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## PENNSYLVANIA (\$)65000?

*Abstract:* In attempting to understand the genesis and scope of modern cost and management accounting systems, accounting historians adopting what has been labelled a “Foucauldian” approach have been rewriting the history of key 18th and 19th century developments in the U.K. and U.S. through new evidence, new interpretation, and a refocusing of attention on familiar events. This is a research project in “disciplinary” history, a history which sees modern cost and management accounting as articulating a new kind of “expert disciplinary knowledge”, as well as exercising a “disciplinary power”, in the construction of a new human accountability.

Within this ongoing, overall research project, this paper focuses on how Chandler’s exposition of the central role of the early US railroads in the development of ‘multi-divisional’ management needs to be reformulated through this disciplinary approach in order to account for the ‘excessive’ administrative co-ordination that he observed was introduced on several of the major trunk lines—the Baltimore & Ohio RR (‘B&O’), the New York & Erie RR (‘NY&E’) and the Pennsylvania RR (‘PRR’)—between 1847 and 1857. In undertaking this reformulation, we are investigating the particular contribution of West Point graduate engineers and here we ask the \$65,000 (*sic*) question: was Herman Haupt (who graduated from West Point in 1835) the key historical figure in the implantation of practices of modern, cost, management and strategy focussed accounting—and thereby in the development of the discourse of ‘modern management’—on the PRR? We focus on the archival evidence and also draw contrasts with some recent attempts to emphasise the accounting and management contributions of other major US railroads, in particular the B&O and the Illinois Central, as well as with the standard histories of British railways during the same period.

## INTRODUCTION

‘We are always rewriting the past, whether through new evidence, new interpretation, or a new focus on old overlooked events. Revisionism constitutes something newly read into some particular aspect of the past—a discovery of new evidence, a discerning of new patterns, a dislodging of old and cherished verities’ (Hoskin & Macve, 2000).

This paper represents a further stage in our research project, which seeks to identify the genesis of ‘modernity’<sup>1</sup> in business management and in particular in accounting. For a number of reasons we have already identified the crucial sites as

being in the US in the early nineteenth century and here we explore further the key role of the early US railroads. Their significance for the development of business organization has long been acknowledged: but the precise nature of that significance has been obscured behind supposed ‘technological’ and ‘economic’ imperatives. Hence the ‘\$65,000 question’:<sup>2</sup> where were the crucial developments? (we shall argue for the Pennsylvania Railroad (‘PRR’); and who were the key instigators? (we shall argue for the importance of Herman Haupt--a West Point graduate--on that railroad.

But this is ‘revision’ not a wholly new history. We agree with Chandler’s identification of the importance of the early US railroads as the first example of large-scale multi-unit management. Nor is the theme of purely historical interest. Parallels have recently been drawn between the impact of the railroads on the 19<sup>th</sup> century and the corresponding impact on the 20<sup>th</sup>/21<sup>st</sup> centuries of the growth in the hi-tech information and telecommunications industry with a view to ‘learning the lessons of history’ (e.g. Chandler and Cortada, 2000; Flesher *et al.*, 2000). The similarities noted include the huge scale of their capital investment in new technology (then in primarily tangible assets, now primarily in intangibles), their dramatic effects on underlying economic activity and on the speed of communication, the new strategic challenges and opportunities they faced in locating their infrastructure and in creating and servicing new mass markets, the fundamental issues they raised concerning public/private investment and ownership, their massive effect on the volatility of capital markets, and the wholly new ‘management’ problems they created both for corporate governance and managerial control as well as for State regulation and competition policy.

When Chandler (1977: 95) identified the US railroads as the first example of large-scale multi-unit management, he gave the credit for the major managerial

innovations in the creation of these giant new corporations, that were to set the mould for a century of development of US 'big business', to practical businessmen solving pressing operational problems. They included Benjamin H. Latrobe in 1847, who was Chief Engineer on the long established Baltimore & Ohio ('B&O') railroad, Daniel C. McCallum, Superintendent of the New York and Erie ('NY&E') railroad from 1854 to 1857, and J. Edgar Thomson, who was with the Pennsylvania Railroad ('PRR') from its beginning in 1847, first as Chief Engineer, then as General Superintendent, and finally as President from 1852 to his death in 1874. Chandler noted that there were only two pioneers of railroad management who had military experience--George W. Whistler on the Western and George B. McClellan on the Illinois Central--but he dismissed them as 'the least innovative of the lot'.<sup>3</sup> While acknowledging the influence of several West Point engineers, some of whom had had military experience in the increasingly professional and hierarchical Ordnance Department or Corps of Engineers, Chandler considered that 'even for such officers, engineering training was probably more important than an acquaintance with bureaucratic procedures. There is little evidence that railroad managers copied military procedures' (1977: 95).<sup>4</sup> Chandler's interpretation has become the conventional wisdom of business history, at least for the USA (e.g. Livesay 1975: 39-40; Gourvish 1972: 266-7; and recently Shenhav, 1999: 24).

The opposing thesis has been argued by O'Connell (1982). In his view it was precisely their familiarity with bureaucratic army organisation (itself reformed and systematised under Calhoun, Scott and Jesup between 1817 and 1821), and whether they experienced it either directly as officers or only indirectly through exposure to military systems and discipline at West Point, that gave men like Long, McNeill, Knight, Swift, Whistler and Haupt the edge in contributing to the organization of the

early major roads. The collapse that followed shortly after McCallum's famed attempt to reorganize the struggling New York and Erie Railroad in 1854-6 is taken by O'Connell as further support for his thesis that the military input was an essential ingredient of success (1982: 295-6, 300-16).

In this paper we build on our argument that the historico-theoretical significance of the influence of the US Military Academy at West Point (e.g. Hoskin & Macve, 2002) requires a third perspective. It was not the exposure to military organisation, nor the scientific mastery of engineering *per se*, that distinguished its graduates of the period from 1817 onwards (when Thayer became Superintendent), but rather the new way they had *learned to learn* at USMA, and the disciplinary power-knowledge they had internalised through Thayer's all-encompassing grammatocentric practices of writing, examining and grading.

We have already set out the elements of the argument (e.g. Hoskin & Macve, 1988) that first the Western RR and later the PRR were, like the Springfield Armory, crucial 'West Point' sites and that close examination of the surviving primary sources reveals the key role played first by George Whistler (who graduated from West Point in 1819 in Thayer's first cohort) on the Western, and later by Herman Haupt (a 'second generation' Thayer graduate) in the transformation of the early PRR's strategy and management--a role in which, where recognized at all, he has conventionally been given second billing to J. Edgar Thomson, first Chief Engineer and then (life) President of the PRR. Here we focus on the detailed evidence (including original archival material from the US and an extensive examination of the *American Railroad Journal* for the period) that both fully reveals Haupt's role and also explains how his lamp has been 'hidden under a bushel' while attention has been focussed on both McCallum on the NY&E and on Thomson on the PRR itself. Some

of the evidence presented here is already in print (Hoskin & Macve 1988, 1994; O'Connell 1982; Ward 1971, 1980): some of it has only been unearthed more recently. However it can now be drawn together sufficiently to give an overall picture of the key stages of the dissemination of the West Point influence and to revise substantially the details that necessarily underlay Chandler's original interpretation of what happened on the US railroads at this crucial time.

Unearthing the true story has required extensive detailed examination of both original and secondary sources in order to explain both 'what really happened' on the PRR and why conventional histories, relying on surface impressions partly created by the protagonists own 'spin', have too easily both misread the nature of the organizational innovations that were achieved and attributed them to the wrong cast of supposed innovators. The story that follows is therefore both long and complex as compared with the more conventional accounts of a simple 'evolutionary' and 'technical' development towards more systematic organization of business enterprise.

In the next section we comment briefly on why we agree with Chandler as to the significance of the US rather than the UK railroads in the early 19<sup>th</sup> century for the development of 'modern management'; in the following sections we set out the key elements of our revision of the role of Haupt in that US development; finally we comment on the relationship of our history to other recent work by accounting historians on early US railroads.(xxxx *do we* xx?)

## WHAT REALLY HAPPENED ON THE PRR?

The story of early US railroad organization as we now tell it differs from Chandler as to the origins and directions of innovation in ways which must change our view of what ‘modern management’ really means. As Chandler tells it, in 1841 following a collision on the first intersectional railroad--the Western--George W. Whistler (then the chief engineer in charge of construction)<sup>5</sup> and a committee of directors ‘made the Western Railroad the first American business enterprise to operate through a formal administrative structure manned by full-time salaried managers’ (Chandler 1977: 97-8).<sup>6</sup>

With the building of the great east-west trunk lines, further managerial innovation to control the huge new flow of business was needed, Chandler argues. In 1847 on the Baltimore & Ohio (‘B&O’) Benjamin H. Latrobe (Chief Engineer) and Louis McLane (President) ‘defined formally the lines of communication and authority and created large, formal administrative departments’;<sup>7</sup> and then in 1854 on the New York & Erie (‘NY&E’), by then the longest US railroad, Daniel McCallum (General Superintendent) ‘was the first to outline the principles of modern business administration and to indicate the type of data required to carry out such principles’. Finally in 1857 ‘Thomson and his associates on the Pennsylvania effectively applied McCallum's principles to the Baltimore & Ohio structure and began to solve certain complexities of control through the development of the line-and-staff concept for the delegation of duties and thereby of the “divisional” type of organization’ (Chandler 1965a: 21-2; 1977) From this first fully divisionalized structure on the PRR the distinctive US brand of organization--the ‘M’ form--would ultimately become the hallmark of global business (Chandler 1977; 1990).

What is wrong with this story? Surely now--some 150 years later--it seems relatively unimportant exactly which innovation in the 1840s and 1850s occurred on precisely which US railroad and exactly when. The overall outcome--which was indeed significant in the genesis of modern business--can surely be seen, as Chandler sees it, as a necessary, evolutionary response by a group of business men facing unprecedented, but basically similar administrative problems. It is clear from their own testimony that their lines fairly freely exchanged information about both engineering and management issues, assisted by journals such as Henry Varnum Poor's *American Railroad Journal* ('*ARJ*')<sup>8</sup>, and in designing the structures for their own particular railroad each of the 'innovators' borrowed heavily from experience and developments in other north-eastern companies. Surely, it is their joint achievement that is significant? But that interpretation is both theoretically incomplete and historically misleading. We discuss both aspects in turn.

### *Theory*

At the theoretical level, as Chandler himself has pointed out, while 'they were the first because they had to be . . . [n]evertheless, the innovations made by the early large intersectional roads in organization, accounting and control went beyond mere necessity. The railroads could have operated well enough with only rudimentary organizational structures, without the line and staff distinction, without an internal auditing staff, and without the development of the more sophisticated financial, capital and cost accounting procedures devised by McCallum, Thomson, and Fink' (1977: 120). Given the easy returns available to much early railroad investment, efficiency was not necessary for survival: indeed McCallum himself said much the same.<sup>9</sup> So why did they do it?

Moreover, Chandler focuses on tracing a ‘rational’ development whereby the successive innovations on the various railroads moved logically towards a culmination in the PRR’s 1857 divisionalized line and staff structure: ‘their answers came in response to immediate and pressing operational problems requiring the organization of men and machinery. They responded to these in much the same rational, analytical way as they solved the problems of building a bridge or laying down a railroad’ (Chandler 1977: 95).

Herein lies the historical crux (e.g. Fleischman, Hoskin, and Macve 1995; Fleischman and Macve, 2002): the modernity of accounting and organizational structure does indeed appear when men and women are regarded as similar to ‘machines’, in the sense that their role and accountability within the organizational structure are defined, their performance can be measured and analysed, and their efficiency can be evaluated by reference to the ‘norm’. But this does not mean that human beings simply *are* machines, and correspondingly organizational structures (which are means of administrative coordination of human behaviour) are doomed to failure if they operate on any such reductionist assumption. The new ‘modern’ managerialism was successful in so far as it created ‘calculable persons in calculable spaces’ who *internalised* their self-awareness of their required performance—something a machine could never do.<sup>10</sup>

Modern organizations are nowadays distinguished by having systems of control discipline—including accounting systems--of a kind that, through internalisation of performance norms within organizational structures and processes of accountability, ‘quietly order us about’ (Foucault, quoted in Megill 1979: 493). It is the emergence of the new practices that shape human behaviour in this way that we must look for in identifying the real ‘management revolution’. Consequently (and consistent with the



emphasis in more recent theorisations of organization on process, e.g. Kay, 1993) successful business organization requires achieving an effective balance between the rational, formal, written rules governing work behaviour and the flexible, informal, tacit creation of shared values and shared understandings among organizational participants that enable the system to function effectively.<sup>11</sup>

Moreover, Chandler's image of the 'engineering' of structural organizational solutions through a succession of 'improvements' taken up by different lines in turn is in danger of glossing over the political infighting among the top management, the equally political problems of external relationships with financiers and the State, and the multitude of contingent factors that provided much of the drama of the early railroads' histories, including both McCallum's time at the NY&E (well documented in the *American Railroad Journal* ('*ARJ*')) and Haupt's time at the PRR (surprisingly ignored by the *ARJ* but well documented in the PRR's board minutes, in the Philadelphia press and by Haupt himself (Ward, 1971).

Successful organization was therefore not only about how to organize the management of technical railroad operations efficiently, it was as much about labour relations, about attracting and retaining good staff, and about handling issues both of internal governance (authority and accountability relationships not only with, but also within, the Board) and of external governance (accountability to the increasingly fragmented stockholder and voter constituencies who were the company's owners, as well as to the representatives of State government and district commissions). In the terms of modern organizational theories, the innovators of the PRR (and primarily Herman Haupt), building on the legacy of the Western and its imitators, successfully introduced practices to secure 'organizational legitimacy'--both internally (and 'up' as well as 'down') as well as externally--alongside the practices that ensured operational

effectiveness (Brunsson 1989). The PRR (like West Point) worked along all dimensions.

### *History*

We now show how our own examination of primary sources, building on that of Ward (1971; 1980) and O'Connell (1982), has revealed that the detail of the momentum that Chandler traced from the Western in 1841, through the B&O in 1847 and the NY&E in 1854 to the PRR in 1857 no longer holds up chronologically. It is true that Whistler--one of the very first 'Thayer' West Point engineering graduates--on the Western is the first significant influence, but as we shall show in more detail elsewhere (Hoskin & Macve, 2003) his organizational influence is not introduced purely in response to dealing with the aftermath of the 1841 crash: he had already been involved with the important organizational developments in 1839 (along with his West Point contemporary and brother-in-law, Wm H. Swift) so that his influence is more realistically attributed to his West Point experience, coupled with his own experience on the B&O (cf. O'Connell, 1982: 202, 213-25). In 1847, the fact that the B&O now copies from other northern lines arrangements which reflected both the innovations introduced by the Western and those of an earlier stage in the B&O's own development [O'Connell 1982: 179-80], also strengthens the significance of that linkage back to West Point<sup>12\*\*\*</sup>. But most importantly, as we shall now show in the next three sections\*\*\*\*\*, where we revisit the PRR's history in some detail, McCallum on the NY&E during 1854-6 can no longer claim the priority that Chandler gives him in providing the significant fertilization that enabled the 'final flowering' of divisionalization on the PRR in 1857, as the most significant changes within the PRR itself came much earlier than 1854. As we shall argue they were there in embryo right from Haupt's original organization plan for the PRR of 1849. Moreover, the real

significance of the PRR's 1857 reorganization itself lay along a different dimension to that emphasized by Chandler.

In particular, we shall explain the historical circumstances that have led to Haupt's role being obscured both in the shadow of J. Edgar Thomson's reputation on the PRR, and also in the publicity (particularly in the *ARJ*) surrounding Daniel McCallum's ideas on the New York and Erie. Finally, at the theoretical level, we identify the significance of the contribution of Haupt in the creation of 'big business', and examine how Haupt built a platform for the development of a discourse of 'strategy' as a business concept out of his application of the West Point practices of writing, examining, and grading. \*\*\*\*\*[do we??]

It is our inspection of the archival materials that has revealed that the organizational innovations on the PRR clearly owe their inspiration primarily to Haupt rather than to J. Edgar Thomson: but it has also shown that Thomson has generally earned the sole credit for them, for example from Chandler, as a result both of Haupt's own generous admiration of Thomson as a colleague and friend, and also of the simple fact that Haupt was only with the PRR formally for less than ten years (1847 to 1856, with an intermission in 1852-3), during much of which time his *de jure* titles (again to assist Thomson in the internal political power-struggles) effectively disguised his *de facto* executive roles and authority. That is why Thomson is the leader conventionally identified with the PRR's successful growth, as he was there right from the beginning in 1847, first as Chief Engineer and then also as *de jure* (but not *de facto*) General Superintendent, and finally was its President from 1852 until his death in 1874 (e.g. Ward 1980; cf. Ward 1971).

## THE SIGNIFICANCE OF HAUPT'S ROLE ON THE PRR

Herman Haupt ('HH') has been acknowledged as a key figure in the first ten years of development of the Pennsylvania Railroad ('PRR') (Ward, 1980; f. Chandler, 1977: 95, 105) but his contribution has generally been seen as secondary to, and overshadowed by, that of JET. However, a more careful look beneath the surface of the internal and external 'spin' that the politics of the early years of the PRR compelled the two men to undertake has revealed how far the conventional history of the PRR's organizational development needs to be rewritten.

HH was a 'second-generation Thayer' West Point graduate of 1835<sup>13</sup>, and he was initially appointed to the PRR as an assistant engineer in 1847 (when he was 30 years old), and despite his lack of previous experience in business management.<sup>14</sup> He rapidly rose to become JET's 'Principal Assistant Engineer' in 1848 and then Superintendent of Transportation (and *de facto* General Superintendent) in 1849 when the first section of the line opened. He was formally appointed General Superintendent in 1851, the first complete year of the road's full operation (albeit that it was still having to make use of intermediate connecting lines). After tendering his resignation in early 1852 in order to assist Thomson's *coup d'etat*, and being allowed to leave in November 1852, he was reappointed as Chief Engineer from 20 April 1853 and stayed until the end of 1856, still carrying out many other executive functions as Thomson's right-hand man. By then his other business interests had made him a rich man, and he was elected to the Board of Directors of the PRR from March to December 1856, when he finally left the company.

During this period many of the most important management innovations that Chandler (1965a; 1977) has identified as constituting the early organization of 'multi-

unit business’--including the development of organizational structures from the ‘natural’ functional to the ‘rational’ divisionalized structure (1965a: 22),<sup>15</sup> the design of bookkeeping and administrative systems adequate to handle a huge volume of daily transactions with sufficient internal control against theft and fraud, and the development of ‘accounting’ out of bookkeeping as a management decision tool--were being introduced on the US railroads.

What was HH’s role? And why is he particularly important to our history? On the PRR, the case can now be made that HH solved, very early, between 1849 and 1852, all of the key issues: how to subdivide the operational responsibilities, how to separate operational and financial control, and how to organize a central General Office which was the origin of the ‘staff’ function in the PRR’s ultimate ‘line-and-staff’, divisionalized organization, and in particular of the ‘controller’ function of accounting and audit that eventually became clearly identified--from 1857 onwards--as the key organ of managerial control. This office could effectively handle both day-to-day operations (in turn comprising not only ‘transportation’--the safe and speedy physical movement of passengers and freight over a properly maintained line by means of properly maintained locomotives and cars--but also ‘traffic’--the business service marketed to passenger and freight customers and priced to beat competition and secure a profit) and also the crucial long-term problems of cost determination, competitive rate setting and strategic expansion. In short, HH changed the rules of business discourse: the image in which he reconstructs business on the PRR is that of the organization which, managed by the numbers, succeeds both in establishing the administrative coordination and the elements of a new, workable corporate governance that ensure efficient operation through internal and external accountability, and also in establishing an accounting information system that

produces proactive, future-oriented decision-making.<sup>16</sup> Both at the level of operational management and at the level of strategy the PRR is thereby set on its path of expansion into *very* big business.<sup>17</sup>

HH also succeeded (where other railroad ‘organizers’--and in particular McCallum on the NY&E--appear to have failed), in securing the commitment of the company’s officials and employees to the success of the enterprise,<sup>18</sup> as well resolving, in partnership with JET, crucial issues of corporate governance and external relations. In today’s theoretical terms, HH designs that organizational ‘architecture’ which can create success ‘by enabling ordinary people to perform in extraordinary ways’ (Kay 1993: 69; see also Jenks 1961: 159-60, 177).<sup>19</sup>

As already noted, described in the terms of modern organizational theories, the innovators of the PRR (and primarily Herman HH) successfully introduced practices to secure ‘organizational legitimacy’--both internally (and ‘up’ and ‘down’) as well as externally--alongside the practices that ensured operational effectiveness (Brunsson 1989). The PRR (like West Point) worked successfully along all dimensions.<sup>20</sup>

All this was achieved primarily through one, initial masterstroke of organizational design, which was adopted by the PRR board in 1849 on JET’s recommendation and based on HH’s analysis of the organizational features of other leading railroads.

