpacking" facilities might be provided, extending the services offered by the company. Finally there was the setting of an Agreed charge which would simplify the clerical procedures involved, thereby decreasing costs. This option was pursued with two sample firms based on the cubic capacity of the container. However this was not altogether successful as one firm returned to road haulage and the GWR rejected using cubic capacity as a basis for charging. The reason for this is not made clear but it is likely that the general principle for this type of traffic at least would not lead to appreciable gains in traffic. Furniture was not the most compact of items, hence its high rate (class 20).

This example gives some indication of how traffic research was intended to work. Analysis of the furniture industry revealed the nature of the problem the GWR faced: road was simply better at the task. Door to door delivery was quicker by road, with most railway companies taking over a day to deliver their consignments.[29] The cost of bringing loads to and from the station had to be borne by the GWR and was especially a problem given the dispersed nature of the furniture factories. These problems were not unique: even a bulk commodity such as grain and oil cake, was similarly affected.[30]

Grain was a bulk commodity imported via London docks, and so on the face of it was suited to rail transit. It was the task of the GWR to distribute this across its

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29 RAIL/250/717, GWR Traffic Research Committee - London District, Minute 42 13 July 1936.

30 RAIL/250/717 GWR Traffic Research Division - London District. In addition see Minute 186 23 June 1937 "Review of Operations of the Committee During 1936," Minutes 13, 14 February 1936; 39, 20 March 1936; 69, 13 July 1936; 90, 2 October 1936 and 140, 30 November 1936 "Grain and Oil Cake Ex. London Dock, Wharfs and Mills."

system. However even here it was the case that road transport was making inroads: from £82,470 in 1931 the business had declined in value to £58,468 in 1936, with an estimated 100,000 tons was travelling by road. Rail traffic reached the GWR through rail transfer from the docks or through barges, many of which came to the company wharves at Brentford. The company decided to bulk loads in 5 to 10 ton lots from here to the destination as a response to the competition, hoping to achieve economies, and thereby decrease rates. This was the first step in reformulating the basis of the rate being charged. The GWR entered into negotiations with mill owners and began a test of the effect on revenue of quoting a "barged and delivered" rate to the GWR depot at South Lambeth. The expectation was that 50 per cent of the road traffic would revert to rail with a profit on this traffic to the company of 2/6d per ton. However, a later minute noted that overall a decrease of £300 in revenue would occur per annum on the given rate. The RRT would in all likelihood reject any applications presented on such as basis. As part of the negotiations, the GWR was in contact with the industry trade association, the National Association of Corn and Agricultural Merchants. In 1936 they were told by the GWR that unless a "substantial" increase in net revenue could be achieved, then no new rates would be forthcoming.

This was not the only problem facing the management: it was not at all clear that the savings could be quantified, rendering such analysis problematic at best. The reason for this was stated to be the existence of tolls, terminal charges and arrangements under pooling. This suggests that the charges could not be allocated to any particular activity and hence no standardised comparison could be made. Related to this was the variety of selling methods from "Ex ship via rail" and "Ex ship via Private wharf" to "Ex Mill" and "Ex Silo." According to the Research Committee, "in every instance the selling price differs according to the various handling costs incurred."[31] The Committee was able to report that from their investigations that road hauliers used the grain shipments as "forward" loads. That is to say that they enabled the lorries to go to the docks with a full load and hence earn revenue. Their real interest was the "back" loads of cement, paper, bricks etc from the docks. This would

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31 RAIL/250/717 GWR Traffic Research Committee - London District, Minute 69 13 July 1936 "Grain and Oil Cake."

make it very difficult for the railways to compete against: road hauliers could certainly charge well below the cost of the outbound trip because they had to go to the docks anyway.

Total receipts from grain and oil cake traffic fell from £42,817 in 1932 to £29,593 in 1936. The effect of the Committee's work was to stem at least part of the flow from rail to road. Comparing the first four months of 1936 with 1937 revenue increased from £7,253 to £8,132, on an increase of 25 per cent in tonnage. However the railways were fighting a losing battle which the information collected by Traffic Research could but confirm. About 81 per cent of home grain production was purchased by merchants in their own vehicles. Only 3 per cent was forwarded by rail, the remainder was hauled by private road hauliers.

Some success was achieved in monitoring new sources of traffic. This was not just the construction of new plants in "traditional industry," but the development of new industry. The Birmingham district Traffic Research Committee reported on the growth of the engineering industry associated with the production of cars.[32] The first task was for the Railway Rates Tribunal to agree on the classification to be used as a basis upon which to charge the rate. This case saw the use of containers for at least some of the traffic. Once this was established, then the Research Committee would proceed as per any usual application.

We can see how it was that the GWR attempted to negotiate decisions on price and service. The information so provided could be used beyond the confines of the GWR. It may have been needed in the negotiations at the RCH, of which more will be said later. Much of the information about local trade conditions was implicit in this analysis. As we shall see other companies made more explicit use of such research.

Commercial Development and Area Research on the LMS

The re-organisation in the early thirties provided an infrastructure for much needed information on the obtaining of traffic and the economic environment. Ashton

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32 RAIL/250/712 GWR Traffic Research Committee - Birmingham District, Minutes 93 31 April 1936; 124 19 May 1936; 239 22 February 1937 and 351 4 November 1937. "Steel Pressings for Motor Bodies: Birmingham to Oxford, Leamington and Coventry."

Davies noted that "..trained staffs are continually subjecting the traffic fields to detailed investigation and statistical analysis."[33] Evidence for the LMS activity in research comes from various sources. Memoranda were presented by the Chief Goods Manager dealing with the effects of road competition, summarising the ongoing activity in attempting to get traffic and the rates that should be charged. Details of commercial and operating matters appeared, as we have seen, in the Goods Conference Minutes. There does not appear to have been a dedicated Traffic Research Committee as with the GWR. However there was a Commercial Development Section, but these records do not appear to have survived. However, some of the reports issued are available.

In 1926, the Commercial Development Section presented a report in which Containers were discussed as a response to road competition.[34] Their task was to facilitate door to door delivery and reduce the need for package loads. It was also stated that the "relative ratio between the cost of labour and of substituting mechanical appliances for labour...has altered in favour mechanical appliances."[35] However it was also noted that only about 8 per cent of rail traffic could "with advantage" be carried by Container.[36] The criteria for this calculation was not made explicit so we have no way of knowing whether this was a reasonable assumption or not. However, detailed comparisons were made of the capacity and revenue per ton mile. It was estimated that for meat the "average station cost per ton" with a Container was 3.35d per ton as opposed to 19.52d using the "assumed ordinary method."[37] The number of journeys, mileage and average length of haul placed the Container within the context of train activity in general. One part of the Development Section Report dealt with "Displacement of Packing - Effect Upon Railway Revenue and Expenditure." It was

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33 Davies "Modern Commercial Practice" *Journal of the Institute of Transport*, April 1934.

