

THE SUSTAINABILITY OF HERITAGE RAILWAYS

by

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A thesis submitted to the University of Birmingham

for the degree of

DOCTOR OF PHILOSOPHY

Birmingham Centre for Railway Research and Education
College of Engineering and Physical Sciences
University of Birmingham

February 2021

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Declaration and credits

Declaration:

"I, Robin Coombes, do solemnly and sincerely declare that the research undertaken and presented is original and I make this solemn declaration conscientiously believing the same to be true."

A handwritten signature in black ink, reading 'Robin Coombes', with a stylized flourish underneath.

Robin Coombes
23 February 2021

In terms of the content of the research. The study is financially supported by the two key organisations of the heritage railway sector: The **Office of Road and Rail (ORR)** is the independent regulator, that operates within the framework set by UK and EU legislation and are accountable through Parliament and the courts. They are an independent statutory body, with powers vested by Parliament in their governing board. The ORR regulates the rail industry's health and safety performance including heritage railways; the **Heritage Railway Association (HRA)** is a volunteer run trade association representing heritage and tourist railways, related museums, tramways, cliff lifts, railway preservation groups and related organisations.

Both bodies expressed an early interest in the study as no comparable work was known or available to them.

The project was reviewed by the Science, Technology, Engineering and Mathematics Ethical Review Committee who confirms that this study has full ethical approval. ERN_16-1537

Abstract

'Heritage railways' are multi-faceted organisations established mainly by volunteers for public benefit, to encourage and promote interest in the preservation and operation of superseded railway technology, systems, artefacts, buildings and routes through the offer to participate in a living history experience. They have so far proved remarkable in their resilience and longevity: many have existed for more than 40 years, compared to a typical commercial company life cycle of around 10 years. This thesis seeks to define 'heritage railways' as an organisational form and examines the basis for their singular longevity. In particular, the thesis explores the necessary condition(s) for the successful operation of a heritage railway in terms of governing their sustainability as expressed through consideration of their life cycle trajectory around the three pillars of sustainability – environmental, economic and social. The hypothesis proposed in the study is that good governance of railway assets and management is the key determinate of the sustainability of a heritage railway. This hypothesis was tested through a survey of 39 Directors and General Managers and 252 heritage railway enthusiasts of 104 heritage railways, semi-structured interviews with 15 Directors and General Managers, and the author's recorded field observations and participation in 52 heritage railway visits and events. The research shows that the longevity of heritage railways does not simply arise from 'good governance' but is in fact the product of multiple interlinked variables and processes. Indeed, many heritage railways have survived and prospered despite poor governance, rather than because of 'good governance'. One of the most significant of these explanatory variables is social capital, a hitherto under-researched governance variable in heritage railway studies. Through case study examples, social capital is demonstrated to have compensated and mitigated for failures of organisational governance and weaknesses in operational conditions on heritage railways. In this respect, heritage railways are argued to be similar to charitable and other public-good organisations. On this basis the hypothesis was rejected, and an alternative hypothesis proposed: that social capital (of which philanthropy, reciprocity and trust are key constituents) is a key determinant of the sustainability of heritage railways. Recommendations are made using this finding on improving resilience and longevity.

*This thesis is dedicated
to all the many men and women involved with every aspect of preserving and
operating heritage railways.*

*Without their dedication, passion, commitment and tireless efforts we would
not be able to keep the past alive and hand on the legacy of the 'steam age' for
a new generation to learn from and to enjoy and experience, the thrill and
emotion of the working steam locomotive.*

Acknowledgements

The Author wishes to acknowledge the help and assistance provided by the following:

Professor Clive Roberts as Director of the Birmingham Centre for Railway Research and Education who hosted the study and acted as the second supervisor for the first year of study.

Professor Anson Jack as first supervisor. Professor Jack provided my inspiration, support and mentoring and proposed lines of research, but perhaps most of all, a constant reminder to the researcher of the importance of taking a dispassionate, independent view of the research and findings.

Doctor Julian Clark who acted as second supervisor from year 2, rigorously guiding the author along an academic path and widening the author's research areas in governance and social capital in the process.

Ian Prosser CBE Chief Inspector of Railways and Director Railway Safety for support and interest in the outcomes of the research.

Ian Skinner Head of Non-Mainline at the ORR who has provided help and assistance in ensuring practical outcomes to the study.

All those **members of the railway heritage movement** who have contributed to the research and provided so much knowledge and insight into its history, development, challenges and day-to-day operations.

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List of acronyms and abbreviations

4Ps	Product, Price, Place, Promotion
7S	Strategy, structure, systems, shared values, style, staff, skills
Act	Act of Parliament
AIR	Association of Independent Railways
APPGHR	All Party Parliamentary Group on Heritage Rail
ARPS	Association of Railway Preservation Societies
Big Four	Companies formed after the Grouping of 1923 - GWR, SR, LMS, LNER

BBC	British Broadcasting Corporation
BCRRE	Birmingham Centre for Railway Research and Education
BIS	Department for Business, Innovation & Skills
Bn	Billion
BR	British Railways
BRB	British Railways Board
CBS	Community Benefit Society
CC	Charity Commission
CH	Companies House
CIC	Community Interest Company
Covid-19	Coronavirus disease discovered in 2019 also known as Novel Coronavirus 2019-nCoV
DCMS	Department for Digital, Culture, Media & Sport
DfT	Department for Transport
DMU	Diesel Multiple Unit
ed	Edition
EFQM	European Foundation for Quality Management
FCA	Financial Conduct Authority
FEDECRAIL	European Federation of Museum and Tourist Railways
FTR	Fitness to Run (examination)
FR	Festiniog Railway The traditional railway spelling of the Festiniog Railway which refers to the company name spelt with one 'f' as opposed to the place Ffestiniog and current branding of the railway.
GDP	Gross Domestic Product
GRC	Governance Risk Compliance
GWR	Great Western Railway
GWS	Great Western Society
GWSR	Gloucestershire Warwickshire Steam Railway
HMG	Her Majesty's Government
HMRI	Her Majesty's Rail Inspectorate
Hi-Vis	High Visibility
HLF	Heritage Lottery Fund
HR	Heritage Railway
HRA	Heritage Railway Association
K	Thousand
KWVR	Keighley and Worth Valley Railway
LCA	Life Cycle Assessment
LNER	London and North Eastern Railway Company
LMS	London Midland and Scottish Railway Company
Ltd	Limited
m	Million
MSM	Mainstream Media
NR	Network Rail
NYMR	North Yorkshire Moors Railway
Ops	Operations
ORR	Office of Rail and Road
PLC	Public Liability Company

PW	Permanent Way
RAIB	Rail Accident Investigation Branch
RHDAB	Railway Heritage Designation Advisory Board
RI	Railway Inspector
RM3	The ORR's Risk Management Maturity Model (2019)
ROGS	Railways and other Guided Transport System Regulations 2006
RSSB	Rail Standards and Safety Board
SLO	Social Licence to Operate
SR	Southern Railway
SME	Small medium sized enterprise
SMS	Safety Management System
SVR	Severn Valley Railway
TLW	Tyseley Locomotive works
TOC	Train Operating Company
TOPS	Total Operations Processing System
TR	Talylyn Railway
TRS	Traction and Rolling Stock
UK	United Kingdom
VT	Vintage Trains
WHO	World Health Organisation
WSR	West Somerset Railway
WSRA	West Somerset Railway Association

Note on references and interchangeable terms, single and plural

Where reference is made directly the following style is used – Name of author (date of publication) - as in “Brown (2017) stated that heritage railways were developed.....”

Where the reference is indirect the following style is used – (Name of author, date of publication - as in “an example being the South Devon Railway in 2018 (RAIB Report 02/2018)”

An example of a sentence utilising both styles to use a colloquialism of Tonks (1985), “stuffed and mounted”, and secondly, railway companies who saw the benefit in marking important anniversaries and reinforcing achievement and progress (Kichenside, 1969).

References to a particular railway magazine take the following forms (Steam Railway ed number), (Railway Magazine month/year).

Rail regulator, regulator and ORR all refer to the Office of Rail and Road.

Government refers to the UK Government

Heritage railway – refers to the singular; heritage railway(s) can mean singular or plural heritage railways refers to the plural, though plural should not be conferred as every heritage railway.

Personal Statement

As far back as I can remember I have been enthralled and fascinated by railways and the age of steam. Throughout my life I have derived considerable pleasure and enjoyment from its pursuit - reading, modelling, volunteering, observing, managing, designing, organising, advising, consulting, photographing, visiting, travelling and most recently, carrying out academic research.

I have made visits to, and casual observations of, heritage railways since the 1960s, with more recent and present involvement as a research student and as an active volunteer as Company Secretary of the Vintage Trains Group of Companies, including Vintage Trains Limited, a licenced (TOC) Train Operation Company.

As an observer I have witnessed the development of the fledgling preserved railways by groups of enthusiastic amateurs from what could be regarded as a niche activity and hobby into what can today be deemed mature heritage tourist attractions having governmental recognised social, cultural and economic value.

My casual observation over this period is that they could also be regarded as a microcosm of both past and contemporary British life, from class structures to Internet warriors. Add to this the application of a technology with a span of around 150 years and they become an intriguing system of organisational depth and complexity.

My eyes were opened to the complexity of the sector by my appointment in 2015 as Chairman of a panel to undertake an independent review of the West Somerset Railway Association, the main supporting charity for the West Somerset Railway with some 6,000 members and volunteers. A series of disputes had arisen between the members and the Charity's trustees and between the Charity and the operating company of the railway.

The findings of the report – The Road Ahead - recommended the removal of the then trustees, which the members implemented at an Extraordinary General Meeting (EGM) in February 2016. My curiosity was aroused during the review by the interplay between the complexity of the sector and the strength of emotions displayed by those it attracted to participate. I questioned if such tensions were a product of governance or an influence on how governance was exercised and the effect on their future.

This curiosity provided the inspiration and idea for the research – where are heritage railways on their life cycle trajectory, how sustainable are they and what is the role and importance of their governance in determining their sustainability?

I discovered in undertaking the review of the West Somerset Railway Association, there was very little in the way of serious academic research of heritage railways. Most organisations, run principally by volunteers, seemed too busy concerning themselves with their own railway and day-to-day operations than to stand back and analyse the bigger picture.

I became aware from casual conversations and media articles that many within the sector are acutely aware of the pressures and challenges heritage railways face – operationally, financially, societally and environmentally. Understanding and describing the past and current conditions under which a heritage railway operates may be a means to determine whether they become more or less sustainable in the future. To form such an understanding has therefore real practical value and potential benefit for heritage railways. Any research undertaken would therefore fill an identified gap in knowledge of the heritage railway sector.

The aim of undertaking the PhD was therefore to gain new knowledge on the conditions of sustainability derived from research into particular aspects of a heritage railway's governance. The research has been part sponsored by the ORR (Office of Rail and Road), which is the safety regulator for the rail sector including heritage railways and their trade body - the HRA, (Heritage Railway Association).

Given both my interest and current involvement in heritage railways, the challenge for the researcher was to maintain independence and be an impartial observer. This has been achieved through the application of a rigorous and scientific methodology to the investigative process by the systemised collecting of information and observations.

In this process I am helped by my holding the office of Magistrate for over 30 years, making judicial decisions on the basis of a standard of proof, after considering all the evidence presented. Also, as an Architect and consultant I have been required to act under codes of conduct and to act professionally and independently when offering advice or making decisions. In interpreting the findings from this research, I have applied all these standards.

The outputs of this work have already proved to be of practical value and benefit to the ORR, incorporating the work in a heritage version of RM3 2019 which is the risk management maturity model used within the wider rail industry. The value of the research has been recognised in an email from the ORR:

...“the RM3 Governance Board’s comments on our plans for the RM3 2019 Topic Set 1 for the Heritage Sector. As the Board is made up of members of GB’s rail community, including RSSB, FOCs, TOCs, NR, IOSH, HRA and LRSSB their support is crucial. The Board provided positive feedback on the concept and the contents; and recognise the work done to get to this stage. Annex A on the “12 Tablets of Stone” was noted as a great piece of work and RSSB want to us to roll that into the next version of RM3 2019. Robin – you aced it here! We go to public consultation on 05/10/2020, and hopefully hard copy press in early 2021. Thanks everyone for getting it to here. Well done!”

*Ian Skinner Head of Non-Mainline at the ORR
16 September 2020*

Robin Coombes
Birmingham
February 2021

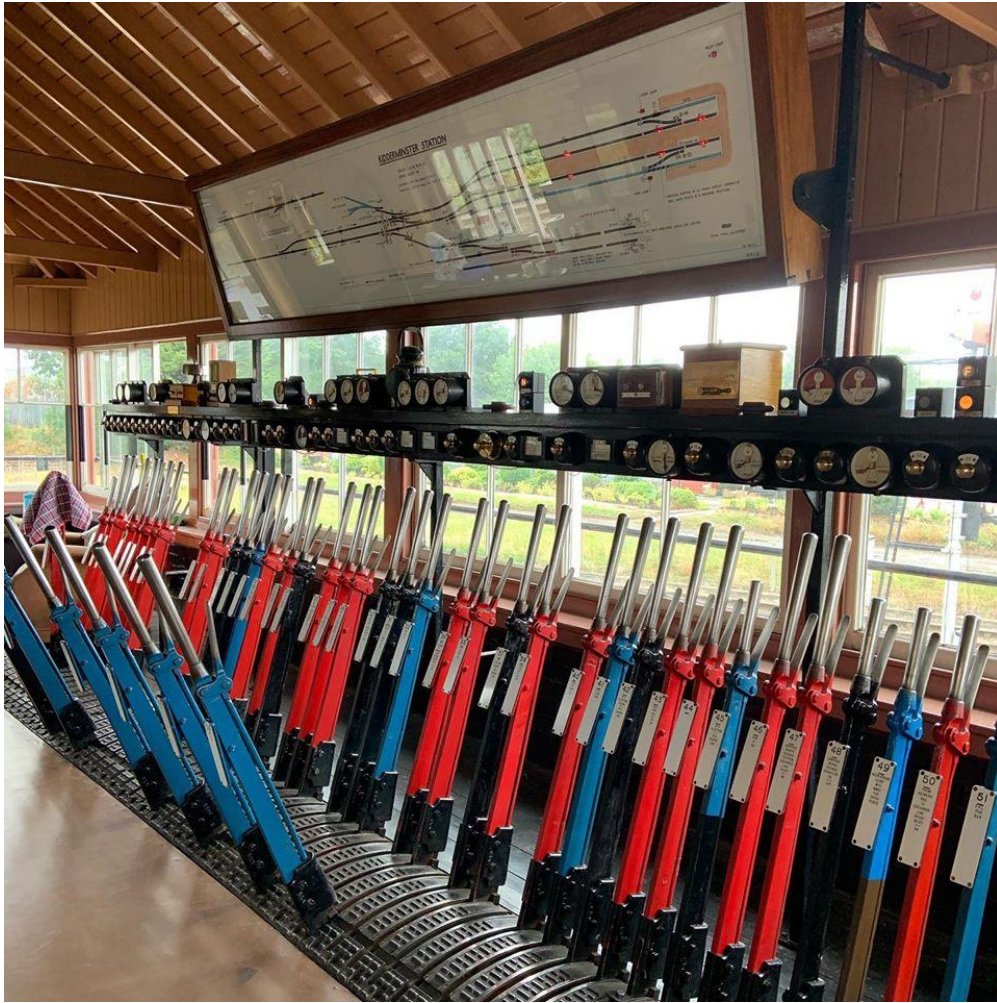


Image 0-01. An image that could act as a metaphor for the research, the use of superseded technology but still providing high levels of safety. The plan shows all the different routes available. To operate safely requires training, skill, knowledge and experience. Each of the levers has a different purpose and outcome but many are interlocked through complex mechanical and electrical systems. This is Kidderminster Signal Box on the SVR built in 1986, the design being based on a typical GWR medium-sized 'box. The installation work alone involved an estimated 8,000 volunteer hours. The 'box was commissioned on 21 November 1987.

Chapter 1

Introduction

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	<i>1.10 Core theme</i>
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	<i>1.12 Layout of thesis</i>
	<i>1.13 A note on style, grammar and diagrams</i>
	<i>Key points of the chapter</i>

The subjects of the thesis and research territory are what are commonly described as heritage railways. They lie at the intersection of the general category of railways and heritage tourism. Railways are multifaceted organisations engaged in transportation, consisting of a network of tracks with trains and associated infrastructure, equipment, systems and personnel required for their working. Heritage tourism being the traveling to experience the places, artefacts and activities that authentically represent the stories and people of the past.

They are commonly described as heritage railways by themselves, their visitors, the trade body - the HRA, the regulator - the ORR, the All-Party Parliamentary Group on Heritage Rail and the media, but as shown in Chapter 3 there is no common definition as they are made up of a number of subsets – preserved railways, tourist railways, museums and steam centres. Heritage railways are different to general railways and their other subsets in that they are in themselves the reason to exist, as opposed to railways in general which are a means to an

end as a transportation system. This makes heritage railways unique within the general classification of railways.

Heritage railways are multifaceted organisations established mainly by volunteers for public benefit, to encourage and promote interest in the preservation and operation of superseded railway technology, systems, artefacts, buildings and routes through the offer to participate in a living history experience that has developed over 70 years.

The value of heritage railways to society, culture and the economy was recognised by evidence presented to the All-Party Parliamentary Group on Heritage Rail in 2013 and its subsequent report. The multifaceted nature of heritage railways being confirmed with split government departmental responsibility between the Ministry of Transport, Department of Digital, Culture, Media and Sport and the Department for Business, Innovation and Skills.

There has been no academic research found into the overall sector, other than some minor aspects which are described in Chapter 4. This makes the research the first study to define the sector, to confirm its importance and then to explore the conditions for its sustainability.

This study seeks to discover evidence that has not previously been researched, that will provide a greater understanding of the current position of the life cycle trajectory – to address the questions - are heritage railways still in their growth and development phase; have they reached maturity; has the decline stage begun; are they currently on course for death or rebirth?

The research discovers in Chapter 2 the characteristics and components that make up heritage railways. The criterion suggested by Steinberg (2011) is used to judge success as being the added value created for shareholders and stakeholders, this not being confined only to financial metrics.

From information discovered in researching individual case studies, heritage railway(s) may be regarded as highly successful, based on their growth from start-up operations to mature organisations with significant numbers of visitors, their longevity, the achievement of original objectives to preserve elements of railway systems and artefacts, that they have turned assets literally placed on the scrap heap into valuable assets both in cultural and economic terms, mostly through the application of voluntary labour. The research undertaken suggests that the present replacement value of UK heritage railways is placed in the range of £5 to £10 billion.

The study commenced with four pieces of knowledge and experience; a threat; a curiosity and a theory.

1.1 Knowledge and experience

The four pieces of knowledge and experience were: the longevity of heritage railways, from personal experience and memory confirmed by the dates of their formation; the importance of heritage railways beyond their narrow appeal to the railway enthusiasts as confirmed in the All-Party Parliamentary Group on Heritage Rail in 2013; the results of the researcher's chairmanship of the review of the WRSA which found poor levels of governance when using a Cabinet Office assessment tool, together with the wider finding of the ORR in their annual

safety report for 2014 that governance of heritage railways “was not where it should be”; the researcher’s own career in GCR (Governance, Compliance and Risk) that demonstrated the importance of evidence decision making and the role of governance in a variety of settings covering private, public and charity organisations.

1.2 The threat

Aside from the researcher reaching his own mature stage of life along with his contemporaries, where the dawning issue of succession has become an ever-present challenge, the threats posed to heritage railways are contained in many contemporary articles in journals (Steam Railway, Railway Magazine, Heritage Railway) and are articulated in many discussion groups and web forums (National Preservation). These include “ageing volunteers”, “environmental pressures”, “loss of skills and knowledge”, “perilous finances”, “a tipping point reached” and “young people can’t remember real steam”. Though these topics are regularly discussed, some for many years, they have not been quantified and the risk assessed in any meaningful and systematic way in a publicly published form, with recognised tools or shared benchmarking.

1.3 Curiosity and questions

The researcher was curious as to why heritage railways had been so long lived and to understand better their life cycle trajectory. From this understanding and the above listed threats, the questions arise - can they keep going and what are the conditions for sustainability? Could what has got them to ‘here’ be the same and good enough to get them to ‘there’ – ‘here’ being the present and ‘there’ being a secure and successful future? What are the roles, influence and impact that governance and social capital play in their

sustainability? The question posed to the researcher prior and during the study and formally by the ORR was - “what does good governance look like for a heritage railway?”

These were not questions the researcher could readily answer.

The first question is, as in any prediction, impossible to accurately answer without a crystal ball. This was vividly demonstrated by the onset of the Covid 19 Pandemic in early 2020. This forced all heritage railways to temporarily close, for the first time in their history, by the imposition of an external event, regardless of whether unforeseen or not. However, the researcher believes and is supported by many sources, for example Owen (2005), Collins (2006), Covey (2006) Harvard Business Review (2011), that it is possible to form an understanding and identification of operational risks, strengths, weaknesses, opportunities and threats to place an entity in an advantageous position. The process for the mitigation of risk and exploitation of opportunity logically leads to improved longevity and resilience, or the reverse where failure to manage can lead to increased vulnerability for the entity.

The second question leads from the first in that risk identification, management, mitigation and preparedness for threats and the ability and capacity to grasp new opportunities are some of the key processes of governance, and therefore it follows that good governance as a minimum would include these processes.

Investigating and researching the context of these questions will allow more informed responses to be given to the questions posed.

1.4 Theory

The initial theory put forward by the researcher prior to the commencement of the research was that improving the governance of heritage railways was the mechanism that would be most likely to improve their sustainability. This is an important area of research, not previously undertaken, and any insight gained would be of value academically to fill a gap in the knowledge base of heritage railways, be of practical value in understanding future policy and decision making and potentially more widely in related sectors of the heritage tourism and charitable sectors.

1.5 The research undertaken

What may be regarded as a spoiler for the reader, the research findings confirmed the importance of governance which lies at the heart of sustainability, but it is a far more complex and nuanced condition than the researcher first considered and lies alongside another overarching condition - social capital.

The research was carried out in the following manner which is explained fully in Chapter 5. The research framework and process are shown in Diagram 1-01 below page 24.

Research questions – the overall research question is ‘what conditions are more likely to lead to whether a heritage railway becomes more or less sustainable’?