HH’s initial design achieved success along five crucial dimensions simultaneously: financial control, cost control, strategic analysis, and both internal and external corporate governance and accountability. Many of its features and their implications were to be contested over the next few years until JET finally became President in 1852. And even thereafter HH and JET sometimes differed over how best to exploit its potential for ‘management by the numbers’. But ultimately it was fully endorsed, and its basic form could still be detected in the organisational and

accountability structure of the infinitely more complex PRR of the 1880s. We now trace its conception and implementation.

Here we shall diverge significantly from both the details and the implications of Chandler's story. As he tells it (1977: 105-7), after becoming President in 1852, JET 'modified the centralized administrative structure set up by Herman Haupt, a highly successful civil engineer who had been the general superintendent of the road since 1849. Thomson's first move was to follow the example of his predecessors and separate the road's financial and operating departments. The modified organization remained quite adequate until 1857. Then, increasing traffic plus rising costs and the onslaught of a business depression brought a major reorganization'. Here Chandler identifies the establishment of the new central accounting department, separate from the treasury department, together with the creation of a secretary's office and a legal department. A purchasing department and an enlarged freight office were placed in the transportation department. Moreover, the most significant development in 1857, including 'many of McCallum's words and phrases' but going beyond his innovations on the NY&E, was the way in which JET now 'centralized the authority, as well as the responsibility for the moving of trains and traffic, and put this authority in the hands of the division superintendents of transportation. They were explicitly delegated the authority to give orders to men and managers in the other functional departments...[t]his line-and-staff concept, by which managers on the line of authority were responsible for ordering men involved with the basic function of the enterprise, and other functional managers (the staff executives) were responsible for setting standards, was first enunciated in American business by the Pennsylvania Railroad in December 1857' and stood in contrast to the more natural, departmental structure typical of British and European railroads. Similarly, '[o]f all the

organizational innovators, J. Edgar Thomson and his associates on the Pennsylvania Railroad made the most significant contributions to accounting' (Chandler, 1977: 109ff.)

The key dates in Chandler's story of organizational and accounting developments on the PRR are therefore 1849, 1852 and, above all 1857. As we shall show, the primary evidence (which was not available to Chandler) reveals that, while 1847 and 1851 also need to be added to this list, the nature and significance of the developments at these different dates also require a very different interpretation. First, we outline the background history of the PRR's business growth.

#### *The first years of the PRR*

In 1846 the PRR was chartered to connect Harrisburg to Pittsburgh, some 250 miles away.<sup>21</sup> It thereby joined the competition with the much older (but still uncompleted) trunk lines (in particular the B&O, the New York Central ('NYC') and New York & Erie ('NY&E')) for the race westwards. Railroad development had been slow during the depression of the 1840s, but the situation was soon to change. Despite further intermittent financial crises, construction was to boom in the 1850s--until the crash of 1857. But whereas these other lines had been long established and only now put on a spurt, the PRR, starting from scratch, did almost everything in the space of less than ten years.

Initially, the plan for the PRR was to build a single-track line from Harrisburg to Hollidaysburg (the 'Eastern division' of about 137 miles, which passed through the Appalachian mountains at Lewistown) and from Johnstown to Pittsburgh (the 'Western division' of about 85 miles). In between, the Allegheny mountain would still be crossed on inclined planes over the State's existing 36-mile Portage railroad (part of the 'Main Line' of canal and railroad works that had been constructed across Pennsylvania in the 1830s). The connection from Harrisburg to Philadelphia (about



another 110 miles) was provided by the existing Harrisburg and Lancaster Railroad (36 miles) and its connection at Dillerville to the state-owned Philadelphia and Columbia Railroad, also controlled by the canal commissioners, of which 71 miles formed the link in the PRR's route (PRR 1852a: 30-1; 33-4). Thus the PRR--given its initial objective to secure a rail connection over the 358 miles between Philadelphia and Pittsburgh--was condemned to have a physically and organizationally very complex structure right from the start, which would require an administrative organization having the 'requisite variety' (ref\*\*Ashby?\*\*) capable of dealing with the differing requirements of its various divisions. It also had to contend with the fall-out of the public pressure from the State to recover its recent 'sunk' investment in the canal system which the new railroads would rapidly make obsolete.

The state had required the PRR to raise at least \$3 million (10% paid) and to have at least 30 miles under contract for construction by 30 July 1847, or else the B&O would also be allowed to extend its main track from Cumberland in Maryland to Pittsburgh in Pennsylvania.<sup>22</sup>

In April 1847 JET was appointed Chief Engineer of the PRR (having initially refused the post), and began the survey and construction of the road (while also still acting for the Georgia Railroad ('GaRR') where he was formally still Chief Engineer). For the initial construction period he drew up a simple, one page organizational structure containing 11 clauses. From the beginning he was in dispute with President Merrick (a leading Philadelphia figure, but with no engineering knowledge) over their respective powers and authority, and faced obstruction from Merrick and his faction of the PRR Board, but a compromise was hammered out and an organizational structure for the 'Engineer Corps' was approved by the Board.<sup>23</sup>

The holding of the weekly Board meetings in Philadelphia, when all the work was west of Harrisburg, over 100 miles away, did not improve internal communication.

In 1847 HH was appointed by JET as a surveyor, to work on some urgent rerouting of the Eastern division. JET was getting desperate, but HH completed his first task of rerouting 4½ miles in just two days (instead of the anticipated month or more (Haupt n.d.a: 3)), and JET was able to meet his target of letting contracts for some 17½ miles (?15 per ARJ????) of the first section of the line to Lewistown, together with fifteen miles on the Western division, in time for the July deadline. The B&O thereby lost its charter in Pennsylvania.

HH impressed JET with his engineering knowledge, insight and ability (he found plenty of time both to fulfil his responsibilities and to ‘pursue [his] investigations on the distribution of strains in bridge and other trusses’ for the second edition of his 1846 *General Theory of Bridge Construction*) and he soon became JET’s personal assistant in the Harrisburg headquarters, doing all the detailed checking on the plans and progress of the whole line (Haupt n.d.a.: 3-5).

When the first 60 miles were nearing completion and the PRR was almost ready to commence operations in 1849, JET, as Chief Engineer, decided HH should be recommended to the Board for the appointment as Superintendent (i.e. chief operating officer). However, recognising HH’s lack of experience, JET sent him on a tour of other railroads in February of that year. JET appears to have been principally concerned with ensuring that HH would master the routines for the transaction of business and the technical aspects of operations. But HH read his brief at a deeper level, and made as thorough an investigation as he could of the organizational structures and lines of authority and accountability to be found on the other roads, perhaps realising that, as the PRR’s first Superintendent, his own position vis à vis the

Board and President would need to be clear (particularly as the President was Merrick who was the leader of the anti-Thomson faction on the Board).

HH was back within the month even though JET had allowed him two or three months. After HH's recommendations had been submitted to the Board in March 1849 (PRR Minute Book I, 155, 7 March 1849), they were adopted within three months.<sup>24</sup> However, in the interim President Merrick did ask JET on 16 March to let him see the background report on HH's tour. In formally replying to JET, HH stated:

‘In compliance with your instructions I have committed to writing and herewith submit a report upon the organization of the New York & Erie and several of the New England Rail Roads.

*The subject of organization was not one of those to which my attention was directed in your letter of instructions; the inquiries which I made were for private information* and therefore less full and detailed in some particulars than they would otherwise have been.’ (HH to Thomson, 28 March 1849 in Thomson, 1849--emphasis added).

JET forwarded the report to the Board via Merrick but observed: ‘I did not charge him specifically to obtain the information contained in his communication being fully conversant with the organization of the Eastern Roads. Their arrangements are generally upon a more expensive scale than we can afford for some years to come’ (Thomson to Merrick, 31 March 1849 in Thomson, 1849).

The most interesting features described in HH's detailed report included his description of the current systems of the NY&E and the Western railroads.<sup>25</sup> He concluded his report by observing that ‘The experience of the older roads is in favor of simplicity in organization and systems of accounts and opposed to any unnecessary multiplication of officers. The Superintendent derives his power from & reports to the

Board of Directors. The President is an executive officer<sup>26</sup> carrying into effect the resolutions of the Board, and attending to the financial operations of the road. The Western road presents the only instance, as far as my information extends, in which the President is burdened with the responsibility of any share in the direct management of the business operations of the road.'

HH was preparing the ground for what was to be almost a three-year battle over lines of authority and the role of engineering and management expertise on the PRR. JET generally seems to have favoured a tactic of accommodation, compromise and ambiguity to avoid open warfare with the President and the hostile faction of the Board (Ward 1980: 76-80) but HH recognised that the issues would have to be faced, in the end if not immediately. At least the structure for operations was now clear, even if the related governance issues were temporarily glossed over, and HH's recommendations on organization were accepted by the Board, apparently with, at the most, only minor alterations. HH had submitted his recommendations on his plan of organization to the Board in March 1849 (PRR 1849\*\*: Minute Book I, 155, 7 March 1849). A subcommittee of five considered it, and on 30 May, some amendments were made, which must have been inconsequential in HH's view (Haupt, n.d.a: 6). The plan was adopted on 8 June.<sup>27</sup>

Although JET, as Chief Engineer, had recommended HH to the Board for the appointment as Superintendent (i.e. chief operating officer), as a result of President Merrick's opposition the title of 'General Superintendent' was formally taken by JET (who also remained as Chief Engineer), with HH officially nominated as 'Superintendent of Transportation' on 20 August 1849 [？\*\*5<sup>th</sup> September] (PRR Board Minutes, I, 199): but it was understood between the two of them that JET would leave everything to HH<sup>28</sup>. 'No sooner was the appointment made than

persecution commenced with a view to embarrass and demonstrate my unfitness. Mr. Merrick and his Road Committee attempted to run the road from Phil<sup>a</sup>. and the Superintendent was ignored' (Haupt n.d.a: 7).

On 1 September 1849, after Merrick had resigned as President (but remained Chairman of the Board's Road Committee) and Patterson (another of the anti-Thomson faction) had replaced him as President, the first 60 miles from Harrisburg to Lewistown were opened, occasioning HH's first clash with the new President when the latter ordered an unscheduled refreshment stop of the excursion train at Harrisburg and thereby almost precipitated a crash on the single-track line.

JET was pressing ahead with construction, but was continually frustrated both by the Board's difficulties in raising sufficient funds to keep pace with the work and by the obstruction of the Patterson-Merrick faction of the Board. By the end of 1849 the Eastern division had reached McVeytown, and by September 1850 it was completed to Hollidaysburg at the foot of the Allegheny mountain. In October 1850 the connection was made to the Portage railroad that would tranship the PRR's passengers and freight over this mountain range. But this brought new problems as, from then on, the PRR and the canal commissioners were embroiled in disputes over timetables and tolls. The PRR therefore set about building its own connection across--or rather through--the Alleghenies.

1850 had also seen further internal wrangling between the Board and its officers over the management of operations as well as over finance for construction. After complaints against HH's 'inexperienced' management, and despite JET's defence of his protégé given the difficult operating conditions he was facing, with new sections of road being opening during the year, the anti-JET faction had secured a resolution in October 1850 that JET, Patterson and two other directors should visit other railroads

(including the B&O and the NY&E), clearly implying that HH's own tour in 1849 to ascertain best practice had been at least inadequate if not more seriously delinquent (O'Connell 1982: 251-9). However, no evidence that this trip actually took place--or that, if it did, it produced anything useful--is recorded in the Board minutes, although some have seen the appointment in 1851 of H. Lombaert as assistant superintendent in charge of the Transportation department, after 'long experience as a Resident Engineer on one of the best managed roads of New England' (PRR, 1852: 36-7) as one of its fruits (e.g. Hagley Library 2000: 63).<sup>29</sup> The tour (or at least, information from the B&O--O'Connell, 1982: 261) may also have formed the basis on which Merrick was appointed to chair a committee on organization in February 1851.

Meanwhile, progress on the Western division had been much slower, including violent strikes by Irish construction workers in February and May-June 1850. By 1851, the planned tunnel through the summit of the Allegheny mountain was under contract, but was proving even more difficult to bore than had been anticipated. To add to JET's frustration, the B&O, the NY&E and the NYC were making rapid western progress on their lines (Ward 1980: 101-2).

In January 1851, when HH formally became General Superintendent and JET reverted to being simply 'Chief Engineer', construction was still under way over the Alleghenies and on the Western division. But the Eastern division of the line from Harrisburg to the Portage Railroad was now complete, so that the road could now realistically offer 'through connections' from Philadelphia to Pittsburgh.<sup>30</sup>

What was the organizational structure that HH had introduced in 1849 and under which he had been developing the railroad's operations as they came on stream? In order to try to offer a 'through' service from Philadelphia to Pittsburgh, he had to cope with the necessity of managing the connections with the Portage, Harrisburg and

Lancaster, and Philadelphia and Columbia Railroads, as well as only having the fragmentary PRR line on the western side of the Alleghenies. HH described the structure in his own 'Report of the Superintendent of Transportation' (16 pages plus accompanying tables, dated 15 January 1851 and addressed to JET as Chief Engineer and General Superintendent, from the 'General Transportation Office, Harrisburg') as included in the PRR's fourth annual report. '[I]t appears to be proper, for the information of those who are interested, that an outline should be given of our business organization' (PRR 1851: 43). HH describes his February 1849 tour of other railroads and that 'I returned and by your directions proceeded to arrange a system which would be adapted to the business of our road.

A careful comparison of the various methods in general use, satisfied me that no other mode of keeping accounts exceeded that of the Georgia Rail Road in simplicity, and *with such modification as would adapt it to our peculiar situation*, no better could be devised; it was therefore assumed as the basis of the business organization which has met your approbation, and in accordance with which our operations have been conducted.

The organization referred to, divides the business of the road into four different departments, viz. Conducting Transportation, Maintenance of Way, Motive Power, and Maintenance of Cars--which have been under the immediate charge of the Superintendent of Transportation--as well as the Accounts of the General Office, and the Disbursements required for materials and labor in conducting the operations of the line' (PRR, 1851: 43-4--emphasis added).

With regard to the 'Accounts' HH explains: 'Without entering into any detailed explanation of the system of Accounts, it is sufficient to state that the arrangements are such that any error committed by Conductors or Station Agents, is almost certain

of detection at the General Transportation Office, where all daily, weekly and monthly reports are examined, and the results reported to the Treasurer for comparison with the statements of deposits made in local banks to his credit. No cash is received at the general office; its business consists in regulating all the other offices on the line, and in securing accuracy and uniformity in their accounts. Records are also kept at this office of receipts, disbursements, purchases, consumption of stores, performance of engines, and all other operations connected with the business of the road. From these records have been prepared the tables which accompany this report' (PRR 1851: 56-7).

A major part of the rest of HH's report is taken up with calculations and comparisons of toll rates being levied as a basis for his objections to the State policy. HH concludes by thanking JET for the benefit of his 'long experience in the practical and economical management of rail roads, and for the cheerfulness with which you have interchanged opinions in regard to the proper arrangements for the successful operation . . .' The tables that are annexed comprise monthly passenger statistics, westward and eastward separately, analysed by station; the expenses of his four departments; and technical data on, miles run by, and costs of the twenty-six locomotives. (\*\*\*\*re-check with web version\*\*\*\*)

### *The significance of Haupt's 1849 organisation plan*

The public relations 'spin' in the PRR's 1851 annual report is that HH's plan is little more than an adaptation of JET's earlier organization of the GaRR. This is valuable for giving it the blessing of the weight of experience. But what were HH and JET discussing daily after HH returned from his tour of other railroads? Their conversations (which cannot have actually lasted many days as HH had his



recommendations--including 'all the forms required in all departments'--ready by early March 1849) can surely not have been simply along the lines of JET saying 'Very interesting: but here's how I did it on the GaRR and I expect you to do the same', or why did JET send him out in the first place?<sup>31</sup>

At the level of overall structure it is indeed difficult at first sight to distinguish the PRR's initial organization clearly from that of the GaRR. HH's operating departments map exactly onto the GaRR's: but then almost every railroad had the same major technical areas of its operations to manage. But there are two significant differences: the first relating to corporate governance and the second to the management and utilisation of information. Moreover, it was a structure that allowed for both the initial necessary 'welding together' of the disparate parts (including the Portage, Harrisburg & Lancaster, Philadelphia & Columbia, together with the incipient parts of the 'Penn<sup>a</sup>. Central' itself), and also for the eventual divisionalization that would be needed once the whole structure was completed into a unified whole. By contrast with HH's enthusiasm for 'system', JET's own experience on the GaRR suggests that he would have had little interest in the minutiae of operational organization and routine.<sup>32</sup>

The strength of HH's organization of the collection and analysis of accounting and statistical information, for both operational control and strategic planning, we discuss further below. On the first dimension--that of corporate governance-- HH's 1849 plan reflected the findings of his tour and resulting report on organization: on the assumption that he was to be the 'General Superintendent' (*de facto* if not *de jure*), his overall responsibility for the four operating departments was to be directly to the Board. [any detailed evidence on this in 1849 minutes etc??????]<sup>33</sup> HH knew that JET as chief engineer had always had direct access to the Board (i.e. not simply through the non-engineer President) and in his view (presumably accepted by JET) it was

essential that when operations commenced the Superintendent should have a similar right.

### *The infighting over corporate governance*

As noted above, President Merrick would not countenance JET's protégé being given such power and he wanted the Road Committee to have the final say on operations. JET's ruse of adding the title of General Superintendent to his own with HH apparently reporting to him, while making HH *de facto* General Superintendent, secured a temporary solution while the line was still incomplete: but when JET finally relinquished that title in 1851 and it was now essential to make clear who was in charge of the full operation of the railroad, matters came to a head and were only finally resolved in 1852 by JET becoming President (encouraged enthusiastically by HH at the ultimate expense of his own position) and thereby entrenching both professional engineering and professional management expertise--the essence of disciplinary power--at the highest level.

In the meantime there had been further internal wrangling between the Board and its officers over the management of operations as well as over finance for construction.

In February 1851, perhaps stung by the insult of HH's formal promotion to General Superintendent, Merrick (now chairman of the Board's standing Road Committee) had himself appointed chairman of a committee to review the organization of the road (PRR Minute Book I: 395). Meanwhile Patterson had told HH to cease negotiating with the canal commissioners and HH had questioned whether Patterson, or only the Board, could give him such instructions. At the Board meeting on February 19<sup>th</sup>, a resolution was passed that 'the General Superintendent be

informed that the Board expect from him a compliance with the instructions of the President' (Ward 1980: 86; PRR Board Minutes, I: 399). The Board however did not accept HH's prompt offer to resign, so the issue continued to fester, with increasingly frequent eruptions (O'Connell, 1982: 258-9).