34 RAIL/421/146 Freight Transportation in Container Trucks, December 31 1926, Development Section Euston.

35 Freight Transportation in Container Trucks, Paragraph 70.

36 Freight Transportation in Container Trucks, Paragraph 177.

37 Freight Transportation in Container Trucks, Paragraph 233.

stated that in tests about 15 per cent of the gross weight was of packaging.[38] Because of this the company wished to offer the use of Containers only to those traffics already going by road. However this would have led to charges of undue preference, with some 15 per cent of LMS traffic being affected by this.[39]

The gains to be made, should Containers be introduced, were contingent on the rates that could be charged. This raised several issues including the position of such consignments within the General Rates Classification. The report was concerned that a simpler classification be used based on the weight rather than value. The tests carried out were weighted according to the classification of the goods so that an accurate picture of the potential revenue was presented.

Also raised were problems associated with the limited use of Containers: it was difficult to obtain a return load and this necessitated empty working. The attempted solution to this was to place the Container within the Rolling Stock Distribution. Indeed it was recommended by the report that a specialised central control be established for just such a purpose. Further investment was also required in the form of cranes and special wagons. However the provision of such equipment was "held in abeyance" because there was no perceived benefit to such expenditure, at least until a more general re-modelling of terminals might take place. Of more immediate concern was the standardisation of already being used, equipment and operating procedures, which were eventually pursued through the offices of the RCH.[40]

While the Development section was devoted to specific issues, a broader description of LMS operations was presented in a "Statement of the Area, Population, Industries, Principal Traders' Payments, and Sales Organisation."[41] This gave details of the main areas of population and business activity within each region. It was used to place the company's operations within the context of the commercial environment.

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38 Freight Transportation in Container Trucks, Chapter V.

39 Freight Transportation in Container Trucks, Paragraph 93.

40 Freight Transportation in Container Trucks, Paragraph 132.

41 RAIL/421/119 "Statement of the Area, Population, Industries, Principal Traders, 1933' Payments and Sales Organisation. We will use the example of the Manchester area.

This involved noting the number of stations, depots and private sidings with listings of the accounts above £3,000. For the Manchester area this was 244 out of a total 23,000. Out of this total number of firms it was estimated that over 10,000 would need to be canvassed on a regular basis. What exactly was meant by a regular basis is not clear. Figures were provided on the number of calls made by canvassers, inspectors and C&D drivers.[42] Whilst this snapshot of operations was used by the agents to develop traffic, it could also have been used as the basis for the standards calculated for the "Quota" system.

These reports also reveal that a close watch was kept on "prospective traffic" via monitoring the local press and trade journals. This involved liaising with the local Chambers of Commerce concerning the needs of the local business community.[43] The extent to which agents had been successful was measured through comparing the previous two years work. The canvasser concerned was then required to explain if deceases in traffic were occurring. Monthly reports were similarly discussed with the District Canvassing officers.[44]

The LNER: Statement of Trade in Area

The LNER produced a report similar to that of the LMS, but which continued from 1933 on a regular basis. These were the "Reports on the State of Trade," produced for each area of the company.[45] When first produced in 1933, the emphasis was on information collected regarding the "micro" environment of company transactions. By 1939, there had been a shift: although business conditions were still monitored there was much more emphasis on macro-economic indicators such as the retail price index, and aggregate measures of output.[46] The explanation for this is

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42 RAIL/421/119 Statement of the Area, pp2-7.

43 RAIL/421/119 Statement of the Area. p11.

44 Statement of the Area, p10.

45 LNER (Southern Area) Report on the State of Trade, are the particular examples that have survived.

46 See RAIL/398/23 and RAIL/398/37 for the reports from 1933 and 1939 respectively.

unclear: certainly all companies were aware of the macro-economic environment, but most did not include official statistics in their research. Perhaps the explanations that they were relatively cheap to collate, being easily available from published sources. The detailed profile of districts provided by the other two companies did not feature in the LNER.

The basis of these reports were the estimates of traffic receipts and originating traffic, their early format a mix of area survey, such as the LMS did in 1933, and the traffic census of the GWR. Note was made of the local trading environment, especially the conditions of collieries and blast furnaces. For example, the Robin Hood coke ovens were to be reopened with the implication that up to 2,000 tons per week of minerals (it is not clear whether it was coal or coke) would be carried by the end of June 1933. Any reasons for variation in traffic were noted. In one case, banana imports fell off due to a hurricane in the West Indies. Canvassers then had an excuse as to why traffic in their area was down. But more importantly this information allowed the use of resources to be planned.[47] A General Trade Report enabled the stocks of selected materials - pig iron building materials, scrap etc - to be monitored throughout the network. Past and future contracts placed with companies within area were mentioned, as part of the regional monitoring. A special section of the report detailed the work of ports such as Immingham. Information by type of commodity and facilities required for handling was collected. Both operating and commercial managers were in a position to see what traffic emanated from where and the facilities required.

Within this example there was, in addition to the main report, a "Supplementary Report" that dealt with the Nottingham District. This again reviewed trading conditions, but in more depth, with details concerning local road and water competition, with estimates of traffic passing by road from specific companies. Intelligence concerning new industry in the area was also noted.

Our foray into commercial research has revealed some variance in procedures. From the specialised traffic research of the GWR, to the detailed surveys of the LMS, it is clear that the companies were heavily involved in trying to understand their

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47 RAIL/398/23 Report on State of Trade (Southern Area), 1933, p16.

environment. The LNER seems to have been less active in this field but this may reflect once more the constraints faced by the company from a financial point of view. The fact that so much of its area was in the depressed regions would not have helped: there was perhaps not the incentive to develop facilities to collect commercial information if the area was dominated by "old industry" such as shipbuilding, iron and steel. It seems that the Midlands and South were the areas for new and growing markets. This gave the LMS and GWR reasons to try and develop traffic.

Outside Research: The Railway Research Service

Research was also conducted by all of the railway companies through the offices of the London School of Economics. The origin of this organisation seems to lie with experience gained from the US Bureau of Railway Economics established in Washington around 1910.[48] The main areas of research were those concerning overseas activity.

An example of the type of information collected and its use is seen in the development of Containers. Its task was to "..arrange connections with Railway correspondents abroad." They would provide special reports on topics at the request of the companies, with periodical reports also being published.[49]

Between 1927 and 1931 there were several reports detailing the use of Containers on US railroads.[50] The first report noted details of the New York Central's experience including the rates charged, loading and technical details. The advantages cited were economies in packaging and less damage, which was placed in context by a description of the routes travelled and traffics handled. By the early thirties the

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48 C.E.R.Sherrington "Britain's part in the International Exchange of Railway Information" *Journal of the Chartered Institute of Transport*, September 1955. Sir Felix Pole (GWR), Sir Ralph Wedgwood (LNER), and Sir Herbert Walker (SR) were prime movers in this.