Research problems - the research problem to overcome was how to develop a method to understand how heritage railways have arrived at their present position on their life cycle trajectory, the threats and challenges they have faced, and the means utilised to overcome

or mitigate these along with the advantages gained from opportunities grasped. A method was developed to seek patterns or commonalities from a vast range of individual situations and events using contemporary articles in magazines and personal recollections of individuals involved. A framework or model based on the conditions necessary for operation was developed to better understand, measure and articulate the problems and life cycle trajectory of heritage railways. The study created a sector-wide database, a timeline, a selection of individual case studies and a risk register.

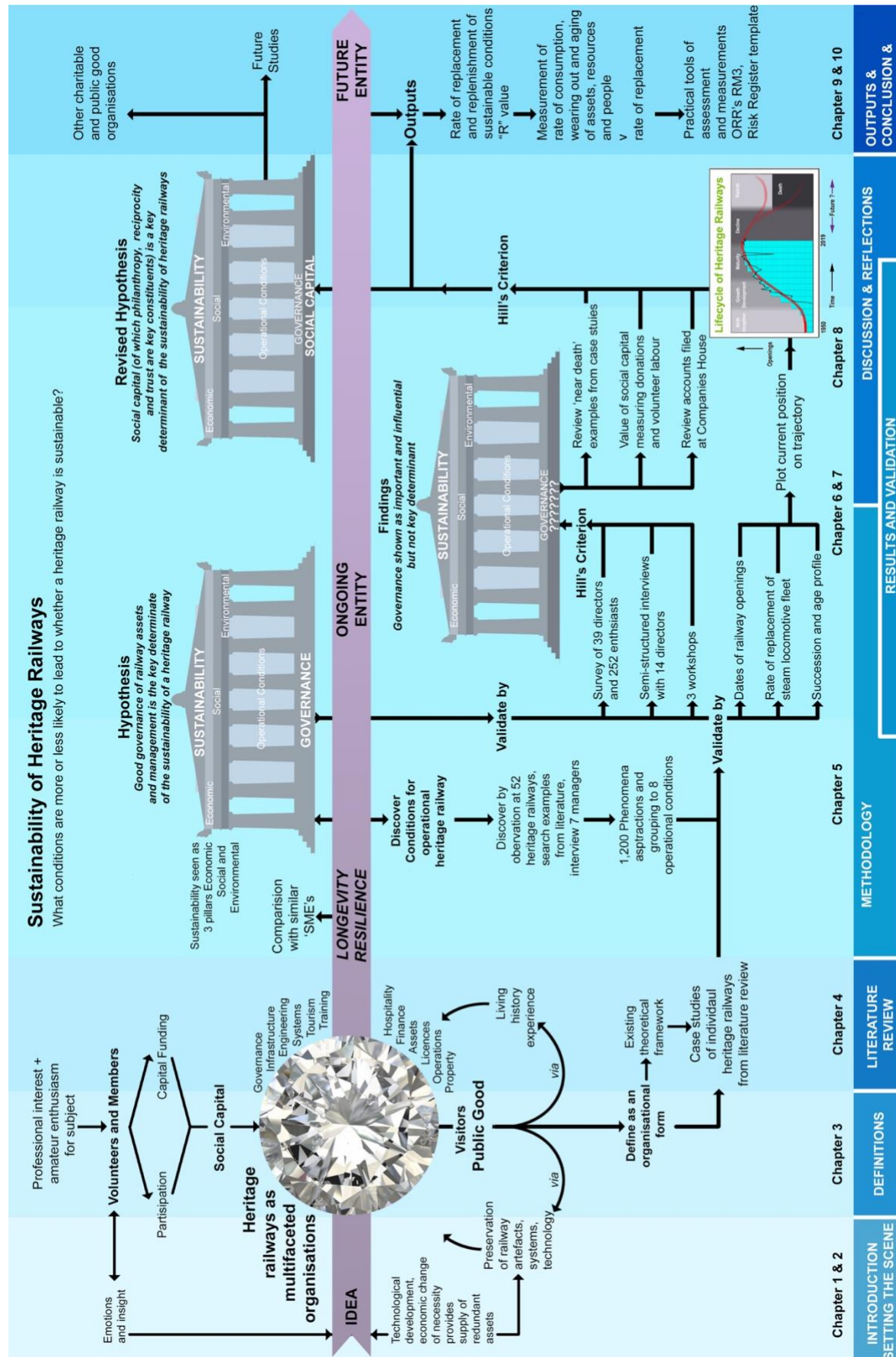
1.6 Research context

The research territory and broader context is the resilience of organisations, their governance and identification and the management of risk through the different stages of their life cycle as shown in Diagram 1-02. The research crosses a number of subject boundaries, these include: governance; organisational structure, type and dynamics; risk management; sustainability as described by its three pillars - environment, society and economic; social good and capital; tourism and in particular heritage tourism; nostalgia and emotion; railway operation and regulation.

1.7 Concepts and variables

For the purposes of the research, it is assumed heritage railways are managed by rational entities not dictated by chance or chaos. They are dynamic entities in the sense they change in nature and composition over time - for example a succession of people, or a gain or loss of assets.

Diagram 1-01 The research concept, framework and process.



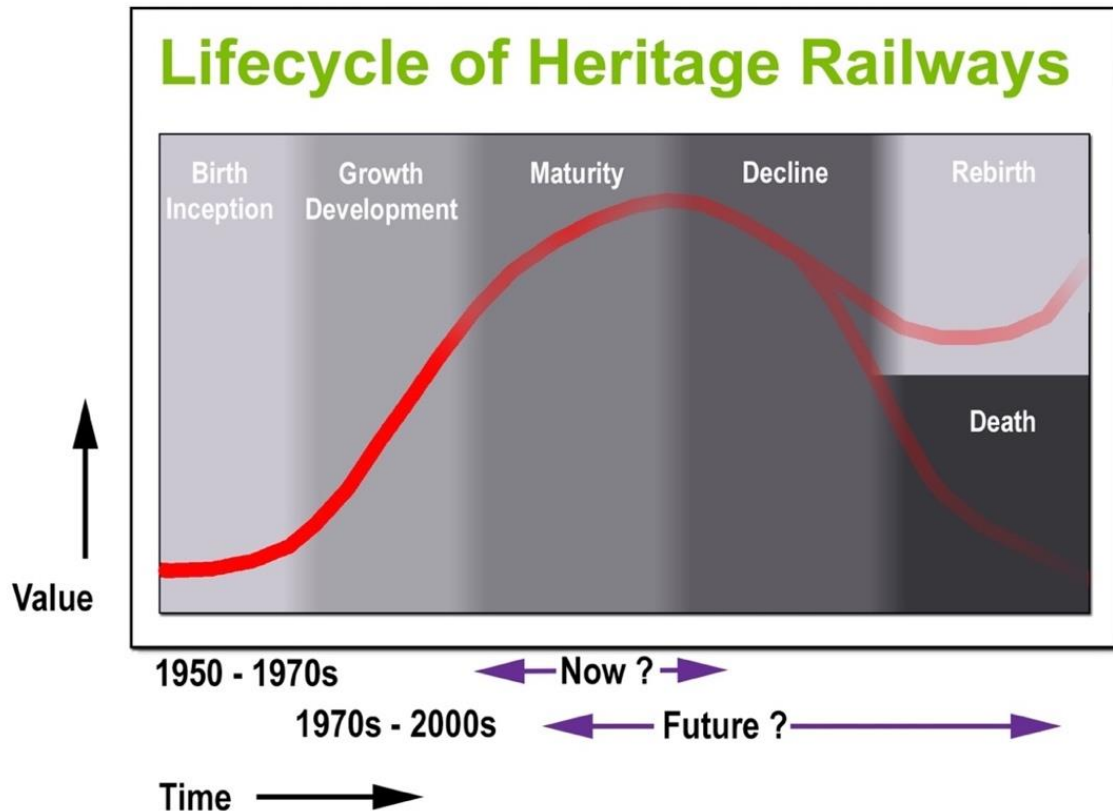


Diagram 1 -02: The classic business life cycle model as applied to heritage railways. Note the trajectory is illustrative of the overall heritage railway sector, individual railways will have different time profiles.

They are not immune to, or isolated from, the effects of external events – recession; pandemic; changes in legislation; social trends. The dynamic is deemed as linear, in that past performance, composition, resources available and behaviours, influence and impact on their current status, and what actions, decisions and behaviours done now, will to a greater or lesser extent, determine their future performance, composition and ultimately their ability and capacity to continue to exist and prosper – to be sustainable.

Although there is a vast range of individual organisations it is assumed there are sufficient commonalities and conditions which can be described and measured to enable a degree of

analysis to be undertaken which will allow themes and patterns to be identified, an overall picture and model of the sector to be constructed and conclusion(s) drawn.

A heritage railway is considered to be a dynamic but unstable system that, in order to sustain itself on a consistent basis, requires intervention, to renew, replace, repair the assets, and adopt, adapt and improve on the conditions experienced. For example, in the case of volunteers, finance or assets, they can't simply be kept at a sustainable level without deterioration and loss, short of some form of intervention to replace or enhance them.

Based on the first-hand experience of the researcher and the literature review, including codes of governance, the researcher considers positive attributes of governance (good governance) to be: demonstrated leadership and accountability; ethical behaviour; safe operation; responsible management of assets; the presence of social capital showing supportive and trusted relationships; financial controls and oversight in place; regulatory compliance; the control of risk and its mitigation; motivated staff and volunteers with a shared purpose.

Similarly, negative attributes of governance (poor governance) are considered to be - weak leadership and lack of accountability; unethical behaviours; not being able to demonstrate safe operation; poor or chaotic management of assets; absence of social capital; poor financial controls and oversight; an inability to demonstrate regulatory compliance; lack of any risk identification or management; blame culture, staff / volunteer discontent; lack of trusted relationships; self-interest over group interest. The sources for these concepts and in particular how they fit together are discussed in more detail in Chapter 4.

1.8 Research methods and procedures

The methods developed to answer the research question and test the hypothesis were a mix of qualitative and quantitative techniques. These included: ethnography, narrative, phenomenological methods together with grounded theory; case studies and two questionnaires and data collection from authoritative sources such as Companies House.

Sources used included the literature and desktop research to provide the context and theory and to build databases; observation, though this was limited to where it could be validated such as record photographs illustrating particular events or phenomena; documentation, records and returns; survey and interview – data gathered from individuals and findings validated by further interview.

The purpose was to discover the conditions critical for the creation and operation of heritage railways, and those that form its contextual conditions. To test and validate those conditions discovered by means of a questionnaire survey and the application of Bradford Hill's Criterion.

1.9 Scope and limitations of the research

The research is a pioneering study into heritage railways. It is a first step to forming a greater understanding of their role in developing the heritage tourism industry, the role social capital plays in creating value and mitigating the challenges and risks faced by heritage railways.

The study is not a history of heritage railways, it does not seek to judge their authenticity, it is not a critique on their environmental aims or green credentials, nor a critique on, or exploration of, the different models of governance to be found on heritage railways.

All these matters do have an impact on, and provide background and context to, the main subject area of the thesis. Appendix 1 provides an outline of the history of heritage railways and Appendix 6 discusses the potential impact of climate change.

1.10 Core theme

The researcher proposes there is a core theme running throughout the thesis in that heritage railways have arrived at a mature point on their life cycle trajectory, not by strategic planning, design or above average standards of operation and governance but by a clearly defined original purpose and vision based on an emotive need of some to save what they feared would be lost. This struck a deep chord and resonance with its originators together with small groups of enthusiasts, that by sheer force of determination and passion to overcome obstacles physical, commercial and bureaucratic and to create entities, were then able to ride a wave of popular nostalgia from the wider public being attracted to and seeking heritage experiences which heritage railways played their part in creating and subsequently benefitting from.

While operating in terms of their legal status as business entities (companies) they are different from purely commercial businesses, insofar as they mostly have charitable objectives and can call upon volunteer labour and donations without which they would be generally financially unviable. The theory proposed is that governance has been at least 'good enough' to get heritage railways to their current position in their life cycle trajectory but may not or is unlikely to be good enough to secure their sustainability through future development and prosperity without improvement.

A conceptual model of heritage railways is suggested describing the importance of governance and their reliance on social capital to mitigate any shortcomings of funding, resource, leadership, administration and expertise. This being described colloquially by one respondent in interview as “in the past flying by the seat of your pants on a wing and prayer, with a ‘can do attitude’ to prove that nothing is impossible but that’s not going to be half good enough going forward”. The research aims are to explore if this core theme is accurate.

The discussion developed is that the concepts and theories of governance and the imposition of regulation usually impose tighter frameworks and parameters of operation over time. The literature on governance and risk management highlights the importance of knowing and assessing an entity’s current and potential necessary conditions of operation and sustainability. Discovering these necessary conditions being the objective of the research.

Managing these conditions and concepts is acknowledged in the context of what was anecdotally described by one interviewee as on the one hand “a naturally rebellious, and fiercely independent temperament”, that was able to overcome all the hurdles and obstacles in first creating heritage railways. And as another interviewee described, “we didn’t get here by following the rules, we did it ourselves in what we believed in with our own blood, sweat and tears”. And on the other hand, “organisations that are strongly departmental focused, and rules-based operating in a safety critical environment”. The question for heritage railway directors is how ready and prepared are they to face these challenges and adapt to any change and what tools may assist them in any transition?

1.11 Stages of the research

There were three distinct stages of the research:

Stage 1 was an investigation to discover the conditions needed to make a heritage railway sustainable. The hypothesis was that governance would have the strongest influence.

Stage 2 followed the failure to fully validate the original hypothesis that good governance of railway assets and management is the key determinate of the sustainability of a heritage railway. A further investigation was undertaken to discover conditions that give heritage railways a resilience and longevity greater than other small and medium size enterprises.

Stage 3 resulted from the effects of the Covid 19 pandemic. This event happened after the conclusion of the research but due to its significance and widespread effect it could not be ignored. The researcher considers whether any immediately available evidence gained from their enforced closure and subsequent need to appeal for financial assistance from members and grants provides further insight into the findings and recommendations made.

1.12 Layout of thesis

The thesis is laid out in the following chapters:

Chapter 2 sets out the background and context of heritage railways and the reasons why they are important.

Chapter 3 defines the terms used in the study. The chapter explores the etymology of the now ubiquitous term 'heritage railways', and its regulatory and historic context. Other key terms and concepts used in the research – governance, sustainability and social capital - are also defined. The chapter describes how the study population of 104 railways was derived.

Chapter 4 reviews the literature and related theories which help inform the research, providing background and context on which to develop the methodology to discovering the conditions for sustainability and the roles of governance and social capital.

Chapter 5 describes the methodology employed. Four distinct methods are used to correspond to the three stages of the research as outlined above. A flow chart showing each stage of the methodology is shown in Diagram 5-01. The methods were: literature and desktop research to provide the context and theory to the study and to build databases; observation, though this is limited to where it can be validated such as record photographs illustrating particular events or phenomena; documentation, records and returns; survey and interview – data gathered from individuals and findings validated by further interview.

The chapter sets out the research that was conducted into the operational conditions and further work and analysis was carried out on each of the conditions through studies such as the sustainability of the 1,159 standard gauge locomotive fleet. Bradford Hill's Criterion was then used to analyse and validate the causal relationship between the conditions and validate the extent to which the conditions exist and are developed, maintained and managed as an indication of a heritage railway's likely future prospects in terms of failure, decline, stagnation, sustenance or growth.

Chapter 6 sets out the discovered results from each of the different methods employed. The results were analysed in terms of the operational and contextual conditions including the security of land, availability of locomotives, management of assets, skilled labour, access to funding, interest in heritage and nostalgia, regulations, the environment, and organisational structures.

The chapter compares the results obtained with those expected if the hypothesis was correct. The obtained results did not fully validate the original hypothesis, the conditions being more complex and nuanced than described in the hypothesis, leading to a proposed refined and modified hypothesis.

The researcher considered the results for the operational conditions were sufficiently robust and comprehensive to use as the basis of a model of sustainability and assessment tools which has been adopted by the Rail Regulator.

Chapter 7 presents a validation of the hypotheses using the criterion of Bradford Hall. Which were validated and which were not.

Chapter 8 discusses the results in terms of the research's core themes and the posing of rhetorical questions based on the collected data and information with numerical quantities and analysis which are set out in Chapter 6.

These themes include: The extent to which the data shows in terms of similarities or differences in operation, resilience, longevity and life cycle trajectory between typical

commercial companies and heritage railway entities. Similarities and differences are explored by considering the degrees of latitude or flexibility that may apply to commercial companies and heritage railway entities within the operational environment they inhabit. This includes the extent and imposition of regulation, the expectations of members, shareholders, owners and trustees, market structure and competitive environment.

An assessment of the current stage of where heritage railways are positioned on their life cycle trajectory is made.

The researcher discusses the theory that longevity of heritage railways does not simply arise from 'good governance' but is in fact the product of multiple interlinked variables and processes. Case studies demonstrate that many heritage railways have survived and prospered despite poor governance, rather than because of 'good governance'. One of the most significant of these explanatory variables is social capital, a hitherto under-researched governance variable in heritage railways studies.

Through the case study examples, social capital is demonstrated to have compensated and mitigated for failures of organisational governance and weaknesses in operational conditions on heritage railways. In this respect, heritage railways are argued to be similar to charitable and other public good organisations. On this basis the hypothesis was rejected, and an alternative hypothesis proposed: that social capital (of which philanthropy, reciprocity and trust are key constituents) is the key determinant of the sustainability of heritage railways.

Chapter 9 describes the outputs from the research, which include a model of sustainability having as its base three foundation pillars of the environment, society and economy which support the eight operational pillars, which in turn support creation and running of the operational railway, upon which is the overarching social capital the entity has built, all together creating a railway that is more likely to be sustainable. Weaknesses in any of the supporting structure will increase the likelihood of the entity becoming less sustainable over time.

The model was developed further into a practical assessment tool and incorporated into the ORR Risk Management Maturity Model as a version specifically for heritage railways. As part of the assessment tool guide as to what good governance would look like for heritage railways a tool was developed entitled the '*12 tablets of good governance*'. A risk register was also developed, both for use by individual heritage railways and for the sector as a whole.

Chapter 10 records the conclusions of the research. It re-examines the research questions and objectives and considers to what extent they have been met and progressed. It sets out what the researcher has learnt to better understand the role of good governance in the sustainability of heritage railways and how this relates to day-to-day governance, proposing a description of what constitutes good governance. It outlines the benefits of the outputs in the form of tools developed for practitioners to assist them in the management and assessment of their railways, including how they can be adopted by the Regulator.

A series of 14 practical recommendations, generated from the risk register, are addressed to heritage railways to improve their resilience and longevity.

The chapter concludes with a reflective account of how the research process modified the original hypothesis and how an alternative modified theory may be the basis of further research. Questions are posed including: have the research and findings contributed to filling the identified gaps? Were the research methods used appropriate? Is the data used reliable, and open to scrutiny? Are the findings challengeable, are other findings possible based on a different interpretation of the data, what questions remain unanswered?

The conclusion is followed by the references used in the research. The appendices containing detailed supporting information including a section on the impact of the Covid-19 pandemic following the completion of the research.

1.13 A note on style, grammar and diagrams

The researcher's objective was to produce practical and accessible tools of value to those involved and responsible for the governance of their heritage railway and the sector more generally. To make the research accessible to those less used to reading academic research papers the researcher has written in a style more commonly found in technical reports and guidance documents, for which I seek the indulgence of the more academic reader. However, the style follows academic practice in not using bullet points and paragraphs are not individually numbered.

Key points of the chapter

The thesis is about heritage railways, a subset of railways. It seeks to define 'heritage railways' as an organisational form and examines the basis for their singular longevity. In particular, the thesis explores the necessary condition(s) for the successful operation of a heritage railway in terms of governing their sustainability as expressed through consideration of their life cycle trajectory around the three pillars of sustainability – environmental, economic and social.

The thesis is important because heritage railways have a recognised (APPGHR 2013) social, cultural and economic value and any loss would have a detrimental effect. There is concern expressed by the regulator (ORR 2014) that their governance is not as it should be and this needs to be addressed by individual railways and the sector. It is an under-researched area of academic knowledge and this pioneering study thesis will contribute towards filling the identified gap.

Chapter 2

Heritage railways - setting the scene

Chapter contents	<i>2.1 The visitors' experience</i>
	<i>2.2 The volunteers' experience</i>
	<i>2.3 The directors' experience</i>
	<i>2.4 The Regulator's experience</i>
	<i>2.5 Heritage railway history and achievements as related in the literature</i>
	<i>2.6 Identifying the attributes and characteristics</i>
	<i>2.7 What is a heritage railway?</i>
	<i>2.8 Different types of heritage railway</i>
	<i>2.9 Characteristics of the different types of heritage railways</i>
	<i>2.10 Miniature and tourist railways</i>
	<i>2.11 Preserved railways</i>
	<i>2.12 Steam centres and museums</i>
	<i>Key points of the chapter</i>

To better understand the subject of the research project there is no substitute for visiting a heritage railway to observe their operation and to experience at first-hand what is offered to visitors and to those that work and volunteer. Fifty-two such visits were carried out during the period of the research to make observations, experience the offer as a visitor and engage in both open unstructured conversation and semi-structured interviews and in subsequent visits, by invitations to 'go behind the scenes' and talk informally and later in structured interviews with heritage railway volunteers and managers.

2.1 The visitors' experience

This was carried out initially by explorative conversation and later by semi-structured interviews with references to experience contained on the website Trip Advisor, the objective being to obtain a broad idea of the experience and the context. The key takeaways were: 'a

ride on a steam train'; "a nostalgic experience"; "liked to see old steam trains kept alive", "a nice family day out"; "a place to take the kids".

2.2 The volunteers' experience

Carried out by explorative interviews and references from web forums such as National Preservation, the objective was to obtain a broad idea of the experience and the context. Key takeaways were: "dedication"; "passion"; "hard physical work"; "enthusiasm"; "knowledge"; "social interaction (being with mates)"; "pride"; "escapism"; "worry about the future"; "keeping it all going".

2.3 The directors' experience

Carried out by explorative interviews and references from web forums, the objective was to obtain a broad idea of the experience and the context. Key takeaways were: "safety critical"; "big responsibility"; "always a struggle"; "rewarding keeping the past alive"; "selflessness"; "politics with a small p"; "reliance on volunteers and fundraising to make it work"; "always lived with difficulties but lots of challenges on the horizon"; "we are all getting older".