In the late Spring JET returned to the GaRR for a month on his last assignment there and, perhaps taking advantage of JET's absence, Merrick pushed through (despite strong opposition--O'Connell, 1982: 262) a revised plan of organization which he no doubt hoped would put HH in his place once and for all by securing Patterson's own authority, if not Merrick's as well. On 2 May 1851, at a special meeting of the Board (Minute Book I, 435-440) the new plan of organization, with some amendments (but ignoring several that HH had suggested--O'Connell, 1982: 259; Haupt 1852a: 13-15), was finally adopted. However, its symbolic significance in the power-struggle seems to have been greater than any practical effect on the governance and operation of the railroad. Previous historians have largely ignored it, and while disagreeing with the factual basis on which most of them have made their assessment, we agree with their judgement as to its lack of historical significance.<sup>34</sup>

By October 1851, the relationships between the Board and its chief officers reached a new low, when HH was charged with insubordination on a pretext trumped up by Merrick. By the end of 1851 JET was again thinking of resigning but now had the prize of completion of the road in his grasp. He had opened 57 miles of the Western division, leaving only 28 miles to make the connection to the Portage on that side of the Allegheny mountain (Ward, 1980: 85).<sup>35</sup>

The Boardroom--and ultimately extremely public--fights over Merrick's attack on HH were finally to lead to the ousting of Patterson and his faction and the election of JET to be President in February 1852 (Ward 1980: 85-90). During the last round of

the fight, and in order to secure JET's position, HH himself felt he had no honourable alternative but to leave the company, but delayed his departure until November 1852 when he felt everything was sufficiently in order for Lombaert to take over as General Superintendent and manage without him.

In the meantime, and while Patterson was still President and the dog-fight was still raging, HH issued his annual report as General Superintendent, dated 1 January 1852, for inclusion in the PRR's annual report, comprising 25 pages of printed text and 8 accompanying tables (PRR 1852: 30-62). We discuss the accounting significance of his preparation of this report below, but it is interesting that, despite the fight over the May 1851 reorganization and the even fiercer battles that were still raging over his position, HH's comment on organization was simply 'The business of the Pennsylvania Railroad is divided into four general departments, viz.: Maintenance of Way, Conducting Transportation, Motive Power, and Maintenance of Cars, as was fully explained in the last annual report. This division is both convenient and natural, and gives entire satisfaction in practice' (PRR 1852a: 36). Moreover, in highlighting how low the 'whole cost of running the trains per mile' \*\*\*\*?passenger and ton-miles of B&O\*\*\*\*\*had been compared with any other US railroad (including 'any of the best managed roads in New England' as well as the GaRR and the B&O), HH observed that 'Should this result be attributed to causes other than good management, it will at least prove the absence of wasteful expenditure, in the Transportation Department' (PRR 1852a: 54).<sup>36</sup> Even allowing for a natural bias in his spin on the situation, the practical impact of the May 1851 reorganization on his own system, as established in 1849, appears to have been minimal. HH's 1849 plan had survived its first trial.

*Did Haupt's plan of organization survive his departure?*

The infighting on the PRR intensified further and finally became such a public scandal that the stockholders in 1852 had voted JET in as President to replace Patterson: as already noted, in the course of the manoeuvrings it was necessary to reassure JET (still Chief Engineer) that it was not too risky for him to throw down the gauntlet and stand for election as President, and so HH, who had become the *bête noire* of the opposition, offered to resign from the railroad.

Although JET, following his successful election, then tried to persuade him to stay on as General Superintendent, HH would only agree that it was honourable for him to stay until affairs were in a satisfactory state to manage without him, and he finally left in November 1852, when JET found him a construction appointment in the South. However, after a few months he would return to the PRR, in April 1853, as Chief Engineer.<sup>37</sup>

Following HH's resignation as General Superintendent, effective 1 November 1852, there had been a further reorganization of operations by JET's Board. On Nov 23, 1852, 'The Road Committee reported a plan of organization for conducting the business of the road' (PRR MB II, 273). The plan was printed for circulation (PRR 1852b) and begins: 'That the duties, powers and responsibilities, of the several officers and employees of the [PRR] may be defined and fully understood, and that their accounts may be systematically kept, the Board of Directors, from whom all the officers of the Company derive their authority, and to whom they are responsible, have adopted the following organization for conducting the business of the Road'.<sup>38</sup> Four departments are defined: construction, transportation, auditor's, and treasurer's. 'The whole to be under the general direction of the President, as the organ of the Board.'<sup>39</sup>

With respect to the Transportation Department, the duties and responsibilities of the Superintendent are set out. In large part the details follow the order of and reflect those set out in the 1851 reorganization, but with some subtle but crucial differences of wording.<sup>40</sup> Reflecting the increasing operating complexity of the PRR, now that all the new line apart from the central mountain stretch had been brought into commission, albeit with double-tracking still in progress, the subdivisions of the Transportation department are also spelled out more fully and the elements of a divisional operating structure now begin to emerge.<sup>41</sup> The organization was gradually evolving, as the road grew, towards the wholly divisional organization of 1857 that has generally been regarded as JET's primary legacy to modern management.

But it is now clear that this particular 'divisional' form in fact evolved principally to suit the peculiar structure of the PRR's operations as they rapidly developed, as was indeed reflected in the original 'divisional' organization of the Engineer Corps when construction started in 1847. The significant contribution to 'modern management' was HH's 1849 organization plan that had laid down the master template of both organization and full accountability of operations (linked to the strategic use of the numbers as discussed further in the next section) from which the final pattern for the PRR was to emerge as the line reached completion, and subject to particular talents of the senior officers that were available at any given time.<sup>42</sup> Unlike the other railroads that he had visited in 1849, the PRR clearly had right from the start, albeit in embryo, a divisional operating structure imposed both by the physical barrier of the Allegheny mountain separating its Pittsburgh and Harrisburg sections (as JET had necessarily recognized in his 1847 organization of his Engineer's department for constructing the road), and in addition the necessity to link into the State-owned connections to Philadelphia (as well as, initially, over the mountain).

Only towards the end of the period of construction and HH's term of service did it become clear that the PRR would be able physically and organizationally to operate continuously between Philadelphia and Pittsburgh (with further new strategic connections being established westward beyond Pittsburgh).

So, in order to weld together the organization of the whole line as it emerged out of the disparate sections, part new and part inherited, in the first phase the priority was to impose a uniformity of operating and reporting standards from the centre. But as this was achieved, the total length of the completed railroad made splitting it back into 'line' operating divisions under what had now been built into a central 'staff' itself a wholly 'natural' mode of organization in which it could, to an extent, look to the precedent of the NY&E: a precedent which HH himself had noted on his 1849 tour, and which therefore considerably antedated both McCallum's own contribution to the NY&E, and indeed the NY&E's other earlier attempts at achieving organizational discipline (e.g. New York & Erie Railroad Company 1852).

Right from the beginning HH had faced, and identified the solution to, the question of how to organize a line which was far more complex than the GaRR, or even the B&O, itself. Both of these had just single main lines, which had been continuously constructed from origin to terminus, together with minor branches therefrom.\*\*\*\*\*[check]

But there was more to the 1852 reorganization under JET. In what Chandler (1977: 105) apparently sees as its most significant feature, a new top-level department was created alongside 'construction' 'transportation' and 'treasurer's', namely the 'Auditor's Department'. In the Annual Report on the year, JET explained that it was necessary to relieve the Superintendent of some of the former accounting and

reporting responsibilities of his post, as ‘they have required too great a tax upon his time to communicate’.

‘To preserve this system in its efficiency, and to subject the accounts of the company to the scrutiny of a responsible officer, the Board have, under the recent organization adopted for the Road department, appointed W. B. Foster, Esq. (formerly Associate Engineer), auditor, and consigned to him the duty of their examination and entry at the principal office in Philadelphia’ (PRR 1853a: 15-16).

The 1852 organization plan now provided that the ‘Auditor shall have the charge and supervision of all the accounts of the receipts and disbursements of the finished road’ (for further details see Appendix IV and Hoskin & Macve 2003)

The Auditor’s department was therefore essentially a separate identification of one of the two main activities of HH’s original 1849 ‘General Transportation Office’, by which he had ensured that ‘any error . . . is almost certain of detection’ given its role of ‘regulating all the other offices on the line, and in securing accuracy and uniformity in its accounts’. This office had grown in the meantime as a ‘staff’ office, based in Philadelphia, as discussed further in the next section where we look at HH’s organization of the accounting in greater detail.

After the provisions for the Auditor’s and Treasurer’s departments had been set out, it is noted that ‘Station and ticket agents shall make their reports to the Treasurer and Auditor, in such manner and form as they may prescribe’ but they ‘shall be subject to the general supervision and direction of the Superintendent’ (PRR 1852b: 12). In other words, the organization of ‘traffic’--the business side of the railroad’s operations--still belonged to the Transportation Department, but with the creation of the Auditor’s department out of that department, added to the original separation of



the money handling by the Treasurer, a somewhat more complex set of departmental interrelationships had to be catered for.<sup>43</sup>

Most importantly however, after all the provisions relating to all the departments had been set out, it was stated in conclusion that ‘All instructions emanating from the Board or President, in regard to the proper business of either<sup>44</sup> of the departments, shall be given through the heads thereof’ (PRR 1852b: 13).

This clear specification of the line of authority was an issue that had concerned HH even after JET had become President. When he had written, as General Superintendent, to the Chief Clerk (his brother L. L. Houpt) on 31 July 1852--during the ‘interregnum’ before his assistant Lombaert took over as Superintendent--about what ticket prices should be, he concluded ‘Notify . . . agents, directions should proceed from you--It is important that you should never act on any supposed instructions from the President without informing me. Mr. Thomson says that what he said was more as an expression of opinion than as a director’ (Haupt 1852b: 174-5). HH and JET were close enough for such potential clashes to be easily resolved informally: but one can almost hear HH telling JET that when he left and there was a new Superintendent in charge the rules on line authority would have to be written down clearly---and they were.<sup>45</sup>

#### HAUPT’S 1849 ORGANIZATION: ACCOUNTING INFORMATION FOR FINANCIAL CONTROL, COST CONTROL, OPERATIONAL MANAGEMENT AND STRATEGIC PLANNING.

**\*\*\*\*\*[this section still very rough!!!]\*\*\*\*\***

Once again, historical investigation of the internal development of accounting and its use on the PRR is limited by the accident of survival of business records. Due to losses through fire at the company's premises very few early internal documents--beyond the company's minute books and certain letterbooks--survive, although the recent cataloguing of the PRR collection in the Pennsylvania state archives in Harrisburg and at the Hagley Library in Wilmington, DE, has enabled us to unearth some rare, lucky survivors of original early management documents that are of great value and importance in now reinterpreting the PRR's early organizational development.

Accounting on the PRR had to begin with the organization of JET's engineer corps for construction in 1847. [*?repetition ->*] We have noted previously that JET was a traditional engineer who had learned from experience but was not schooled or 'grammatocentric' in the least. However, during his period working as chief engineer on the Georgia Rail Road ('GaRR') from 1832 to 1847, he had placed emphasis on accounting and cost recording as important in controlling expenditure and revealing that railroads really could be a profitable, sound investment. JET described his system of organization in his annual report in May 1842 (Georgia Rail Road and Banking Company 1842: 4-5). Although he did not describe his matching system of accounts and reports here, in his 1844 report, in referring to the tables accompanying his report, he said: 'These are abstracted from a carefully arranged system of accounts, kept from the commencement of the business of the road, in greater detail. This system of accounts, strictly adhered to, has mainly contributed to the economical administration of the several departments, and will also be found, in their future management, to be of great service to the company' (Georgia Rail Road and Banking Company 1844: 18). Included in the tables is an analysis of expenses arranged under the familiar four

departmental headings of ‘Conducting Transportation’; ‘Motive Power’; ‘Maintenance of Way’; and ‘Maintenance of Cars’ (Georgia Rail Road and Banking Company 1844: 21; see also 1843: 14; 1842: 16). [*←?repetition*]

The GaRR annual reports also included various comparative figures and operating statistics<sup>46</sup> which made it one of the better railroads at disclosing information and would naturally have been carried forward when JET moved to the PRR: but in this regard the B&O had long set the precedent.<sup>47</sup> Moreover, while JET recognised the crucial importance of cost control and the need to understand the cost implications for rate setting, he was not the kind of man to be capable of, or interested in, investigating the detail for himself. We have already seen both his reluctance in getting involved in detailed organizational design and operating detail on the GaRR, and his corresponding delegation of both these responsibilities to Haupt on the PRR.

His similar lack of expertise in the detail of accounting is illustrated with regard to the PRR’s fifth annual report on the business of 1851 (PRR 1852a). In the President’s report ( i.e. from Patterson, dated 31 January 1852), after the Treasurer’s report there is a ‘Statement showing the receipts and expenditures of the Transportation Department, for the year 1851’ giving net receipts of \$337, 864.82, with a note saying ‘As shown by the books of the Treasurer, January 1 1852. The actual net revenue, after the payment of all bills against the business of the year, is \$332,925.30, as far as ascertained’ (PRR 1852a: 11), which is the net amount that appears in Haupt’s own report as General Superintendent (PRR 1852a: 58). There is a difference in revenues of \$13,946.98 as between the Transportation department’s records (\$1,039,565.49 - shown in the annual report at p.58) and the Treasurer’s books (\$1,025,618.51). This has to be explained by Haupt in a letter to JET, dated 15 June 1852 (Haupt 1852b:58), as JET--presumably concerned in his new role as President--had agreed that the

General Superintendent should be questioned about the apparent discrepancy, which was due to uncollected bills (i.e. the Treasurer's accounts included only cash receipts and payments, without the accruals made in the General Office accounts to reflect the business done, 'the records bearing the dates of ticket sales and manifests'). Haupt comments: 'From these causes, differences must always exist. The close agreement under the circumstances is an evidence of accuracy'.<sup>48</sup>

When Haupt had described, in the PRR's fourth annual report, in his own 'Report of the Superintendent of Transportation' (16 pages plus accompanying tables, dated 15 January 1851 and addressed to JET as Chief Engineer and General Superintendent, from the 'General Transportation Office, Harrisburg') the arrangements he had introduced when operations began on the PRR in 1849, he stated: [*?repetition -->*]

'A careful comparison of the various methods in general use, satisfied me that no other mode of keeping accounts exceeded that of the Georgia Rail Road in simplicity, and with such modification as would adapt it to our peculiar situation, no better could be devised; it was therefore assumed as the basis of the business organization which has met your approbation, and in accordance with which our operations have been conducted' (PRR, 1851: 43-4).

With regard to the 'Accounts' Haupt explains: 'Without entering into any detailed explanation of the system of Accounts, it is sufficient to state that the arrangements are such that any error committed by Conductors or Station Agents, is almost certain of detection at the General Transportation Office, where all daily, weekly and monthly reports are examined, and the results reported to the Treasurer for comparison with the statements of deposits made in local banks to his credit. No cash is received at the general office; its business consists in regulating all the other offices on the line, and in securing accuracy and uniformity in their accounts. Records are

also kept at this office of receipts, disbursements, purchases, consumption of stores, performance of engines, and all other operations connected with the business of the road. From these records have been prepared the tables which accompany this report' (PRR 1851: 56-7). [*←?repetition*]

The tables that are annexed comprise monthly passenger statistics, westward and eastward separately, analysed by station; the expenses of his four departments; and technical data on, miles run by, and costs of the twenty-six locomotives. (\*\*\*\*re-check with web version\*\*\*\*)

*N B like GaRR and B&O: but much more complicated for him given structure???hence his file 286 calcs?? but ?B&O had sub-bit comparisons too*

Indeed, where the PRR's structure was to show the most significant development was with respect to the 'General Transportation Office'. By comparison, the GaRR's accounting ??while enabling the ?Supt or JET?????to monitor and control expenditure levels in a traditional financial management, did not appear to utilise the accounts as a direct management statistics tool for engineering the future.

\*\*\*\*\* (o/s evidence re JET and accounts there(Ward and 1842 report) and Haupt re Western (and ?B&O which created one department for Working of the Road and one for Collection and Disbursement of Revenue)\*\*\*\*\*also need to cater for inevitable divisionalization on PRR (and given existing Portage, H&L and P&C)\*\*\*\*\*

One function developed in that General Transportation Office was the control of 'Traffic', i.e. the administration of the business service marketed to passenger and freight customers and priced to beat competition and secure a profit.<sup>49</sup> Before the end

of 1849 Haupt appointed a Bookkeeper of Transportation plus two clerks (one was his younger brother, Lewis L. Houpt<sup>50</sup>). These men worked with preprinted forms in order to generate timely, accurate freight information from the independent Philadelphia freight agents, in order, so Haupt told the latter, 'to relieve the agency of a large portion of the labor'.<sup>51</sup> (\*\*ref\*\*)

While the General Transportation Office itself remained in Harrisburg (relocating to Altoona at the eastern foot of the Alleghenies by the beginning of 1853), an increasing amount of administration was carried out in Philadelphia where the company's head office was, as well as the Chief Engineer's office. By 1851 a separate Freight Agent's office was set up in Philadelphia, thus internalizing the business management of the freight collection, storage and transportation function.<sup>52</sup> Also Haupt regularized a passenger transport department. One of the key functions of this was to oversee the issue of tickets and collection of fares. [It appears that Haupt uses a coupon ticket system: this will prove valuable for matching revenues to journeys actually travelled and passenger-related costs incurred.\*\*\*evidence\*\*\*]

The organization of the 'general office' therefore provided a firm foundation on which to build the routine administration of and accounting for the PRR's rapidly expanding business, and its regular reporting both to the Board and publicly in the annual reports. As Chandler (1977: 110) notes, by 1857, when the separate 'Accounting' department is established, the PRR had '144 sets of basic accounting records'.<sup>53</sup> But what is most remarkable is that these 'sets'--which represent the expense headings in what is effectively a chart of accounts annexed to the 1857 reorganization--in turn all fall either under the major headings of Haupt's *original* 1849 departmental structure (comprising Transportation--split between passengers (by

1857 numbering 28 accounts) and freight (29); Motive Power (26); Maintenance of Way (22); and Maintenance of Cars (8)) or else under 'General Expenses' (8) or--the residual vestige of JET's original 1847 Engineer Corps--under 'Construction and Equipment' (21). In addition of course, albeit not specified in the list, there must also have been an array of revenue accounts enabling the analysis of the road's earnings from the various classes of freight and passengers over the various sections of the line: analyses which Haupt had been able to provide in his annual reports as General Superintendent from the beginning of operations in 1849.

Of even greater interest for the development of modern cost and management accounting is the way in which the vast amount of information routinely processed by this accounting system, when aggregated under Haupt's account headings, provided the basis both for financial reporting to stockholders and, even more significantly, for cost accounting for management decision making and control at both the operating and the strategic levels.

By 1850, Haupt was pursuing the question of rate-setting. In 1850 the Board's Road Committee issued a freight toll sheet with rates that--although they appeared to cover the charges and tolls due to the other transport links the road had to use--did not, Haupt quickly calculated, cover a range of other transportation costs ('a dozen or more items') that the directors had left out of account. Haupt therefore suspended the rates. The directors immediately summoned him and the General Freight Agent, and Merrick (Chairman of the Road Committee) 'expected to demonstrate the ignorance of the Superintendent'. Haupt thereupon provided them with the detailed cost figures to prove his case, and the Chairman retreated to suggesting that 'that is not a heavy loss for the Pennsylvania Railroad, not enough to make a fuss about', to which Haupt witheringly replied: 'If the Board was willing to do any business for nothing and pay

for the privilege I would always be found willing to carry out instructions after advising them of the facts' (Haupt n.d.a: 9).

But he went much further towards competitive rate-setting. In early 1852--during the last days before the JET coup--he was finally goaded to publish to the citizens of Philadelphia the detailed grounds on which he believed--or rather had calculated--that the Patterson-Merrick board was fundamentally mistaken about the relationship between tariffs and costs of different classes of business, and their impact on the overall profitability of the railroad (Haupt 1852a; Ward 1971, 87-89). His information on freight patterns led him to introduce heavily discounted rates for larger shippers or those who shipped in carload lots. He was quite happy to use contribution pricing if the business volume dictated it (e.g. on otherwise-empty eastbound freights). As two major elements of the PRR's costs were the tolls it had to pay for using the State-owned portions of the line (i.e. the Philadelphia and Columbia and the Allegheny Portage sections) and the tonnage taxes it also had to pay to the State (which was thereby attempting to protect itself from the loss of revenues from its existing Main Line canal), Haupt also factored into his analyses the adverse effects of these costs on the demand for and therefore on the volume and costs of the PRR's own business, and the consequent greater loss to the State from traffic being competed away to the other new railroads and improvements, in particular the B&O and the Erie Canal. He and JET made a main plank of their political attacks--constantly reiterated in the PRR annual reports and backed up with detailed correspondence and negotiations--the economic logic which made imperative the need both for efficiency improvements and cost reductions on the State roads and for the abolition of the taxes, so that the PRR's increased volume could bring the benefit of lower costs and in turn rates, in a virtuous circle of increasingly available and cheap transport for the benefit of



customers, stockholders, and ultimately the State's own revenues (Ward, 1971: 84-6; 1980: 110-16).