49 RAIL/390/381 Railway Research Service, Memo to the Traffic Committee "Proposed Establishment of a Railway Research Establishment at the London School of Economics" dated 13 November 1923.

50 See "Use of Containers on American Railroads," Vol.6, No.3, March 1927; "The Development of Containers in the United States," Vol.8, No.5 May 1928; "Costs of Handling Freight in Containers," Vol.12, No.6 June 1930; "Use of Containers by American Railways," Vol.13, No.4 October 1930; "Container Services and Rates," Part One, Vol.15, No.4 October 1931 and Part Two, Vol.15 No.6 December 1931, *Railway Research Service Monthly Bulletin.*

Service was reporting details of the Inter State Commerce Commissions cost studies of container traffic. The final reports, published in 1931, noted the prevailing rate structure in the US when containers were being used. By this time the principle was accepted on Britain's railways and probably accounts for the ending of reports at this time. However during the early phases of container development the Service offered examples of practice overseas which may have persuaded managers that the system was worth investigating.

This is given credence by internal company reports: the LNER, in a review of funding, noted that "The Research Service continues to prove of value to the Railway Companies in providing up to date information in regard to transport developments in other countries. It has come to be regarded as part of our railway organisation."[51]

To understand fully the role of commercial information we need to examine the context in which it was used. Once contact had been made with a trader it was necessary to then develop a service at a given price. We have seen how the different categories of information collected brought together the operating and commercial aspects. We now need to go further into the rate making process. Many decisions affected the other companies, and so were referred to the RCH for consultation. If necessary these would then have to go to the RRT for confirmation of the charge. The RCH acted so as to present a united front to external agents such as the RCH and traders. It also provided an opportunity to utilise, and share, commercial information, as well as generating its own. By the twenties and thirties, the RCH was providing a forum for commercial as well as technical information to be investigated and exchanged.

The Railway Clearing House

The story of the RCH down to 1922 has been told in Chapter Three.[52] Its role in coordinating technical standards and as a forum for Rate Conferences proved very

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51 RAIL/390/381 Railway Research Service, Memo. to the Traffic Committee "Railway Research Service" 26 June 1939.

52 See P.Bagwell (1968) *The Railway Clearing House in the British Economy, 1842-1922*, London George Allen and Unwin.

successful. Certainly at the end of its life it was much more than a means of reconciling receipts between companies. What is perhaps less well known is the role the RCH played in the inter-war years. Here it is important for several reasons: it was a key part of the rates setting process, continued to advise on technical standards and, as we have seen, helped instigate a system of traffic costing.

An example of how operating and commercial elements came together may be found in the "Goods Managers, Superintendents' and Engineers Sub-Committee" which was involved in establishing the best way to move a long load.[53] It established a standard for all the companies to use in moving such loads. Given the problems involved with such loads and the fact that they often travelled over more than one line, this was the perfect task for the RCH. This case was the transit of 90 foot steel rails from Cargo Fleet Iron Works, Middlesborough to London. The RCH used Inspectors to monitor procedure noting any particular problems that arose. Chief Mechanical Engineers Department representatives and Traffic Department managers were present from each of the affected companies. From the Inspectors report, the RCH drew up detailed instructions as to procedure, including drawings of the ideal load.

We will consider the activity of the Rates Conference and Goods Managers Meetings. These give a clear indication of the sort of issues being addressed and their relationship to other aspects of commercial management.

The RCH Rates Conference

The Rates Conferences dealt with the detailed, everyday tasks of pricing. It was a forum where companies could propose ideas and have them investigated by the associated Rates Clerks Committee. These clerks produced reports at the request of the main Conference. These would then form the basis of decisions. There were some similarities in what this Conference did and the Goods Managers meetings, except that we find more specialised aspects of rating coming under scrutiny.

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53 RAIL/1080/235 Goods Managers Minutes, Goods Managers, Superintendents' and Engineers Representatives Committee 16 May 1935, "Conveyance of Long and Projecting Loads."

The case we have chosen centres on the quoting of rates in the context of increasing road competition.[54] Details were given as to why road transport was attracting the business: lower rates, less breakages and next day delivery were cited along with the advantage that road could obtain more bulk loads in proportion to the size of the vehicle. This is, of course, familiar. The research conducted by companies and the their Conferences had reported much the same. The function of the Rates Conference was to bring together the experiences of the companies in the hope that solutions could be offered.

In this case it was thought likely that a 4 ton rate be applied to any weight of traffic. A detailed profile was provided of the traffic: the stations, rate per ton conditions of carriage and road competition were presented. A selection of "Bolts, Nuts, Rivets, Spikes and kindred commodities" were carried in a representative month. How this was determined is unclear, although local Agents would be aware of the most opportune times for the railway due to their local knowledge. Here at least the average was a useful measure, provided there were know capacity or peak loading problems. It allowed both parties to use it as a foundation for negotiations. The Rates clerks discussed the proposals and pointed out the problem in quoting these charges. In this case a reduction of 10 shillings per ton would have to be made in other categories, on rates of between 25 and 49 shillings. Their decision was backed up by details of the carryings, including road and rail tonnages and their recommendation was accepted.

The clerks were clearly specialist purveyors of this type of information and important parts of the decision making process. This is not surprising given the nature of the classification. It demonstrates the advantage of the RCH as a coordinating body where managers could meet on neutral territory and discuss what in any other industry would be commercially confidential.

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54 RAIL/1080/449 Minutes of the General Rates Conference, Minutes 7472, 8 September 1937; 7513 5-6 October 1937; 475c Rates Clerks Meeting 29 October 1937, and 7554 9-10 November 1937, "Castings, Iron or Steel of Light Type - Scottish Castings Trade Group."

The RCH Goods' Managers' Meetings

This meeting seems to have been one of the most important, generating numerous sub-committees and reports. It was the forum within which all aspects of commercial operation could be discussed. The Container, Road and Rail Representatives, Storage and many others would report to this Committee, aiding discussion of a specialist nature. Traders were asking for quotes from different companies separately and any differences to the detriment of their operations were questioned.

For the purposes of analysis, a case arising out of the transport of Motor Spirit will be discussed. This was typical of many cases coming before the RCH from the railway companies in that it involved dispute resolution and the testing of traffic flows.[55] In this instance, following a disagreement with traders involved with the refining of motor spirit, the LMS reported to the RCH. There seemed to be a problem with the rate structure which was preventing the LMS from quoting competitive rates. A meeting of Goods Managers Representatives compiled a report entitled "Rates for Kerosene and Motor Spirit in Owners' Tank Wagons."[56] This provided an opportunity for the railway companies to "confer," to ensure the sanctity of the overall rates structure. A comparison was made of the different company charging policies giving both rates and the tonnage carried. The road charges for each oil company were also compared, alongside a calculation of how far this was below the standard rate.