2.4 The Regulator's experience

Carried out by interview with former and current Railway Inspectors, the objective was to obtain a broad idea of the experience and the context. Key takeaways were: "safety critical"; "standards vary widely, from very poor to quite good"; "governance and risk management not well understood or appreciated"; "a 1950s experience with twenty first century safety standards".

2.5 Heritage railway history and achievements as related in the literature

The insight gained from this means of enquiry reflects the nature of the literature related to heritage railways which mainly focuses on guides for visitors - Awdry & Cook, 1980. *'A Guide to the Steam Railways of Great Britain'*; descriptions of the technology such as Ellis, 2019. *'UK Preserved 2019 Locomotives, Units, Track Machines and Trams preserved within the UK'*; and a chronological history such as Brown, 2017 *'The Railway Preservation Revolution – A History of Britain's Heritage Railways'*. See also Appendix 1.

The narrative most often put forward in the literature tells us that over the past seventy years heritage railways have developed from a niche interest for railway enthusiasts to become a significant part of the UK's heritage tourism – (English Tourist Board, 2018). Several of the now larger railways such as the North Yorkshire Moors Railway, the Festiniog Railway in North Wales and the West Somerset Railway represent one of their Region's major tourism attractions. Many towns and villages connected to heritage railways rely on the income generated as a by-product of their location. The Festiniog Railway claims a boost of some £25m to the local economy from their activity. The town of Bridgnorth in Shropshire was reported in the local press to have suffered economically when heritage trains on the Severn Valley Railway were suspended due to a landslide.

Until the late 1940s, railway preservation in the UK had been the preserve of, firstly, the State, through museums such as the Science Museum, where artefacts, equipment and documents were collected and displayed - to use a colloquialism of Tonks (1985), "stuffed and mounted", and secondly, railway companies, who saw the benefit in marking important anniversaries and reinforcing achievement and progress (Kichenside, 1969).

The 1950s saw a fundamental change, when it was members of the public, enthusiasts and professional railwaymen devoting their leisure time, who took the lead in railway heritage. Beginning in 1951, Rolt (1953) describes preserving and running a remote and almost forgotten narrow gauge railway - the Talylllyn Railway - in Mid Wales. Specialist railway journals such as The Railway Magazine report monthly on the development of the sector over an almost 70-year period of continuous history.

The Heritage Railway Association (HRA), the sector's trade body, states that in 2016 its members received 13 million visitors - of whom 9.6 million rode on trains. There were 18.6 million passenger journeys, travelling 130 million passenger miles on 1.3 million passenger train miles. Members of the HRA directly employ 2,867 (full and part-time) staff. They also benefit from the work of 21,659 volunteers. The members list heritage assets of 790 steam locomotives, 1,021 diesel locomotives and 2,176 coaches together with a number of historic listed buildings and structures. Not all heritage railways are members of the HRA.

In addition, in 2016 there were over 400 excursions operated on the national rail network hauled by steam locomotives which are mainly privately owned (UK Steam.info at <http://www.uksteam.info>). In 2008 a number of individuals within the UK heritage rail sector had the confidence, funding, engineering capacity and skill to construct from scratch and launch a new mainline steam locomotive, the A1 Class Pacific No 60163 Tornado that achieved a speed of 100mph, a record for UK preserved steam (Steam Railway, ed 400).

2.6 Identifying the attributes and characteristics

The importance of identifying and describing the attributes of heritage railways gives the basis on which to compare and contrast what is different, what is similar. To investigate conditions of sustainability an understanding must be gained first of the physical components, the assets, the technologies and how these are integrated into an operational system.

Understanding the role of safety and governance and how it is discharged is critical in knowing how people are not killed or injured by heavy moving machinery and vessels under high pressure. Equally important are the regulations and oversight that are in place to ensure safe operation and compliance with law.

The overall entity associated with each heritage railway can have differing legal structures and relationships between the various parts – charity, trust, operating company, subsidiaries, support associations and owning groups may or may not be a material consideration but without knowledge of these it would not be possible to consider this aspect.

An understanding is also necessary of the distinction of the separate individual railway entities, the subcomponents of these entities and the aggregation of these entities into an industrial sector sufficient for categorisation and classification, and how this is manifested, for example a trade body.

To address these questions the researcher needed to discover amongst other matters the definitions and descriptions currently in use. The attributes of heritage railways, the etymology of heritage railways and other terms in use, geographical distribution and number

of distinct railway entities, list of formations and opening dates, reasons and objective on formations and whether these reasons and objectives varied. The market conditions at the time of formation and how and if these have changed over time. To discover any information that is available on the pioneers that formed and created the railways.

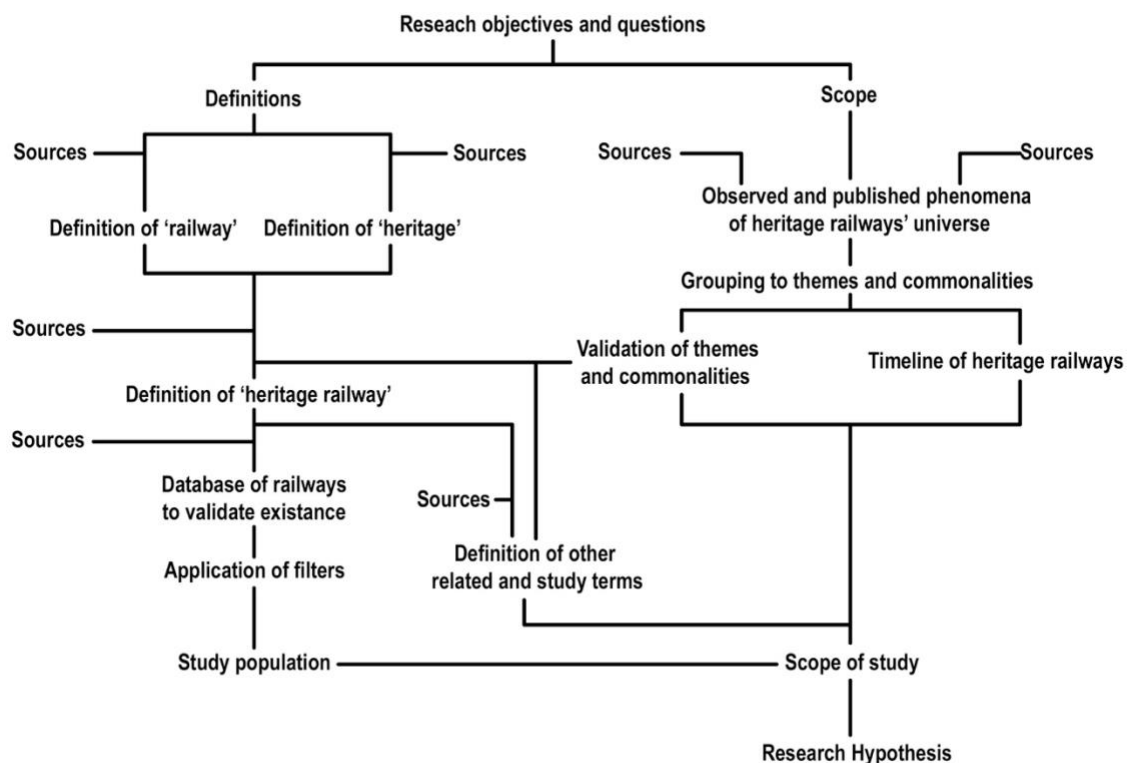


Diagram 2-01 *The process of reaching the hypothesis from the research objectives and questions.*

2.7 What is a heritage railway?

The term ‘heritage railway’ is a collective term of fairly recent (late twentieth century) origin and post-dates the formation of a variety of distinct and different types of railways and railway centres – preserved railways, tourist railways, narrow gauge railways, miniature railways, railway museums.

It is unclear when the term 'heritage' was first used in connection with railway preservation, but it is now in widespread use. Brown (2017) titled one of the chapters in his book, 'From preserved railways to heritage railways'. It is relevant that at the same time as the term 'heritage railway' was coming into use in the 1980s, Hewison, (1987) was writing 'we are manufacturing heritage, a commodity which nobody seems able to define, but which everyone is eager to sell'.

No two preservation schemes are alike, but Tonks (1985) considered they are capable of being grouped together, provided one was careful about definitions. As with all new ventures, he notes, 'it is only possible with hindsight to begin to classify the various trends and threads of the movement. Each of the different types are discussed below'.

2.8 Different types of heritage railway

These different types of railway broadly include (although there are some, as later discussed, that contain many overlapping features):

Firstly, railways which were originally developed for an economic purpose as part of a system of transport to which that purpose was insufficient to maintain them and they closed or would otherwise be closed and whose operation was taken over, usually by volunteers, to run a new style of operation based around a theme of living history. These were described as preserved railways (Body, 1976).

Secondly, railways which were developed with an original purpose of leisure usually as part of a wider tourist experience.

Thirdly, museums dedicated in part or whole to the preservation of railway artefacts and presentation of their history and impact, which could also include live demonstrations and interpretations.

Diagram 2-02 shows the ‘family history’ and development and use of the term ‘heritage railways’ and the history predates even what is commonly described as the first preserved railway in 1951.

2.9 Characteristics of the different types of heritage railways

A visit or study of the information published for each separate heritage railway shows distinct characteristics that are based on the location, the type of landscape and geology present which in turn influences the designs, styles and operating practices of the original and subsequent operating companies.

The main feature promoted by heritage railways, appearing first or prominently in their publicity material, is a ‘train ride’, usually hauled by a steam locomotive (though other forms of traction / motive power such as diesel locomotive and multiple units are regularly used such as the Severn Valley Railway, a small number of heritage railways also use electric trams such as Crich, the National Tramway Museum).

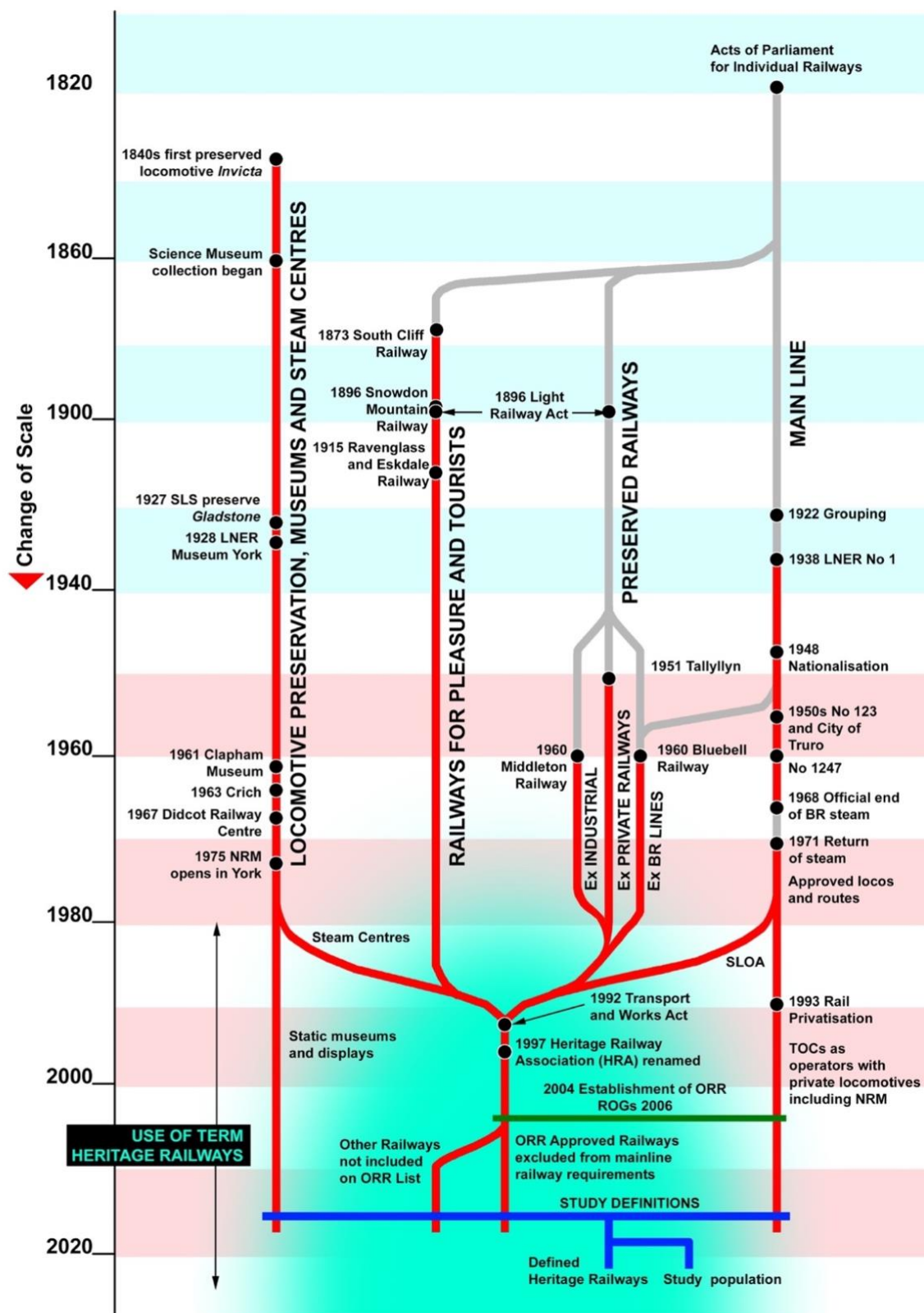


Diagram 2-02 Development of use of the term 'heritage railways'.

The gauge (distance between the rails) of heritage railways varies: 'Broad' - greater than 4ft 8.5inches (1435mm), an example at 7ft 0.25inches (2140mm) being one of the demonstration railways at the Didcot Railway Centre; 'Standard' - 4ft 8.5inches (1435mm), an example being the Keighley and Worth Valley Railway; 'Narrow' - smaller than 'standard' and above 15 inches (381mm), for example the Festiniog Railway - 1ft 11.5 (597 mm); 'Miniature' - 15 inches (381mm) and below, an example being the Romney, Hythe & Dymchurch Railway.

The length of line can be from a few hundred yards, for example the Fife Heritage Railway, to around 20 miles, for example the West Somerset Railway. The size and structure of the organisation operating it can be a small group of individuals, for example Mangapps Farm Railway Museum, to a commercial company or charity with both employees and several hundred volunteers, with turnovers that vary between a few thousand pounds and several million, an example of a small to medium sized railway Dean Forest Railway with a turnover of £731K, (2017) an example of a large railway being the Bluebell Railway with a turnover of £3.8m, (2018). The source of the figures is returns made to Companies House.

There are national network Train Operating Companies (TOC) with a safety certificate / license to run heritage traction including steam locomotives, an example being West Coast Railway Company and its regular timetabled Jacobite service in Scotland and ad hoc charter services running throughout the UK.

There are heritage railways with running rights over the national network, for example the Swanage Railway and there are those that have connections to allow transfer of vehicles or trains, for example the Paignton and Dartmouth Railway. There are demonstration lines

within the grounds of accredited museums, for example Beamish Open-Air Museum or railway museums with only a static collection, for example STEAM at Swindon which is operated by the local authority.

The number of visitors will also vary considerably from a few hundred on a limited number of days when the railway operates, for example the Gartell Light Railway, to hundreds of thousands for the larger railways, open on most days of the year, for example the North Yorkshire Moors Railway with 350,000 visitors.

2.10 Miniature and tourist railways

Miniature and tourist railways include such railways as the Rhyl Miniature Railway opening in 1911, the Ravenglass & Eskdale Railway opening in 1915, the Fairbourne Railway opening in 1916, the Romney Hythe and Dymchurch Railway opening in 1927 as well as railways such as the Snowdon Mountain Railway which opened in 1896, these railways have never changed their purpose and generally have always had a commercial aspect at their heart relying on giving the public rides for pleasures.

Table 2-01 *Number of Miniature / Tourist Railways opening by decade*

27																
26																
25																
24																
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22																
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1																
	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	

Table 2-02 *Accumulated number (openings – closures) of Miniature Railways / Tourist Railways*

110														105		
105													100		101	
100																
95																
90												87				
85																
80																
75																
70											66					
65																
60																
55																
50																
45										39						
40																
35							32	33	33							
30					24	27										
25				19												
20			16													
15		10														
10	3															
5																
	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	

2.11 Preserved railways

Preserved railways using the definition of Tonks (1985) are railways that once served an economic purpose, having been taken over or reopened to preserve some aspects of their history or purpose. These include: passenger or freight railways as part of the nationalised British Railways; privately owned freight-only lines serving industry; Light Railways or other railways not being part of the national network. A Light Railway is a railway constructed under the Light Railway Act of 1896. This has now been replaced by the Transport and Works Act 1992.

Table 2-03 *Number of preserved railways formed by five-year intervals*

12															
11															
10															
9															
8															
7															
6															
5															
4															
3															
2															
1															
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020

Table 2-04 *Accumulated number (openings – closures) of preserved railways*

90													83	86	
85										78	81	82			
80															
75									71						
70															
65								59							
60							53								
55															
50															
45						42									
40															
35					30										
30															
25				19											
20															
15			8												
10	2	5													
5															
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020

2.12 Steam centres and museums

Railway locomotives and railway artefacts have been preserved and collected by museums since 1857. Later railway companies also started to preserve some of the early locomotives such as the North Eastern Railway in establishing its museum at York in 1922, opening to the public in 1928, went on to be adopted by the LNER, then the British Transport Commission and became the precursor to the National Railway Museum, first at Clapham (1961) and then later at a new building in York opening in 1975.

It was not only the state that has preserved locomotives and railway artefacts, private collections often in former locomotive depots, were started at Didcot, Carnforth, Tyseley, Ashford, Southport and Dinting as well as private sites such as Dowty and Bressingham. Living history museums were also developed at Beamish and Black Country with either tram or railway (or both) displays and demonstrations.

Table 2-05 *Number of railway museums and railway centres opening by five-year intervals*

9														
8														
7														
6														
5														
4														
3														
2														
1														
	1940	1950	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015

Table 2-06 *Accumulated railway number (openings – closures) of museums / railway centres*

55												48	49	47
50											47			
45									39	41				
40							34	36						
35						28								
30														
25					20									
20														
15				11										
10	2	2	5											
5														
	1940	1950	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015

Table 2-07 Combined table – all heritage railways - accumulated (openings – closures)
blue: miniature / tourist railways, green: museums and railway centres, red: preserved railways. This table is helpful in understanding the current position on the life cycle of heritage railways.

Min	33	33	35	38	51	66	71	87	94	100	105	105	104	101
Cen	2	2	5	11	20	28	34	36	39	41	47	48	49	47
PR	2	5	8	19	30	42	53	59	71	78	81	82	83	86
240														
230														
220														
210														
200														
190														
180														
170														
160														
150														
140														
130														
120														
110														
100														
90														
80														
70														
60														
50														
40														
30														
20														
10														
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015

Key points of the chapter

Heritage railways can be viewed from different perspectives – the visitor, the volunteer, the director, the regulator. Overall, it develops and confirms the central argument of the thesis that the development of heritage railways is driven not by commercial objectives, but from an overriding passion to keep the past alive as a living history experience and social good for both volunteer and visitor and that directors willingly take responsibility to lead this process despite its obvious difficulties and challenges. The role of the regulator to inspect heritage railways and to raise awareness of the risks in a safety critical operation and where necessary enforce relevant health and safety legislation.

The chapter confirms the multifaceted nature of the operations undertaken and the variety of individual railways within the broad category of heritage railways. The longevity of heritage railways is also confirmed implying they are at a mature point on their life cycle trajectory.

The particular interest areas of the research project - their sustainability - indicated a risk from a number of threats and a perception of their governance having widely varying standards but seemingly having little effect on their overall ability to survive and prosper.

The Chapter draws on a number of sources, to present for the first time an overall view of the sector which the researcher has not found elsewhere.

Chapter 3

Study definitions

Chapter contents	<i>3.1 Heritage railway definition</i>
	<i>3.2 Non railway definitions</i>
	<i>3.3 Governance</i>
	<i>3.4 Sustainability</i>
	<i>3.5 Heritage tourism</i>
	<i>3.6 Social capital</i>
	<i>3.7 Study population</i>
	<i>3.8 Definition of other terms used in the research</i>
	<i>Key points of the chapter</i>

The previous Chapter indicated considerable individual variety within the broad category of heritage railways, although everyone interviewed and the media recognised what a heritage railway is and the experience offered, but surprisingly there was no definitive or authoritative definition.

It was necessary for the purpose of the research to define heritage railways and each of the concepts used.

3.1 Heritage railway definition

To define the term heritage railway, the researcher took as a starting point the evolution of the different sub classifications of – preserved railways, tourist railways, museums and steam centres, each requiring their own definitions and timelines based on their history and different characteristics. The study definition for heritage railways drew on definitions used by the Transport Trust, UNESCO, ROGS 2006 and the Museum Association.

The definition developed was:

A physically defined, publicly accessible railway/tramway, with a gauge of, or greater than, 350mm, of which the overall setting, buildings, infrastructure, route and systems, practices and technology used, which relate to or recreate a period(s) prior to 1968, being currently operational and intended to be bestowed for the benefit of future generations.

Other passenger or goods-carrying railway or tramway systems that have a special or significant historic merit as recognised by an appropriate authority.

The definition includes accredited museums or heritage railway / tramway centres, heritage workshops that preserve, restore and display heritage traction, rolling stock or other railway or tram technology and systems - and which have an operating demonstration railway / tramway to which the public have access and included within the premises of a heritage railway. Those with only static displays and exhibitions and not within the premises of a heritage railway are defined as Non-Operating Railway Museums.