Even more significantly these calculations were not merely used as ammunition to attack his enemies: Haupt stood by them even when they showed his allies to be in the wrong. He wanted to move much faster than JET to high-volume, low-cost, competitive pricing. As he pointed out in his reminiscences of the PRR, he calculated that by bringing rates on bulk produce (coal and lumber) to Philadelphia down to 6 mills per ton-mile (over just the easier eastern division) or 7 mills per ton-mile (all the way from Pittsburgh) he could generate a large increase in business and also in profits. But JET, hidebound by his experience of being able to extract profits from high rates and low volumes through a near monopoly for transporting cotton on the GaRR, believed that a rate below 2 cents (i.e. 20 mills) per ton-mile would not cover costs. So Haupt reminisces:

‘I made an analysis of the business of the preceding year, dividing expenses into fixed and variable and determined the influence of volume and other conditions upon the variable expenses. It was perhaps the first detailed analysis of the cost of rail transportation that had been made . . . ’ (Haupt n.d.a: 22)

But JET and his managerial and board colleagues did not approve of discounts in general and would not believe his calculations about the volume effect. Only Thomas A. Scott would support him and on this issue Haupt lost. JET would not drop freight rates below 15 mills per ton-mile.

It is clearly a matter of great interest as to when Haupt made this pioneering cost analysis. The most natural interpretation of his own exposition of the story is that the argument occurred after JET was made president (in February 1852) and Scott had reached a position of some seniority (he became assistant superintendent, with

responsibility for the western division, after Haupt's first resignation from the PRR at the end of 1852). This fits the context of the story in which Haupt also remarks that:

For asserting in my first report as Chief Engineer that with a reasonable reduction of rates the business of the Penn. RR could be increased to a million tons per annum I was regarded as a fit candidate for the lunatic asylum. The term visionary enthusiast was one of frequent application (Haupt n.d.a: 22).

The report Haupt refers to was that of February 1854. In it Haupt argued that with the expansion of the Erie canal its eastward freight capacity would expand from 3 million to 7 million tons per annum, giving New York, with its railroads, a total capacity of 9 million tons per annum. So Philadelphia should be able to capture some of that vast business as at present the Pennsylvania Canal's capacity was only about 1 million tons per annum (and it was actually carrying only 0.1 million tons per annum). So, even if the PRR reached 1 million tons, the total Pennsylvania capacity would still be less than 2 million tons per annum. 'I can see nothing unreasonable, therefore, in the supposition that the demands of trade upon the Pennsylvania Railroad may reach one million of tons--the single item bituminous coal, transported at about one and a quarter cents per ton per mile, could afford half a million of tons per annum, and allow a profit on the increased business' (PRR 1854a: 33). Haupt also notes that a million tons implied the need for 300 freight engines<sup>54</sup> costing \$2½m and concomitant facilities and employees. This could be financed out of retained profits, but the PRR must have repeal of tonnage tax, 'and LOW RATES with MODERATE DIVIDENDS' as growth for the sake of Pennsylvania's cities and the State was more important 'than large profits upon transportation' (PRR 1854a: 34). Finally Haupt notes that the 'Erie Canal, when enlarged, will be able to carry, tolls included, at seven mills per ton per mile, and pay ten per cent. to the State on its whole cost.' So he even contemplates

carrying heavy freight ‘at less than cost’ if the taxes are removed, as the PRR would still be profitable ‘on aggregate business’ given the increase thereby made possible in profitable passenger business (PRR 1854a: 35).<sup>55</sup> [*?correlation??*]

The most likely interpretation is therefore that Haupt made his pioneering analysis of ‘fixed and variable’ costs at the beginning of 1854, after his return as Chief Engineer in 1853 and based on the accounts for 1853. Interestingly, he went public in 1857--after he had finally left the PRR--on his continuing disagreement with JET and his Board over the tolls for coal freight and the potential for profitable expansion of this business (Haupt 1857). His pamphlet runs to 33 pages, largely consisting of detailed and highly sophisticated calculations--based entirely on the figures for 1856 in the published Annual Report--of the incremental cost implications of carrying more coal a) within the capacity of the existing engines and cars and b) if investment were made in additional engines and cars.<sup>56</sup>

What is particularly remarkable is that he is able to make these calculations after he has left the company and relying solely on the figures published for different categories of cost in the annual report on 1856 (albeit informed by his own direct experience in knowing how to interpret them). In other words he was able to demonstrate that the system of accounts he had established in 1849 for the ‘four departments’, and which was to remain in use long after his final departure in 1856, provided information not only useful at the level of stockholders’ appraisal of their investment in the railroad but at the senior management level of identifying the likely implications of strategic alternatives.<sup>57</sup>

As the figures arrived at in his 1857 analysis differ from those referred to in his reminiscences, this analysis cannot have been the ‘first’. Indeed, given the complexity of the calculations, and his own new preoccupation at the time with the exceptional

difficulties of the Hoosac tunnel construction on which he was now engaged in Massachusetts, he must have done similar calculations in preceding years and had now to do little more than update the numbers.<sup>58</sup> So the 1857 pamphlet shows the pattern on which he must have made the complex calculations underlying that earlier analysis.

It is just possible that the first analysis could have been only a year earlier (i.e. on the 1855 figures), during his last year with the PRR, but given that similar conclusions are reached about the potential volume increases that are feasible (i.e. to a million tons per annum) as were contained in his ‘lunatic’ report as Chief Engineer dated 25 January 1854, we are led again to the most plausible explanation being that Haupt’s first detailed analysis of cost behaviour was also carried out either on the 1853 figures at the beginning of 1854, or possibly even on the 1852 figures after his return to the PRR as Chief Engineer in April 1853. Of two things however we can be sure: a) long before Fink’s work in the 1860s HH had found new ways to utilise the accounting and other statistics that railroads such as the B&O and the GaRR, and now the PRR, had been publishing but which he knew had not previously been analysed in this strategic manner;<sup>59</sup> and b) no historical claim could now be sustained that Haupt derived his approach to costing from any principles established on the NY&E, as McCallum was not made superintendent there until 1 May 1854, and did not publicise his own management approach until his report in the NY&E annual report in March 1856.<sup>60</sup>

With his January 1852 report Haupt provided full accounts of the 1851 year’s operating results, supported by a detailed breakdown of the expenses of his ‘four departments’ together with a range of tables giving analyses of passenger and freight receipts and statistics, costs and statistics of engines, and an inventory of cars.<sup>61</sup> By a rare chance of survival, the thirty-eight handwritten background working papers for

this report are still extant in 'Board file 286'.<sup>62</sup> Interestingly, while over half of the papers do reveal the supporting calculations and analyses which underlay both Haupt's published tables and also some of the complex cost calculations in the body of his report, several of the papers provide additional analyses that are not reported in the published version. These include further monthly analyses of receipts by division, by type of business and by length of journey etc. on the PRR 'proper' and on its connecting roads (documents 1 through 5, and a further nine documents between numbers 21 and 37); an allocation of all the 'Expenses of Penna. R.R. subdivided between Passenger and Freight' (document 17), which is consistent with the figures in document 16 as published in the printed report (PRR 1852a: 55-7) but also includes allocation of the Maintenance of Way expenses (which are not allocated in the printed report)--it is not known how these were allocated; and a calculation of the 'Average length and cost of road in use' (i.e. time-weighted lengths open on the Eastern division during the year, with estimated adjustments to take out costs attributable to Mountain and Western sections) (document 30).<sup>63</sup>

It is therefore clear that right from the beginning Haupt had been using the figures revealed by the accounting system he had established in 1849 to provide as objective a basis as possible both for operational control (and in particular, cost efficiency), for reporting performance, and also for strategic decision making. The extent of the work underlying his published report on 1851 is reinforced by two further documents that also luckily survive in Board file 286, namely two lengthy letters from Haupt also dated January 1852 (so also made to the 'old' Board), and also replete with detailed calculations, comprising, first, a thirteen-page report 'exhibiting the injury which must result to the trade of the State by a continuance of the three mill tax upon the tonnage of the Penna. R.R.' and, second, a ten-page report covering 25 heads of

argument as to the difficulties and the increased cost of transport over the PRR arising in consequence of its connection with the State improvements. Moreover, his published reply to the Patterson-Merrick faction's attacks on him, dated 20 January 1852, is similarly replete with detailed calculations of how much the various incompetent if not negligent actions of Patterson and others had cost the PRR (Haupt 1852a).

Fundamental to Haupt's calculative practice was the prior determination of costs.<sup>64</sup> It has been apparent that Haupt was from an early stage getting from each department of the business daily, weekly and monthly reports [*evidence on frequency??*], which were required from employees at all levels. There was a combination of broad vision and petty obsession, familiar to many managers since: he even concerned himself with 'washing the cars. . . overseeing the peddlers on the trains and chasing the stray cattle off the track' (Ward 1971, 79). But it has not been clear until fairly recently, when the worksheets compiled by Haupt for the 1851 Annual Report were unearthed, that he was generating valuable management data, based on careful analysis of both costs and sources of revenue, very nearly from the outset.<sup>65</sup> Given the physical and organizational structure of the railroad at this time, comprising a string of different sections, gauges and owners, any attempt at analysis must have been dauntingly complex. [*repetition?? →*] These sheets provide the data, compiled from the monthly returns, on receipts, expenses, and volume of the year, broken down by categories of passengers and freight, that allowed him to undertake cost allocation using a range of activity measures, and also, perhaps due to the ticketing system he was compelled to adopt to deal with the complexities of the road's structure and connections\*\*\*, to allocate revenues to the various parts of the network. Thus, unlike most railroads, then and since, it appears he has a simple workable

system for exploring the relation of transportation volume to transportation costs and revenues, and thus is able to carry out his pioneering analysis of cost behaviour--as we have argued, probably in 1853/4--for the purpose of determining minimum rates for coal-freight. [*←repetition??*] The cost data were always those from the past: but he used them to provide an objective benchmark against which to gauge the realism of his projections for the future. From the outset Haupt committed himself to managing by the numbers and put the two principles of grammatocentrism and calculability into operation. Everything--and thereby everyone--was turned into writing, examined and rendered calculable. And this applied to the future just as much as to the past: to strategy as much as to cost control.

Certain episodes stand out in this first few years, where strategic planning to maximize volume, and based on the numbers, is enacted by Haupt.

The first instance is only an aside from the disputes with the Board over rate-setting. In summer 1851 he argued that the road should carry passengers and freight bound for Baltimore and do so at standard rates, but to the Board this was to offer free assistance to the competition on the Baltimore & Ohio. Haupt's written response to the President was that their policy should be:

‘to get all of this business that we can conveniently accommodate, and charge upon it as much as it will bear; thus using it as a means to cheapen tolls to Philadelphia . . .’ (quoted in Haupt 1852a: 23)

He soon gave this policy specific direction, once he had full-year figures to work from. The 1851 figures revealed that gross income from passenger traffic was almost double that of freight: he therefore decided to concentrate on maximizing passenger revenue. But within this category while there had been 13,441 regular passengers from Philadelphia to Pittsburgh, the figures showed there had been only 4,218

emigrant passengers. Haupt decided that there was room for significant expansion here. What followed is a classic early marketing solution. He needed to generate his traffic from the immigrant market, but that nearly all came in through New York. As the PRR had no direct access to New York, nor any ticket agent there, Haupt, undaunted, negotiated link-ups with the Camden & Amboy Line, and various state-owned canal sections. He set up deals with the existing ticket agents in New York to draw business from the New York based railroads, and then set up his own employee on the Camden & Amboy pier to sell tickets before the immigrants were even off the boat (Ward 1971: 82-3). In the end by late 1852 he had achieved his objective. In so doing, he was not looking to the short term. After paying all the parties involved, on a \$5.25 through ticket, only \$1.55 was coming as revenue to the PRR. But he had established a means for generating market share where previously there was none. And he had done so by pursuing the logic that only emerged in the first place from the written figures.

As we have seen, he could not carry JET with him on the argument over tariff rates for coal-freight. A decade later however the Haupt approach was standard railroad practice. Nobody could afford not to adopt it. [*evidence??*]

We will briefly mention one other instance that confirms this strategic vision. It comes later, after he had left the railroad and then returned as Chief Engineer. By then (1853) the Board has changed, after the coup which saw JET become President. The Board now has a policy of trying to integrate and expand the whole line: they buy into a link with a local branch road, for instance, by offering to pay the survey and location work. And when in March 1854 the State announces that it will sell off the state works, the PRR has no doubt about buying up the right of way so that it gets its route into Philadelphia. But there is a further issue, raised before but never acted upon: a



link westwards to Chicago. In April 1854 Haupt is sent to negotiate with the directors of a new line, the Ohio and Indiana, which has hit financial trouble. He reports that the Pennsylvania should come up with \$737, 701 to enable its completion, because the acquisition of the Chicago connection was of vital importance to the interests of the Pennsylvania Railroad (Haupt, 1854). The Board would only come up with \$300,000. The line went under, they lost their investment, a joint road was then formed, the Pittsburgh, Fort Wayne & Chicago, in which the Pennsylvania had to invest \$2 million to keep it from the Baltimore & Ohio (Ward 1971: 95-6). [o/s Ward 1980; ARJ\*\*\*\*\*]

So Herman Haupt did not win them all. But in these cases we see the specific implementation of what is the essence of the modern practice of strategy. This innovation had not, to our knowledge, been undertaken previously by any other railroad or any other business organization in this meticulous calculative way. And it paid off: despite all the odds, the PRR had become the Number One railroad by 1870. It 'was certainly in 1882 the largest private business concern in the world, with more than 30,000 employees on the 3,500 miles of main track which it owned, leased, and controlled east of Pittsburgh and Erie'--with almost as extensive a system west of Pittsburgh under its control through a separate corporate organization (Jenks 1961: 154).

#### *Appraising and Rewarding Performance*

One of the most well-known distinguishing features of the PRR was the strength of its personnel policies, and the 'informal organization' by which its employees and managers, generally hired as young men and promoted on merit, were trained to create an effective business organization out of the bare, formal structure of authority and division of responsibility.

As Jenks (1961: 159-60; 162) has pointed out, an anonymous contributor to the Railroad Gazette in December 1882--believed to be Charles L. Condit--observed (after tracing the PRR's development from the beginning) that a 'well-known officer of another road' had called it 'the only road having an organization' and commented that it was JET's adherence to the policy of avoiding 'direct executive<sup>66</sup> interference' and respecting the delegation of responsibility, strictly down the line (as enunciated in the 1852 organization plan), that had given the PRR the strength to survive his own departure. 'The test of strength on the part of any organization is what becomes of it, and what it becomes in its development by its first principles on the decease of its originators' (Jenks 1961: 167). The writer further pointed out, in relation to the 'informal part of the organization' and 'the essential spirit of its methods' that 'we give the credit of that policy which has resulted in the [PRR] as now organized to its early officers', emphasising the 'resistance to outside influences' (such as nepotism and patronage) and that 'merit and training are the most potent of all influences in giving positions of every kind upon the road' and 'no officer without that self-control which enables him to work through the regular lines of authority can gain any position upon this road' (Jenks 1961: 176-8). Unlike McCallum on the NY&E, who left no legacy there, the HH/JET team had established a modern, 'Foucauldian' system that outlived them and 'quietly ordered one about' (Megill, 1979).

How was merit determined? Clearly there would be a multiplicity of factors, especially in the early days of a rapidly growing, new railroad. But Haupt's accounting numbers would provide one, very important, 'objective' benchmark. Unfortunately, the absence of any surviving, original accounting records makes it much more difficult for us to establish how precisely the numbers were deployed than is the case at the Springfield Armory. But from the PRR's published annual reports it

is clear that Haupt and JET benchmarked their own performance, as measured by the accounts, against the performance of other roads, particularly in respect of the ‘operating ratio’ i.e. percentage of revenues absorbed by operating costs, and the cost per mile of running the trains, and were also proud to report the rate of return on investment that they had achieved (e.g. PRR 1852a: 53-4). While other railroads also published such numbers (often according to the requirements of State laws, and not as systematically in many cases as the editor of the *American Railroad Journal* would have wished \*\*\*\*\*), and in particular the B&O and the GaRR provided worthy precedents, to HH and JET the numbers were not just ‘statistics’--they were performance measures that showed that under their management the PRR was ‘the best’.

Haupt was not, however, blinded by the numbers. As we have seen, at the end of a lengthy and detailed attack on the inefficiency and high costs of the state-owned portions of the railroad, he could recognise that their superintendents were nevertheless doing a good job in difficult circumstances (Haupt, letter of January 1852 to the President and Directors of the PRR, in Board file 286)--good enough for one of them, Roumfort from the Philadelphia and Columbia Railroad (a fellow West Point graduate of an earlier generation)<sup>67</sup>, to be appointed assistant superintendent covering the Harrisburg to Philadelphia section on Haupt’s departure at the end of 1852 (Jenks 1961: 164-5; PRR 1853a: 47).

As on the GaRR and other roads (check B&O\*\*\*), statistics of running costs of engines were kept, and would have provided a basis for assessing drivers’ and enginemen’s performance. Indeed McCallum was to try, unsuccessfully, on the NY&E in 1854 to tie their remuneration wholly to ‘premiums’ calculated by reference to running cost efficiencies, resulting in more than one severe strike. Haupt however

seems to have been aware that engine running was still in an experimental stage (e.g. his reports on trials of different mixes of wood, coal and coke in PRR 1852a: 39-42). It was perhaps not until JET had had the engines all converted for coal-burning (between 1858 and 1865) that proper standards could begin to be set (Ward 1980: 100-1) so that such premiums later became the norm. (cf HVP\*\*\*and UK).<sup>68</sup>

Moreover, it is not merely having in place systems which (in McCallum's famous words) enforce 'a rigid system of personal accountability through every grade of service' and 'it is believed, will have the effect of exciting an honorable spirit of emulation to excel (Chandler, 1965b: 107-8) that it is important. If organizational members are to be incentivized by these measures they must know that there is genuine commitment by senior management to the principle of recognition of achievement and that they will in fact be rewarded and or punished by reference to the stated criteria and measures. Otherwise the recording of the measures will remain an empty ritual. This is where the PRR's adherence to 'merit' as the basis for advancement was so crucial. And this was the policy that Haupt consistently stuck to through all his later appointments on other roads, both during the Civil War and in the peace thereafter (e.g. Haupt n.d.c: \*\*\*; unknown n.d. (re NP)\*\*\*\* already quoted), and to which he himself attributed his strike-free industrial relations (which were in marked contrast to the effects of McCallum's attempts at enforcing rigorous discipline on the NY&E).<sup>69</sup>

It is clear that ideas of 'full accountability' and 'excitement to emulation' were mantras that were increasingly chanted by many railroad (and other enterprise) managers, in the UK as well as in the USA (\*\*\*\*e.g. Gourvish re Carr Glynn\*\*\*\*\*): but only on the PRR did Haupt actually succeed in introducing the necessary detailed

accounting systems and organizational practices that began to make such a modern style of management feasible.