It was apparent that the GWR was quoting rates below standard, as a matter of policy, while the LMS and LNER were not. These latter companies believed that to do so was to risk the entire rates structure. This was important as the charges could be applied to other companies' traffic and made legally binding by the RRT. It was however agreed to extend reductions on selected traffics for an experimental period as the threat from road transport was considered great.

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55 RAIL/1080/235 Minutes of Goods Managers Meetings Minutes 4102, 11 April 1935; 4173,20 June 1935; 4206, 18 July 1935; 4239, 19 September 1935; 4274 17 October 1935, and 4392, 20 February 1936.

56 RAIL/1080/235 Minutes of Goods Managers Meetings, Memo of Meeting of Goods Managers Representatives, 5 June 1935. This report is bound in with the Goods Managers Minutes and so has no independent reference only by date.

The results from this test were not encouraging: for the 6 months of 1935, compared with the same six months in 1934, the GWR had increased its revenue by £4,145. However the LNER and LMS had decreased by £4,886 and £14,798 respectively and this despite overall imports in oil having increased.[57] The GWR proposed to still quote these rates, and the LMS and LNER realised that they would have to follow suit. Otherwise the rate structure as a whole would be challenged, creating expense and possibly souring relations with traders. An Appendix to the report gave details relating to the proposed new rates. The station and distance were noted along with the ownership of the property. The latter would presumably relate to the likelihood of the trader leaving the location if rate reductions were not granted. The applicant's tonnage was compared to other, similar, trader's accounts. Present and required rates were given as a percentage below standard. Finally the rate recommended for the purpose of negotiation and its value below standard was stated. The document presented the stance that the companies were to take on this particular rate. More details were collected at a follow on meeting, when the number of privately owned tank wagons and the tonnages carried was collected. The tonnage and number of depots went toward an estimate of likely demand. The number of depots which had closed or relocated could then be used as a guide to how the market was developing spatially.[58]

It seems that most traders were happy with the new rates, but one of them, Shell, was not. As one of the original complainants they wanted the rates to be backdated to when the initial approach was made ie January 1935 as opposed to November 1935. This the railways refused to do and the case drops from view. Whether the rates were eventually adopted, or the traffic lost to competition, is not clear.

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57 RAIL/1080/235 Minutes of Goods Managers Meetings, Memo of a Meeting of Goods Managers Representatives 16 and 30 August 1935, "Rates for Kerosene and Motor Spirit in Owners' Tank Wagons."

58 RAIL/1080/235 Minutes of Goods Managers' Meetings, Memo of the Goods Managers Representatives "Rates for Kerosene and Motor Spirit in Owners' Tank Wagons," 10 October 1935.

The role of other committees will be seen in later sections when we discuss particular examples of commercial information being used in the development of road services and the adoption of the container. What we have seen is the way that the commercial information was utilised outside of the internal company structures. It has been claimed that the process of grouping was facilitated by the RCH, and even that it was a substitute for nationalisation.[59] Certainly it had always facilitated the operations of a network industry with all the problems that entailed. What we see after the 1921 Railway Act was an enhanced RCH becoming involved in all aspects of commercial and operating activity. We are now able to bring together the commercial activity of the companies with that of the RCH. The response to road competition provides us with an example of how commercial information was applied to combating road competition.

Road Competition

This chapter so far has examined the procedures by which companies monitored the commercial environment. We can now place this in context by considering the response of the companies in terms of action: how were decisions influenced by such information? We have already seen how the threat perceived from road hauliers by the railway companies dominated the thoughts of railway companies. Not only were they able to consult railway rate books as to prices, but they were also better able to obtain backloads. The reactions of managers reveal something about how management met competition within the regulated environment, utilising commercial information,

There is some paradox in this: many managers believed that it was the railway industry rather than transport that was their core business, and this was encouraged by the framing of the 1921 Act. In fact most of the legislation in the previous 50 years pointed to this. By the time of grouping, although the railways had been involved with shipping and dock interests, it seems that road haulage was considered a thing apart. Most would have agreed with the GWR report that stated "The cardinal point of policy

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59 P.Bagwell describes the potential problems of not having a Clearing House when setting Rates, pp266-268 *The Railway Clearing House.*

has been, and will be, to retain as much traffic as possible to the railway."[60] The LMS certainly did, at least in the twenties. It noted that road conveyance would only have been used if business "would have been lost from the railway."[61] This was consistent with profit maximisation. Perhaps one of the reasons for this reluctance was the prohibition of railway companies from carrying goods by road. Throughout transport, whereby the company's own lorries would take the traffic without recourse to rail, was prohibited until 1928. However, companies were extending their collection and delivery services. Once granted road powers, they planned to use them to the full. There were certainly profits to be made: the LMS realised a 42 per cent profit on a road service between Leeds and Bradford, indicating that revenue was possible from such operations.[62]

By 1933 the LMS had reconsidered its road services. There were three reasons stated for such a move: firstly it would reduce costs, both those of transhipment and terminal. Secondly it would provide additional net revenue and finally competition would be reduced by driving out private hauliers. It was estimated that as of January 1932 60 per cent of traders in LMS territory had their own road transport.[63] Technology was also forcing the railways to adjust. A visit to a Commercial Motor show in London by the LMS, noted the availability of bulk liquid vehicles. These gave to the road hauliers "regular bulk traffics giving full loads for moderate distances."[64] The general means of combating road competition were stated in the retrospective view of the commercial manager:

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60 RAIL/257/42 Draft Report on Road Competition by Motor Lorries and How the GWR are Meeting the Position, p1; See also pp137-138, Burtt *Railway Rates.*

61 RAIL/418/102 LMS General Reports to the Board, p1 "Throughout Road Transport for Merchandise Traffic."

62 RAIL/418/102 Throughout Road Transport for Merchandise Traffic, Memo to the Board January 1929, p3.

63 RAIL/418/105 LMS General Reports to the Board, "Road Competition for Merchandise Traffic" January 1932, p10.

64 RAIL/418/163 LMS Chief Goods Managers Conference, November 1925 "Commercial Report for October 1925," p4.

> It has not been practicable at any time to meet road competition by any general modification of rail rates and the railway companies have been compelled to confine their action, in the main, to particular traffics between specific points, or principal streams or classes of traffic, as such have become more vulnerable to attack.[65]

In cases where outside haulage was used, the objectives of the company were explicit: such services were developed with "a view to undermining the stability of private haulage concerns."[66] As we shall see, their ability to do so was somewhat limited by legislation and their own suitability to carry loads. However to even consider pursuing such a policy required good commercial information

By 1931, it was noted that the "Railway Companies in their present circumstances can only expect to maintain their carryings of many of their important merchandise traffic at the expense of a loss in gross receipts." Furthermore, road transport revealed "a situation, the gravity of which cannot be disguised."[67] To monitor the activity of road hauliers, to help the legislative campaign against road transport, the company engaged in what they called "organised observation," to prove that "goods commercial vehicles are constantly exceeding the speed limit." The company also had evidence from local authorities on overloading which they planned to use at meetings of the traffic licensing authority.[68]

By 1933 the LMS Chief Goods Manager, Ashton Davies, would open his report on "Goods Traffic Receipts and Road Competition" thus:

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65 RAIL/418/209 Review of the LMS Commercial Organisation, p35.