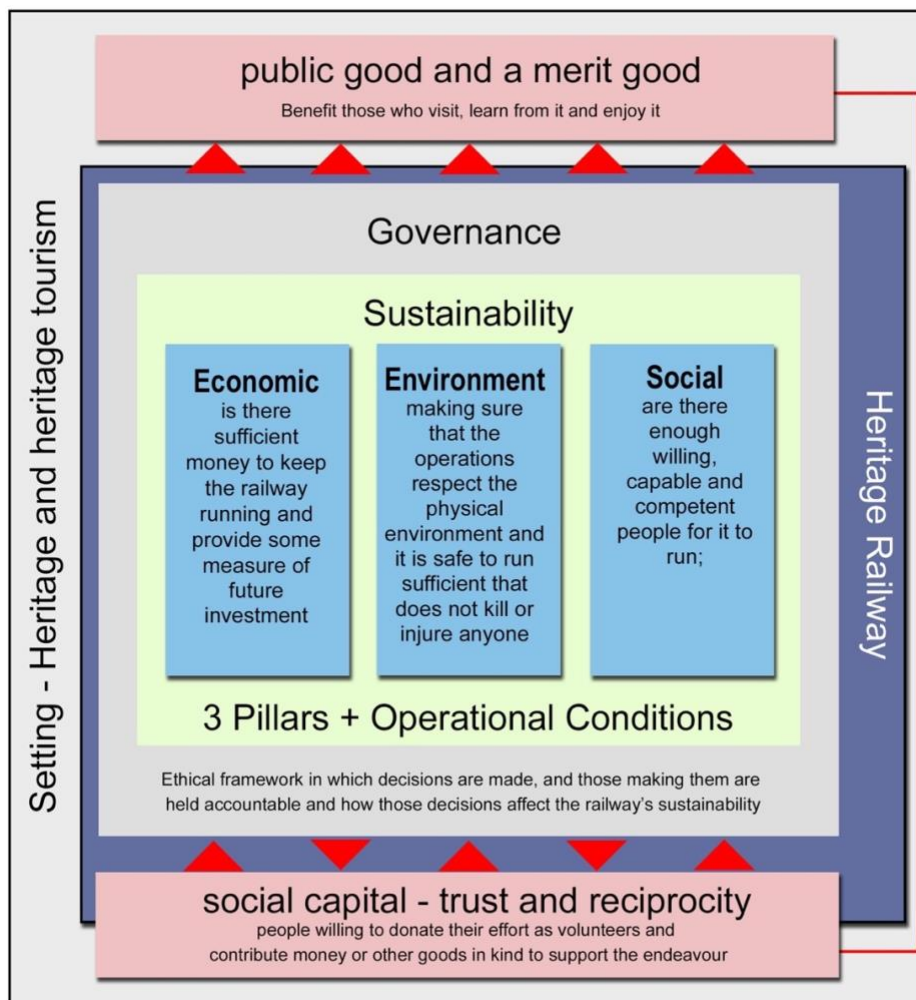
A validation of this definition, relative to railways in general, proposed by Robbins in 1962, was undertaken, which was satisfied apart from a requirement as a 'Common Carrier'. This was a status and obligation placed on railways, arising from the Railway Acts of 1845 and 1854. Later it was seen as placing railways at a disadvantage when competing against road transport. Railways were only emancipated from this legal requirement in the Transport Act of 1962 which allowed them to become private carriers and permitted them to choose which goods they wished to carry. Other associated railway definitions were also developed such as

heritage locomotives a set of associated definitions are included as Appendix 3. It is hoped that the study definition will become a definitive classification for the sector.

3.2 Non railway definitions

The Diagram 3-01 shown the linkages discovered between heritage railways and the related areas of interest – sustainability viewed through the lens of the three pillars of economy, environment, society and their governance both with its link to sustainability and social capital, of which philanthropy, reciprocity and trust are key constituents, within the framework of public good and in their wider setting of heritage tourism.

Diagram 3-01 linkage of related concepts and framework to heritage railways.



3.3 Governance

The definition selected from the vast number of terms available to describe governance, itself an indication that it is a concept that can mean and cover many different aspects, was a modified version of Bevir (2012) – which is the closest match to the processes discussed with directors and the Regulator in Chapter 2.

“All of the processes of governing, whether undertaken by a controlling body or the internal structure of the operating company, through laws, rules, power or language. The processes of interaction and decision-making among the people involved and how structured, sustained, regulated and held accountable.”

To understanding ‘good’ and ‘poor’ governance and particularly the question of ‘what does good governance look like for a heritage railway’, the literature on the subject is reviewed, analysed and discussed in Chapter 4 and its impact for heritage railways is an output of the research set out in Chapter 9 as the ‘12 tablets of good governance’.

3.4 Sustainability

The starting point was to use the widely established three pillars of sustainability - economic, environmental and social. The reasoning being that these are widely accepted and readily understood concepts also applicable to railways (Modern Railway, 12/2008)

Viewing sustainability through the lens of these three pillars implies that the critical activities of a heritage railway are (at a minimum) ecologically sound, socially just, and economically viable, and that they will continue to be so for future generations. The railway would function

as a sustainable community, embodying responsible consumption of materials and energy, treating its diverse members with respect, and supporting these values in the surrounding community. A sustainable heritage railway would emphasise these concepts in all its policies, activities and operation.

For a definition of a sustainable heritage railway, the definitions of a heritage railway and sustainability have been combined as:

“A heritage railway that can sustain itself into the future, socially, economically and environmentally. For a heritage railway to prosper and develop, they will maintain the ability to operate regular public services in an environment that has a historic ambience, using heritage traction, of which a significant proportion will be steam locomotives. On the national rail network for steam locomotives to continue to be allowed access to a variety of routes and hauling passenger excursion trains under normal operating conditions.”

This is defined further in minimum terms of:

Economically, *as being able to trade legally so that wrongful trading under the 1986 Insolvency Act does not occur, this is when the directors of a company or trustees of a charity have continued to trade past the point when they: "knew, or ought to have concluded that there was no reasonable prospect of avoiding insolvent liquidation".*

Socially, *the company or charity is able to fulfil its purpose as stated in its Articles of Association or Charitable Objectives.*

Environmentally, the organisation complies with all laws and regulation in particular those relating to safety and the environment.

3.5 Heritage tourism

Use of the National Trust for Historic Preservation in the United States definition which defines heritage tourism as:

"travelling to experience the places, artefacts and activities that authentically represent the stories and people of the past", and "heritage tourism can include cultural, historic and natural resources".

3.6 Social capital

The term social capital has not in the literature discovered been applied or associated with heritage railways, therefore for the purposes of the research a readily used definition from the Cambridge Dictionary - *"the value of the relationships between people who work or live together and the knowledge and skills that they have and share"*, found at <https://dictionary.cambridge.org/dictionary/english/social-capital>.

3.7 Study population

Initially the study definition was applied to the database of the 408 railways discovered that styled themselves as heritage railways. This reduced the population to 206, a list is included in Appendix 2. It must be noted, these are dynamic numbers as new railways are developed and existing railways fail. Further it does not mean that 202 entities are falsely styled, but simply that they do not fit the study definition of a heritage railway, for example being a 'Non-

Operating Railway Museum'. The objective was to create alignment between a definition of heritage railways contained in the statutory list of non-mainline railways which fall within the regulatory jurisdiction of the ORR. As a result of the research the statutory list will be reviewed, with a view to creating a common listing.

To make the study population more manageable a further filter was applied. The filter applied was as below:

Heritage railways with a route greater than 1 mile (1.6km), existing or planned, accessible by the public and running on at least 25 days per annum or with an income or turnover of at least £500,000 p.a. or assets with a valuation of at least £500,000.

When this filter was applied the final population used in the study was reduced to 104. See Appendix 2 for a full list of these railways.

Of the 104 heritage railways defined as the study population, 5 are miniature gauge, 17 are narrow gauge, 71 are standard gauge, 8 railway centres and museums and 4 tramways. In addition, there are 3 mainline train operating companies (TOC) licenced with the primary purpose to operate steam on the mainline – Locomotive Services Limited, Vintage Trains Limited and West Coast Railway Company with a fourth DBCargo also having a licence for steam but being only a minor part of its overall business and therefore not included.

The justification for including the mainline TOCs is that they fit within the definition developed, albeit that the track over which they operate is owned and maintained by another body (Network Rail) from whom they hold a contract for access and to whom they pay charges.

The 104 heritage railways of the study population refer to 104 heritage railway entities and not 104 completely separate railway systems. The Festiniog and Welsh Highland Railways are counted as one entity.

3.8 Definition of other terms used in the research

Act / Regulation – a UK Act of Parliament and rules made by government, government agency or recognised authority to control the way something is done.

Charity – a UK registered charity.

Company - a UK registered company.

Interview(s) - for this research it was a series of unstructured, semi-structured and structured conversations for the purpose of gathering information. Interviews were conducted face-to-face and over the telephone.

Literature – refers to publications that were read and referenced as part of the literature review undertaken as part of the research a full list of which is contained in the references after Chapter 10.

Observation – this was seeing something that could be recorded either by taking notes or a photograph.

Questionnaire – refers to the two sets of written questions completed online by directors and non-directors.

Survey – in this research it refers to the questionnaire and the general view and collection of

data of particular aspects of a heritage railway, for example locomotives, carriages, buildings, directors.

Validation – in this research it is the means by which information, or a theory can be verified as valid in so far as it is a reasonable interpretation of the observations made, and the theories and hypotheses proposed.

Workshop – these were structured interactive sessions held with 5 directors to combine elements of qualitative research, brainstorming and problem solving.

Key points of the chapter

For the first time ‘heritage railways’, a previously loose, vague, all-embracing and relatively recently introduced term to describe a classification of railways, has been defined for the purpose of the study, which it is hoped will be more widely adopted and used as a basis to review the statutory list of non-mainline railways. A database of all relevant railways, facilities and sites was created, from which a population of 217 heritage railways was defined and with the application of a filter a study population of 104 was produced.

The research in this chapter underpins the central argument that heritage railways are a defined distinct sub classification of railways. That they were created to preserve the technology and systems of the past, are long lived and are based around creating a living history experience for visitors and participants. That within the overall classification of heritage railways there is variety of scale and style of operation, it is not a case of ‘one size fits all’.

Chapter 4

Literature review

Chapter contents	<i>4.1 Terms and railway literature</i>
	<i>4.2 Relevant non-railway literature and application to heritage railways</i>
	<i>4.3 The research literature on heritage railways</i>
	<i>4.4 General literature and sources on railways and railway history</i>
	<i>4.5 General literature and sources on heritage railways</i>
	<i>4.6 What has been established from the wider literature review</i>
	<i>Key points of the chapter</i>

The review confirms that following a search of academic databases such as Academic Info, iSeek Education, Virtual LRC, together with Google Scholar, there are few research papers relating directly to heritage railways and none specifically on the governance of heritage railways. This demonstrates that the study will break new ground, fill a gap in the academic research knowledge base and potentially be of practical assistance to the industry.

There is substantial information and knowledge contained in the non-academic literature explaining the workings, operation and past practices of both railways in general, particularly from the period prior to 1968, and of the start-up of the early heritage railways such as the Talylyn. This is sufficient to form a basis for further research on the necessary operating conditions of heritage railways. There is also contained within the contemporary magazine articles indication of the threats facing heritage railways, including the process of ageing on both its assets and people, and environmental regulation to control carbon emissions.

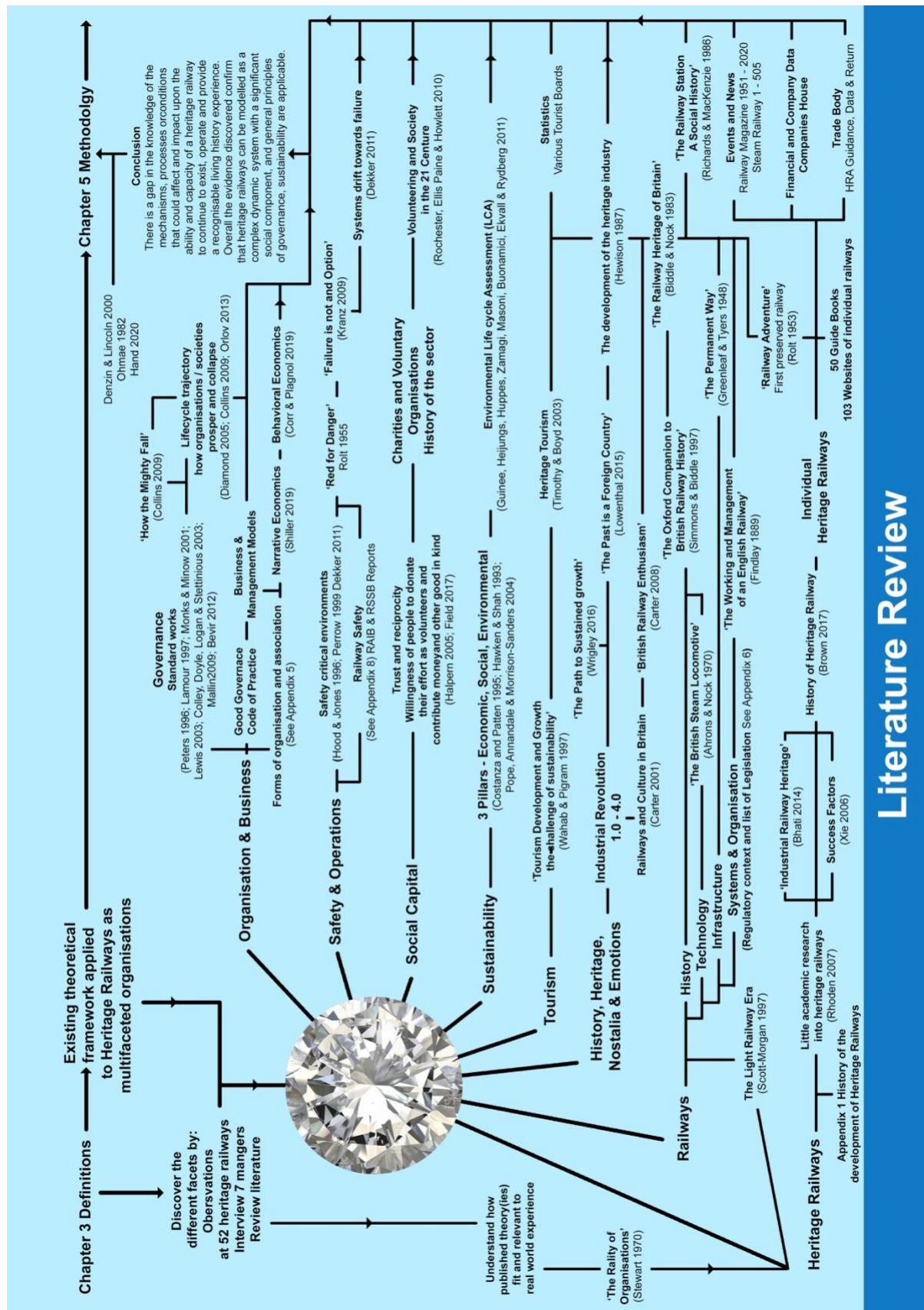


Diagram 4-01 Literature review framework and process

In the absence of significant academic material on heritage railways the researcher looked firstly at non-academic sources of published industry and heritage sector focused books, guides and magazines to provide a non-academic foundation on which to build this academic thesis. And secondly at a range of academic work on the topics identified as related to the subject of this thesis to extract the definitions, techniques, ideas, concepts and theories that would be then used in the research.

The researcher identified, through using the internet academic search engines noted above, a significant body of existing work on related areas of study - railways in general; governance; sustainability; social capital; safety and risk management; heritage tourism - although these separate topic areas had not been brought together and applied to heritage railways. This required breaking new ground in these areas by using this material and techniques to undertake the research and draw conclusions on the sustainability of heritage railways.

The review method used was based on Templier & Pare's (2015) six generic steps: "formulating the research question(s) and objective(s); searching the extant literature; screening for inclusion; assessing the quality of primary studies; extracting data, and analysing data."

4.1 Terms and railway literature

The main terms used in the title, the research question and the hypothesis – 'heritage railways', 'governance (corporate)', 'sustainability' and 'social capital' are rarely, if at all, to be found in any of the literature published prior to the 1990s. A review of the etymology using the Oxford, Cambridge and Webster Dictionaries of these words show they are of relatively

recent interest and popularity. Though it must be noted that according to Garratt (2010) the concept of governance evolved around 3,500 years ago from the Greek word *kubernets* - the person giving steerage/direction to a ship.

The general literature prior to the 1990s forms an important source of evidence as it provides contemporary accounts of the beginning and early stages of the development of heritage railways.

Therefore, in addition to the key words identified for this research above, other equivalents were also included, the full list being: heritage railways; preserved railways; tourist railways; railways for pleasure; governance; management; leadership; Boards of Directors; organisational structure; sustain(ability); survival; success; life cycle; safety; failure; growth; development; loss; risk; volunteer(s)(ing); charities; trusts; not for profit; community; public good and benefit.

4.2 Relevant non-railway literature and application to heritage railways

The academic search engines reveal an extensive body of research in the subject areas of heritage tourism, volunteering, governance, risk, safety, sustainability and social capital. At a general level this was found to be helpful in providing context, and an understanding of current theory and practice and was applicable, at least at what the researcher considered to be a superficial level, to heritage railways. This was sufficient to demonstrate that heritage railway organisations at a general level operate similar to other small to medium sized enterprises, coming under the jurisdiction of the Companies Act (2006) and for charities, the Charity Act (2011).

What was not found was how any of these concepts and the theories contained in the literature had been specifically applied to heritage railways or how events recorded in the literature regarding heritage railways could be interpreted using these theories. The researcher was struck by the lack of analysis when describing past events. The researcher considers that theories found on the operation of various models of governance, how systems and process can drift towards failure, the importance of communicating clarity of purpose and vision and the building of social enterprises could prove helpful and give insight into explaining the events recorded.

For example, the literature describing both the early and later phases of heritage railways shows a clarity of purpose to preserve a working railway in its entirety, both its technology and systems (Tonks, 1985). Though only implied, it follows that what cannot be preserved is the original purpose of the railway as a means of transportation, though this was part of some proposals, preservation being an end in itself.

Brown, 2017 goes on to describe that increasingly, managers and directors, often encouraged by others such as local authorities, saw and managed heritage railways as heritage tourist businesses and attractions in their own right. Letters to magazines and discussions on web forums such as National Preservation reveal that where compromise is made to an alluded authenticity of historical precedent this causes and generates much tension, discussion and controversy from enthusiasts. Terms such as “Disneyfication” are used. Magazine articles (Steam Railway ed 415, 423 & 465) refer to a ‘constant balance’ of competing interests since heritage railways, with one or two exceptions, are not financially viable without both visitor income and free labour and donations. (Rushton, 2017)

The literature on social capital for example Halpern (2005) and Field (2017) provides insight into this conflict of purpose in that while heritage railways have managed their operations in a safety critical environment, as any other professional railway, to satisfy the regulator, while attempting to maximise their commercial activities as visitor attractions, at core (Steam Railway ed 378) they were created and remain as social enterprises closer to cooperatives for the enjoyment of their members who contribute the majority of their leadership, governance, expertise, labour and capital on a voluntary basis, which could be withdrawn at any time (Brown, 2017).

The literature on safety management such as Hood and Jones (1996) and the tendency of 'system drift' described by Dekker (2011) aligns with the Regulator's view that governance is "not where it should be".

No published work was found that offers a description or explanation as to the conditions under which heritage railways are likely to be capable of continuing to exist in a sustainable manner, nor the reason(s) why heritage railways have enjoyed the resilience and longevity they have, compared to commercial companies.

The gaps identified are that, while separate components of heritage railway operation and events are recorded and there is extensive literature on theories of governance, sustainability, systems and social capital, see below, these separate threads have not been combined in any meaningful way.

The extensive nature of the gaps identified cannot easily be addressed in a single piece of research. This research focuses on the discovery of what conditions are necessary for a heritage railway to operate and how these are impacted and influenced by their organisational form and purpose, and how it relates to published theory in governing their sustainability as expressed through a consideration of their life cycle trajectory around the three pillars of sustainability – environmental, economic and social.

4.3 The research literature on heritage railways

As discovered in the scoping study there has been relatively little academic research into heritage railways. Goddin (2001) produced a short paper on volunteer motivation on two heritage railways. Holmes (2003) suggested that volunteers in the heritage sector were a neglected audience, this was partly addressed by Wallace (2006) who argued that volunteers working on preserved railways are “modern-day pilgrims through their moving in and out of different identities as they seek solace in the certainty of operating and working in complex and highly satisfying workplaces”.

Subsequently Rhoden (2007) considered that heritage transport was the focus of academic research “less often than other heritage tourism types, especially with regard to volunteer motivation”. His study extended the literature by examining heritage railway volunteers' initial motivations for volunteering and their demographic profile. The study analysed the associations between the key variables of age, gender and employment experience and volunteers' initial motivations. However, this study was confined to one heritage railway and did not deal with leadership or governance of the volunteer workforce.

The growth of heritage railways as described by Tillman (2002) was a response to both market and government failure. When private and commercial (nationalised) transport organisations were modernised during 1950-70 they did not preserve obsolete equipment and systems. Tillman further notes that public sector preservation was inadequate for those interested in transport preservation and many transport enthusiasts were willing to take on the task of preservation themselves.

Tillman (2002) noted that heritage railways operate in a “resource-constrained environment” and must make choices about how to use their limited resources to meet their objectives. He noted that “heritage railways have other characteristics that need to be understood, including public goods and externalities, philanthropy and provision of public goods, and non-profit organisations”.

Success factors were addressed by Xie’s 2006 paper ‘*A life cycle model of industrial development*’ which proposes six key attributes of heritage attractions: “The potential to offer visitors the opportunity to interact with the local heritage; support by the full diversity of stakeholders including local businesses, planners, active members in grassroots organisations, general members of the local community and those likely to visit the destination; adaptive reuse whereby dilapidated buildings and equipment are conserved and reused in the heritage attraction; the economic benefits to the region to minimise the losses associated with de-industrialisation; the authenticity of the experience for the visitors; community perceptions of what is worth conserving, based on aesthetic preferences and a consideration of the area’s heritage and history, by common community perception.”

The researcher considers that these criteria are insufficient and do not include factors such as financial performance, access to on-going funding, ability to maintain the historic assets, governance, safety and regulation, and a return (financial or other) to its owners. The relationship between these and the role of other factors in a heritage railway's ability to be successful and sustain itself is the subject of this research.

The only published study on a particular aspect of the management of a single heritage railway, is a paper by Baughan & Crapper (2016). This research outlines the importance and difficulties of importing common practices and systems from the mainline railways to volunteer run heritage railways particularly focusing on a competence management system. Although Baughan & Crapper (2016) examine only a single management system they establish the interoperability of safety critical operation between mainline and heritage railways and highlight the ease and difficulties of introducing new management practices into both a paid employee, higher risk profiled environment and one with a lower risk profile run mainly by volunteers.

Carter (2008) published a general work on 'railway enthusiasm' and devotes a chapter to preserved railways titled – "playing trains or running trains". Carter highlights the dilemma and fine balancing act of running significant sized businesses safely and viably commercially while maintaining historic authenticity, a hobby and passion for many of its volunteers and a job of work for its paid staff. He does not offer any solutions, guidance or recommendations as to how this viability should be achieved, which the researcher will do.