### THE 1857 REORGANISATION

Finally we come to what has conventionally been seen as the most important event in the organizational history of the early PRR--JET's reorganization of 1857 that 'perfected McCallum's principle\*\*\*' of divisionalisation. There were indeed divisions and the line-and-staff principle was now well established. But one can search in vain for any acknowledgement on the PRR itself that this was the most important feature of the reorganization. JET himself in his annual report focuses on another aspect: the creation of the 'Accounting Department' by the merger of the existing Auditor's department (created in 1852) and the accounting function that had until now remained within the Transportation department. The end result therefore was that the functions of Haupt's original 'General Office' of 1849 were now combined again in this major, separate staff department (in the charge of Lombaert), while the General Superintendent (now Thomas A. Scott) had supervision of the four\*\*\*\*divisional superintendents who had full responsibility for their sections of the line--averaging about 90 miles each-- between Philadelphia and Pittsburgh.<sup>70</sup>

Given the evolution that we have traced from 1849, it is therefore not so much that the ground was being laid for what would be a major organizational breakthrough in 1857 (as others have seen it), but rather that the principles established in HH's original organization plan had gradually been adapted as the diverse operations of the initial road themselves gradually were welded into a unified organizational whole. 1857 tidied up the loose ends.

*Recapitulation of the significance of Haupt's organizational innovations on the PRR*

How then should we summarize the essential stages in the evolution of the PRR's organizational structure? Leaving aside the governance issue of the role of the President vis a vis the Board and in acting as 'CEO', at the level of structure analysed by Chandler we have argued that the main developments were:

In 1849 HH's original plan for organizing operations (alongside the existing organization of the Construction department established by JET in 1847, and recognizing the responsibility of the Treasurer for handling receipts and payments), divided responsibility into the four natural, functional 'departments' under his control as *de facto* General Superintendent (Conducting Transportation, Maintenance of Way, Motive Power, and Maintenance of Cars), together with the 'General (Transportation) Office' responsible for the accounts (PRR, 1851: 43-4). True, the four functional departments were the same as those on JET's Georgia Railroad--but they were the same as those on most railroads.<sup>71</sup> [?B&O\*\*\*]

In 1851 the Merrick plan for operations--designed to humiliate HH and thereby JET--formally established (again alongside the Construction department) that 'the business of the Road shall be organized in two principal departments'. Only the first department, concerned essentially with operations (including 'the supervision of accounts connected with the business of the road') was to be the responsibility of the General Superintendent. The second department was to 'have charge of the receipt and disbursement of money' under the Treasurer (PRR Minute Book, I: 434).<sup>72</sup> But as the handling of money had already been segregated, as far as practicable, under HH's 1849 plan, the real significance of this plan lay in the powers it gave the President (then Patterson) to interfere with the General Superintendent's (i.e. HH's) running of

the railroad, together with HH's downgrading, despite his recent formal promotion to General Superintendent, to running only one of two 'business' departments. However, within the General Superintendent's department HH appears to have continued to organize matters generally in line with his original 1849 plan (PRR 1852a: 36), but with adaptation and extension as the complexity of operations was increasing with the completion of the Eastern division. There was now an 'Assistant Superintendent' (Lombaert); Freight and Ticket (passenger) agents had been appointed; and the 'General Transportation Office' staff was growing.

However, the 1851 plan did also provide a *pro forma* for the writing of the later versions that would be produced under JET's presidency.<sup>73</sup> [and ?NY&E 52\*\*\*\*\*]

After JET became President, and when Lombaert took over from HH as Superintendent on HH's (temporary) departure at the end of 1852, the 1852 plan provided for a structure comprising four departments defined as: Construction, Transportation, Auditor's, and Treasurer's. If we take the view that the separation of the Treasurer's money-handling responsibilities had, as far as feasible (and as on the B&O\*\*\*?), been built into HH's original arrangements, the only really new development here (apart from the restatement of the new President's powers) was the formal establishment of the Auditor's department, which took over the internal check role that HH had originally assigned in 1849 as one of the two main responsibilities of his General Transportation Office. The other responsibility, that of keeping accounts and preparing reports, still remained with the Superintendent of Transportation.

Within the Transportation department the four functions (transportation, motive power, maintenance of way, and maintenance of cars) remained but the organization of the roles of two of Lombaert's four 'Assistant Superintendents' reflected more strongly their emerging responsibilities for operations on the separate divisions of the

road, which would lead over the next few years to the title of ‘division superintendents’. However, this arrangement primarily reflected the physical characteristics of the PRR’s road and the nature of its inherited connections to Philadelphia and indeed can be traced back to JET’s original organization of the ‘Engineer Corps’ for construction in 1847.

More important is the clear statement of the principle of ‘line’ authority (which had also been set out in the NY&E’s reorganization a few months earlier and which therefore antedated McCallum’s own expression of it on the NY&E in 1855-6). But crucially even then it was not a principle that had been adopted from the NY&E--it was the principle on which HH had always insisted above all else. Indeed it had been the cause of most of his own troubles with the pre-JET Board and with the first two Presidents--both of whom he had seen off. It really only required formal articulation now in the organization plan because of the increasing complexity of operations, the new role being adopted by JET as ‘professionally qualified CEO’, and the need to clarify Lombaert’s status in succeeding ‘General Superintendent Haupt’ (and JET’s close ally) as ‘Superintendent Lombaert’.

Between 1852 and the December 1857 formal reorganization, there were some further evolutionary organizational developments.<sup>74</sup>

From this perspective of gradual evolution of the precise arrangement of duties, what was the major achievement of the December 1857 reorganization? It took the existing ‘Transportation’ and ‘Auditor’s’ departments and transferred from the former to the latter (which had previously been mainly concerned with performing the internal checks of vouchers necessary for authorising payments to suppliers) the other more managerial role of HH’s original 1849 ‘General Transportation Office’ i.e. keeping the accounts of the Transportation Department from which the annual reports



were prepared and which provided the essential expense and revenue data for management control and strategic planning. This transfer gave the General Superintendent 'a comparative release from office duties' (PRR 1858a: 16).

The real significance of the 1857 plan therefore lies, not in the establishment of the divisional structure, but in the redefining and renaming of the 'Auditor's Department' as the 'Accounting Department' and the addition of 'Controller' to the old 'Auditor' title.<sup>75</sup> The renamed department now once again had both the functions of HH's original 1849 General Transportation Office: and its importance was clearly signalled by the current General Superintendent (Lombaert) being content to take over responsibility for it, and passing the mantle of General Superintendent to Thomas A. Scott. The 'line and staff' structure was now nearly complete.<sup>76</sup>

The area where there was still development to take place was with regard to the roles of the Freight and Passenger agents. Chandler (1977: 107-8) observes that by the 1870s on most US railroads their functions were organized in the 'Traffic Office', dealing with the service to and administration relating to customers, as distinct from the technical arrangements for physical 'transportation'. In the 1857 PRR organization, as noted above, while the duties of the 'General Freight Agent' were separately defined (as indeed the duties of the 'Freight Agent' had been ever since the 1851 reorganization), he remained under the authority of the General Superintendent. In respect of passengers, there was now an 'Assistant Auditor for Passenger accounts' under the control of the Accounting department (as his predecessor 'General Ticket Agent' had been in the 1852 organization plan).<sup>77</sup>

In this regard it is interesting to see how the features of the PRR's early structure can still be recognised in its vastly more complex organisation at the end of the nineteenth century. For example, in the organization adopted with effect from 1 April

1893, running to over fifty pages (PRR 1893), there are a President, three Vice-Presidents, a Secretary and a Treasurer, and thirty-six further officers whose responsibilities are specified. The First Vice-President has ‘special supervision of the Freight, Passenger and Transportation Departments . . . He shall have special charge of those relations with competing companies and connecting lines that may be associated with the performance of his duties’; the Second of the ‘Treasury and Accounting Departments’; and the Third ‘shall, under the direction of the First Vice-President, have charge of the Transportation Department. He shall aid the First Vice-President in matters connected with the Freight and Passenger Departments, and also in matters concerned with competing companies and connecting lines . . He shall have general supervision of all construction work . . . He shall have general supervision of the Insurance Department . . . He shall be assisted by a Chief Engineer and a Chief of Motive Power.’ Under the Third Vice-President is the General Manager who ‘has charge of the operations of the Transportation Department’ and to whom report *inter alia* the General Superintendents (i.e. of divisions, each ‘assisted by a Principal Assistant Engineer and a Superintendent of Motive Power’), a General Superintendent of Transportation, a General Superintendent of Motive Power, and an Engineer of Maintenance of Way. In the Accounting Department there is still both the internal audit and the accounting role and ‘the Company’s Expense Accounts shall be kept under the following general heads:--

- I. Conducting Transportation.
- II. Motive Power.
- III. Maintenance of Way.
- IV. Maintenance of Cars.
- V. General Expenses.

VI. Construction and Equipment.

VII. General Accounts.

Classification VII comprises mainly financial expense (interest and rentals).<sup>78</sup>

Otherwise nothing much has changed since 1857--or indeed since HH put in his 1849 plan. As he said about that plan himself:

‘The plan was well adapted to the then existing conditions and several new features had been introduced but alterations were subsequently required to meet the enormous development of business which the most sanguine enthusiast had never dreamed to be within the bounds of possibility’

(Haupt n.d.a: 6).

That about sums it up.

## CONCLUSION

In focusing on the distinctly grammatocentric contribution of HH to the organization of the PRR we have argued for three fundamental changes to what has become the conventional wisdom that, in 1857, ‘J. Edgar Thomson and his associates on the Pennsylvania effectively applied McCallum’s principles to the Baltimore and Ohio’s structure and began to solve certain complexities of control through the development of the line-and staff concept for the delegation of duties and of the “divisional” type of organization’ (Chandler 1965a: 22). We have looked carefully into the surviving primary sources that have now been unearthed and found enough evidence there to demonstrate that, first, it was HH rather than JET who drove the organizational and accounting innovations on the PRR; second, that McCallum on the NY&E more likely borrowed from the PRR than vice versa (and that any borrowing by the PRR from the NY&E dated to well before McCallum’s appearance); and, third, that while

the PRR's organizational contribution did indeed clarify the line-and-staff concept, and develop the 'divisionalization' of operations, its primary distinction lay more in the commitment to total systematisation that was introduced from the beginning of operations in 1849. The new grammatocentric practices worked to achieve successful coordination at all levels, from corporate governance, through operating structure and managerial accountability, to employee discipline and efficiency, providing accounting and statistical information for strategic analysis as well as for routine management of operational revenues and costs; and achieved it amid the recurrent threats of financial disaster, external political intrigue, and organizational infighting that characterize any major human endeavour. It worked.

To support the first of these revisions, we have traced here the tangled evolution of the PRR's organizational development from the plan introduced by HH based on his tour of other railroads in 1849. Although HH's own career at the PRR appears *prima facie* to have been a chequered one, where he was officially only General Superintendent for less than two years, and on notice of leaving for nearly a year of that, the reality of his influence lay in his particular relationship with JET and the stratagems by which the two of them disguised HH's real power in order to defeat the factions ranged against them. That real power is clear from HH's role in pricing, in internal and external political negotiation over tolls and State competition, and in other aspects of strategy both before his temporary departure in 1852 and after his return as 'Chief Engineer' until the end of 1856 (when, for example, he led on the issue of investment in the 'Chicago' connection and in representing the PRR at meetings with other railroads, neither of which had much to do with his formal responsibility for new construction). To this can be added HH's own successful

mentoring of Scott, which led in turn to the rise of Carnegie, who was in no doubt about HH's 'greatness' [ref????\*\*\*\*\*].

On the second point, we have traced the wording through the sequence of PRR organizational plans and shown that McCallum's organization plan of 1856 could well have borrowed its wording from the PRR's 1852 plan. But as this in turn reflected borrowings of wording from the NY&E's 1852 plan (which in turn could have reflected earlier plans of that or other railroads), it is not possible to be sure from the surviving evidence which was the 'chicken' and which was the 'egg'. What is clear is that the substance of the organizational principles was central to HH's own approach to 'system' from the beginning--in turn reflecting the principles he had imbibed from the practices at Thayer's West Point.

While the conventional view of the direction of influence has been able to gain support from the publicity given to McCallum in Poor's *ARJ*, we have argued that that journal's New York base--if not bias--naturally gave McCallum's efforts to restructure the NY&E and rescue it from its long history of inefficiency and repeated financial disaster--particularly by trying to reduce its excessive headcount and increase productivity--a special degree of interest not matched by the new, and by comparison relatively untroubled, developments taking place on the PRR.<sup>79</sup>

As to how practice could have been disseminated from the PRR to the NY&E and other roads, there appears to have been substantial infrastructure, even without having the assistance of the *ARJ*, in the free availability of its regular annual reports, as well as the customary exchanges of information and experience between railroads and the community of railroad engineers and managers, which could have in turn have been enhanced by the 'conventions' which JET first organized, certainly by 1854, but HH, like McCallum, regularly attended.

And on the third issue, again we have traced how the ‘divisional’ form emerged both on the NY&E and on the PRR, and how on the PRR it largely reflected the ‘natural’ physical operating conditions and availability of suitable personnel--and how like all organizational solutions it was never ‘perfect’. But the PRR did make clear the ‘line and staff’ principle through the role of what began as HH’s General Transportation Office and ended as the Accounting Department, alongside the other head office functions that set the corporate standards, and handled the corporate affairs, for the operating divisions.

And HH’s system survived long after his final departure from the PRR in 1856. In this regard it is illuminating that Charles E. Perkins, President of the Chicago, Burlington and Quincy Railroad, in an unpublished memorandum on ‘Organization of Railroads’ written in 1885, treats the simple functional structure as suitable for ‘the first stage’ of a railroad’s development, and the divisional, line and staff structure as suitable for ‘the second stage’ where length of line and / or intensity and / or complexity of traffic require much greater delegation to divisions as quasi-independent business units. Indeed the ‘first stage’ structure he describes is largely similar to that of the PRR between 1849 and 1852, while the ‘second stage’ is similar to that of the PRR in 1893.<sup>80</sup> The interesting point (albeit with the benefit of hindsight) is that Perkins sees the appropriate *form* of organization as wholly contingent on operating circumstances, and indeed envisages them both occurring in different parts of the same large railroad company (Chandler, 1965b: 124). But what is taken completely for granted, and what we have argued is due primarily to the pioneering efforts of men like Whistler on the Western and HH on the PRR, is that there must be a clear, grammatocentric structure of authority and accountability even in the ‘first stage’. And moreover, as Jenks (1961) observed, it was the harmonious

combination of the ‘formal’ and the ‘informal’ aspects of organization that marked out the PRR’s unique success.

In summary, these three arguments make our case for identifying once again the significance of the West Point influence on the PRR. Here is the \$65000 question. Have we indeed understood HH and the nature of the PRR’s contribution to ‘rational’ business organization (Chandler 1965a: 22) correctly? As to HH himself, his insistence on ‘system’ is clear both from his time with the PRR and also from his later activities. He will appear again in the ‘West Point’ network in the Civil War, where his first complaint was that the line of authority as between himself and McCallum was blurred and must be clarified: and it was.<sup>81</sup> And again, when from 1881 to 1883 he became General Manager of the huge Northern Pacific Railroad (which would run thousands of miles from the upper Mississippi to the Pacific and from Puget Sound to the northern boundary of California, with the head office in New York), he described his first priority as:

‘When I took charge, in 1881, no plan of organization had been adopted prescribing the duties and relations of the several Operating Departments. Serious disagreements existed between prominent officials, rails were worn out . . .’ [he gives a long list of problems and deficiencies] ‘. . . in a word, trouble on all sides.’ After calling for what statements of duties, forms etc. he could find, and consulting various managers ‘for several weeks’, ‘a plan of organization was prepared, revised and finally submitted to the Board for approval. No action was taken . . .at last I was authorized by the Vice-President to put the plan in operation without waiting for further action in New York. Thus, at last, a foundation was laid, upon which the reorganization of the Departments could be commenced. It is probable that no more perfect system and no better code of rules and instructions than now exists on the

Northern Pacific Railroad can be found on any other railroad in the United States, when the comparison is made with reference to the conditions to which it was applicable' (Unknown n.d.: 5-6). But again HH knew that 'organizational systems' were not just another application of scientific engineering principles. 'The remedies for these evils required time and prudence; immediate reforms of too radical a character would have precipitated strikes and caused confusion. But the progress of improvements was rapid, and now the operations of the line are characterized by organization, system and strict discipline; not a single strike in any of the Departments has occurred during my connection with the Road' (Unknown n.d.:7). Was he deliberately inviting favourable comparison with McCallum?<sup>82</sup>

And although pressures from Wall Street (based in his view on an ignorant, myopic concentration what in his view were meaningless 'performance indicators') finally forced his resignation, he ended on a (personal) high note: 'I will say in conclusion that in an experience of over forty years I have never seen a new road, with the possible exception of the Pennsylvania Railroad, in as good condition when opened as the Northern Pacific' (Unknown n.d.: 30).

Perhaps HH did need the intermediation of a JET for his approach to work successfully outside the arena of strictly military discipline or outside the schoolroom. To that degree alone is the conventional picture of the significance of the developments during the PRR's first ten years correct. But the key legacy to future business organization was that left by HH.

***\*\*\*\*[NB at end of all this need do we need to repeat Chandler's story of the PRR orgs to show how much more was really going on!]\*\*\*\*\*\*\****



**APPENDIX I**  
**THE MANAGEMENT OF THE BRITISH RAILWAYS IN THE EARLY**  
**NINETEENTH CENTURY**

main distinctions:

HH vs Huish

organisation delegation: cf Huish's interference

Good on depreciation (Huish)

Accounts just 'fraud'?

Managers vs Board cf PRR

cf Huish as 'military' (link to H,M&S 1998)

## **Appendix II: J. Edgar Thomson's 1847 organization of the Engineer Corps on the Pennsylvania RR**

For the initial construction period JET, as Chief Engineer, drew up a simple, one page organizational structure containing 11 clauses. The printed draft of the 'Pennsylvania Railroad Engineer Corps Basis of Organization', showing the amendments as adopted in the Board Minutes of 9 April 1847, has luckily been preserved, tucked in with 1867 version in the Board file re. the Engineering Department (Hagley Library, Accession No. 1807, M78, BF44). Apparently JET and Merrick were in disagreement over the structure, with Merrick wanting the assistant engineers as well as the chief to report directly to the Board (Jenks, 1961: 163).

As amended and approved by the Board, the structure comprised:

1. Chief Engineer (in communication with Board of Directors)
2. Two associate engineers appointed by Board of Directors (one for each of the first two divisions to be built). [JET had originally styled these as 'Engineers of Division' but this title was replaced by 'Associate Engineers'.]
3. All the above officers dismissible only by the Board
4. Engineer-in-chief's decisions to rule, subject to Board approval
5. Associates to give written reports to Chief Engineer, and he to Board
6. Assistant engineers for the Divisions to be appointed by Board on nomination of Assocs.
7. Those assistant engineers who are required to act directly under the Chief Engineer to be appointed by the Board on nomination of the Chief Engineer<sup>83</sup>
8. Subordinate officers dismissible by Assocs., Chief Engineer, Board or its exec. officer or cttee, with cause reported to Board
- 9/10. Minor rules re residence, full-time work, pay and expenses
11. Once general route of road determined and the two divisions put under contract for construction, 'a corp (sic) shall be organized by the Board under the immediate direction of the Engineer in chief, with a principal and subordinate Assistants, who shall have charge of the survey and location of the road to connect the two divisions already commenced'.

These provisions were incorporated as Section X of the company's by-laws (PRR 1850), and remained unchanged through subsequent editions (e.g. PRR 1853) until the section was dropped in the revision to the by-laws approved on 17 September 1856 (PRR 1859b). By that date HH was due to resign as from 1 January 1957, having been Chief Engineer since 1853 (and also now a Director). Accordingly, the accounts of the Engineer (i.e. Construction) Department were closed on 31 December 1856 and

the General Superintendent was set in charge of 'all matters hitherto connected with the Engineering Department' (PRR Board Minutes, III, 201).

In view of the PRR's famous development of a 'divisional', line-and-staff structure for its operations in 1857, it is noteworthy that from the very beginning of its construction, due to its unusual physical and organizational circumstances, requiring dependence on sections still run by the state railroads, the PRR was necessarily accustomed to envisage its organization in terms of relatively autonomous divisions under the overall supervision of the chief executive (to whom HH became effectively a personal assistant in 1848 thereby creating the basis for developing a staff office (Haupt n.d.a: 5)). In his first annual report as Chief Engineer in June 1848, JET commented that while he had originally planned for three divisions of the PRR's own line (Eastern, Western and Middle), he had now decided that it was better to plan for the Eastern and Western to meet in the middle, so he was only making appointments of associates to those two divisions, i.e. Edward Miller on the Western and W. B. Foster, Jr. on the Eastern (PRR 1848). Such a divisional organization would not however have initially been feasible for *operations* given that the line initially included sections operated by other concerns with whom central co-ordination was essential.