66 RAIL/418/105 LMS General Reports to the Board "Road Motor Competition for Merchandise Traffic," January 1932, p9.

67 RAIL/418/104 Road Motor Competition for Merchandise Traffic, p9.

68 RAIL/418/104 Road Motor Competition, p18-19 For example Liverpool made 39 test weighing of lorries to find 34 overloaded.

> If it is inevitable, with road vehicle costs as they are, that the railway be continuously undercut, and traffic has to pass to the road, why shouldn't we go "all out" on the road ourselves and get what profit there is?[69]

Even here the railways would have difficulty in attracting traffic as many traders had their own fleets of lorries. Nevertheless the LMS along with the GWR and LNER did attempt to develop throughout road services once they were legally in a position to do so.

Because of the government regulation and the co-operation afforded by the RCH, the basis for rate reduction was similar throughout the companies. Failure to follow the procedures outlined above would lead to censure from the Railway Rates Tribunal. As an example of how railway companies in general calculated rate reductions was as follows, we will examine this case from the LMS.[70] Given the degree of cooperation we have seen from the rates procedure this was not unreasonable.

First there had to be "reasonable proof" that traffic would increase, the gross level of rates would have to be maintained and the loss from such reductions would have to be less than that from "inaction." The task for the Goods manager was to mediate for the company between the Rates Tribunal and customers. This was by no means straightforward: for example one reduction in rates for fruit, sugar and groceries led to a call for iron and steel charges to be dropped.[71] The company analysed how much traffic was going by road and how much by rail from Liverpool to Manchester, and the rates were then compared. Any special rate quoted in order to attract traffic back from the road would prejudice rates for iron and steel traffic between Liverpool and Manchester. A decrease in rates to attract traffic would of necessity reduce rates

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69 RAIL/418/106 LMS General Reports to the Board, "Goods Train Receipts and Road Competition" January 1933.

70 RAIL/418/106 LMS General Reports to the Board, "Goods Traffic Receipts and Road Competition" January 1933, pii.

71 RAIL/418/102 LMS General Reports to the Board, Half Yearly Memo. "Road Competition" Appendix A, p6.

for existing traffic. To prevent undue preference the Rates Tribunal would forbid such charges lest the net revenue would be threatened. The company had to defend itself against such requests, a task which required evidence regarding the economics of each particular traffic. A "Progress of Combative Measures" report was used to describe the reports to the Board of such action. This discussed the various reductions available for large amounts, special quotes, adjustment of minimum weight and the reclassification of traffic.

The policy of revenue maximisation was carried out even when it was clear that profit was not forthcoming. In the late twenties the rates on grain and oil cake were reduced.[72] The upshot of this was an increase in tonnage carried from 210,656 in 1928 to 226,999 in 1929. However the amount of revenue fell by £686. Not much on a turnover of £295,426 but this was with an increase of 16,343 tons carried. This delighted the LMS management who saw it as a deduction from the "road hauliers at the expense of their earning capacity." However in 1930 both receipts and tonnage had fallen.[73] A comparison with rates existing in 1928 revealed the extent of the problem: gross revenue would have been £70,000 higher, but of course the railway would then not have been competitive enough.

Using an exceptional rate was seen as a solution, by adjusting price and service to specific circumstances. The standard rate was gradually being eroded not just by these but by charges based on "Average rates per ton or per consignment covering a variety of commodities and destinations."[74] The problem with this was that it could backfire: it was not at all clear to the LMS that extra traffic would be attracted or that the gains would not be eroded by concessions to other traders who would have used the railway in any event. The law regarding undue preference eroded further any gains.[75]

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72 RAIL/418/102 LMS General Reports to the Board, Half Yearly Memo, "Road Competition" Memo. 5 November 1928.

73 RAIL/418/104 LMS General Reports to the Board, Memo Road Motor Competition for Merchandise Traffic, July 1931 from Chief Goods Manager, p3.

74 RAIL/418/105 LMS General Reports to the Board, Road Competition for Merchandise Traffic, January 1932, p7.

75 For an example of undue preference due to the granting of exceptional rates see p6, RAIL/418/106 LMS General Reports to the Board "Goods Traffic Receipts and Road

Overall it was estimated that rate reductions would have to be of the order of 20 to 30 per cent at least. However it was also noted, again because of undue preference, 80 per cent of road traffic could not be competed for.

The GWR argued that the response to such competition lay with the pursuit of speedy delivery and good transhipment. As we have seen this later activity was pursued by their operating departments with the aid of the Traffic Research Committees. As with the LMS rate reduction was vital, but not at the expense of existing rates. However as early as 1921, the GWR was testing the market for schemes which hint at later developments.

Responses to Competition: Road Services

The information collected by the railways on the extent of road competition was soon put to use developing their own road services. Once more extensive powers had been granted in 1928, a more integrated system of transport could be developed. The GWR in particular emphasised the gains to be made by introducing improved transhipment. All companies introduced "Country Road Services." However all were impressed by the need to operate integrated road services. What was being suggested now was a far more systematic service based not only upon the delivery requirements of customers, but also whether the speed of service could be improved. This was the basis of the throughout road services offered as well as the Country Lorry Services.

The extension of railways into road operation required a new approach to commercial matters. This involved the restructuring of delivery services on a more systematic basis. The Country Lorry Services and the Railhead Distribution schemes sought to do this. These required careful planning and knowledge of traffic flows obtained from working experience and specialised reports. In all cases close monitoring and cost estimation were undertaken. The information collected sometimes verged on the provision of the railways providing a total transport service. They would ask the company exactly what their requirements were and attempt to meet them. This was the province of the Goods Agent who could also call on special representatives

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Competition" January 1933.

from the operating department. These were able to advise on any special facilities required and offer solutions to particular transport problems. For example the GWR had appointed Development Agents whose task this was.[76] It was only a small step to move from the provision of C&D to these more specific services. It was considered by the LMS more as a service supplementing rail charges. It could be offered at below cost as it was being seen as being able to "maintain the railway rate itself at a higher level, thus reducing prejudice in other directions." Thus it was explicitly seen as a means of attracting revenue rather than earning profits.[77]

Some companies were willing to further extend road services. The LNER considered the use of road vehicles to transport heavy and out of gauge loads. Limitations on the gauge coupled with improved transit times made this an attractive proposition. In the event it was decided that this would not be appropriate, because it meant that heavy loads were less likely to be banned from the highway. The railways could hardly be seen to be condoning such traffic giving that they were proposing legislation banning such traffic from the roads.[78]

The LMS reports to the Board on Road Competition noted the targeting of "particular blocks of traffic," with the use of "radial collection and delivery service."[79] These presented information of the effect on revenue of the various measures being taken to combat road haulage. The company could then determine the service to be provided. These were divided into three main categories: Contract, Regular and hybrid road/rail. The first dealt with local "about town" haulage and loads which were short haul and so uneconomic for rail carriage. The criteria for establishing these varied according to local conditions: the traffic on offer, both type and amount, local

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76 RAIL/250/767 GWR Goods Conference, Minute 6420 September 26, 1922 "Appointment of Development Agent."