Recent research by Jiang, Long and Baas (2019) presented an interpretation of value

advantage and sustainable tourism development for railway heritage in China based on an analytic hierarchy process. This research sought to evaluate which of several railways (routes) in China should be developed as heritage railways following a loss of their original economic purpose, considering the following factors: technical difficulty; physical evidence; cultural communication and social impact.

This research is clearly important and relevant in two respects, it demonstrates that firstly Chinese authorities (the work references the UK and other countries' experience with heritage railways) consider the concept to have social and cultural benefit to China's culture and economy. Secondly it reflects the political and economic differences between the UK and China by introducing a high level systematic and analytical process for their potential selection as candidates for preservation.

This is very different from the UK experience as described by several authors, for example Tonks (1985) and Brown (2017) which was organic, driven by groups of enthusiasts, and individuals, regarded as eccentric (but partly tolerated by the authorities) who used their own efforts and money to save particular closed or closing railways, outdated technology and discarded artefacts and equipment.

In terms of on-going sustainability, it is necessary to consider some form of success criteria and measurement. The definition adopted for this study looks through the lens of its environmental, economic and social elements. In terms of measuring the economic component, according to Brown (2017) heritage railways generally were not created as purely commercial ventures, though there are specific examples that were, such as the Dart Valley

Railway which was created by a group of businessmen (Body, 1981). Currently, as noted by Brown (2017), the following heritage railways can be regarded as primarily commercial enterprises: The Paignton and Dartmouth Railway; Snowdon Mountain Railway; Lakeside and Haverthwaite Railway; Vale of Rheidol Railway and Brecon Mountain Railway. For mainline operation, West Coast Railway Company is also considered a purely commercial operation.

Tillman (2002) argues heritage railways, as non-profit organisations, tend to maximise the preferred outputs rather than maximise profits. He notes that with a mainly volunteer base, heritage railways are not dependent on shareholders looking for a continued return on capital.

Bogiazides (2005) notes the significant multiplier effects of investment in heritage railways have not been properly assessed in either the UK, which possesses the densest railway heritage network, or elsewhere in Europe. He notes, "Its impact on local communities in terms of income generation, job creation, youth training scheme places, skills development, etc. has not been comprehensively evaluated, nor have any attempts been made to assess some of its more qualitative (non-quantifiable) impacts in terms of the 'local distinctiveness' advantages characterising a location with such a historic asset or the sense of pride shared by a community whose past transport modes and vehicles, production methods and industrial skills, cultural aspects and social traits are being acknowledged and appreciated, cherished and consumed both by locals and visitors from afar".

The All-Party Parliamentary Group on Heritage Rail in its 2013 *Report on the Value of Heritage Railways* estimated the sector to contribute a quarter of a billion pounds annually to the UK tourist and leisure industry, (the latest estimate by Falconer in 2019 is over £400m which

aligns with the researcher's estimate) but recognised that more work was needed to quantify the benefits. The HRA's equivalent at a European level, FEDECRAIL, the European Federation of Museum and Tourist Railways, claims that every year around 20 million people visit Europe's heritage railways – the scale of this number of visitors can be compared to being almost twice the visitor intake of Disneyland Paris.

One finding from this review is the lack of research into heritage railway(s) as a sector, which may be considered surprising given its significance and achievements in both the volunteering and heritage sector. One interviewee claimed that “heritage railways demonstrate the most effective use of formalised volunteer labour in the UK”. Given, as will be shown in later chapters, the replacement value of the assets that volunteers have created is in the order of seven billion pounds over a seventy-year period, on more than 200 individual sites from mostly scrap metal, discarded buildings and former railway routes, the movement has around 23,000 active volunteers, second only to the National Trust with 65,000 volunteers, there is therefore some merit in the claim.

4.4 General literature and sources on heritage railways

The general body of literature on preserved railways and the development of heritage railways includes: Cornwell (1978), Awdry (1984), Heavyside (1984), Lambert (1999), and Dunstone (2007). These are generally in the form of a guide to the railways or lists of preserved locomotives and do not include analysis of their development or operation. There are a small number of histories of individual heritage railways such as, Parsons (2011) for the West Somerset Railway and Pallant (1993) for the Kent and East Sussex Railway.

There are two monthly magazines (Heritage Railway and Steam Railway) that are devoted to steam preservation and several general regular railway publications such as Railway Magazine that publish articles and news on heritage railways. In addition, individual railways have their own in-house magazines and newsletters such as Severn Valley Railway News or The West Somerset Railway Journal, both of which are produced quarterly. There are also a number of Internet forums that cover the subject, for example National Preservation (<https://www.national-preservation.com>).

Following the creation of a long list of phenomena, see Chapter 5, evidence was sought for confirming the conditions necessary for operation and sustainability of heritage railways from articles in contemporary magazines, journals and reports, these include: **security of landholding** – an example being the Swansea Vale Railway (Steam Railway ed 340) which lost the tenure of its land holding for commercial development; **safety of operation** – to date no railway has been terminated for reasons of safety, but several have received significant fines by the courts for breaches of safety regulations, an example being the South Devon Railway in 2018 (RAIB Report 02/2018), or had their license to operate temporarily suspended by the ORR, (West Coast Railway Company in 2015 RAIB Report 08/2016); other railways have had improvement notices or temporary closures; **financial viability** – most heritage railways rely on a mix of funding sources from revenue to grants and donations as well as volunteering labour (Ransom, 1973). An example of a heritage railway that failed to get the mix right was the Mid Hants Railway which became effectively insolvent in 1992 and was only saved by last minute donations from its members (Steam Railway ed 149); **tangible assets** - a number of heritage railways have got into difficulty by not having available their locomotives to run services due to being out of service for repairs and it has only been possible to continue with

the emergency loan of other railway locomotives, an example being the East Lancashire Railway (Steam Railway ed 356); **infrastructure** – most railways have infrastructure that, if it fails, can cause disruption and is expensive to maintain and repair, this includes cuttings, embankments, bridges, viaducts and tunnels, as well as being vulnerable to the vagaries of weather and nature, for example, the Gloucestershire Warwickshire Railway had a collapsed embankment at Chicken Curve in 2011 and a bill to repair of £850,000 while the railway had an annual income of only just over £1m, the money was raised through public appeal and donations (Steam Railway ed 394); **experience, skills and knowledge** – a number of key skills both for railway operation and engineering are required, these include footplate crew, signalmen and signalwomen, signal technicians, locomotive fitters and boiler work, which require years of training to become suitably qualified (Ransom, 1973).

In securing their future success heritage railways face a number of challenges - Hollingsworth (1976) describes four: legal; physical; financial and personal. Legal relating to regulations and gaining permission to operate; physical - maintaining the locomotives, rolling stock and infrastructure; financial – having sufficient monies to repair, maintain and invest; and personal – the motivation of volunteers. In the researcher's opinion, as confirmed in interviews, these challenges are as relevant today as they were in 1976.

Mann (2006) noted that “over the years the preservation movement has grown up piecemeal. Few of the railways were created with a business plan, as originally it was a hobby and an opportunity to operate steam locomotives”.

Articles and debates in the magazines *Steam Railway* (ed 321, 457 & 465), and *Railway Magazine* (07/2003, 09/2011) demonstrate that most railways have an awareness and understanding of the need for good business planning, and many have moved their respective railways onto a more commercial basis, shown by the example of the increasing appointments of full-time marketing and sales staff. However, the articles and debates also demonstrate that some still operate on a day-to-day basis with little regard to their medium and long-term prospects.

Mann's opinion in 2006 was that "many railways will not survive more than 10 years unless they take steps to improve their situation." All heritage railways in the study population that operated in 2006 continued to operate for ten years until 2016, this leaves the questions, did all the railways take the necessary steps to improve their situation, were the problems overstated, or has the day of reckoning been postponed? These questions form much of the motivation for the current research.

4.5 General literature and sources on railways and railway history

There is a vast body of literature on British railway history - a bibliography was first published in 1963 (Ottley) with a second edition in 1983 and a further two supplements, the latest in 1998. This literature, while out of date in terms of more recent works on management and business research, practice and guidance, is still of value to provide both an insight and evidence as to the development and history of railways since their inception. In an interview with Whitehouse, in 2018 he considers it relevant insofar as today's heritage railways are concerned. It being the manifest of their history in terms of not only physical presence and technology but that these railways seek to emulate both the operational practices and

systems of the past and present so that volunteers can participate, and visitors can experience them. The educational aspect of providing this participation and experience being a key requirement for obtaining their charitable status (Charity Act 2011).

Chapter 1 established that heritage railways today and all railways since their creation are governed and operate as multifaceted organisations. This is confirmed by studying the literature relating to railway companies, their organisation and management such as Williams (1852); Findlay (1889); Ivatts (1904); Macaulay 1912; Hare (1931); Gourvish (1986) & (2005). These works provide contemporary accounts of the management of Britain's railways from the 1850s to 1997. This literature describes specific private railway companies such as the Great Western Railway, London North Western Railway and the later nationalised British Railways as multifaceted organisations covering a variety of topic areas from management to operation, engineering both civil and mechanical through to services such as catering.

The organisational structure of a typical railway company in the early 1900s - the Great Western Railway - was set up with the General Manager at its head, reporting to a Board of Directors (Russell, 1983). The General Managers Department was responsible for head office administrative functions together with the four main divisions – The Engineering Department; The Superintendent of the Line; The Goods Department and the Locomotive Department. Each of these main divisions was then divided further into specific departments such as carriages or signalling.

An organisational diagram for the Welshpool and Llanfair Light Railway in 2020 mirrors this earlier form of organisation almost exactly, other than there is now no Goods Department and instead there is Education and Heritage Manager.

4.6 What has been established from the wider literature review

A wider search of the connections between governance and heritage assets produced a number of published works, Timothy & Boyd, 2003 provides insights into the challenges of, and need to, preserve endangered assets in a resource constrained and limited environment and presenting these to the public as part of an educational or entertaining experience. Although somewhat dated and provocative Hewison, 1987 provides an excellent summary of Britain's "seeming obsession with the past". Equally the work of Lowenthal in 2015 revisits his previous work to demonstrate how society uses and reinvents nostalgia and heritage to serve its present needs and how it "pervades every facet of public and popular culture".

These works confirm the commonality of the challenges across the heritage and heritage tourism sector, heritage railways being at the intersection of railways and industrial heritage and while as Whitehouse (2016) notes the early railway preservation pioneers were in the vanguard of a wider movement, those leading and managing heritage railways are now an integral part of heritage tourism.

Orr's 2006 paper "Museum Volunteering: Heritage as Serious Leisure" argues that volunteering is a way of practicing heritage as leisure that is 'self-generated', with museum volunteers active in constructing their own identities, which resonates with the work of Wallace (2006) referring to heritage railway volunteers as pilgrims.

In terms of governance, the review covered standard works on governance that may fit heritage railways, for example, Larmour (1997), Monks & Minow (2001), Sundaramurthy & Lewis (2003), Colley, Doyle, Logan & Stettinious (2003), Mallin, (2009), Bevir (2012). All these works frame governance positively. The application of different models of governance and published guidance such as the UK Governance Code (2018) highlight the virtues of ‘good’ governance and that ‘good’ governance is a critical condition for creating successful organisations. However, there is variance between different authors (Micklewait & Dimond 2017 v Covey, 2006) on how ‘good’ is defined in detail and understood in practice though the general principles of fairness, justice, ethics and transparency are common.

Despite what is a proliferation of the governance concept in both popular business books and the research literature, there is little agreement on definitions, scope and what actually constitutes governance, for example Veerle van Doeveren (2011) refers to vague definitions of governance allowing governments and companies to escape proper scrutiny, Fukuyama (2013) lists sixteen different definitions. This has led, as discussed in Chapter 3, to the researcher developing a specific definition of governance for heritage railways based on the most appropriate and relevant definitions found in the literature. There are a large numbers of case studies on governance, but these are usually of large public or corporate organisations such as Enron, Merrill Lynch and Hewlett-Packard but little in the way a common conceptual framework to assess how well governance is exercised in detail.

The case studies also mainly refer to the extremes of size, spectacular success or catastrophic failures of which lessons may, in theory, be learnt and applied. There are also a number of

theories (Handy, 1976 and Collins 2001) on how certain behaviours demonstrate good and poor governance within a variety of generalised circumstances. However, what is much rarer in the literature is the 'ordinary', the 'everyday', small and medium sized organisations that are perhaps 'muddling through', not good or great but not so bad they fail.

On heritage railways, governance is in the main exercised by volunteers (Brown 2017), undertaking it by choice, in their spare time and not as in commercial organisations by remunerated employees, professionals and owners as part of their career and full-time job.

This, the researcher argues, places heritage railways into the category of 'muddling through' with those individuals exercising governance in a voluntary capacity, more as a means to achieve their own wider goals of preserving and operating heritage railways, as later shown in the responses to the surveys. This identifies a gap in the research of what is necessary in terms of defining and describing 'doing just enough governance' to 'scrape by' and how it can be measured and what it looks like in not-for-profit type organisations.

Perhaps there is no better example of governance than contained in '*The Allegory of Good and Bad Government*', a series of paintings Lorenzetti began in 1338 and completed in 1339, commissioned by the governors of Siena to show the different outcomes of good and bad government. Although the difference between government and governance is appreciated, governance is what government does, and is the act of governing or ruling, while government is the body through which this is done. It is sufficient to also illustrate the concept of good and bad governance.

Romero (2017) in describing the paintings said, *“good government is characterised by justice, concord, peace, and wisdom while bad government is animated by division, avarice, fury, vainglory, even tyranny. When good government reigns, all is well. When bad government plagues the realm, the tyrant usurps the power of the people and the citizens suffer.”* This was part of a ‘TED talk’ in 2017 putting forward the argument that these concepts are as relevant today as in Italy in the 1300s.



Image 4-01 ‘The Allegory of Good Government’ by Lorenzetti (image sourced from internet)

The Researcher considers these visual and philosophical concepts could be equally and easily applied to heritage railways as readily understood concepts - good governance being characterised by a safely run operation, buildings and assets in good repair, visitors and volunteers positively engaging in all the different aspects of the railway from education to leisure, the board and management displaying good judgement, identification of risk, forward planning and creating public good. Bad governance would display the opposite, a disregard for safety, quarrelling volunteers, lack of visitors, poorly maintained and neglected assets and a board and management with only self-interest. These concepts will be developed in

producing a guide to what good governance looks like for heritage railways, see the 12 tablets in Chapter 9.

There is a large resource of data and information about organisational systems and how systems can fail and collapse (Collins, 2009 and Gramm, 2015), that systems will tend to drift towards failure (Dekker, 2011), and that there is a bias toward normalcy and underestimating the consequences of rare but catastrophic events (Clearfield & Tilcsik, 2018).

As with governance there is a significant volume of research into sustainability. A search of definitions of sustainability produces over twenty different versions covering all aspects of the subject, which demonstrates its multi-dimensional nature. What the researcher was seeking is a working definition and framework that will be applicable to heritage railways.

The Brundtland Report of 1987 contains the most commonly quoted definition: *“Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs.”*

Costanza and Patten, 1995; Hawken, 1993; Pope, Annandale & Morrison-Sanders, 2004 provide a general introduction to the subject. The 2005 World Summit on Social Development identified sustainable development goals, such as economic development, social development and environmental protection. Bridge (2007) notes that “sustainability relates to the connection of economic, social, institutional and environmental aspects of human society, as well as the non-human environment”. Morelli (2011) indicating that the three pillars of sustainability are not mutually exclusive and can be mutually reinforcing, the three

pillars being “interdependent, and in the long run none can exist without the others”. These three pillars are also referred to by Elkington (1994) as people, planet and profits - the “Triple Bottom Line”.

This research uses the three pillars collectively as the overall framework in which to assess a heritage railway’s overall prospect for sustainability, all three pillars being addressed collectively. These three pillars are interpreted in a practical way that is relevant to heritage railways: **Economic** - is there sufficient money to keep the railway running and provide some measure of future investment? **Social** – are there enough willing, capable and competent people for it to run? **Environmental** - making sure that the operations respect the physical environment and is it sufficiently safe to run so as not to kill or injure anyone?

Halpern (2005) offers evidence from a number of sectors as to the efficiency of social exchange. Field (2017) suggests that the building of social capital is desirable as it results in ‘beneficial outcomes’ to all concerned through shared values, trust and reciprocity. Its application to heritage railways is demonstrated within a number of narratives which point to the importance and role played by groups and individuals in setting up heritage railways and sustaining them through crises, (Pallant, 1993, Parsons, 2011 and Brown 2017) such as the means to overcome a lack of funds, failure of infrastructure, poor governance and lack of availability of serviceable locomotives. Such philanthropy (Rushton, 2017) taking the form of donations of labour, expertise, loan of assets and financial gifts or ‘soft’ loans. The concepts of social exchange and capital are important to this research as it eventually led to the modification of the original hypothesis.

Key points of the chapter

This review of the literature has shown how heritage railways are primarily positioned at the intersection of the industrial heritage tourism sector and the regulated railway sector, with secondary intersections from the charity sector, generators of regional economic benefit through job creation and secondary spend and specialist interest groups acting within a social setting.

Published work on organisational forms and systems indicate that heritage railways could also be modelled as a complex dynamic system with a significant social component, and that general principles of governance and sustainability are applicable. The application of such theories to heritage railways has not been previously undertaken. It is possible that the research being undertaken can also have wider relevance to the related sectors of heritage in general, heritage transport, charities and trusts. This research seeks to advance knowledge of the sector and be a definitive source of information on which the industry can draw for future strategic and policy decisions.

The literature review provides further confirmation of the thesis' core theme that heritage railways have arrived at a mature point on their life cycle trajectory not by strategic planning, design or above average standards of operation and governance but an original purpose and vision, based on an emotional need to save what they feared would be lost. It appears that this model, with its strong component of creating social benefit for its volunteers and members may have been influential in ensuring the longevity of heritage railways, this will be tested in the following chapters. The current position of heritage

railways at the intersection of competing interests and the forces to change through evolution and adaptation will be further explored through the discovery of conditions necessary for successful operation and sustainability.

Chapter 5

Methodology

Chapter contents	<i>5.1 Research objective</i>
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	<i>5.8 Research methods</i>
	<i>5.9 Weighting of sources used</i>
	<i>5.10 Stage 1 Analysis</i>
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	<i>5.13 Validation of hypotheses</i>
	<i>Key points of the chapter</i>

5.1 Research objective

The aim of the research was to better understand the role of good governance in the sustainability of heritage railways. This aim was refined into a research objective whereby the thesis develops the definition ‘heritage railways’ as an organisational form and examines the basis for their singular longevity. In particular, the thesis seeks to discover the necessary condition(s) for the successful operation of a heritage railway. These conditions are explored in the context of their governance, life cycle trajectory and through the three pillars of sustainability – environmental, economic and social. An output from the research was to develop tools for practitioners that would assist them in the management and assessment of their railway’s forward trajectory.

5.2 Research question

The research question addressed is ‘what conditions are more likely to lead to whether a heritage railway becomes more or less sustainable’?

5.3 Research scope

The research question as stated above encompasses heritage railways as a collective. However, there is no defined ‘heritage railway sector’ beyond the aggregate of those individual railways falling within the developed definition. For the purpose of the research the heritage railway sector is defined as the aggregate of these defined railways. All these railways fall within the ORR’s jurisdiction for regulation as non-mainline railways, and a number of the railways, but not all, are members of a Trade Body – the Heritage Railway Association.

5.4 Research context

The research territory and broader context is the resilience of organisations, their governance, identification and management of risk through the different stages of their life cycle. The research crosses a number of subject boundaries, these include: governance; organisational structure, type and dynamics; risk management; sustainability as described by its three pillars - environment, society and economic; social good and capital; tourism and in particular heritage tourism; nostalgia and emotion; railway operation and regulation.

5.5 Research hypothesis

The hypothesis proposed in the study is that good governance of railway assets and management is the key determinate of the sustainability of a heritage railway.

Other hypotheses proposed are: The extent to which the discovered conditions collectively exist and are developed, maintained and managed, being measured as a strength or weakness, gives an indication as to a heritage railway's likely future prospects, in terms of failure, decline, stagnation, sustenance or growth. Heritage railways are at the mature stage of their life cycle.

If it follows that these hypotheses are confirmed then: firstly, they can provide an explanation for the past trajectory and the position reached in their current life cycle; and secondly a theoretical model can be constructed from which tools can be developed which would be of practical use and benefit to heritage railways in managing their maturity and their future prospects.

5.6 Research design

A framework for the research was developed as shown in diagram 5-01. This framework was designed to show how each of the elements of the research were linked. The X axis is divided into 4 sections: Lifecycle – birth, development and growth, maturity and decline or rebirth; trajectory – moving from the idea and concept of a heritage railway through its physical and ideological manifestation to an ongoing and future entity; research – the defining of the concept, discovery and description of conditions to operate, understanding the role of narratives and the mechanisms sufficient to maintain balance in an inherently unstable and dynamic system through the passage of time and need to replace; outputs - a definition of terms, operating conditions, a theory of 'doing just enough governance' and the link and integration of social capital and finally, practical tools for assessment. This framework was used to define the totality, objectives and scope of the research.

From this framework a flow chart with decision points was designed and developed to guide the researcher through the research process. Minor modifications were made to the chart as experience was gained and new leads developed. A thumbnail of the final flow chart is shown in diagram 5.02 below and full size as a separate document. The flow chart commences on the lower left side of the page. The red line shows the critical path through the process, the blue line the related activities. Beginning with the research objectives and hypothesis leading to the research questions and the seeking and discovery of evidence with the research methods highlighted to test and establish the validity of the hypothesis, which in this case as the evidence did not fully validate the hypothesis, then using Bradford Hill's criterion, the production of an amended hypothesis.

5.7 Research stages

Stage 1 - was an investigation to discover the conditions needed to make a heritage railway sustainable. The working hypothesis was that governance would have the strongest influence.

Stage 2 - followed the failure to fully validate the original hypothesis that good governance of railway assets and management is the key determinate of the sustainability of a heritage railway. A further investigation was undertaken to discover conditions that give heritage railways a resilience and longevity greater than other small and medium size enterprises. The focus was on variations in *raison d'être*, structure and culture of the different types of organisations. The working hypothesis developed was that social capital is the key determinant of the sustainability of heritage railways as it was demonstrated that their longevity does not simply arise from 'good governance' but may be the product of multiple interlinked variables and processes.