### **APPENDIX III: The PRR reorganization of 1851**

Merrick's plan provided that 'the business of the Road shall be organized in two principal departments'. The first department was to be concerned essentially with operations (including the care and maintenance of all the railroad's property and equipment, the superintendence of transportation of freight and passengers, and 'the supervision of accounts connected with the business of the road') and was the responsibility of the General Superintendent. The second department was to 'have charge of the receipt and disbursement of money'.

At this level the plan may have seemed no more than good 'internal control'. Indeed, as HH had explained in his January 1851 annual report, his own existing plan of 1849 had already ensured that 'no cash is received at the general office' while the Superintendent's detailed operating accounts and the Treasurer's separate records of receipts and payments provided good internal check on honesty and accuracy. Similarly, Merrick's plan required that, in the first department, 'accounts for all disbursements made by [the Treasurer] on account of the road shall pass through the General Superintendent as heretofore' and in specifying the system for the 'second department' had to recognize the operating realities that, wherever separate arrangements were not feasible, 'money shall be collected by such officers of the first department as the General Superintendent shall prescribe'; that for payments by passengers to Collectors (employees of the second department), tickets should be issued 'according to a system arranged for that purpose by the General Superintendent'; and that the Treasurer should make all payments against vouchers with the 'Certificate of purchasing officer countersigned by the General Superintendent'.

In support of Merrick there was the respectable precedent of the B&O, which had created in 1847 one department for ‘Working of the Road’ and one for ‘Collection and Disbursement of Revenue’--but the B&O had also recognized that they ‘have their business so much blended that they are mutually dependent on each other in almost all their transactions’ (quoted from the B&O’s 1847 organization manual by Chandler, 1965a: 23-4).

However, the real point of Merrick’s plan was that, by creating a separate ‘department’ responsible for the money handling side of operations, it demoted HH’s department, which had been established in 1849 as the *sole* department in overall charge of operations (alongside JET’s engineering department for the continuing construction).<sup>84</sup> Moreover, the penultimate provision of the plan, headed ‘President’ specified clearly that ‘All Regulations, Instructions & other actions of the Board shall emanate from the President as its organ and in the absence of such action the acts of the President shall be regarded as duly authorized’.<sup>85</sup>

Even more significantly, while the provisions relating to the ‘second department’ took up only about a page and a half, and consisted of various miscellaneous sections (of which, as already noted, a substantial portion in fact represented the granting of necessary powers to the General Superintendent in relation to the administration required for handling receipts and payments), the provisions relating to the ‘first department’ covered three and a half, close-typed pages, most of which set out the detailed duties and powers, and particularly limitations of powers, of the General Superintendent. In particular, onerous requirements for monthly reporting to the Board, including ‘estimates in detail of the Expenditures & probable disbursements required in his department one month in advance’ were set down. ‘They shall be in detail showing the amount which will be required for each branch of the service

classified under different heads & the General Superintendent shall not be authorized to exceed the amount appropriated under the estimate unless with the sanction of the President.’ He had to ‘furnish to the Board copies of all regulations and general orders . . . as soon as they emanate’. No permanent appointments were to be made or new posts established without Board authorization. His officers were to ‘be responsible to him & shall report as he may prescribe but all Books & papers in possession of any officers in this department shall be open at all times to members of the Board’ (a requirement that surprisingly was not specified in parallel for the Treasurer’s department that actually handled the money).<sup>86</sup>

Overall, the Merrick plan was unworkable, particularly for an expanding line where new operations and activities were being added almost daily.<sup>87</sup> HH responded by ‘working to rule’ and inundating the Board with detailed reports. He defiantly sent in his first ultra-detailed report on 4<sup>th</sup> June 1851, which was so long the Secretary could not include it in the minutes (PRR Minute Book, I: 454). In the meantime he conducted correspondence with other roads’ superintendents, and in particular with the General Superintendent of the B&O (whom Merrick had reputedly consulted when the new plan was being framed) and got from him confirmation that the required frequency and precision of the specified monthly accounting and estimates were infeasible (O’Connell 1982: 261-2; Haupt 1852a: 16-17).

## **Appendix IV: JET's 1852 reorganization on the PRR**

As noted, Chandler (1977: 105) describes this reorganization in terms that, after becoming President in 1852, JET 'modified the centralized administrative structure set up by Herman Haupt...Thomson's first move was to follow the example of his predecessors and separate the road's financial and operating departments'. Here he is following Ward (1971: 78) who observes that 'a more decentralized scheme of organization was effected in November 1852, which removed many of the responsibilities from the superintendent of transportation'.

However, there is no reason to see this as any kind of deliberate reduction of the powers of the Superintendent: rather it appears to have reflected no more than an adjustment to cope with Haupt's departure (given that JET had been accustomed to rely on him completely) coupled with his successor (and previous assistant) Lombaert's natural desire to make some changes to suit his own way of working and personal capabilities. Indeed, given its length (16 printed pages) and the speed of its appearance it may well represent little more than a decision now to publish as a manual what was already largely Haupt's prevailing practice in order to strengthen Lombaert's position as his successor. This 'continuity' was reinforced by utilizing some of the format and wording laid out in the 'Merrick' 1851 plan wherever convenient.

Even more noticeable (e.g. Jenks 1961: 164, 167) is the similarity of much of the wording with that of the NY&E's recent reorganization of 21 February 1852. In particular the preamble just quoted is almost word for word (although the NY&E referred to the accounts being '*more* systematically kept and managed' (our emphasis) improvement being needed there but not on the PRR), and the NY&E's departments

were identical except that the Treasurer was not regarded as a ‘Department’. The duties of the ‘Auditor’s Department’ were also set out in very similar terms, and there were many similarities in the specification of the duties of the General Freight Agent, the General Ticket Agent and the Chief Clerk of the Freight department, although the NY&E specifically referred to responsibilities for ‘statistical accounts’ (which may have reflected provisions in the New York State law).

There was a significant difference however in relation to the provisions for the four geographical divisions into which the ‘working of the road’ was divided. Section 18 prescribed that: ‘The Superintendents of Divisions shall have charge, under the general directions of the Superintendent, of the Masters of Track Repairs and the Masters of Engine Repairs, and of the movements of all Trains upon their Divisions, and shall have charge of the ordinary repairs of the Road and Telegraph.’ Finally, the provision in section 30 that ‘All instructions emanating from the Board, or the President, in regard to the proper business of either of the departments, shall be given to the Heads thereof, and by them communicated to the proper subordinates’ was virtually repeated word-for-word in the PRR’s new organization plan in November 1852, as was the provision in section 32 as to the absolute discretion of the President in resolving interdepartmental disputes (New York & Erie Railroad Company 1852).

While we cannot know to what extent the wording of these provisions repeated that of earlier provisions on either of the railroads (or indeed on any others), two crucial points to emerge are: first, any resemblance in *wording* between the later ‘famous’ PRR reorganization of 1857 and McCallum’s reorganizations on the NY&E between 1854 and 1856 are in fact the historical result of earlier resemblances between the NY&E and PRR 1852 reorganizations; and second, as the PRR wordings reflect no more than the principles and practices already established on the PRR under



Haupt's superintendency, any derivation of the *words* from the NY&E's formulation does not of itself signify a corresponding derivation of *practices*, but may merely reflect JET's habit of economizing when it came to what he regarded as the mere bureaucratic necessity of spelling out organizational detail. It is equally plausible that the NY&E included its particular wording in its organization--approved 21 February 1852--having observed how the PRR had actually, and successfully, resolved its internal--but highly public--battles over lines of authority through JET's coup earlier in the same month on 2 February.

Certainly no criticism of Haupt's earlier organization was expressed in the Report of Committee on the General Superintendent's Resignation, Oct 13, 1852. This is almost a reference letter, however it contains certain interesting phrasing:

'...he had evinced both as an Engineer and Superintendent since he entered the Service of the Company unusual ability in the management of the responsible duties assigned him, uniting with great business capacity and professional skill the rare qualification of enlarged scientific attainments.'

They then express 'entire approval of the faithful and energetic manner in which he had performed the arduous and intricate duties of Superintendent of a work which in the diversified and delicate relations it bears to other interests has no parallel in this country.'

They also note 'that the rigid discipline and temperate habits in employees of the Company enforced under his administration has notwithstanding the embarrassment on a single track road caused by uncertain connections with the trains of other roads insured to the travelling public entire freedom from injury from accidents while the economical expenditures in conducting the business of the Co has returned to the Stockholders a fair remuneration for the Capital invested in the unfinished work.'

There is also no appearance of overt disagreement as to how things should be run in the Haupt's correspondence with Lombaert during the period after he had announced his intention to resign and his final departure\*\*\*\*\* (Letterbook)

In the 1853 Annual Report, JET in his President's report commented on the Superintendent's Report simply:

'The system of accounts adopted for this branch of the Company's service, afford every desirable information in relation thereto, worthy of preservation; and are as simple as they can be made to meet this object. To preserve this system in its

efficiency, and to subject the accounts of the company to the scrutiny of a responsible officer, the Board have, under the recent organization adopted for the Road department, appointed W. B. Foster, Esq. (formerly Associate Engineer), auditor, and consigned to him the duty of their examination and entry at the principal office in Philadelphia.

This arrangement, when fully carried out, will render accessible at all times information in relation to details of disbursements which have heretofore been procured through reports furnished by the Superintendent, which have required too great a tax upon his time to communicate' (PRR, 1853a: 15-16).

In his conclusion JET adds: 'Since the last Annual Meeting of the Stockholders the Board have re-organized the Transportation Department, and appointed Herman J. Lombaert, Esq., Superintendent, in the place of Herman Haupt, Esq., who resigned his post to fulfil a professional engagement at the South. While the Board regrets the loss that the Company has suffered in accepting the resignation of the energetic individual who so ably and faithfully managed this department since its organization, they feel satisfied that they have secured in his successor a gentleman whose experience and well-tryed judgment give an assurance of a successful administration of the important duties assigned to him' (PRR 1853a: 26-7).

Lombaert's own report as Superintendent describes the new division of duties under 'the new organization, which went into operation December 1, 1852'.

'During the greater portion of the year the operations of the road were conducted under the direction of H. Haupt, late General Superintendent, whose ability and success, the results of the present and preceding years operations abundantly testify, and to whom no one will more readily than your present Superintendent award all the credit it may reserve.

The new organization has given evidence of its being well adapted to the wants of the road; the Assistants have entered upon their duties with a zeal that gives assurance that the interests of the Company and the reputation of the road are as much a matter of pride with them as it has heretofore been with your Superintendent under the old organization. (PRR 1853a: 47-8).

Even allowing for public relations ‘spin’ there is no evidence that JET or Lombaert saw themselves as having done any more than develop Haupt’s existing arrangements as the road’s operating complexity increased (at the same time as perhaps allow for a somewhat lower energy level in the new Superintendent!).

With respect to the Transportation Department, the duties and responsibilities of the Superintendent are set out. In large part the details follow the order of and reflect those set out in the 1851 reorganization, but with some subtle but crucial differences of wording.<sup>88</sup> Reflecting the increasing operating complexity of the PRR, now that all the new line apart from the central mountain stretch had been brought into commission, albeit with double-tracking still in progress, the subdivisions of the Transportation department are also spelled out more fully. ‘The Superintendent shall be aided by as many assistants as the Board may designate, to be denominated first, second, third, &c., Assistant Superintendents.’ Here the elements of a divisional operating structure now begin to emerge. The ‘First Assistant’ has charge, ‘under the directions of the Superintendent of the police and repairs of the Road, Bridges, and Depots, east of the Portage Rail Road’ (with temporary responsibility, under the Chief Engineer, for construction there ‘until the completion of the Mountain Division’). He was therefore responsible for the ‘Maintenance of Way’, with the Chief Engineer temporarily having that responsibility over the line west of Altoona until the double track was laid. The ‘Second Assistant’ has general charge, ‘under the directions of the Superintendent’, of the motive power and running stock and is to act as deputy Superintendent when necessary. The ‘Third Assistant’ has charge of the company’s business at Pittsburgh, and of the Western Division and over the Allegheny Portage Road.<sup>89</sup> The ‘Fourth Assistant’, expected to be stationed at Harrisburg, is to ‘have general charge of the business of the company at and below that point, under [the Superintendent’s] direction.’ So, while the First Assistant was responsible for the

‘Maintenance of Way Department’, and the ‘Second Assistant’, holding the senior post as the Superintendent’s deputy, was effectively responsible for the ‘Motive Power’ and ‘Maintenance of Cars’ Departments of HH’s 1849 plan,<sup>90</sup> the other two assistants were effectively ‘divisional superintendents’, responsible for the ‘Transportation’ on their own divisions and between them and the Superintendent spanning the length of the road and its feeders to Philadelphia.<sup>91</sup> The organization was gradually evolving, as the road grew, towards the wholly divisional, ‘line-and-staff’ organization of 1857 that has generally been regarded as JET’s primary legacy to modern management.

We therefore see the significance of this reorganisation very differently from both Chandler (1977: 105) and Ward (1971: 78), who, as previously noted, also appear to conflate it with that of 1851.

## **Appendix V: JET's 1852 reorganization on the PRR**

some more detail re the divisions etc. from what will be Ch 7

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<sup>1</sup> Just as the 18<sup>th</sup> century 'enlightenment' is generally recognised as marking the fundamental intellectual transition to 'modern' rationalism (and thence to more recent 'post-modern' relativism) (e.g. Giddens, 1991; 1999) so the early 19<sup>th</sup> century objectification of human performance marks the transition to 'modern management' (and thence to more recent post-modern problematizations of the notion of 'rational management') (Hoskin & Macve 19xx).

<sup>2</sup> with apologies to the game shows where the ultimate question is the '\$64,000 question'. Ours is yet more important: and Glenn Miller and his orchestra gave us 'Pennsylvania 6-5-0-0-0'.

<sup>3</sup> Flesher *et al.* (2000; 20xx) have recently explored the early history of the Illinois Central (which joined the Great Lakes to the Gulf of Mexico), the significance of the land grants made to encourage

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settlement in the mid-west in the 1850s, and the achievements of the pioneers of that huge railroad.

\*\*\*\*In conversation they have indicated that they believe that, in dismissing the significance of McClelland's innovations there, Chandler may have been unduly influenced by the *ARJ* and its New York 'yankee' bias. We comment further below on a similar bias vis à vis the PRR.

<sup>4</sup> Haupt received only passing mention (Chandler 1965a: 33; 1977: 95). It is noteworthy that the most influential British railway manager, Captain Mark Huish, who was General Manager of the London and Northwestern Railway between 1846 and 1858 (almost contemporaneously with Haupt's time on the PRR), had served in the East India Company's army, primarily in administrative capacities (Gourvish 1972: 27, 48-9). Although the US railroads were familiar with many aspects of British railway practice, the British railways do not appear to have provided any model for US management. Even on the London & Northwestern, Huish was unable to follow the principle of strict delegation of duties down the line of command (often interfering himself and overruling subordinates' decisions), while the Board of Directors also retained the practice of actively directing operations through an array of Committees of a (very numerous) Board, to whom the General Manager was accountable (Gourvish, 1972\*\*\*\*; cf. Jenks, 1961). Moreover, practice was very different from articulated principle: one of the London and Northwestern's most influential directors, George Carr Glynn, had clearly expressed in a confidential memorandum as far back as 1836 the principle that 'each department should be directed by a *responsible* officer . . . to him should be left the management of the details of the business in each department' and that the Board needed 'the assistance of a confidential superior officer, whose principle duty it must be to generally to superintend the working of the system and to observe the working and operations of each outdoor department . . . all orders should be issued direct to the head of dept.' (Gourvish 1972: 25-6). Huish was finally sacked in 1858 by the Board, *inter alia* for his overbearing personal style of management which, it was alleged, had also lost him the respect of the heads of other railways (Gourvish 1972: \*\*\*).

<sup>5</sup> since his appointment in 1839, his duties had also included those of general superintendent in charge of transportation (O'Connell, 1982: 220).

<sup>6</sup> 'This embryonic modern business enterprise included two middle managers--the master of transportation and the master mechanic--and two top managers--the superintendent and the president. The latter, who became in 1852 a full-time officer, was the link between the full-time salaried managers and the part-time representatives of the owners elected to the board of directors' (Chandler 1977: 98). [o/s ?B&O etc. at the time:see Appendix/O'Connell\*\*\*\*] ?HH tour in 1849 comment. Say we do this elsewhere\*\*\*\*\*

<sup>7</sup> Apart from the Chief Engineer's department (concerned primarily with construction), there were two major operating departments, segregating 'the working of the road' from 'the collection and disbursement of the revenue' while recognizing that they 'have their business so much blended that they are mutually dependent on each other in almost all their transactions' (quoted from the B&O's 1847 organization manual by Chandler, 1965a: 23-4). The first department was the responsibility of the Secretary (assisted by a Chief Clerk) under the Treasurer; the second of the new General Superintendent (a professional engineer) to whom in turn reported three officers: the Master of the Road, the Master of Machinery (responsible for the maintenance respectively of the fixed infrastructure and of the locomotives and cars), and, the most important, the Master of Transportation responsible for the movement of passengers and freight. The B&O also had a central legal department under an Attorney (Chandler 1965a: 23-7). For further discussion of the B&O see\*\*\*\*\*

<sup>8</sup> Poor was Chandler's great-grandfather. His business name survives in "Standard & Poor's".

<sup>9</sup> In the extract from his Superintendent's report, quoted in the *American Railroad Journal*, 2<sup>nd</sup> Quarto Series, Vol.12, No.15: 225-6 (for Saturday, April 12, 1856), McCallum states: 'In my opinion, a system of operations to be efficient and successful, should be such as to give to the principal and responsible head of the running department a complete daily history of details in all their minutiae. Without such supervision, the procurement of a satisfactory annual statement must be regarded as extremely problematical. The fact that dividends are earned without such control, does not disprove the position, as in many cases the extraordinarily remunerative nature of an enterprise may ensure satisfactory returns under the most loose and inefficient management.'

<sup>10</sup> 'Far from being neutral devices for mirroring the social world, the calculative technologies of accountancy are complex machines for representing and intervening in social and economic life. Along with allied expertises, the creation of calculating selves and calculable spaces enables a normalization of individual lives that is cast in financial terms. The visibility conferred on the calculating self who occupies a specific locale within a loosely assembled network of calculable spaces is intrinsically linked to norms of financial performance. Ways of organizing and ways of calculating have developed hand in hand' (Miller 1992: 78-79).

<sup>11</sup> It is true that Thayer attempted to embrace all aspects of West Point life within his grammatocentric system, awarding grades for conduct in the same way as for academic achievement to achieve an overall ranking of every cadet. The crucial factor was the way in which all aspects of performance were internalized by the cadets. But real life businesses such as the new factories and railroads were more complex than a military academy, and without the USMA's backdrop of military discipline, needed more nuanced and developmental approaches to establishing their organizational 'architecture' (Jenks, 1961; cf. Kay 1993: 66). This subtlety appears to have distinguished Haupt's success on the PRR from McCallum's difficulties on the NY&E, where the latter's rigorous enforcement of his detailed operational regulations and personnel policies in 1854 led to repeated strikes by the engine drivers and finally to his own resignation in February 1857 (O'Connell 1982: 290-4). By contrast Haupt was able to observe that, during the Civil War (some five years after he had left the PRR and when he was now Brigadier General Haupt), when Thomas A. Scott (now Assistant Secretary of War) sent men from the PRR in 1862 to join Haupt's new 'corps of artificers', 'there were . . . experienced tracklayers, well officered, and probably the best corps of trainhands [\*\*\*\*\*?] that the country could have furnished.' They included many conductors whom Haupt had appointed when General Superintendent of the PRR, and 'to be once more officially reunited was a source of mutual gratification' (Haupt n.d.c: 7). Jenks (1961) reinforces this appraisal of secret of the PRR's success.