77 RAIL/418/102 General Reports to the Board, "Road Competition," October 1929, p12,.

78 RAIL/390/2035 Meetings of Goods Managers - York, Minutes 2760, 26 April 1929, and 2764 8 October 1929, "Increased Tendency for Heavy Loads and Out-of-Gauge loads to be Conveyed by Road."

79 RAIL/418/102 LMS General Reports to the Board, Half Yearly Memo: "Road Competition" March 1929, p8. This regularly included an appendix detailing the "state of play" in the freight business produced by the Chief Goods Manager.

competition and the degree to which traders had invested in their own road transport fleets.

Rates were subject to similar constraints as the rail charges. Cost data was used as a basis for calculating at least some of the charges. For throughout road transport it was a simple calculation of the cost of operating various vehicles according to the variables of time and distance. For example, ale and stout from Blackburn and Bolton to the Lancashire coast was carried at a per vehicle per day rate, with due allowance for tonnage. This earned over a 4 week period revenue of £221 at a cost of £149.[80]

The extension of road services by the railways was not limited to C&D. Once road powers had been granted they provided Railhead Distribution schemes. It is to these that we now turn.

Responses to Competition: Railhead Distribution

As the C&D service developed, so it became clear that rail transport could be extended further. The goods would arrive at the rail terminal for delivery by the company. If collection or delivery could not be effected at once then it was sometimes possible for storage in the Goods shed or its attendant warehouse to be offered. This was eventually developed into what became known as Railhead Distribution.

According to K.G.Fenelon, Railhead Distribution "combines rapid transit by rail in bulk loads, warehousing of goods, and retail distribution by road."[81] Transportation by a railway company was moving away from just movement, towards a function more closely associated with what we would now call logistics. The purpose of Railhead Delivery was the provision of road services within a given area supported by rail deliveries. They provided a focus for the other services on offer such as express delivery and the breaking of bulk. It was also a means of facilitating the coordination of road and rail. As Fenelon put it "The railways now are not merely carriers, but have become, in a sense, retail distributors."[82] We can see this reflected in the type of

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80 RAIL/418/102 LMS General Reports to the Board, "Road Competition" October 1929, p12.

81 K.G.Fenelon *Railway Economics*, p202.

82 Fenelon *Railway Economics*, p204.

consignments attracted to these schemes. Cadbury and Rowntree used these schemes to distribute confectionary. Express freights and containers were used to serve the depots.[83]

As early as 1924 the GWR was investigating the possibility of establishing a system of railhead distribution. The first customer was a biscuit manufacturer from Gloucester, Macfarlane, Lang and Co. However it was noted that "There appears to be a lack of enthusiasm in most district in respect of railhead distribution."[84] By 1926 schemes were still limited and it was stressed via the Goods Conference that "It is impossible to lay too much stress upon the importance of interesting firms in the companies storage facilities and the distribution of traffic." Indeed there was implicit criticism from the chairmen of the performance of management in this respect. This seems to have succeeded in motivating the agents and their managers, as it was later reported that "A good deal of interest has been aroused" in such schemes. This was manifested in the signing up of various tobacco companies had signed up for the schemes.[85] The GWR seems to have seen the development of Railhead Distribution as part of the wider rail delivery system. Hence the concern with transhipment management and the extensive Country Lorry service. A Booklet, *Speed in Transport*, provided details of the service charges and facilities available at the different depots. In 1930 the GWR had 54 schemes in operation, split between four districts. Of these only Cardiff and Swansea were in a position for comparison. For a cost of £8,433, receipts were taken of £7,455.[86]

The LMS began in 1922 with 63 depots, which by the end of 1927 had risen to over 400. A wide variety of commodities were making use of the service including

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83 See Lamb *Modern Railway Operation*, Chapter XVIII "Traders and freight Distribution."

84 RAIL/250/767 GWR Goods Conference, Minutes 6685, June 12 1924 and 6740, November 24 1924, "Road Motor Competition."

85 See Minute 6975 July 16 1926 and Minute 6995 November 3 1926, "Road Motor Competition." Evidence of the companies involved comes from Minute 7150 November 18 1927, "Road Motor Competition," RAIL/250/742 *GWR Goods Conference*.

86 RAIL/250/743 GWR Goods Conference, Minute 7441 February 5, 1930 "Railhead Distribution," A copy of the booklet issued by the GWR can be at the PRO Reference RAIL/268/71.

cement, groceries and cars.[87] Express freight trains were despatched to the depots, there to be unloaded straight to the warehouse. Then they could be broken down to be delivered by road. For example, Cadbury sent wagons daily from their Bourneville works at 5.30pm to Camden where they arrived at 2.00am. They were unloaded at 8.00am when the depot opened. A system of pallets called cages were used to convey loads within the vans for ease of handling. Cadbury had asked the LMS in 1921 for a service "..more comprehensive and complete than the general conception of a depot.."[88] This particular distribution centre consisted of a (un)loading clerk, a stockroom and an office.

By 1932 the LMS was developing purpose built distribution centres in conjunction with traders. Cadbury's Finchley Road depot was designed by the Chief Engineers Department of the LMS in conjunction with Cadbury. This was a clear example of a railway company developing its services specifically with the trader in mind. The LMS Agents had to fully understand the business of the customer and be able to taylor their own services to fit. This was the payoff for the collecting of commercial information by the company. Traffic would hopefully not be lost because the service could utilise the advantages of road and rail. LNER experience shows how far companies had come from the view that they were only involved in rail transport. By 1938 Railhead Distribution had replaced "smalls" traffic on the branch lines: 83 Railheads served over 3,000 villages, using 134 vehicles.[89]

The growth in such delivery services led to the RCH being called in to mediate disputes between companies. As schemes were established the zones covered expanded and met other railways delivery areas. In Taunton, the LMS, SR and GWR were vying for traffic. The latter had apparently established a scheme without first consulting the others. As a result they were requesting the payment of compensation that was the norm in these instances. The Goods Managers (Commercial and Road Transport)

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87 For what follows see *Railway Gazette* Anon "Railhead Freight Distribution on the LMSR" December 23, 1927 and Anon "Railhead Distribution Depots" July 5 1929.