Framework for Research into the Sustainability of Heritage Railways

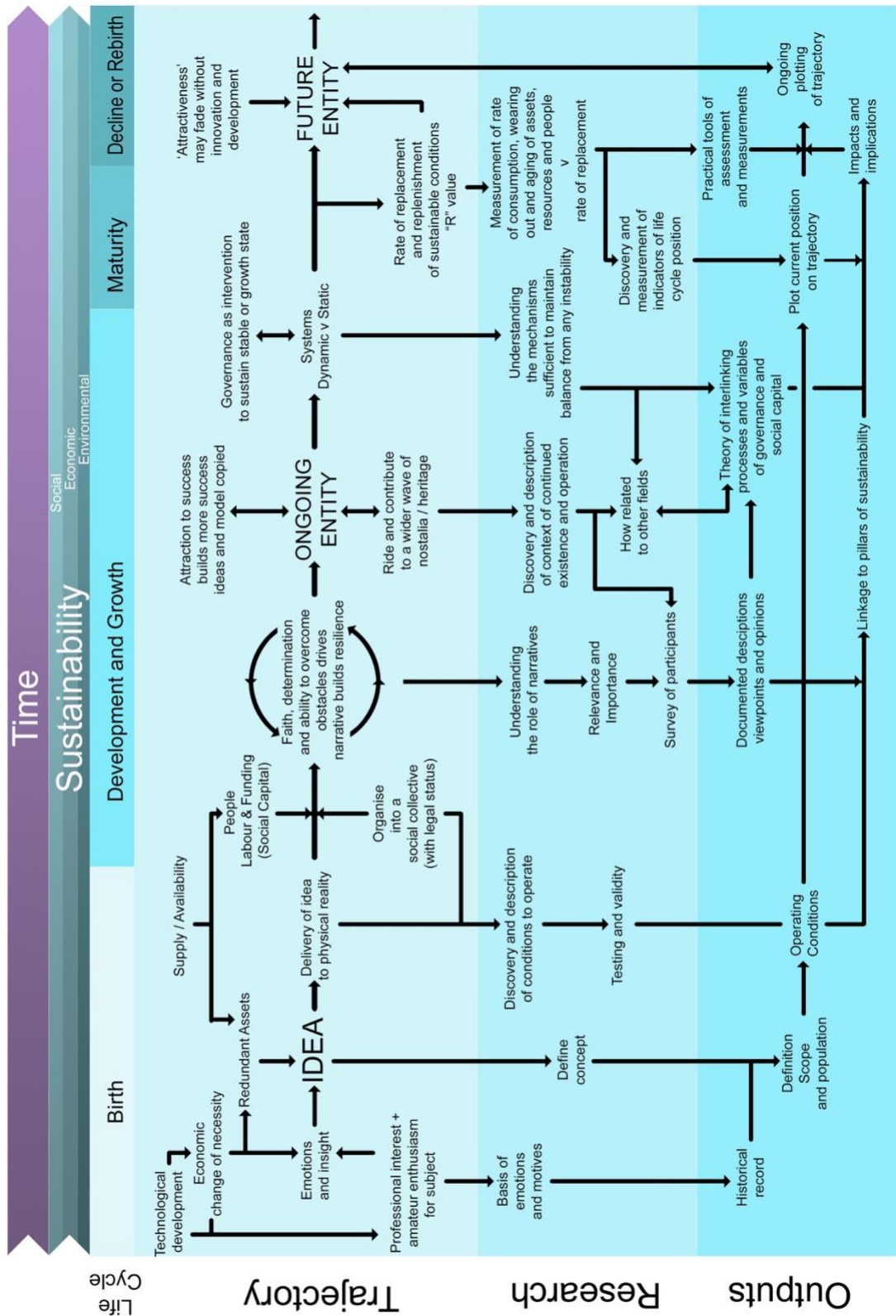


Diagram 5-01 (Above) Research Framework

Diagram 5-02 (Below) A flow chart of the thesis methodology reproduced in full in the appendix

Social capital is not a simple readily measured concept and efforts were made to find examples of its presence through proxy such as the degree of philanthropy exhibited and the financial value of volunteering efforts and how governance may be instrumental in building or reducing its presence and value, governance itself being a part of social capital. The aim being to provide a more comprehensive model of sustainability for heritage railways than initially envisaged.

Stage 3 - a pandemic was identified on the risk register created for heritage railways in October 2019, together with other external events such as terrorist incidents and civil unrest. Following the conclusion of the research this identified risk became a reality during the first three months of 2020.

The UK was locked down from 23 March 2020. The effect on heritage railways was that, for the first time in seventy years, they were all forced to close, depriving them of all visitor revenue. The magazine *Steam Railway* (ed 504) called it an existential threat. The researcher collected contemporaneous data on dates of reopening, fund raising appeals, government schemes to help the sector and grants provided by various organisations. Press statements and web-based announcements were collected.

The researcher gained first-hand experience of the day-to-day decision-making process of a train operating company on whether to run its steam services during the pandemic. The purpose being not to commence any new line of research, but to assess if the impact of the

Covid-19 pandemic provided any evidence to support the thesis' conclusion(s) or provide new insight into the subject of the research.

5.8 Research methods

A mixed methodology was adopted utilising both qualitative and quantitative research. The following qualitative methods were used:

Ethnography (Madison 2011) – whereby the researcher has been immersed in the world of heritage railways through the position of volunteer company secretary of the Vintage Trains group for the period of the research. This method was used mainly as the means to develop contacts with other heritage railway organisations which would be potentially more difficult to acquire by an 'outsider' and to 'listen in' on conversations at meetings and events. This raised a number of potential ethical issues, selectivity and bias. This has been addressed by giving greater weight to the data from the survey sent to all organisations and all quotes used are from structured or semi-structured interviews with the interviewee's awareness and permission.

It is possible that the response rate from participants may have been higher as the originator was known to them, but this is not regarded as likely to lead them to infer any bias in their responses. The researcher's visits to heritage railways and recording of events and processes also falls within the method. The method adopted to record the events, activities and conversations were diary entries and the collection of documents or copies of documents, such as guides, brochures, minutes of meetings, reports, emails, risk assessment, rules, method statements, operational notices and certificates.

Two processes were adopted to analyse the information gathered. The first, in the early stages, was to note events and phenomena, activities and events that could be used as a contribution to the long list of conditions that would be later filtered and grouped to form the necessary operating conditions. The second was to confirm if there was evidence for the existence of these conditions and if the condition(s) was critical to the entity's operation and were there any other conditions not previously included.

Narrative (Herman, Jahn, Ryan 2010) – this approach is used to weave together a sequence of events to form a cohesive story. The sources are a mixture of first-hand experience, in-depth interviews, narratives within published books and magazines, in which themes and connections are identified and explored. The purpose is to show how a particular story may illustrate the bigger picture. An example would be an individual's story of their volunteering experience as an example of volunteering generally, or how an individual railway's growth was emblematic of other railways. This carries the limitation of how valid it is to aggregate up small samples or specific examples. To overcome this limitation there must be other means to demonstrate and validate that the narrative is representational of a larger group.

Phenomenological (Moustakas 1994) – This method was used to describe an event, activity, or phenomenon. It was used in the process to understand the meaning and the way different aspects of a heritage railway are seen or interpreted by various participants. An example is a steam locomotive - a member of the public might refer to it incorrectly as a train (locomotive plus wagons or carriages), an enthusiast in terms of its class and number, an historian in terms of its date of construction and service history, an engineer its technology and configuration, an engine driver its performance, a manager as a unit of motive power, an accountant as an

asset in an asset register or a line of cost in a budget spreadsheet. A common language and understanding of what terms mean and how they are used became an important consideration in the development of groupings to form the conditions for sustainability.

This process was undertaken by interview (see also below) conducted in the form of open-ended questions to heritage railway directors, volunteers, members, the public who had visited a heritage railway while some who had not were shown a photograph of a typical heritage railway scene (see image 5-01) and asked to make comments on what they saw in the image.



Image 5-01 The image used in interview to identify different contextual themes

Grounded Theory (Tie, Birks & Francis 2019)- while the phenomenological study is used look at ways to describe the essence of an objective or process, the researcher uses grounded

theory to provide an explanation or theory behind the object(s) or event(s). For example, the number of failures in daily service may be an indication of the repair and maintenance regimes; levels of quality control or financial problems may be an indication of poor oversight or lax management. The limitation is that an indication, theory, or possible explanation is not a validation and therefore great care must be used without further direct and substantive evidence.

Case Studies (Gillham, 2000) – similar to the narrative method noted above, a number of case studies have been explored to gain an understanding of real-life examples of events and their consequences. The advantage of case studies is that events can be explored over time with the outcomes recorded. They are useful to run scenarios whereby they can be ‘paused’ at any point, options available explored and then what ‘actually’ happened can be clearly seen. Examples include railways that have overcome multiple challenges or very specific life-threatening events.

The Questionnaire (Marshall 2005) - Two questionnaires were used as a mechanism for obtaining information and opinions on the conditions for sustainability from two sources: directors and senior managers of heritage railways and a wider group of non-directors that would include volunteers, enthusiasts and members of the public.

The purpose of the two questionnaires was to validate the list of conditions and to gather a range of data from the respondents on their opinions as to the likely sustainability of heritage railways and the strengths and weaknesses of current operations.

The reason for designating two groups was that directors have a statutory duty under the Companies Act 2006 for the governance of their companies and are therefore the relevant group to which to address the questions. The responses from non-directors would act as a comparator.

The questionnaires were designed using Qualtrics on-line software under a licence held by the University of Birmingham and approved by the University's Ethics Committee. The Qualtrics software allows both the generation of reports with results and the raw data.

The directors' survey was distributed to the Company Secretary of each of the 104 heritage railways and operators from the researcher's database, as described in the study population, via email and post where email was not available. A follow-up email was also sent to gather further responses.

The non-directors' survey, unlike the directors' survey, had no publicly listed names available to aid distribution so an indirect method was used, this being press release to the three main magazines covering heritage railways, with a web link. The link was further published on Facebook and railway discussion groups such as National Preservation, with a request to share and disseminate further.

The questionnaires also captured data on the background, gender, ethnicity, age and interests of respondents. The limitations of a small sample size of the questionnaire are recognised.

Interviews (Kvale 1996) – Unstructured, semi-structured and structured interviews were carried out at different stages of the research. At the initial stage, a series of unstructured interviews was carried out to first explore the heritage railway universe and experience of participants, using open questions, follow up and probing questions, with the responses being recorded. Initial selection was, as far as practically possible, random and undertaken on visits to heritage railways.

This was refined as more knowledge was gathered of the various groups to ensure a representation and response from each of the following: public (families, couples and individuals), railway enthusiasts, volunteers, staff and managers. This was followed by semi-structured interviews with a group of 15 directors selected from the study population, with specific questions related to the conditions necessary for a heritage railway to operate, to seek their views and opinions by direct questions whether they agreed or not with the findings, and for them to provide further insight, all responses being recorded.

A final series of unstructured interviews was carried out with 6 directors during the development of the research outputs to create assessment tools. The purpose was to test the practicality and usefulness of the tools.

Outside the remit of the research, the ORR conducted a series of workshops in late 2019 / early 2020 with heritage railways to trial the use of RM3, which produced feedback via self-completed questionnaires.

The possibility of an element of self-selection is recognised in the sampling of those for interview, from approachability, willingness to participate, and in the case of directors, known to the researcher.

Data Collection (Sapsford & Jupp 1996) – In addition to the primary qualitative data stated above, six specific data collection exercises were carried out.

The first exercise was the gathering of information to complete the database of heritage railways. This included collecting data under the following headings: **authorised/official name of railway** from Companies House, Charity Commission or ORR; **whether a member of the HRA** from published membership list, whether contained on the ORR list of exempt railways 2017; **location**, nearest town, county, country (Wales, England, Scotland, Ireland) from Google Maps; **gauge**, actual in metric and imperial measure and type – miniature, narrow, standard and broad (information from railway); **length of route** in metric and imperial measure from guidebook and confirmed on Google Maps; **financial turnover** as contained in published accounts submitted to Companies House; **profit (loss) or surplus** in published accounts; **balance sheet value** (net worth) in published accounts; **date formed** from information provided by the railway or contemporary magazine articles; **date opened to public**, normally the first train operated as previous source; **current status** - operational (running trains), open (to public but not running trains), closed with date of closure or proposed but not yet open, information sourced from the railway's website or contemporary magazine articles; **visitor numbers** obtained where available from press release and/ or contemporary magazine article; **number of members**, as previous source; **whether a steam service operated**, information source from published timetables; **purpose** - preserved railway

(must have been, as a minimum, on a track bed of a railway originally offering a public transport or freight service), tourist railway (a railway built without a public transport purpose), a railway fulfilling its original purpose (example a cliff railway), a museum with only static exhibits, a museum with an operation or demonstration railway, information sourced from railway's website or guidebook; **type** – a national network train operating company with safety case / licence to run heritage traction including steam locomotives; entity with fleet of steam locomotives certified for and regularly operating on the national network; heritage railway with running powers over designated sections of the national network; heritage railway with connection to the national network for transfer of passengers or trains; heritage railway operating as a Statutory Company by Act of Parliament; heritage railway operating as a single commercial vertically integrated company; heritage railway owned and operated as a single not-for-profit / not-for-dividend company or registered charity; heritage railway with a mixed structure of ownership / operating between public company / registered charity / association of members; heritage railway solely within the grounds of an accredited museum; an entity with a collection or a fleet of steam locomotives / other heritage traction / vehicles operating on heritage railway(s); other minor tourist and heritage railways including those operated on estates, theme parks and cliff railways, (information from Companies House, Charity Commission, railways' website, contemporary magazine articles); **other entities** with significant influence or control of heritage railways, information from railways' website, contemporary magazine articles; **address of registered office** at Companies House; **name of operating company** as previous source; **link to company number** where applicable; **link to charity number** where applicable; **link to website**; **telephone contact number**; **other organisations and groups** associated with the individual railways with contact details; **names**

of current directors information from Companies House; **date of birth** (month and year) of each director, as previous source.

There were 408 railways / museums listed making total entries of over 10,000, taking account of the names of directors and associated organisations. A copy of the data base is available on request and a copy provided to the ORR.

The second exercise derived from the database was an analysis of the financial well-being of heritage railways drawn from information contained in the annual accounts submitted to Companies House.

The third was an age profile of directors, compiled from the dates of birth of Companies House registered directors.

The fourth was a data collection exercise to better understand one of the conditions discovered – assets. A separate research exercise was undertaken to look at two sub-elements of this grouping - locomotives and coaches. How sustainable are both the locomotive and carriage fleets?

The methodology for one of these sub elements – locomotives – is explained in detail. The reason is to demonstrate the depth and breadth of a single aspect of a heritage railway, a similar level of complexity could be applied to almost every aspect from its signalling system, permanent way, equipment or buildings.

There were three main sources from which steam locomotives were saved: directly from British Railways, in working order, an example being GWR Castle Class locomotive 7029 Clun Castle; purchased from private scrap yards following disposal by British Railways, the largest by far being Barry scrapyard from which 225 were purchased or around 56% of the current ex-BR preserved fleet; directly from private and state industries, some in working order but most in end-of-life scrap condition.

The literature (Brown, 2017) explains that the largest proportion of steam locomotives entered the preserved fleet either at the end of their service life or in scrap condition, this varying from all parts present to a virtual wreck with few useable parts. To return a steam locomotive to working order and maintain it in running order is no mean feat. It requires labour, skill and finance in equal measure. Visits to heritage railway locomotive workshops showed that to return a locomotive to working order from 'Barry condition' can take ten or more years by a dedicated team of volunteers and financial sums into the hundreds of thousands of pounds, much depending on the size and complexity of the locomotive, varying between a small industrial saddle tank and a main line Pacific locomotive such as 71000 Duke of Gloucester.

It was noted from the literature (Nock, 1966) that the average life of a steam locomotive in everyday service is around 40 years. British Railways adopted a policy of quick replacement under the 1960s 'modernisation scheme' once it had decided to replace steam locomotives. This led to many being withdrawn for scrap, some having less than ten years' service but the potential for another 30 years or more of life on a heritage railway, particularly as use is less intensive there, with speeds limited to 25 mph (Meanley, 2018).

Steam locomotives, once restored to working order, have their boiler certified ('ticketed') under the Pressure Systems Regulations 2000 for a maximum of 14 months. This may be renewed annually for up to a maximum of 10 years, subject to at least one major intermediate inspection and re-tube of the boiler, normally after about 5-7 years. It is often referred to (Steam Railway ed 345) as a "ten-year ticket," but according to Meanley (2018) this is incorrect, it being a series of annual tickets for a ten-year period.

At the end of this period the boiler must be lifted from the frames and a full overhaul of the locomotive undertaken. This in itself can take several years and again run up costs into the hundreds of thousands of pounds. Hence, in looking forward, a ten-year horizon is the critical timeframe.

The regulations require a locomotive currently being overhauled, and due for completion in 2022, to receive a series of annual 'tickets' up to a maximum of ten taking it to 2032, during which period it should only require running repairs, minor works and one major inspection to keep it operational, though more significant failures are not unknown. A locomotive with ten years of service expiring in 2020 will then spend perhaps three to five years waiting in a queue to enter works before being overhauled then return to service in 2025, then being expected to run until 2035.

For each heritage railway to secure its operational requirements, in the best-case scenario, it needs to own a fleet of locomotives sufficient to fulfil its timetable and have enough locomotives in reserve to cover any daily failures or maintenance and enough to cover the

cycle of major overhaul. The railway is then able to pool and distribute funds and costs across its operational fleet.

The methodology adopted to gain a full picture of the steam locomotive fleet was to create a database of all individual locomotives, classified by identifying locomotive number, class, status, location and ownership.

The main purpose of the creation of the database was to allocate a status to each locomotive being:

Static Display – This means the locomotive is either on permanent display or unlikely to be restored to working order in the foreseeable future, although longer term this will always remain an option for most but not all locomotives.

Unrestored or in store – Remains in scrap condition or has little prospect of being returned to steam in the foreseeable future.

Awaiting or under restoration – Either planned or actively being restored from scrap/long-term store, or a considerable period since previously operated.

Awaiting or under overhaul – Locomotive has operated since being preserved and is awaiting or undergoing an overhaul to renew its ten-year boiler certificate.

Operational, or under repair – Locomotive with a current boiler certificate, and where known date of expiry.

Ownership was differentiated by: heritage railway; charity or association closely aligned with a heritage railway; private, individual or group; accredited museum or similar.

For locations, the following categories were used; accredited museum or similar; private site; heritage railway; depot for use mainly on the national network.

The sources relied upon to populate the database were a mixture of magazine articles, published lists of locomotives and website updates from owning groups. The first problem encountered with these sources is that while most contain much technical detail of the locomotive and its original service history, details of its history and ownership during preservation are generally much sketchier. This is particularly true of locomotives that worked formerly in industrial ownership, which often do not attract the same level of interest from enthusiasts, whereas individual locomotives, classes of locomotives or locomotives belonging to a particular 'Big 4 company'¹ or a region have their own dedicated following. For members of the public, there is no evidence to suggest that they discriminate between different types of preserved steam locomotives other than particularly 'famous' locomotives such as Flying Scotsman, as shown in a number of BBC news reports in 2019 on its tours throughout the UK.

¹ Big 4 companies were the GWR, SR, LMS and LNER that were nationalised in 1948 to form British Railways.

The second problem was that the published information in books is often out of date as the cycle of restoration, operation and overhaul is constantly moving forward. Information published on web sites is often more up to date but can be contradictory.

Therefore, the database does not claim to be 100% accurate but the best it can be as a snapshot in time. This is considered reliable enough for analysis, patterns and trends to be discerned and conclusions drawn.

The data base consisted of 1,159 standard gauge locomotives, including both former British Railways and industrial locomotives. The following categories were used for each locomotive: operational status; date boiler certificate expires; number (running number BR and grouping company works number if an industrial loco); number (TOPS for those locomotives operating on the main line); name (if carried); class designation; wheel arrangement; owner - private / heritage railway / museum; whether used on the main line; current location; owner address where available; contact details or web site

In total circa 13,000 cells were completed. A similar data base was constructed for coaches.

5.9 Weighting of sources used

Table 5-01 sets out the sources used in the research, their purpose and the weight given.

Table 5-01 Sources with their weighting.

Source	Purpose	Weight given
Visual observation capable of being recorded as a photograph	Comparison for historic reference, interpretation and counting e.g. type of visitor	Medium
Experiences gained from personal visits to heritage railways	Background and context only	Low
Published web sites, books and magazines on railways	Main source of historic information and information to compile data bases	Medium to high
Published general material on related topics e.g. popular books on business, news stories, etc.	General background and context	Low to medium
Published research in associated and related areas – heritage, culture, organisational theory and practice	Theoretic framework and understanding	High
Published data from authoritative sources such as Companies House and Charity Commission	Compiling data bases	High
Discussion and debate on web site forums	Background and context, indicators as to problems and issues, source of quotations for emotive dimension	Low
Survey responses from two surveys conducted with directors and non-directors	A primary source of comparative data on which to form conclusions	High
Personal correspondence	A secondary source of comparative data on which to form conclusions	Medium to high
Formal interviews with directors and relevant stakeholders	A primary source of comparative data on which to form conclusions	High
Ad-hoc discussions with directors, volunteers and visitors	A secondary source of comparative data on which to form conclusions	Medium

5.11 Stage 1 Analysis

Operational conditions - To discover those conditions under which heritage railways operate and have so far demonstrated their longevity and resilience, a method to narrow these down was required. The method selected was one familiar to the researcher, devised by Ohmae

(1982). It seeks to list concrete or observed phenomena, then to use a process of abstraction, which included brainstorming and discussions with directors of heritage railways to itemise individual elements and general themes which are necessary for a heritage railway to operate.

These themes are then classified under a smaller number of headings according to any common factors in an iterative process. Any phenomena sharing common factors are themselves combined as further themes. The advantages of this method are that all the possible conditions are tabulated before a final set of conditions emerges. The process of grouping and abstraction allows the emerging conditions to be traced back to observed phenomena, providing an effective audit trail and minimising the risk of over-looking anything important.