<sup>12</sup> The B&O's history is explored briefly in Appendix \*\*\*\*\*???????

<sup>13</sup> After 1826 West Point operated a more encompassing system of calculability, when Thayer expanded the numerical grading to control conduct as well as academic performance. The full expression of this system was achieved only from 1832. All crimes and misdemeanors had a tariff of demerits from 1 to 10 and penalties were weighted by year of study (50% up by the senior year) (Hoskin and Macve 1988??\*\*). From 1832 over 200 demerits meant instant expulsion. Haupt enters West Point aged only 14 in 1831, confident he can beat the system. At the end of the 1832/3 year he ends up on precisely 200 demerits, and then believes he has failed an academic exam. Humiliation looms. In his panic and anticipated shame he undergoes a conversion experience, and becomes a total devotee of the system (though not of Thayer personally). In fact he passes brilliantly. Thus the die is cast (Haupt 1889: 26-36).

<sup>14</sup> He had been employed for a while between 1835 and 1840 working on the construction of various other Pennsylvania railroads but the depression made finding engineering work impossible. So his main 'managerial' experience since leaving West Point was schoolteaching at two institutions in Gettysburg, where he was the founding Principal of Oakridge Select Academy for boys and then, following a merger, Principal and half-time professor of Civil Engineering and Mathematics at the Female Seminary of Gettysburg (later Pennsylvania College and in modern times Gettysburg College) between 1844 and 1847. He had also been working on his theories of bridge construction and on writing his major textbook *General Theory of Bridge Construction* (Ward 1971: 74). Nor did he have any significant military experience. After graduating from West Point in 1835 (aged 18, its youngest graduate), he escaped from the army after only three months service through a clerical error (or possibly an administrative formality) whereby his required service was reduced by a year because, although he actually entered West Point when he was 14 in 1831, he was deemed to have completed the normal necessary further year of service because he had originally been offered admission and registered as a cadet a year earlier, but was then considered too young to go at 13 (O'Connell 1982: 245; Haupt 1889: 16).

<sup>15</sup> As we shall argue below it was the fact, rather than the form, of the systematisation of structure that was the crucial development [cf. Hoskin & Macve, 1988, fn\*\*\*\*]\*\*\*\*\*

<sup>16</sup> 'Far from being neutral devices for mirroring the social world, the calculative technologies of accountancy are complex machines for representing and intervening in social and economic life. Along with allied expertises, the creation of calculating selves and calculable spaces enables a normalization of individual lives that is cast in financial terms. The visibility conferred on the calculating self who occupies a specific locale within a loosely assembled network of calculable spaces is intrinsically linked to norms of financial performance. Ways of organizing and ways of calculating have developed hand in hand' (Miller 1992: 78-79).

<sup>17</sup> Speaking of his original organizational plan of 1849, Haupt says: 'The plan was well adapted to the then existing conditions and several new features had been introduced but alterations were subsequently required to meet the enormous development of business which the most sanguine enthusiast had never dreamed to be within the bounds of possibility' (Haupt n.d.a: 6).

<sup>18</sup> [NB HH re PRR having to have 'new' staff (cf. Lombaert!) whereas B & O and NY&E long established]\*\*\*\*\*

<sup>19</sup> As Haupt put it in January 1852: 'The drudgery is to a great extent now over; the task of organization has been performed; the numerous parts which constitute the complicated mechanism of a railway system have been brought into harmonious action; a complete code of regulations, applicable to almost every possible contingency, has been established; subordinates, who entered the service of the Company without experience, are now competent and efficient officers; every wheel in the machine is now in order. The work of the pioneer is now over. My successor will find the highway prepared for him . . . Haupt (1852: 8) (quoted by O'Connell 1982: 264). As O'Connell puts it (1982: 277, fn.49): 'Even as he and the board struggled for control of the railroad, the employees learned to carry out their functions in peace. The staff level that Haupt represented served to insulate the line and lower staff officers from the turmoil in Philadelphia. As in any good bureaucracy, the work continued even as the crisis developed.' However, although JET accepted the necessity of Haupt's resignation at this juncture, he was not indispensable yet, and as he later put it in his 'final' resignation letter to the Board, stating that he would leave on 1 November 1852, 'no other officer was familiar with the details of the business of the road, and I could not then withdraw without causing difficulties which I felt it my duty to avoid . . . The time has now arrived when I can retire from the management of the road with less embarrassment to its operations than at any previous period. Every department is fully organized and \*\*\* officered. \*\*\*\* of any kind so far as it can be conducted without impediments from the political machine with which we are in contest \*\*\*\* with great regularity. Accidents are extremely rare and no passenger I believe has ever received the slightest injury upon the Penn<sup>a</sup>. RR. The financial difficulties of the Company are over. The end of our trouble with the State is plainly visible and near at hand -- The Penn<sup>a</sup>. RR will soon be ready for a race in which no competitor can distance her. So great are her advantages that a rate of change which would result in loss upon other competing roads will yield a reasonable profit upon this. Ignorance and prejudice are about to yield before the dissemination of correct information and the restrictions imposed [through] mistaken State policy will soon be removed as they have been in other States by the influence of enlightened public sentiment or by the opening of new avenues of communication. . . . I shall look back with pride upon my connection with the location, construction and subsequent management of an improvement which has no superior, and retire from office with the best wishes and confident anticipation of its triumphant success (Haupt 1852b: 265-7, in letter of 11 September 1852 from 'H. Haupt, Gen<sup>l</sup>. Sup<sup>t</sup>.' to 'The Board of Directors of the Penn<sup>a</sup>. RR Co').

<sup>20</sup> It is true that Thayer attempted to embrace all aspects of West Point life within his grammatocentric system, awarding grades for conduct in the same way as for academic achievement to achieve an overall ranking of every cadet. But real life businesses such as the new factories and railroads were more complex than a military academy, and without the USMA's backdrop of military discipline, needed more nuanced and developmental approaches to establishing their organizational 'architecture' (cf. Kay 1993: 66). This subtlety appears to have distinguished Haupt's success on the PRR from McCallum's difficulties on the NY&E, where his rigorous enforcement of his detailed operational regulations and personnel policies in 1854 led to repeated strikes by the engine drivers and finally to his own resignation in February 1857 (O'Connell 1982: 290-4). By contrast Haupt was able to observe that, during the Civil War (some five years after he had left the PRR and when he was now Brigadier General Haupt), when Thomas A. Scott (now Assistant Secretary of War) sent men from the PRR in 1862 to join Haupt's new 'corps of artificers', 'there were . . . experienced tracklayers, well officered, and probably the best corps of trainhands that the country could have furnished.' They included many conductors whom Haupt has appointed when General Superintendent of the PRR, and 'to be once more officially reunited was a source of mutual gratification' (Haupt n.d.c: 7). In fact at West Point Thayer himself had been somewhat less successful in his own external political relations. He finally felt compelled to resign (at the end of Haupt's second year at West Point) after President Jackson overturned his expulsion of several cadets caught playing cards, on grounds of lack of natural justice in the court martial proceedings (Haupt 1889: 32).

<sup>21</sup> At that period the conventional spelling was either 'Pittsburg' or 'Pittsburgh'. The distance involved is comparable to that from London to Fishguard, Holyhead or Newcastle-upon-Tyne, but over much more difficult terrain. Including the link from Philadelphia to Harrisburg, the whole distance to be managed was comparable to that from London to Edinburgh.

<sup>22</sup> A map comparing US railroads (outside New England) operating in 1849 and in 1854 is given by Chandler (1956 and 1965b).

<sup>23</sup> For details see Appendix II

<sup>24</sup> JET said to Haupt: '[Y]ou have never had any experience in the operation of railroads and I wish you would take leave of absence for 2 or 3 months, visit all the important roads of New York and New England, study their systems of bookkeeping and accounts, get copies of all their forms, make sketches

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of snow plows, frogs, switches and other machinery, also of station plans and post yourself fully in regard to all details of operations so that on your return we will be prepared to get up a proper plan of organization for conducting the business of the Pennsylvania Railroad. The opportunity thus afforded was utilized to the fullest extent. I returned with full sets of forms and some weeks were spent in digesting the material with daily discussions with Mr. Thomson as to merits and defects of particular systems with suggestions of improvement. When at last the plan of organization was completed with full sets of all the forms required in all departments, I handed the bundle of papers to Mr. Thomson for final examination. He turned to me with the remark "You don't expect me to go over all these papers do you?" "I think we have discussed them sufficiently, send them into the Board." They were sent in and adopted without alteration' (Haupt n.d.a: 6).

<sup>25</sup> For further details, see Hoskin & Macve 2003.

<sup>26</sup> As O'Connell (1982: 258) observes, Haupt drew a distinction between the 'executive' and 'operational' business, which would be important in the subsequent battles over authority as section II of the PRR's original 1847 by-laws (PRR 1850) required the President to 'attend generally to the executive business of the Company, under the direction of the Board' and Haupt would argue when he became General Superintendent that President Patterson had no right to give him directions on his own responsibility (Haupt 1852a: 10).

<sup>27</sup> Perhaps because he considered that his father's examination had identified issues that went beyond the operating requirements of the PRR's own incipient service, Lewis M. Haupt included the plan, entitled *Report on General Systems and Policy for the Pennsylvania Railroad*, amongst the publications of which Haupt is listed as 'Author' in the printed *curriculum vitae* pasted in 1913 into the front of Haupt's copy letterbook of 1852 (Haupt 1852). However, if it was published, no copy appears to have survived, nor does there appear to be a full copy in the PRR minutes.

<sup>28</sup> 'Mr. Thomson offered to assume responsibilities for my management and agreed to retain the nominal title of General Superintendent but with the understanding that I was not to trouble him with any business details, which I never did' (Haupt n.d.a: 7).

<sup>29</sup> Lombaert was a relative of James Magee--a pro-Thomson, but not quite as enthusiastically pro-Haupt, director--Haupt, n.d.a: 15-16. He was subsequently to be promoted from Assistant Superintendent to Superintendent in November 1852 when Haupt resigned (as Magee foresaw--Haupt n.d.a: 15-16), and was still titled 'Superintendent' in 1857 (PRR 1857a: 17). In the end-1857 reorganization, when the Auditor's department was renamed the Accounting Department, he appears to have rejoiced in the title 'General Superintendent' just long enough to relinquish it when he became Auditor and Controller from the beginning of 1858 (at the same time as Thomas A. Scott took over from him as 'General Superintendent' in charge of the Transportation Department) (PRR 1858a: 16). Subsequently, in 1863, Lombaert was promoted to Second Vice President & Controller until 1869, when he relinquished the Controllership, but retained oversight of the Accounting Department as Second Vice-President until his retirement in 1873 (the year before JET's death in office). It may be noted that what was finally titled the position of Comptroller 'was the chief accounting officer, and as a staff position, no further promotion was possible' (Hagley 2000: 63).

<sup>30</sup> The full journey still required use of the other lines east of Harrisburg (involving a change of gauge and therefore passengers having to change trains--Ward, 1980: 83), a further transshipment over the Alleghenies, and then use of the Western Division of the Pennsylvania Canal or stage coaches).

<sup>31</sup> JET's covering note to President Merrick, in forwarding Haupt's detailed report on 'organization', stating that he (JET) was 'fully conversant with the organization of the Eastern Roads' must have been there to head off any suggestion that JET was questioning the President's authority by giving blessing to Haupt's investigations and conclusions on this contentious issue.

<sup>32</sup> for further detail see Hoskin & Macve 2003, which discusses the role of Richard Peters as JET's 'right-hand man' on the GaRR in relieving him of the burden of the organization of operations there (cf. Ward, 1980; Shingleton, 1985)

<sup>33</sup> On the GaRR, JET as 'Chief Engineer and General Agent' of only one of the company's two businesses (i.e. alongside the bank) retained overall responsibility for the whole railroad activity, both construction and operation, and the superintendent reported to him.

<sup>34</sup> Ward (1971: 78), followed by Chandler (1977: 105), apparently conflates it with the 1852 reorganization after JET became President (and Chandler, 1965a: 33, had previously apparently further conflated Haupt's 1849 plan with both of these). However, O'Connell (1982: 257-63) gives a blow by blow account of its introduction. The details are set out in Appendix III and discussed further in Hoskin & Macve (2003).

<sup>35</sup> JET, newly elected President, reported in February 1852: 'A section of the Western Division, extending from Johnstown to Lockport, twenty-one miles, was opened in August last, and that division

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is now in use throughout its entire length, with the exception of a gap of twenty-eight miles, between Beatty's Station and Turtle Creek, in Westmoreland County. Every effort has been made by the Board to hasten the completion of the work and they still cling to the hope, that the whole road will be ready for use before the close of canal navigation in 1853' (PRR 1852a: 6-7). In fact they had to wait until February 1854 before the whole line, including the Allegheny mountain section, was opened (PRR 1855a: 37).

<sup>36</sup> o/s Board file 286 re. excised comments!!!\*\*\*\*\*

<sup>37</sup> Ward (1971; 1980) and O'Connell (1982) give much of the detail of the infighting, based principally on Haupt (1852a; n.d.a; n.d.b).

<sup>38</sup> For further details see Appendix IV.

<sup>39</sup> O'Connell's discussion (1982: 267-9) of this reorganization focuses on the governance issue of the President's authority. The effective solution to the long-running argument within the PRR had been to appoint in JET a 'professional' President whose authority *de facto* derived from his extensive practical engineering and railroad business experience. See also Ward (1980: xxxxxx).

<sup>40</sup> These are analysed in detail in Hoskin & Macve (2003)

<sup>41</sup> see Appendix IV

<sup>42</sup> The accounts for the expenses of 'Transportation' following this reorganization in 1852 still continued to be analysed under the four headings of the four functional 'departments' of the original 1849 plan (PRR 1853a: 46) as indeed they still did after that of 1857 (e.g. PRR 1859a: 11).

<sup>43</sup> Chandler's description of the key feature of the 1852 reorganization as being 'to separate the road's financial and operating departments' is therefore a major oversimplification of the various developments taking place. It may have resulted in part from confusion with the 1851 reorganization (see Appendices III and IV). The Transportation department was still responsible for 'accounting' (and remained so until 1857) as we describe further below.

<sup>44</sup> The context makes clear that, consistent with usage elsewhere (e.g. PRR 1852b: 16) 'either' means 'each'.

<sup>45</sup> One of McCallum's well publicized 'principles of organization' as articulated in 1856 was 'A proper division of responsibilities'. 'All subordinates should be accountable to, and *be directed by their immediate superiors only*; as obedience cannot be enforced where the foreman in immediate charge is interfered with by a superior officer giving orders directly to his subordinates' (Chandler, 1965b: 102-4--emphasis is McCallum's). It would appear a) that McCallum was only expressing a principle that had been recognized on the NY&E since at least 1852 \*\*\*\*and b) that Haupt and the PRR were also well ahead of him. It has been argued that it was failure to respect this principle that was one of the main weaknesses of Captain Mark Huish's otherwise advanced management of the London & North Western Railway (Gourvish 1972:xx)--see Appendix I.

<sup>46</sup> In his last surviving annual report as Chief Engineer and General Agent of May 1844 JET gives

some basic operating statistics ('The expenses of the motive power department are \$25,838.24, or 16 8-10 cents per mile run by the engines. The repairs of the engines and tenders, and the cost of fuel, are each 3 7-10 cents per mile run. The whole expense of the road is 65 2-3 cents per mile run by the trains. The cost of maintaining the road is, this year, \$260 per mile, or nearly 25 cents per mile run by the trains.' After discussing the view that railroads represent a highly risky investment, he goes on to say 'The defects of the system have, however, been gradually undergoing a cure, and we are now enabled to present it in its true character, a good and *improving* investment of capital when "judiciously located between desirable points"--such as we conceive our main line to be. The cost of the management of finished railroads, for a time veiled in obscurity, we now have ample data, drawn from experience, for calculating with tolerable accuracy.

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Annexed to this report will be found a table, in which the expenses of our road, for a series of years, are given under their appropriate heads.’ (Georgia Rail Road and Banking Company 1844: 17-18)

\*\*\*\*O’C 243 says complicated but standard rr practice\*\*\*\*). The accompanying five tables cover A: monthly total passenger and freight statistics and revenues (up and down separately) and mail revenue for the year; B: a five year comparative table of the working expenses analysed by functional headings (e.g. wages, fuel, provisions and clothing for Negroes) within each of the four departments ‘Conducting Transportation’, ‘Motive Power’, ‘Maintenance of Way’, and ‘Maintenance of Cars’; C: combining the totals of A and B into a seven year comparison back to November 1837 of yearly total freight and passenger statistics, total receipts (also including mail), total operating expenses, and net profits with a note of the miles of road in use each year (the road had reached its full extent of 147½ miles in 1841); D: a four year comparison of the revenues from passengers (up and down combined) and freight (up and down separately) at each station; and E: mileage statistics and repair and improvement costs for the year, together with other information, for each of the twelve locomotives. The previous year’s report is similar (but naturally having one fewer year of comparative figures), while the 1842 report gives the same information but only for the current year. The other extant GaRR annual reports we have examined, for May 1841 and May 1840, are similar.

<sup>47</sup> \*\*\*Chandler HVP re this. As noted in the previous chapter, JET’s report in 1842 indicates that he had been somewhat reluctant to have to take on the organization of the GaRR’s operations. It is therefore more than likely that he looked to the B&O’s published reports for a model for accounting and reporting, subject to his own imperatives for simplicity and cost minimization. For the B&O see Vangermeersch, 1978; Previts and Samson, 2000 (and Ch4?).\*\*\*\* (cfWard 1971: 63 and fn31? \*\*\*\*O’C 243 says report tables complicated but standard rr practice\*\*\*\*)O’C 242 / cf 255says structure similar to B&O and Western. \*\*\*\*o/s/to do Previts and compare B&O, GaRR, and PRR reports \*\*\*\*NB ?role of STATE LAWS??? (and all familiar to HH who still claims he was ‘first’).

<sup>48</sup> The Treasurer also appears to omit approx. \$275,000 from the receipts, and a similar amount from the expenses, presumably relating to the connecting roads.

<sup>49</sup> In much later reorganizations ‘traffic’ became effectively a separate department, although generally closely linked to the ‘Transportation’ department--the various changes in the way the responsibility was allocated on the PRR in the 1860s and through to the end of the century are described in Jenks, 1961: 168-171. Some divisional railroads did not have a separate traffic department but kept the



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responsibilities decentralized. For example, on the Chicago, Burlington and Quincy Railroad, as described by its president Perkins (1885), the ‘traffic executives worked within its several autonomous units’ (Chandler, 1965b: 100). Chandler regards the 1860s as the period when ‘as traffic and mileage increased, the Pennsylvania also pioneered in the creation of a third great functional department’ [i.e. in addition to finance/accounting and transportation/operating] ‘--the traffic department--which became responsible for obtaining and processing, but not moving, freight and passengers. The Pennsylvania also formed one of the first central offices manned by executives who concentrated on the broader problems of cost determination, competitive rate-making, and strategic expansion rather than on the more routine operating activities’ (Chandler, 1965b: 99). On our reading, HH has anticipated the need for these developments on the PRR more than 10 years earlier.