88 Anon "Railhead Distribution" *Railway Gazette*, July 5 1929.

89 A.A.Harrison (Road Motor Superintendent, NE Area, LNER), "Road Transport in the North East" *Railway Gazette*, September 23, 1938.

Representatives first discussed the problem before passing it on to the main body of the Goods Managers for a decision.[90]

As we would expect, the RCH also played a more proactive role in establishing and coordinating distribution by road. In 1936 the GWR was approached by Silvertown Lubricants Limited concerning the distribution facilities offered to another company, N.C.C.Wakefield.[91]

Railhead Distribution enabled closer working between the railway and the trader to be achieved. This had implications for the handling infrastructure. Railhead Distribution enabled materials handling to be better integrated into the business process of the client. The development of palletised loads would have to await war time experience but this, together with the container shows that some progress was being made pre 1945. A clearer understanding by the transportation company of the Trader's business enabled better techniques and technologies of handling to be developed. It was noted by the *Railway Gazette* that the use of Containers was being developed alongside the Railhead system of distribution. It was certainly true that there were similarities between the two. Both offered a door to door service and containers may be seen as an extension of the loading practices developed under railhead distribution: packaging was being reduced and loads homogenised. It is to this that we now turn.

Responses to Competition: Containers

The introduction of Containers demonstrates several important areas of business practice on the railways. We can see how the commercial functions of the RCH helped to coordinate activity across all the companies through the RCH Container Committee, established in July 1933. This dealt with operational issues such as the design of the Containers, the devising of technical standards etc, as well as the commercial, such as what type of traffic should be carried and at what rate? This illustrates the complexity

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90 RAIL/1080/235 Goods Managers Minute, Goods Managers (Commercial and Road Transport) Representatives Meeting 10 February, 1936.

91 RAIL/1080/618 Goods Managers and Road Transport Representatives, Minutes 1, 17 July 1936 "Storage and Distribution of Lubricating Oil;" 2, 2 September 1936 "Services in Connection with Conveyance of Lubricating Oil in Bulk."

of incorporating new products into the existing system of rates. It involved establishing a new Classification of commodities based on the use of Containers.[92] The RCH seems to have become a part of the marketing organisation of the railways. As an example we will see how the Container was used to attract furniture traffic form the roads to the railways. First we need to be clear in what exactly a Container was. After all packaging had long been an important part of the railway business. What set the Container apart?

According to the LMS "The function of a container in a railway sense is its ability to hold a large number of small units of traffic and permit of their being handled as one package by mechanical power."[93] The use of Containers was seen as a means of both minimising costs and improving the service. Door to door delivery was seen as a vital selling point in the competition with road transport. It offered the elimination of packaging with a decrease in damage to goods.

All three of our companies developed Containers, although some were more enthusiastic than others. Early experiments with "containers" were carried out on the GWR as early as 1921. However these were much smaller than those developed in the late twenties; they could fit four, six or eight to a truck.[94] A GWR minute from 1927 reveals the LMS as keen proponents and the LNER relatively antagonistic towards Containers. Evidence that the LNER was not a prime mover in these matters also comes from memoranda which refers to the fact that the company had been borrowing Containers from the GWR and LMS.[95] It was the LMS that led the way in the development of Container traffic.[96]

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92 RAIL/1081/92 Container Committee Minutes, Minute 1 26 January 1936 "Minute of Appointment." This Committee was appointed as a result of discussions by the Goods Managers Conference.

93 RAIL/421/146 Freight Trains In Container Trucks, Paragraph 120.

94 RAIL/250/767 GWR Goods Conference Minute, Minute 6359 "Use of Containers" January 27, 1922.

95 RAIL/390/906 Memo to the Locomotive and Traffic Committee, "Containers for brick etc traffic" 27 July 1933.

96 See Bonavia *Railway Policy*, p56.

The outcome of these early experiments was that by 1930 it was clear that the Container was viable. It was reported that "the container facility often turns the scale in favour of rail, and its employment is a necessity to the continued rail conveyance of a large and growing volume of high rated traffic."[97] As evidence of this, calculations were made as to the amount of traffic accruing to the LMS over a four week period. From this the amount of estimated traffic which would have been carried anyway, was deducted, with the result that a net gain of £4,950 was reported.[98] From over 13,000 loads in 1927 to over 48,000 in 1929, an increase from 24,833 to 92,655 tons, the Container had established itself on the LMS.

Once introduced, the performance of the concept was monitored. As with other specialised equipment there were problems of coordinating loads with wagons. In this case the problem of return loads was particularly acute and all companies experienced difficulties in this area. At various times the GWR Goods conference monitored the Average number of journeys per week for each type of Container.[99] For the LMS reports were made by the Chief Goods Manager in his Memo "Road Motor Competition for Merchandise Traffic." The LNER was able to monitor all its specialist stock movement from within the Wagon Control System structure. From the individual company activity identified above we move now to see how the RCH responded to the operational and commercial challenges posed by the container. The story of Container development illustrates the role of the RCH in developing both technical standards and commercial cooperation.

The RCH and the Marketing of the Container

The role of the RCH in coordinating the development of Container operations is best seen in the light of a specific example. In 1932 the conveyance of new furniture from London was addressed by the Container Committee. In a series of Minutes, the

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97 RAIL/418/29 The Development of Container Operation, Memo 17 November 1930,p5.

98 RAIL/418/29 The Development of Container Operation, p3.

99 See for example RAIL/250/745 GWR Goods Conference Minutes, Minute 8102, "Provision and Use of Containers."

question of rates, service and costs were addressed. The starting point for such analysis was the amount of traffic estimated at passing by road: 16,000 tons by road out of a total 20,000 tons with the rail traffic limited to small consignments. A report was prepared for the Goods Managers which outlined the reasons for this.[100] There were several perceived causes, not least the ability for the road hauliers to be able deliver door to door and at a lower rate. They could do this because there was no minimum load if furniture was being carried as a back load: one chair would suffice as a return load. This was made possible by the ease of obtaining a return load. Damage was also minimised, despite having less packaging. The railways noted the changing nature of the furniture business with traders offering delivery and less stockholding. The report recommended that loads should in future be carried at carriers risk with exceptional rates quoted around a minimum load of 1 ton, covering delivery in specific areas. The railway companies were also to provide labour to help load and unload. To assess the effects of these policies the General Managers Committee requested some "hypothetical" calculation that would indicate the effect on Net Revenue. The results of LMS research were passed on which calculated the average cost of loading, and the amount of labour involved. The average cost was based on a turnaround of 1 load every 10 days. This was estimated to be an additional cost of 11/6 per Container, with average receipts of £5.1.6d.[101] Further experiments were conducted in 1933, covering 34 loads, most of which had been attracted from the road. The results of these were presented by date, destination, nature of traffic, number of containers used, weight, rate and conditions, receipts and claims, if any.[102] Extra labour costs were calculated on the basis of the number of men and their grade, as well as the time spent.