Diagram 5-03 *The grouping method after Ohmae*

To populate the matrix's list of concrete or observed phenomena, reference was made to the sources listed above. This included:

Examining photographs - such items as physical assets, landscape, age and gender of volunteers, condition and upkeep of buildings, number of cars in the car park, could be recorded.

Notes made and experiences taken from visits – such items as discussions held, tearooms visited, buying books, rides on trains, hearing locomotives working hard, watching volunteers at work.

Published web sites, books and magazines – these were trawled through and items noted such as events and galas, disputes, news updates on repaired locomotives, Santa Specials, appeals for funding, proposed railways, closed railways.

Published general material – those items that could relate to a heritage railway and its management and operation were noted such as risk management, collection policy, sinking funds.

Published Data from authoritative sources – such as returns to Companies House, boiler certificates, planning permission, safety management systems, equality legislation.

Discussion and debate on web site forums – such as members' subscriptions, communications, liveries of locomotives, signaling systems. Ad hoc discussions – such as business models, high net worth individuals, community plans.

In all over 1000 observations and phenomena were recorded. These were then grouped into first 20, then 11 subject areas and then into a final group of 8 conditions necessary for a heritage railway to operate.

From these methods (see Chapter 6 for results) combined with the responses from the questionnaires there emerged the following eight conditions – property; assets; risk management (later included within governance); environment; safety and operational systems; governance; staff, volunteers and members; visitors and money.

An ‘affect relationship diagram’ was then constructed to show and measure (strong or weak) each of these conditions. For example, the number of visitors buying a ticket would have a strong effect on the revenue (money) generated whereas the amount of money available to the railway may have no or only a weak effect on the number of visitors attracted to visit the railway.

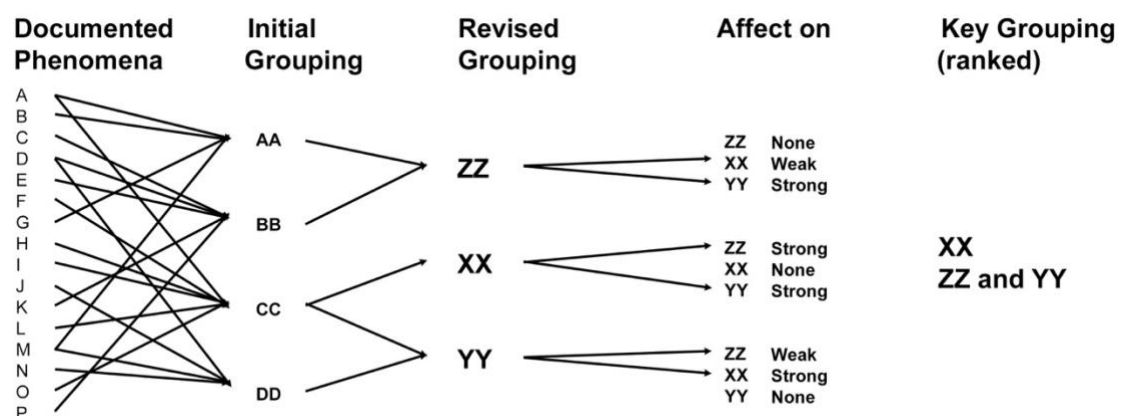


Diagram 5-04 Principle of the ‘Affect’ relationship diagram

The resulting exercise shown in Diagrams 5-05 and 5-06 demonstrates the importance of both the organisational component and governance (governance being part of the organisational component) as having the greatest number and strengths of impact and influence.

Property: Data sources were published descriptions of heritage railways where property and buildings were referenced, photographs taken on visits and Google Maps from which site boundaries and buildings could be identified.

Assets: Asset registers of individual railways are not generally publicly available. Data was therefore compiled from published descriptions of heritage railways, their assets were identified and referenced; photographs taken on visits. One particular asset – steam locomotives - was researched in depth to determine the sustainability of the fleet. A database of each locomotive with information on its operational status and condition, with dates of overhauls recorded, was sufficient to construct a forecast as to future availability with high levels of confidence for three years ahead, diminishing in confidence up to a maximum of ten years ahead, see above.

Environment: Data sources used were a report on coal and the future of steam locomotives by the All-Party Parliamentary Group on Heritage Rail and reports prepared for and published by Network Rail and RSSB on climate resilience.

Safety and operational systems: Data sources relied on the railway regulations, guidance and notes published by the ORR and rule books for individual heritage railways, where published. Primary sources were responses from semi-structured interviews with 9 heritage railway directors with direct responsibility for operations and safety, questions were asked on: the importance of safety to heritage railways; the operational systems used.

Governance: Data sources were the annual reports of the regulator. Primary sources were responses from semi-structured interviews with 15 heritage railway directors questioned on: the importance of governance to heritage railways.

Staff, volunteers and members: Data sources were the HRA who publish the number of volunteers; a value of volunteering was gained from the questionnaires, where respondents were asked to state the time devoted to volunteering, this was aggregated up by the total number of volunteers in the sector. To obtain a monetary value, Heritage Lottery Fund (HLF) figures for volunteer days were used. The total figure obtained was discounted by varying percentages to account for error in aggregation, the purpose being only to reach a figure that could give an indication of the overall value when compared to revenue, costs and profit as the figures for volunteer labour are not normally assessed or included in the audited accounts of a heritage railway. The questionnaires provided data on the background, gender, ethnicity, age and interests of volunteers. Data recorded at Companies House provides the month and year of birth of all registered directors, this allowed an age profile and average age of directors to be created.

Visitors: Data sources were the annual visitor figures published by the HRA, last updated in 2016; visitor figures for individual railways, where published; experiences recorded on the web site Trip Advisor. The researcher also drew on commissioned research for one heritage railway entity – Vintage Trains. This research sought to identify and provide a profile of its existing and potential audiences, their frequency of visit or travel, what interests and requirements they have, and what activities they usually, or would be, willing to participate in.

Money: Data sources were returns to Companies House containing the audited annual accounts. These were aggregated to form estimates of the balance sheet value, profit and turnover of the sector. Other sources were responses of semi structured interviews with 5 heritage railway directors with direct responsibility for finance. Questions were asked on: the importance of finance and funding to heritage railways; the business models used and the constituents that make up the model; and the current financial health of the heritage railway(s).

Life cycle - The opening dates of each of the 104 railways were plotted on a timeline to determine any patterns, clustering of dates or evenly spread out - dates checked against the timeline for any coincident of other related events.

The status and number of heritage railways was reviewed. The number of years in existence of each of the 104 railways was tabulated and an average to-date life determined. This average to-date life was compared to the average life of UK SMEs, taken from Companies House data. Heritage railway companies are themselves a part of the total number of SMEs but making up only a fraction of the current (2020) total of six million (House of Commons, Briefing Paper 06152).

Data published by the HRA on current visitor figures was analysed to look for an indication of long-term trends of growth, maturity or decline.

The literature was examined for news stories or events that could be categorised as indicating growth, maturity or decline.

5.11 Stage 2 social capital

The concept and value of a heritage railway's social capital was investigated, initially by using indirect measures such as the contribution of donations and free labour supplied by the members and volunteers and to articulate the value of what volunteers and members received in return. Followed by exploring the importance of trust, reciprocity and networks in unstructured and semi-structured interviews and the role played by key individual benefactors.

The value of labour as a constituent of social capital was calculated using the method described under volunteering, above. In terms of funding by donation, which is also considered an element of social capital, the monthly railway magazines usually contain a number of appeals for funds, recent examples include – start-up funding for a Train Operating Company, a new P2 Class locomotive and a new station building. There is no published estimate of what this funding may be worth, but a guestimate was made for this research by adding up a number of appeals over a year.

To seek an explanation as to the conditions that have mitigated potential failures of heritage railways, a table of what was termed a “near death” experience was constructed listing the type and cause of the failure and the mitigation. In other words, they had come close to failure but had survived. This table was drawn up from a search of the literature and an appeal on social media for examples. These examples were then researched as to the mitigation measures present or enacted and documented as case studies.

5.12 Stage 3 Covid 19

Data sources used were contemporaneous records of media news reports and articles on the effects of the pandemic on heritage railways, beginning with their temporary closure under government restrictions, the issue of appeals for funds, the results of those appeals, the staggered reopening and further closures of railways and announcements of grants awarded.

5.13 Validation of hypotheses

Bradford Hill's Criterion was used to analyse and validate the causal relationship between the conditions and validate the extent to which the conditions exist and are developed, maintained and managed as an indication of a heritage railway's likely future prospects, in terms of failure, decline, stagnation, sustenance or growth.

Key points of the chapter

The methods developed to answer the research question and test the hypothesis was a mix of qualitative and quantitative techniques. These included: ethnography, narrative, and phenomenological methods, together with grounded theory, case studies and two questionnaires and data collection.

Sources used included literature and desktop research to provide the context and theory and to build databases; observation, though this was limited to where it could be validated, such as record photographs illustrating particular events or phenomena; documentation, records and returns; survey and interview – data gathered from individuals and findings validated by further interview.

A weighting was applied to the information gathered from each method, the greatest weight being placed on authoritative documents such as those obtained from Companies House and least weight to personal opinions not supported by any authoritative source.

Research into the operational conditions was undertaken by building up a long list of over 1000 observations and phenomena. These were then grouped and refined into a final group of conditions necessary for a heritage railway to operate. The output from these exercises was a working list of conditions. An 'affect relationship diagram' was then constructed to show and measure (strong or weak) each of these conditions on each other.

Further work and analysis were carried out on each of the conditions through studies such as the sustainability of the 1,159 standard gauge locomotive fleet by looking at the rate ten-year overhauls are being undertaken, again creating a database of some 10,000 items, a financial analysis from submitted returns to Companies House, and building of an age and succession profile of current directors.

Bradford Hill's Criterion was used to validate the causal relationship between the conditions and validate the extent to which the conditions exist and are developed, maintained and managed as an indication of a heritage railway's likely future prospects, in terms of failure, decline, stagnation, sustenance or growth.

The concept and value of a heritage railway's social capital was investigated initially by using indirect measures and then in interviews exploring the importance of trust, reciprocity and networks and the role played by key individual benefactors.

The methodology used was successfully developed and applied in creating a conceptual model, the purpose of the model being to describe the importance of governance and reliance of social capital to mitigate any shortcomings of funding, resource, leadership, administration and expertise, which forms the core theme of the thesis. To explore if this conceptual model and theory is accurate, and if so, is it likely to prove sustainable going forward.

Chapter 6

Results

Chapter contents	<i>6.1 Ethnography</i>
	<i>6.2 Narrative</i>
	<i>6.3 Phenomenological</i>
	<i>6.4 Grounded theory</i>
	<i>6.5 Case studies</i>
	<i>6.6 The questionnaire and follow up interviews</i>
	<i>6.7 Data collection</i>
	<i>6.8 Stage 2 Social Capital</i>
	<i>6.9 Stage 3: Effects of Covid 19</i>
	<i>Key points of the chapter</i>

This chapter sets out the results obtained from the research undertaken. As described in the previous chapter a mixed methodology was adopted utilising both qualitative and quantitative research. The results are set out for each of the methods used.

6.1 Ethnography

The researcher, as noted in the previous chapter, immersed himself in the world of heritage railways during the period of the research through his position as volunteer company secretary of the Vintage Trains group.

The group consists of 7029 Clun Castle Limited (7029CCL) the owner of the Tyseley historical collection of locomotives and carriages; Vintage Trains Charitable Trust (VTCT) the overarching charity responsible for the management and maintenance of the collection; Vintage Trains CBS (VTCBS) a Community Benefit Society for which a public share subscription was issued and operating under the rules of the Financial Conduct Authority (FCA); Tyseley Locomotive Works (TLW) an operating company responsible for the locomotive works carrying out new build, overhauls and maintenance (it is a subsidiary of VTCT); Vintage Trains

Limited is a subsidiary of VTCBS and a licenced Train Operating Company (TOC), permitted to run charter passenger services on the national network. The entity began operating in 1968.

This lengthy description gives an indication as to the complex nature of a heritage railway entity which is not untypical and explains why the term entity has been generally adopted rather than the simpler term 'company' which refers to a specific organisation with a specific legal status.

The data gathered during this period includes personal diary entries, minutes of meetings, reports, emails, risk assessment, rules, method statements, operational notices and certificates.

The result of this immersion was to provide an insight into the operation of one particular heritage railway company during a limited period of its existence. The position provided the opportunity to make contact formally and informally with people engaged at all levels of the heritage railway sector. It also provided access to visitor research commissioned by Vintage Trains. For the reasons set out in the methodology, that of potential ethical issues, selectivity and bias, the results have been used to provide context and background to the heritage railway universe. The position also made it possible to trial the study outputs in a live setting and obtain feedback from practitioners at an early stage.

The following evidence was found relating to the operational condition:

Property: The entity is in the process of negotiating an extension to a 99-year lease for its site with Network Rail. The evidence is contained in the existing lease document, emails between the parties describing new terms and is a formal consultation process carried out within the national rail industry. The extension of the lease allows security of tenure for 99 years and therefore is a key condition of operation.

Assets: There were a number of events recorded demonstrating the critical nature of assets to the operation. These included the refurbishment of a turntable (a device to turn a locomotive 360 degrees and/or allow access to storage sidings). The overhaul and entering service of a Castle Class locomotive No 7029 Clun Castle in time for the withdrawal of a sister locomotive 5043 Earl of Mount Edgcumbe for it to undertake its ten-year overhaul. Without an operational locomotive, services could not be run.

Operational systems: The granting of a licence to operate charter passenger services by the ORR dated 4 September 2018 is evidence of the requirement of the need to have approved operational systems in place. The evidence is in the form of a certificate. There was, in addition, substantial documentation of other critical operation systems such as a safety certificate, track access agreements and station access agreements before a service could run as well as documentation for each individual service from crew rostering to timings.

Governance: The group, as part of a National Heritage Lottery Fund grant, undertook a formal governance review, the results of which were submitted to the HLF. As a result of the review several improvements were made to the governance of the entities in terms of clarifications of roles and responsibilities. The evidence was contained in Board minutes. Changes of Board

personnel were made during the period of the study, as set out again in the Board minutes and the appointment of a volunteer as the named Managing Director which is a formalised position as part of the Regulator's approved safety management system, this confirmed the critical nature of governance positions and importance of volunteers within the organisational structure.

Environment: The evidence of this condition was the requirement to obtain derogation from the Environment Agency to discharge waste onto the track pending the implementation of toilets which retain effluent. The operation of steam locomotives must meet the requirements of the Clean Air Act 1996.

Staff, Members, Volunteers: The evidence was contained in the organisational structure in that the positions of all Directors and Trustees of both the overarching Charity and Community Benefit Society were held by volunteers. Key positions in the Train Operating Company - Managing Director, Director of Safety and Operations and Company Secretary were held by Volunteers. A current requirement is that coaching stock cannot operate on the national network without either central door locking or the physical supervision of the door, this requirement is fulfilled by travelling stewards all of whom are volunteers, therefore no service could operate without their presence. Tyseley Locomotive Works has approximately 25 full time salaried staff including a General Manager, Finance Officer and workshop staff including apprentices. The workshop has a variety of traditional craft skills associated with locomotive building and repair.

Visitors: The critical nature of visitors was evidenced by a documented process that gives a go/ no go decision 14 days prior to the running of all individual charter services that sufficient passengers have booked to travel to make the running financially viable. Evidence of the contribution of visitors was contained in the return of passenger bookings made, and monies received contained in the financial outturn. Visitor/passenger revenue made the single largest contribution. An in-depth visitor and audience survey was carried out during the period of this research and the results incorporated as contextual background information.

Money: The evidence of money as a critical condition was contained in the budget, management accounts and audited accounts of the entity. Evidence of the need to raise funding was evidenced by the issue of a public share subscription to raise £800k as the working capital for a Train Operating Company.

All the evidence described above was in documented form either in the public domain or held by a recognised legal body and therefore was capable of being verified and reproduced. The researcher categorised all the diary entries and documents and no additional conditions necessary for operation were discovered that could not be included in the eight listed above.

The information that the researcher took away from utilising this method was the importance of volunteers, an organisation at the mature stage of its life cycle, the importance of innovation to reach new audiences, the urgent need to address succession for an ageing group of volunteers and create a generational shift in both audience and volunteers, the constant need and struggle to fundraise capital projects. The passion, commitment and dedication of its staff, volunteers and members to overcome all obstacles and issues. That the

outputs in terms of continuing to run express steam trains was widely valued and appreciated by a variety of stakeholders and there was goodwill within the wider rail industry and the regulator for it to continue.

The second part of the immersive experience was the programme of 52 visits to heritage railway events. The evidence discovered was as follows:

Initial visits: Evidence was obtained as to their wide geographic distribution in mainland Britain from Google Maps and the HRA as shown in Diagram 6-01. The only pattern discernible was that the majority are located in less densely populated rural areas rather than urban areas, a result, it is suggested, that matches the typical distribution pattern lists published in the 1963 closure plans of British Railways which featured more rural than urban lines due to their lower traffic densities and therefore reduced economic viability.

The locations therefore give the advantage of a ride through attractive countryside, some of which was designated as of outstanding natural beauty and within National Parks but making them more remote from immediate large conurbations and less accessible by public transport, though several still retain rail connections to the national network such as Grosmont on the NYMR, Kidderminster on the SVR and Sheringham on the NNR.

Also, from Google Maps data was available on the route and terrain, position of bridges, tunnels, embankments, cuttings, level crossings, stations and ancillary buildings such as signal boxes, locomotive depots and workshops. A description of the railway and its history both pre- and post-preservation from guidebooks produced by the railway(s). The researcher was

able to collect data on the services provided, timetables, conditions for visits and travel, prices charged and events. The majority (over 90%) of heritage lines have a closed winter period (except December opening for Christmas services), an operating season generally running from early Spring to late Autumn with peak services in the Summer. Special and themed events and galas tend to be held in the Spring and Autumn.

Services will usually commence mid-morning (10-11am) and conclude in late afternoon (4-5pm) with perhaps 3 or 4 round trips in early season rising to 7 or 8 in high summer. Events range from railway themed galas to 'Forties' Weekends, Victorian Festivals, Thomas the Tank Engine weeks and for Christmas, 'Santa Specials'. Charges for a round trip range between £10 and £25. It must be noted these are representational results, exceptions were found to all these values, the SVR operate a series of 24-hour services in September, some railways open on weekends in January and February, some operate more dense services starting earlier and finishing later at galas and in Summer and Bank Holidays.

At the early stages of the study the researcher visited the railway as a member of the public to experience the railway as an ordinary visitor. Normally, this would be planned as a day visit, arriving mid-morning usually by car, parking, going to the ticket office, purchasing a ticket and guidebook, standing on the station platform waiting for, and then catching the train, usually steam hauled. Observing the passing landscape and features, reaching the destination or an intermediate station possibly spending a period of time at the destination station, perhaps with a visit to the cafe or tearoom, then returning.

Spending time visiting any associated facilities, such as a museum, exhibition area, model railway, café or shop. The opportunity would be taken to converse with visitors, staff and volunteers on an unstructured basis, but see also the section on interviews below. Then if time was available a journey by car following the route of the railway and taking photographs of the railway and passing trains in the landscape where access was available. A photographic collection is included as a separate Appendix to the main thesis.

In later visits the researcher would seek permission to attend prior to public opening, this provided an opportunity to 'see behind the scenes' including visits to the locomotive depot to record the activities associated with preparation of the day's services. The researcher was on these occasions usually for safety reasons provided with a guide, who would explain to the researcher the activities observed.

For example, even though public services may not commence until 10am, it was explained that the nature of a steam locomotive means that the fire has to be lit and steam raised which, depending on the size of the locomotive, can take several hours, so it is not unusual for the operating day to begin at 3 or 4am. Equally at the end of the day it was observed the locomotive must have its fire dropped, and ash cleaned out, these are by modern industry standards extremely dirty jobs carried out manually by volunteers.

It was explained by the guide that there are similar processes to make carriages ready for public use including cleaning and topping up of water for toilets. The whole train being subject to a FTR (Fitness to Run Examination) before it is allowed to take up a service. On a normal day 2 or 3 trains may be in operation but it was not unusual to observe 5 trains on the longer

railways for summer services. Up to nine locomotives were necessary to run a gala service, some of which had been hired from other heritage railways and transported by road.

The researcher was given access to observe other activities partly or fully out of sight of the public. These included: the operation control which is the command centre of the day's running; the administration offices covering general management, marketing, finance, stores, personnel; catering and kitchen areas to support café; ticket office; locomotive depot where running locos are stabled when not running, coaling and watering with fuel oil for diesels; engineering workshops where repairs and maintenance were carried out on all the different types of rolling stock; the signalling department which includes the signal box(es) with its signaller and the signalling system together with the workshops to undertake its maintenance; the civil engineers' department including the permanent way department which is responsible for all track and lineside maintenance.

All heritage railways visited had these activities present, though the scale and sophistication varied depending on the size of the railway. For example, a small railway may cover daily control, administration, selling tickets with one or two volunteers. On larger railways these duties may be covered by perhaps ten or more permanent staff with some volunteers. The researcher was told that 35 people are required to have 'signed on' before a train can run on the West Somerset Railway, this includes train crews, signallers, fitters, inspectors, control and station staff.

Following the development of the working list of the 8 conditions, all these conditions were observed and recorded on all the visits made.

The main information that the researcher took away from these visits was that the operation of a heritage railway regardless of size is a complex and safety critical operation carried out by multifaceted organisations needing a trained, experienced and qualified workforce. It was explained on numerous occasions by staff and volunteers interviewed that there was little or nothing to differentiate the running of a heritage railway from any other type of railway, with the two exceptions that the Light Railway Act under which they operate, limits speed to 25 mph and the equipment, technology and systems used have been generally superseded on modern railways.



Diagram 6-01 *Distribution of Heritage Railway Association members includes all 104 railways as the study population.*

6.2 Narrative

This approach produced the substantive contribution to the development of heritage railways, both from published sources and interviews. This collective narrative forms the basis of Chapter 2 and for brevity is not repeated here. Sufficient to highlight the consistency of the sources, which also underpinned the core theme running throughout this thesis that heritage railways have arrived at a mature point on their life cycle trajectory.

The evidence being the passing of the designated stages: birth/inception – indicated by their date of formation, incorporation and grant of a Light Railway Order; their growth and development – indicated by rising visitor numbers, extension of route mileage, the restoration of increasing numbers of locomotives; maturity- stable visitor figures, steady flow of restoration projects, few new heritage railways being opened, one or two heritage railways being reported in the railway press as struggling (West Somerset Railway, Dartmoor Railway).