<sup>50</sup> Lewis, like their father, used this spelling of the family name for easier pronunciation. However, Herman was told by his sponsor for West Point to spell it correctly, as Houpt was meaningless ‘while Haupt means Chief or Principal’ (Haupt 1889: 16). This was not the first time that the elder brother had found employment for the younger (nine years his junior). In the catalogue of the Oakridge Select Academy of 1845 (or possibly 1846), of which a copy is held in the library of Yale University, the instructors are listed as: H. Haupt, A.M., Principal and Teacher of Mathematics, Natural & Moral Science, Drawing, etc., William H. Harrison, A.B. (Latin, Greek and German) and L. L. Houpt [*sic*, i.e. with no degree], Teacher of French and Assistant in the English, Mathematical and Classical Departments. However, although family influence might have gained him employment on the PRR there is no evidence that he gained any further advancement. In 1852 he was written to by Haupt as ‘Chief Clerk’ (Haupt 1852b: 173-5). In the published Annual Reports Haupt tended to incorporate his subordinates’ reports into his own report (although the table prepared by ‘F.A. Denning, Car Inspector’ appears in PRR 1852a). On becoming Superintendent Lombaert adopted the practice of publishing his subordinates’ reports directly and the names of administrative staff that emerge in the Annual Reports are:

‘Thomas R. Davis, Chief Clerk Transportation Department’ and ‘Daniel W. Caldwell, Chief Clerk Motive Power Department’ in PRR 1853a; Davis again in the same post the following year, but now it is ‘Wm. M. McClure, Chief Clerk Motive Power Department’ and ‘Alfred L. Smith, Chief Clerk’ who provides the table of freight statistics etc. (including ‘ton miles’) from the ‘general freight office’ in PRR 1854a; in PRR 1855a it is ‘B. F. Custer, Ch. Clerk Motive Power Department’; in PRR 1856a

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Davis is still there (in Superintendent's Office, Altoona).\*\*\*\*\*?o/s other tables after 1-4? o/s ?JET sacking his brother on GaRR?

<sup>51</sup> We assume that Haupt was behind JET's letter of 14 August 1849 to C\*\*\*\*& B\*\*\*, the Philadelphia freight agents, re. the Superintendent of Transportation (i.e. Haupt) supplying them with the PRR's own bookkeeper and forms. (\*\*ref\*\*)

<sup>52</sup> The increasing centralization at Philadelphia was apparently against Haupt's advice. In a letter of 17 June 1852 (from Philadelphia) to Lombaert, then his assistant superintendent in charge of transportation based at Altoona and 'successor in waiting', Haupt comments: 'Your remarks in reference to centralization are correct the reports should be made to and the accounts kept at the general office and the location should be Altoona. I have never entertained any other opinion but the Board wills the passenger and freight offices to be located at Phila and their will must be law. In this case a sub office for collecting reports may be installed at Altoona, where after examination such extracts could be made as you require and the reports forwarded. There will be some way of arranging it' (Haupt 1852b: 79). The Board may have had good reason, beyond the public relations image of having all corporate offices identified with Philadelphia, as by 1852 work had been started in downtown\*\*\*\*\* Philadelphia on the largest freight depot in the US with 92,750 sq. ft. of storage space and plans were afoot for a passenger depot\*\*\*\*\*[cf Ch7 p.4].

<sup>53</sup> Strictly this should be 142 as some of the numbers give by Chandler for the individual departments do not tally with the list set out in PRR1857c.

<sup>54</sup> At this date the PRR had a total of around 50 engines ((PRR 1854a: 83-4)\*\*\*\*get p.83!\*\*\*

<sup>55</sup> Ward (1971: 85-6) says the State experimented with removing tax on coal and timber and this was so successful that it dropped the tax permanently on these items in 1855, although other tolls remained until the PRR purchased the Main Line in 1857. (????JET still fighting tax as unconstitutional in 1859 (PRR 1859a: 20)\*\*\*\*)

<sup>56</sup> On the first basis his calculations demonstrate that '50,000 tons of coal, in addition to the present business, could be carried over the [PRR] from the summit of the Allegheny Mountains to Harrisburg, at an actual cost to the Company of less than 3 mills per ton per mile on that part of the road owned and operated by the [PRR]' (Haupt 1857: 18-19). On the second basis, he calculates a total cost (exclusive of interest on capital) of 4.20 mills per ton mile over the eastern division, and 6.06 mills per ton mile over the western division. He then makes calculations to allow for the need to transport the coal over

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the portions of the line between Harrisburg and Philadelphia owned by the State and other roads, arriving at a total cost of just over \$1.96 per ton (excluding interest on new cars and engines--would be \$2.07<sup>5/8</sup> including interest--but including an allowance of \$1.05 for the tolls payable to the connecting roads on top of the PRR's own costs) for transporting coal over the 251 miles all the way from the summit of the Alleghenies east to Philadelphia (i.e. an average of 7.82 mills per ton-mile excluding, and 10.74 mills per ton-mile including, interest). He concludes: 'The tonnage of the Eastern Division of the [PRR] eastward has only been about one-fourth of a million of tons. Six or seven hundred thousand more tons could be carried, and yet be within the limits of the capacity of the road, if additional cars and engines be provided for it. The coal business could be increased in two or three years to 500,000 tons, paying not less than \$600,000 direct profit, and perhaps \$400,000 more in the increase of passengers and other freight consequent upon it' (Haupt 1857: 31)

<sup>57</sup> In the introduction to his pamphlet, Haupt says: 'In the following pages I do not expect any consideration in consequence of past services or experience. I desire that no assertion shall be credited unless it be sustained by proof, that no results be admitted unless the process of reasoning or of calculation by which they are obtained is so simple and intelligible that you can be satisfied with the premises and conclusions' (Haupt 1857: 4).

<sup>58</sup> As he observes: 'It is probable that from the peculiar position which the writer has occupied in reference to the [PRR], and to operators, he has thought more and figured more than any other person connected with the road upon the cost of transportation and the ways and means of increasing the business and profits of the Company' (Haupt 1857: 30-1).

<sup>59</sup> A precedent can be found in the B&O\*\*\*\*\*but very crude, based on hypothetical figures, and not clear how it was made use of.\*\*\*\*\* (Vangermeersch 1978:\*\*) )

<sup>60</sup> It is even possible that Haupt's first analysis was still earlier, based on the 1851 figures, as we now know that he was carrying out careful analyses of the operating figures from at least this year, when the eastern division of the line from Harrisburg to the Portage Railroad was now complete and overall sufficient track had been completed for the PRR to be able to claim to have linked Philadelphia to Pittsburgh (albeit through a fragmented journey still requiring transshipment onto the linking State roads on the eastern division and over the Alleghenies, and, on the still incomplete and more mountainous western division, the continued use of stage-coach and canal-boat connections during 1851 and 1852 (PRR 1853a: 16)). Although at this date he was proposing that only a modest amount of coal business

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should be sought for the present (because of the difficulties of the various connections and transshipments still required) he did observe, in his report dated 1 January 1852 as General Superintendent, that it would be advantageous to have some coal business available to fill otherwise partially empty trains, and that ‘for the purpose of securing it I proposed a rate of toll, which, I believe, has not yet received the favourable attention of the Board’ (which at this date was still the Patterson-Merrick board) (PRR 1852a: 47).

<sup>61</sup> HH had begun to provide most of this information the previous year in respect of 1850. (o/s GaRR etc\*\*\*).

<sup>62</sup> The original (or microfilm??\*\*) is now held at the Pennsylvania archive in Harrisburg (where it first became available to us in 1990 when the relevant cataloguing was completed) and a microfilm copy is also available at the Hagley library, Wilmington, DE under accession number 1807. Within Board file 286 the working papers are batched with a contents list as ‘Statement of Documents accompanying the Report of the General Superintendent of the Penna. R.R. for the Year 1851’. (The individual pages have been microfilmed out of order so document numbers are given here.)

<sup>63</sup> While this calculation must be related to that on p.58 of the printed report, it is not clear to us how. The file also contains the manuscript draft of Haupt’s printed report: interestingly the final section on general policy, in which he draws attention to his intention to resign, and attacks the shortsightedness and unbusinesslike approach of the Patterson-Merrick board to the setting of passenger and freight tariffs, was censored out of the published version, either at the insistence of Patterson (who signed the President’s report) or because by the time the report was actually published (albeit dated 2 February 1852, the day the stockholders voted to replace the old board with the JET ticket) JET thought it no longer relevant now he was in charge. It may be noted that the tenor of the observations, and much of the substance, was anyway made public in Haupt’s published response of 20 January 1852 to the attacks on him by the Patterson-Merrick faction (Haupt 1852a). (?MS alterations by JET?\*\*\*\*\*and in 1851???)

<sup>64</sup> As is clear from the disputes that we have discussed, he was equally concerned while he was General Superintendent with analyzing how to achieve revenue maximization. But, as he says himself, ‘Unable to effect a change in the policy of the Board in regard to revenue, my suggestions and representations being viewed as acts of insubordination, I confined my attention to a watchful supervision of the

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expenditures . . .', achieving a lower 'cost of running the trains per mile' than on any other important railroad (Haupt 1852a: 32).

<sup>65</sup> Board file 286 only survived because the manuscript papers for these early years somehow got filed in with much later Board papers relating to 1902, and thereby escaped the general destruction by fire.

<sup>66</sup> see fnx to Chapter X for the meaning of this adjective at the time.

<sup>67</sup> He had graduated in 1817, the final year before Thayer's arrival. According to Jenks (1961: 164-5) he unsuccessfully attempted to introduce uniforms on the PRR\*\*\*\*\*

<sup>68</sup> In this regard one might note that the Springfield Armory had been in the business of making firearms for several decades before Tyler introduced his performance standards (Hoskin & Macve, 1994).

<sup>69</sup> By contrast with HH, JET himself appears to have had little concern about 'human resource management' with respect to his labourers, whether they were Negro slaves on the GaRR or striking Irish navvies on the PRR (Ward 1980: 31-2, 66-7, 83, 125).

<sup>70</sup> For further detail see Appendix V. The evolution of the precise wording of the new organization plan is analysed in Hoskin & Macve (2003)

<sup>71</sup> Lardner (1855: 52-3--first published in 1850), in his classic treatise based on information obtained from UK, Continental and US railroads up to 1849, in his Chapter III on 'The Organization of a Railway Administration' identifies four departments/services which are 'more or less distinct from and independent of each other. These are--

1<sup>st</sup> The service of the way and works

2<sup>nd</sup> The service of the draft

3<sup>rd</sup> The service of carriage

4<sup>th</sup> The service of the stations

Each of these departments has its separate staff machinery and stock.' In his four following chapters he describes each in detail. The first is equivalent on US railroads to 'Maintenance of Way'; the second to 'Motive Power'; the third to Maintenance of Cars'; but although the fourth is equivalent to 'Transportation' (covering clerks, porters and others and maintenance of stations and freight depots) all the description is about the physical arrangements. Accounting only appears with reference to the operation of the 'Clearing House' for inter-company settlements. Gourvish (1972: 151) identifies Captain Mark Huish, General Manager of the London & North Western Railway from 1846 to 1858, as an important source of Lardner's information on railway practice, including costs and other operating statistics.

<sup>72</sup> Some further detail explaining the responsibility and authority of the Freight Agent (generally subordinate to the General Superintendent) was also included.

<sup>73</sup> and of course, as noted above, we do not now know how much detailed wording may have gone back to 1849.

<sup>74</sup> These included:

- Establishment of a legal department from 1853, and its formal incorporation into the organization as set out in the by-laws adopted in September 1856 (and still in place until at least 1859--PRR 1859b). The 'Construction Department / Engineer Corps' disappeared in the 1856 by-laws (the line being essentially complete and its residual duties transferred to the Superintendent) and the remaining three departments are those of the 1852 reorganization.
- A continual strengthening of the authority of the 'Division Superintendents' as the whole line is completed and comes under the PRR's direct management (as reflected in the

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September 1857 manual of the Transportation Department's 'rules and regulations' (PRR 1857b)).

<sup>75</sup> Somewhat confusingly, in his annual report JET describes the reorganization as having 'separated the business of the Transportation Department into two divisions', the first to be under the General Superintendent and the second under the new post of 'Controller and Auditor' (PRR: 1858a: 16). While strictly correct (the former duties of the General Superintendent had been split) in fact the accounting duties had not been put into a separate division of the Transportation Department but had been completely removed and added to those of the former Auditor's Department to create the new 'Accounting Department'. Further confusion is caused by the September 1856 edition of the By-Laws (which still referred to the 'Auditor's Department' as one of the four) still being published as current after the 1857 reorganization (PRR 1859b 119). But, as JET might say (and as he had more than once said to Haupt, e.g. Haupt, n.d.a: 5, 7) 'Don't bother me with the detail'.

<sup>76</sup> As noted above, the precise role of the Maintenance of Way and Motive Power departments took some time to clarify.

<sup>77</sup> The particular organizational role of these agents, outwith the general authority of divisional superintendents, had also been catered for in the NY&E's 1856 organization (Chandler 1965b: 103)--as indeed it had there in 1852 (NY&E, 1852: pp.6-7, sections 13-15)

<sup>78</sup> For the PRR's organizational development to 1882 see Jenks, 1961.

<sup>79</sup> Moreover, JET had crossed swords with the *ARJ*'s editor at the beginning of 1854 over Poor's comments on the prospects for railroad investors in Pennsylvania, which threatened to reduce the marketability of the PRR's bonds (Chandler, 1956: 191). In an article in the *Pittsburgh Gazette*, reproduced in the *ARJ*, 27: 97-9 (February 18, 1854) Thomson bitterly attacked the *ARJ* for 'endeavouring...to destroy the credit of Pennsylvania, to depreciate her bonds, and the bonds of her cities and railroads.'

<sup>80</sup> However, unlike the PRR, Perkins's own traffic executives worked within the several autonomous units of his railroad (Chandler 1965b: 100), not as central traffic departments (Freight Department and Passenger Department, both under the First Vice-President) with the division agents of each department, required 'to consult with the General Superintendents of their respective Divisions' (PRR 1893, 29-30; 34-35).

<sup>81</sup> For further details see Hoskin, Macve, and Stone (1998) and Hoskin & Macve (2003)

<sup>82</sup> The through line was opened in September 1883. Shortly afterwards HH resigned after the Board faced pressure when the view on Wall Street that the ratio of operating expenses to gross earnings was too high led to a raid on the stock. HH, as usual, set out careful calculations and accounting arguments to show that concentration on such a crude statistic, and consequent insistence on reduction of immediate expense, was ruinous to economical management for the future, but these were ignored. In his (lengthy) resignation letter of 2 November 1883, he commented: 'Whatever opinion others may entertain, I can say that with the possible exception of my connection with the Military Railroads of the United States during the war, I have never made a record more satisfactory to myself in the results accomplished than on the Northern Pacific. The organization and discipline are now as perfect as on any road in the Northwest . . . Great improvements have been made in the records and system of accounts, so that during the present year the Auditor has been able for the first time to furnish detailed accounts in all items of passenger and freight traffic separated and by divisions (*sic*). Albert Fink and other railroad statisticians will appreciate the value of such a system without explanation, but its practical and economic value consists in the ability to compare all items of expense per train mile, car mile, and passenger and ton mile on the several Divisions, and thus detect excessive expenditure upon any one, excite emulation to secure results, and promote economy of operation' (Unknown n.d.: 26). In a final published (and also lengthy) press statement on 25 November, he remarked: 'Good management on a railroad is not exhibited by a low percentage of operating expenses, regardless of existing conditions, but rather by minimum freight train mileage with maximum car mileage; by . . . [he lists a number of factors] . . . ; by treating employees as men, with consideration and respect, and preventing strikes by attaching them personally to the management; by . . .' And he reiterated the importance of costing for strategic pricing: 'It may be wise sometimes to take business at non-paying rates, for the purpose of encouraging industries from which future profits may be derived; but traffic managers are very frequently ignorant of the actual cost of transportation, and are solicitous simply to secure business regardless of cost, and without proper concert with the Transportation Department to carry such business, where practicable, as back-loading, and reduce the empty car mileage as much as possible' (Unknown n.d.: 27, 29).

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<sup>83</sup> Although O’Connell (1982: 244) says that Haupt’s appointment by the Board, on 12<sup>th</sup> January 1848, as ‘Principal Assistant’ to JET (on JET’s nomination) was outside this authorized structure, it appears to be covered by clause 7.

<sup>84</sup> One may also speculate whether Merrick’s plan was designed to lead to a new extension of the powers of the Committee on the Road, of which he was still chairman, to embrace operational oversight, as this would fit alongside the role of the Committee on Accounts with respect to what was now to be the ‘Treasurer’s department’. The original by-laws had provided for three standing committees of the Board: Finance, Road and Accounts. The Finance committee dealt primarily with the raising of funds externally and with investments. The Accounts committee had responsibility for supervising the Treasurer’s accounts. The Road committee (‘of which the President shall always be a member and chairman’) had ‘a general oversight . . . of every thing having reference to the construction of the work’ (PRR 1850). Merrick had remained chairman of the Road Committee even after ceasing to be President. However the committee’s scope was still limited to ‘construction’ in the edition of the by-laws published in 1853 (PRR 1853), although by 1856 it had indeed been extended to ‘a general oversight of all matters concerned with the construction and management of the road and its appurtenances’ (PRR 1859b). It was a feature of the management structure of the most important UK line, the London and Northwestern Railway, that the operational responsibilities were allocated to a number of board committees to whom the General Manager was responsible\*\*\*\*(Gourvish, 1972\*\*\*).

<sup>85</sup> This was stronger than the provision in the by-laws, which were to continue to state that the President ‘shall . . . attend generally to the executive business of the Company, under the direction of the Board’ (PRR 1850; 1853; 1859b).

<sup>86</sup> In one respect the plan did acknowledge fully the necessary authority of the General Superintendent: the Freight Agent in Philadelphia had to submit his monthly expenditure estimates to the General Superintendent, and although he could directly requisition the Treasurer for certain specified payments, such as tolls, his accounts had to ‘pass through the General Superintendent as heretofore.’ While given equal powers to the General Superintendent to ‘nominate his subordinates to the Board and have the power of dismission’, the ‘Freight Agent shall report to and receive instructions from the General Superintendent & any instructions that he may receive from the President conflicting with General Orders or instructions shall be reported by him to the General Superintendent.’

<sup>87</sup> As previously noted, this particular reorganization has generally been overlooked by earlier histories. Haupt gives further examples of its impracticability in Haupt, 1852a: 8-9.

<sup>88</sup> These are analysed in detail in Hoskin & Macve (2003)

<sup>89</sup> The first appointee here was Haupt’s protégé Scott. ‘Before leaving for the South I called the attention of Mr. Thomson to the more than ordinary ability of the Agent at Hollidaysburg Junction, Thomas A. Scott. . . . On my recommendation he was appointed assistant superintendent and was thus started on the line of promotion that carried him to the Presidency of the company’ (Haupt n.d.a: 19). Scott became General Superintendent in the 1857 reorganization after Haupt finally left the company (PRR 1858a: 16) and President in 1874 on JET’s death (Ward 1980: 216).

<sup>90</sup> Physically the 2<sup>nd</sup> Assistant’s responsibility was represented by the extensive PRR engineering workshops that had been built at Altoona and were in operation from Spring 1852 (PRR 1852a: 29) (thereby creating a huge ‘railway town’ near Hollidaysburg), where he, together with the Superintendent, was headquartered.

<sup>91</sup> In his first report as Superintendent Lombaert, introducing the reports of his assistants, notes that ‘The Third Assistant, Thomas A. Scott, Esq., having been placed in charge of the Western Division, including the Allegheny Portage, since the opening of the Western Division in December last, no detailed statements could be made, his services having been fully taxed in arranging and perfecting our plan of operations at Pittsburgh and along the line of the road. The Fourth Assistant, A. L. Roumfort, also came into office under the new organization, December 1, 1852. His time has been fully occupied with the detail of business connected with the Transportation Department, and in arranging and perfecting an organization by which we hope to secure greater security in the transmission of baggage, as well as to retain unclaimed baggage until claimed by its rightful owner’ (PRR 1853a: 47).

Arrangements for baggage (and passenger) handling in downtown Philadelphia, when transport had to be arranged across the Schuylkill river to West Philadelphia, and then the PRR’s own line did not really start until Harrisburg, had been a major problem taxing Haupt in 1851 (PRR 1852: 51-3).

Roumfort was another West Point graduate (who graduated in 1817 just before Thayer’s arrival) who had been superintendent on the Philadelphia and Columbia. Apparently his attempt to put train crews on the PRR in uniform was unsuccessful (Jenks 1961: 164-5). Haupt had spoken highly of the efficiency of the superintendents on the state lines, when he wrote to his Board in January 1852 to discuss the ‘problem’ of these connections and their high cost, saying he had been ‘surprised that they

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were able to discharge their duties under the system to which they were required to conform, without giving us more annoyance' (Herman Haupt, General Superintendent, letter to the President and Directors, January 1852, p.10 [in PRR Board file No.286]).