The growth of the Container as an inter-model means of transportation was a portent for the future. Even so the railways had made great strides toward their introduction on road and rail. By 1937, the LMS had 7,961, the GWR 1,765. Their

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100 RAIL/1081/92 Container Committee Minutes, Minute 492 19 July 1932 "Conveyance of New Furniture in Containers from London."

101 RAIL/1081/92 Container Committee, Minute 5237 December 1932.

102 RAIL/1081/92 Container Committee, Minute 602 15 June 1933, "Conveyance of Furniture,".

introduction was perhaps the ultimate recognition of the effects of road competition on railway operations with goods carried by rail being packaged to reflect the needs of road transport.

Conclusion

This chapter has demonstrated how the railways dealt with a complicated commercial environment. Government regulation coupled with the nature of the pricing mechanism necessitated a system for monitoring the old rates and presenting the new. The use of Exceptional rates and Agreed charges meant that information gathering was an inherent part of the management practices used in the Commercial Departments. If revenue was to be maximised, then the needs of Traders had to be known. What we have revealed by understanding this process is that the railways were able to understand their market, but were unable to influence it. It was the competitive pressures of road transport and the regulatory environment, of prices and conditions of service set by law and determined in public, rather than poor management, that was the most important component in the failure of rail transport to meet its revenue targets. The use of traffic costing reveals that the railways were willing to analyse their costs, but only if there were benefits. Similarly improvements in services were possible when it was clear that regulation and revenue objective allowed it. Containers, Country Lorry Services and Railhead Distribution were all important steps in responding positively to the changing commercial environment. These were only possible by the use of commercial information applied to operating problems.

They were able to establish services through the Programming and Planning mechanisms of the RCH and their own Goods Conferences. Overall, the railways produced a system of marketing management which indicates that the railways had considerable vigour in this aspect of management.

Chapter Eight

Conclusion.

The task of this thesis has been to relate how the railways were moving towards a scientific, systematic, approach to management. Procedures were adopted in the face of a depression that affected the market for transport and increasing road competition. The ability of the railways to respond to this was hampered by regulation of rates by government. Not only were prices set, but rates had to be published by law. This made responding to the adverse market conditions by cutting prices difficult.

Given the circumstances outlined in Chapter Four, the railway sector was not managerially moribund in the post 1923 period, as has been claimed by Aldcroft. It faced difficult circumstances by trying to develop new ways of thinking about business. The different approaches to problems were partly a reflection of organisational culture and partly one of circumstance. Both the LNER and LMS had been through radical reorganisation, with the GWR alone relatively unchanged. The latter had always been conservative compared to most other railways and it continued to be so. For the LNER, the main problem was that their business was in areas particularly badly hit by depression. Thus financial constraints rarely enabled innovations to be fully developed even if in the long run savings could be made.

If we refer back to the model of management control described in Chapter 1, we can identify where specific management methods were used. Using figure 1, we may locate commercial research as informing the Programming activity by establishing the service to offer and at what price. Planning was similarly conducted with the aid of commercial research as well as Transhipment and Time and Motion analysis. The service was Executed, and general control maintained, by monitoring the transportation process via Train Control. Train Control was also important in Evaluating conveyance, a task that was conducted for terminal services by Transhipment and Time and Motion analysis.

The response of the railways was to improve both operations and their commercial practice. By controlling the process of conveyance many of the items which increased

cost could be monitored. In Chapter Five, the development of Train Control was seen as an important feature by which conveyance could be monitored. Whilst the GWR developed exceptionally good train services and its terminal costs were reduced, the lack of proper train control, and in particular the utilisation of information for wider management control, was a failing. That the LMS did develop such a system should not be surprising. It was the largest network, and had the legacy of the MR system to draw from. The LNER did not lack in invention either, but did not develop centralised, network wide Train Control. However the Wagon Control offices did show that in rolling stock distribution at least, the company had developed information systems. In Chapter Six we have seen how transhipment practices and depot design were modified according to information from analysis and reports. Problems were perceived and solutions sought to enable costs to be kept to a minimum. This was not always easy, as the experience of the LMS in terminal design demonstrates. What matters for our purposes is not that they failed to realise significant economies, as far as we know, in the pre-World War Two period. There was, and is, always a problem in achieving economies when using new methods. It is the fact that they were approaching management utilising a systematic approach to management. The GWR approach was much more successful, but in the long run they realised that the LMS approach was valid.

As we have seen in Chapter Seven, although the companies were distinct entities, they co-operated to an extraordinary degree on commercial policy. That they were able to do this reflects on how little competition there was between railway companies. Instead they were cooperating to head off the real competition, namely that of road transport. The railways developed Commercial Research as a means by which to ameliorate the decline in traffic due to the aforementioned market and regulatory conditions. The RRT and RCH provided a forum for such cooperation. The nature of the industry was also a factor: by definition a network has to find some means of co-operating on technical specifications. This was the main task of the RCH. In the period after the amalgamation, it was to deal with more commercial as well as operating aspects. It was no accident that Traffic costing was first introduced through the offices of the RCH. The research from all the companies had long been put to use there for pricing and

matters of technology. The growth of railhead distribution, the use of containers and increased speed of service were all adopted by our companies. The RCH formed a valuable conduit through which these could be utilised to everybody's benefit.

The advent of road competition was compounded by the view of regulators that railways operated in a monopoly transport market, which created a far from ideal commercial environment. Both government intervention and, to a lesser extent, management prevented the railways from becoming integrated movers of freight. Nor was the government's intervention particularly helpful to attaining "efficient and economical" working. We have seen how regulation could produce information which firms found useful. Thompson, Miranti and Yates all found this to be the case in US regulatory practices.[1]

To summarise the case studies, the LMS was more systematic in its use of ideas than either the GWR or the LNER. This was due partly to the size of the company. Its inherited managerial cultures mixed well with the arrival of Stamp who was able to motivate many of those around him with an enthusiasm for relatively sophisticated management practices. The Executive Research Committee was the most visible of these. The GWR was conservative and eventually it was recommended to follow the LMS type train control procedures by the 1940 Committee on Congestion. Its record on terminal and commercial management practices was good, however. The LNER was limited by financial pressure and the nature of its inherited companies. Nevertheless it clearly recognised that some form of train control was necessary and recommended time and motion studies for its own depots.

The study of how management information was used to develop certain management practices can be used to discern if management was performing well or not. In general increasing profits, or in this case net revenue, are not a good indicator of management's performance if they are defined by events outside management's control. Given that much of the microeconomic statistical data no longer survives, how these

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[1] See Chapter One, and in particular references to Thompson The Passenger Train in the Automobile Age; Miranti "The Minds Eye of Reform" and Yates Control.

problems were approached is a more means by which we can assess performance.

If there was little attention paid to what we might call the more mainstream elements of systematic management, it was not because it was rejected. A more likely explanation is that railway managers were already debating such issues within their own research infrastructure.

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