The narrative highlights the importance of the vision of its originators, both influential individuals and small groups of enthusiasts that, by determination and passion, overcame obstacles physical, commercial and bureaucratic, to create entities which were then able to ride a wave of popular nostalgia from the wider public being attracted to and seeking heritage experiences which heritage railways played their part in creating and subsequently benefited from.

The narrative also revealed the tensions and conflict of the pressure to create financially viable heritage visitor attractions and preserve the authenticity of the living history experience plus the need to provide this living history experience within the framework of

twenty first century safety standards. The review undertaken by the researcher into the West Somerset Railway Association published as 'The Road Ahead' (2015) confirmed that the extensive contribution of ownership, governance, labour and donations from its volunteers and members gives this group a strong and potentially decisive influence in determining the strategic direction of the entity.

6.3 Phenomenological

The aim of using this method was to produce an understanding of the different ways and aspects of a heritage railway, as seen or interpreted by various participants. Responses were recorded from the interviewees in unstructured interviews and in a semi-structured interview where the interviewee was shown a photograph (image 5-01) and asked to describe what they saw. The responses obtained from the different groups are shown in Images 6-02 to 6-03.

The results varied considerably from the casual family visitor looking for little more than an entertaining experience who would see, for example, a train, station and people, to the volunteer looking for a total immersive experience of living history who would see the same elements in great detail; for example, the train was made up of British Railways Class 7 pacific locomotive No 70000 Britannia built in 1951 currently owned and operated by LSL together with a rake of 11 Mark 1 air braked coaches; and so on in varying degrees of detail. The responses also varied in the way activities were described, visitors using few very simple terms whereas the volunteer or enthusiast would provide infinite detail of what a fireman, guard or signaller does, their responsibilities and duties.

There were also variances between volunteers depending on what duties and responsibilities they held - a volunteer involved in locomotive restoration would be knowledgeable about engineering aspects but may show little interest in other aspects of the operation such as station operation; an enthusiast knowledgeable in historical information may have little knowledge or interest in the current commercial aspects of the railway unless, in their view, it impinged on the historical authenticity.

Directors interviewed gave much more comprehensive and rounded responses. Elements were often described in terms of issues such as safety, or commercial opportunities or external threat.

These variances in perception and understanding, also explained by three directors interviewed, contribute to the tensions and conflicts referred to above, with active frontline volunteers caring particularly about the authenticity of the experience, while the volunteer directors are concerned with commercial reality of running a viable business and meeting the required standards of safety, having assets in sufficiently good condition, risk management and compliance.

These descriptors together with the literature and workshop were used as the basis of listing conditions that would be applicable to heritage railways.



Image 6-01 Example of how a visitor to a heritage railway interprets the image. Note the locomotive is often 'incorrectly' labelled 'steam train' by the public. See Chapter 5 as to the methods used to create this image.



Image 6-02 How a volunteer of the railway interprets the same image. See Chapter 5 as to the methods used to create this image.

6.4 Grounded theory

This method produced results that indicate (but as outlined in the methodology not necessarily fully validate) that the general theories of social and charitable organisations and management are applicable to the operation of heritage railways. Widely known business theory models such as listed by Berg van der & Pietersma, 2016 could be applied equally to heritage railways as to other organisations. Examples of models and theory used were for example: Corporate and Business Strategy – Ansoff’s matrix and product market grid; Organisation and governance – the 7S framework; Finance – real options theory; Marketing and Sales – 4Ps of marketing; Operations – the EFQM model; Innovation – innovation circle; Human Resources – Belbin team roles.

The main take away being that heritage railways are dynamic organisations which require intervention at all levels to maintain their balance and stability. The most critical intervention taken from the interviews being the need to maintain wearing out and ageing assets and maintaining an active volunteer workforce and core audience, all of which continue to age.

Case studies

Seven case studies were produced in detail and fourteen in outline of individual heritage railways. The main source of information to construct these came from the non-academic published books and guides. Clearly these are reliant on their authors’ own research but were generally corroborated when interviewing respondents with a knowledge of the particular railway. The railways chosen were: Talylyn Railway as the first preserved railway; the Severn Valley Railway & North Yorkshire Moors Railway as both were widely regarded by enthusiasts and media as the premier preserved railways; the West Somerset Railway, known to the

researcher; Vintage Trains as it covers the running of heritage trains on the national network and known to the researcher; the Festiniog Railway together with the Welsh Highland Railway due to the amount of published work; the Kent and East Sussex Railway as an example of a smaller heritage railway.

The case studies were particularly useful in gaining an insight into the mitigation measures taken when a heritage railway faces a crisis that could endanger its continuation. This allowed scenarios to be run whereby they could be ‘paused’ at any point and options available explored and then what ‘actually’ happened can be seen. For example, if the Severn Valley Railway had been unable to raise sufficient monies to repair its embankment after a landslip, it could potentially have survived as one or two separate, shorter railways. Such a change would have an impact on its operation and its attractiveness to visitors.

There has been only a small number of failures of heritage railways – of 29 railways that have failed, none would have been categorised in the top tier with over 100,000 visitors, and only three may have scraped into the list of 104, and all three were reformed or relocated. Dinting Railway Centre moved to Ingrow on the KWVR, Southport Steam Centre became the Ribble Steam Railway and Swansea Vale Railway moved to the Gwili Railway. Only 16 can be said to have fully closed and even then, no significant assets were lost in the process.

A list of railways that have come close to a ‘near death experience’ was compiled as shown in the table below.

Table 6-01 *Railways with near death experience*

Railway	Nature of crisis	Means of mitigation and recovery
Severn Valley Railway	Landslip	Funds raised by grant and public appeal
Mid Hants Railway	Governance	Restructured Board
Gloucester and Warwickshire Steam Railway	Landslip	Funds raised by grant and public appeal
East Lancs Railway	Lack of motive power	Loan of locomotives
Mid Hants Railway	Close to insolvency	Funds raised by appeal
West Somerset Railway	Track replacement	Fundraising ongoing
West Somerset Railway	Close to insolvency, first occasion	Paid staff replaced by volunteers
West Somerset Railway	Close to insolvency, second occasion	Replacement of Board and new financial controls
6024 Society	Close to insolvency resulting from internal legal dispute	Taken over by 'friendly' trust
Peak Rail	Close to insolvency resulting from internal legal dispute	Soft loan by benefactor
Llangollen Railway	Close to insolvency	Voluntary agreement with creditors, fund raising and soft loan

6.6 The questionnaire and follow up interviews

From the directors' survey responses, 39 directors and senior managers completed the survey and from the non-directors including volunteers and enthusiasts there were 252 responses. The directors' responses covered 36 different railways and the non-directors 113 railways. After the distribution and analysis of the questionnaire a further series of 15 structured interviews were undertaken in person and by telephone with directors to present the initial findings and seek their views and opinions by direct questions on whether they agreed or not with the findings and for them to provide further insight, all responses being recorded.

The response to the question: "In terms of being able to continue to operate successfully, how would you rank the following in importance: tangible assets, property assets, safety and

operational systems, governance, members, staff and volunteers, risk management, visitors and money” was as follows:

Directors considered the most critical factor to be visitors with 64%, closely followed by staff, volunteers and members at 61%. Tangible assets, safety and operational systems and money all ranked equally at 51%, Governance was seen as critical by only 25% of directors. However, it was still seen as important or very important by another 72%. Leaving only 3% of directors believing it to be only slightly important.

Overall, 97% of directors considered the eight listed factors as at least important and 69% as very important or critical. No director considered any of the factors as not important and only 3% as slightly important.

The non-director survey produced slightly different results with safety and operational systems and staff members and volunteers being the two most critical conditions followed by visitors and money. Governance was ranked fifth in importance as critical. None of the conditions were not considered important and less than 5% as only slightly important for any one condition. 95% of non-directors and 97% of directors endorsed the conditions as at least important. The non-directors produced a similar level of response that 71% (69% for directors) considered the conditions as very important or critical.

This result gives very strong confirmation that the conditions listed are those that both directors and non-directors consider to be important or critical to operate successfully.

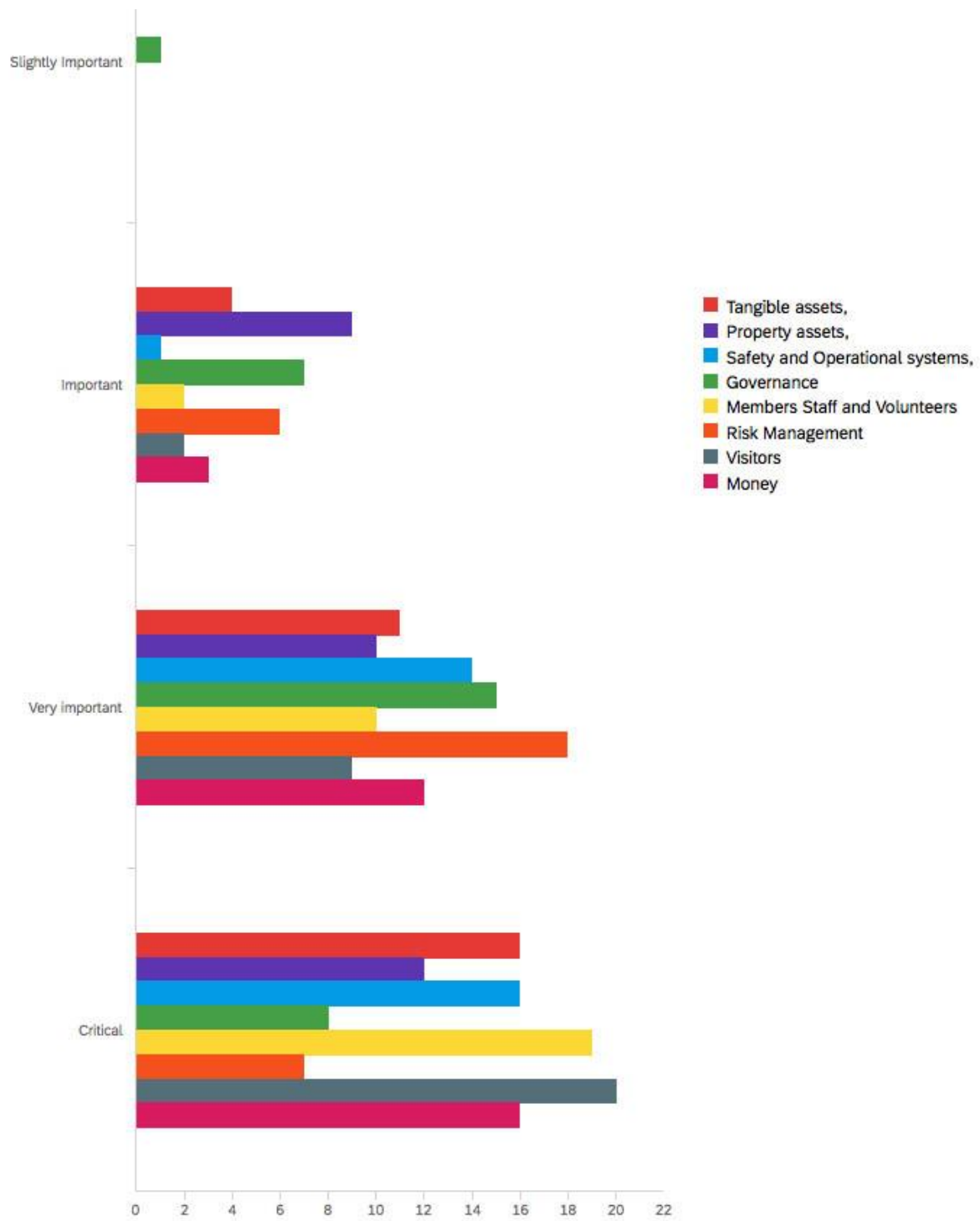


Diagram 6-02 Graph showing responses of directors on what conditions they consider important.

Whether the list of conditions provided was complete was tested in the following question:

“Do you consider there are any other factors necessary for the continued successful operation

that have been missed out?" 43% of directors and 41% of non-directors answered no, therefore considering the list complete.

57% of directors and 59% of non-directors considered there were extra conditions that were necessary. Respondents were then offered the opportunity to add any conditions they considered necessary. The list included for example: knowledge management, external funding, investment, age of volunteers, donations, environmental impact, marketing, recruiting of directors, commercial activity, locomotives and availability of coal.

The new factors mentioned most by the 52% of directors and 41% of non-directors providing additional conditions, were words that could be grouped as environmental factors – environmental legislation, environmental impact, stopping coal production and green policies. Such terms were mentioned by 33% of the directors and 36% of non-directors of the total samples.

In analysing these additional factors, the words used by respondents were checked against the original long lists of factors and groupings. No completely new terms were found, which confirmed the completeness of the original long lists. So for example, funding and investment had been grouped under money; knowledge management, depending on the type of knowledge, had been grouped under both operational systems and governance; recruitment of directors was recognised in the grouping of governance and as the majority are volunteers it would relate to that grouping as well; locomotives were already included in tangible assets; commercial activity at a strategic level was included in governance and at an operational level such as sales in the shop or café, grouped both within the operational systems and visitors.

In forming the final groupings, it was recognised that they would not be totally definitive and exclusive to each other. There would be elements of overlap and cross condition themes, such as those highlighted above.

The obtained results, while confirming the validity of the original eight conditions, caused the researcher to re-evaluate the groupings. The researcher proposed placing the risk management within the condition of governance, this was considered justified on the common business theory of GRC – Governance Risk Compliance. Forming a new grouping of ‘Environment’ was justified on the basis that 33% of respondents mentioned terms that would be considered in this grouping as additional to the original list. This proposal was discussed in the follow up interviews with directors and all agreed that this was a justified modification to the original eight conditions.

The revised list being: tangible assets; property assets; safety and operational systems; governance; members, staff and volunteers; environment; visitors and money.

The next question to directors – “In terms of your own railway which do you consider having been, and will be, a strength or weakness in the last 5 Years”. Directors considered the strengths, in order of priority: their staff and volunteers; followed by tangible assets; money; visitors; property; safety and operational systems. In terms of weakness, governance was considered their weakest factor followed by operational systems. This result mirrors the conclusions of the ORR, which, in several of its annual reports, considers governance a particular weakness and has expressed concern at the operational systems on several heritage railways.

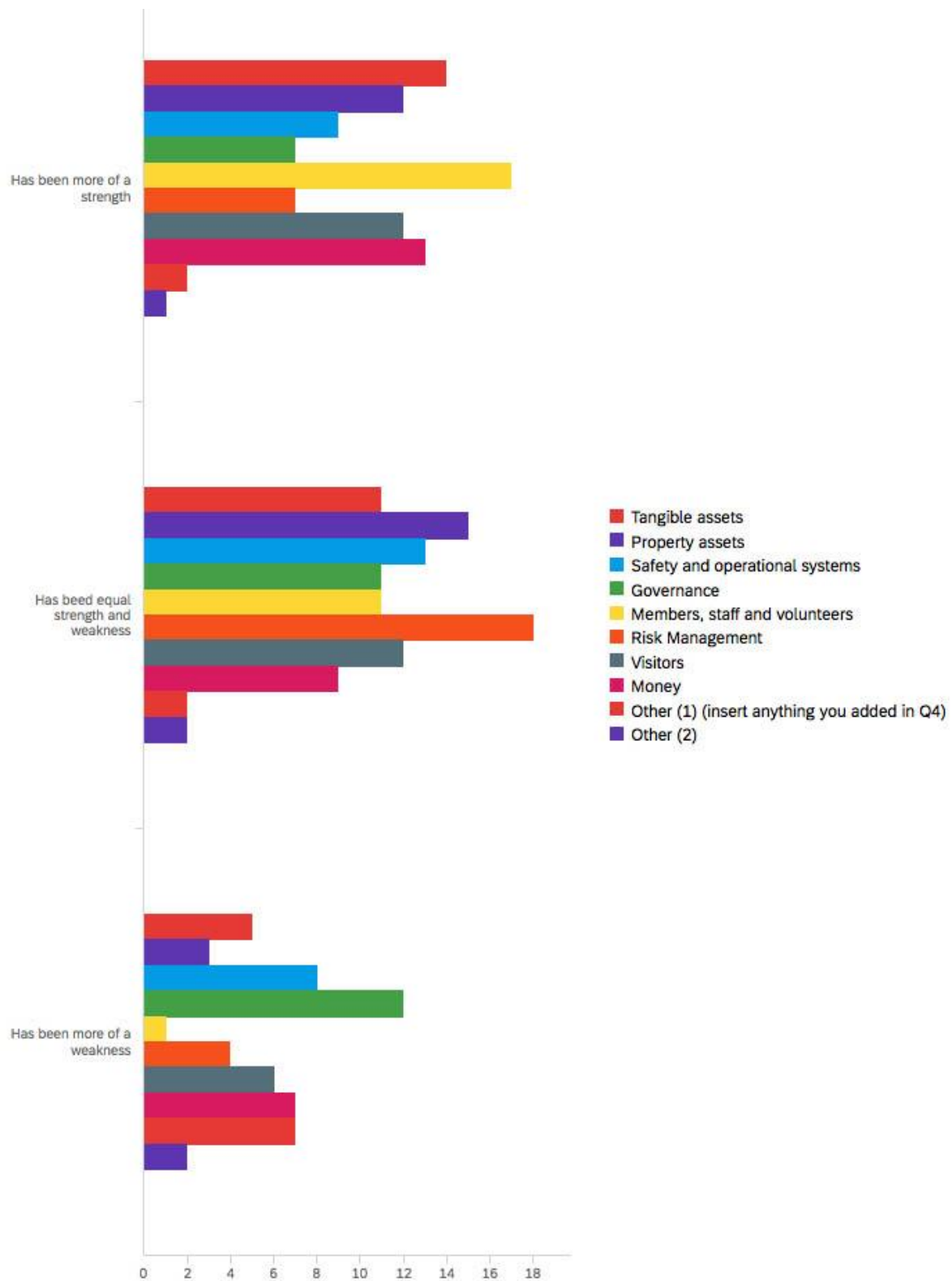


Diagram 6-03 Graph showing responses of directors on what conditions they consider having been a strength or weakness.

It was noted that only 5% of directors consider staff, members and volunteers an area of weakness, confirming their strong position as heritage railways' greatest strength.

This question was then re-phrased as which do you consider to be a strength or weakness over the next 5 years. Here directors' response was that governance, operational systems and visitors would be a strength and that in future the weaknesses would come from money and volunteers.

Question 7 of the directors' questionnaire then sought responses as to how they saw the performance of their organisation. The responses were 20% recognising the need for significant improvement, a further 31% not being satisfied and there was room for improvement, the highest percentage – 38% considered it was appropriate for their size of operation but still considered there was room for improvement, only 10% were completely satisfied as being appropriate and no one thought their operation was over managed.

In the follow-up interviews, directors were asked how results from questions 5,6 and 7 should be interpreted. The consistent opinion stated was that they and other directors were recognising that heritage railways' strength had been in their volunteers and members, and perhaps governance and operational systems had not been as good as they could have been in the past, but that this had been highlighted by the regulator and needed to be addressed urgently so would (and must) become a future strength but that volunteers through ageing was a big issue to be faced, finding sufficient money was going to be ever harder and that increasing environmental concerns of the public and politicians would become a greater challenge.

Question 8 (question 5 for non-directors) addressed directly how sustainable their railway was going to be over the next 5 and 25 years. Again, it must be noted this was pre-Covid 19. Generally, the responses from both cohorts can be considered positive.

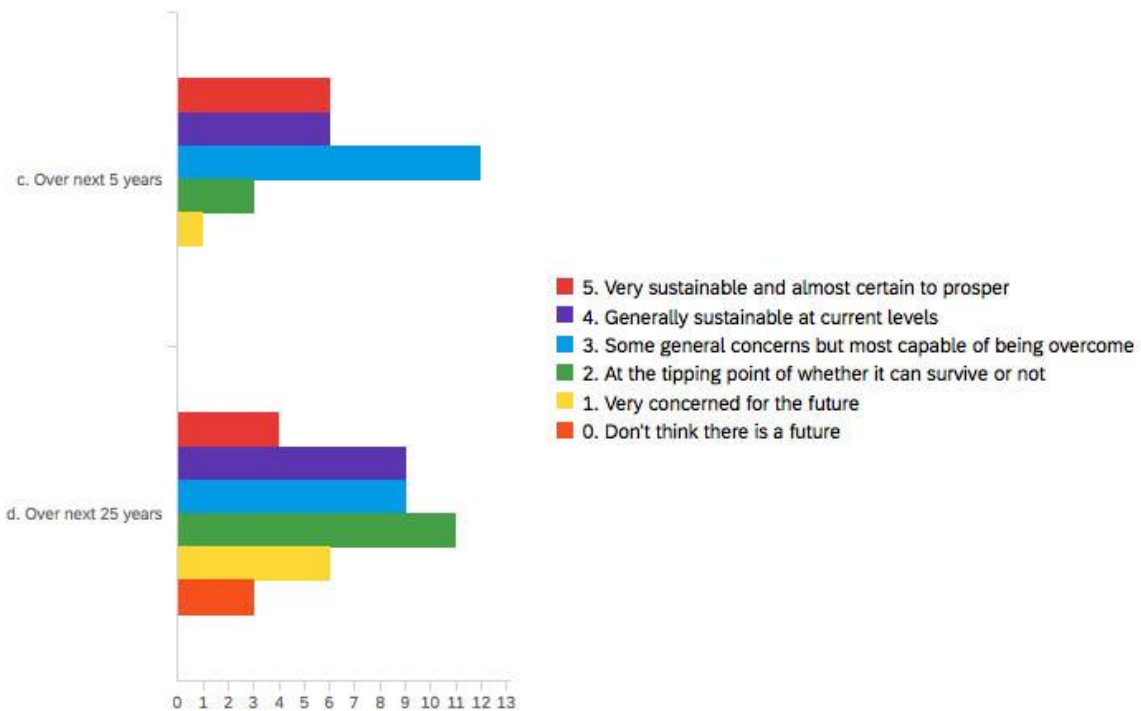


Diagram 6-04 Graph showing responses of directors on how sustainable they consider their railway.

No director and less than 1% of non-directors thought there was no future, 3% of directors were very concerned over the next 5 years rising to 18% in the next 25 years. This compared to 5% and 15% for non- directors. 10% of directors considered the railway was approaching a tipping point in the next 5 years rising to 12% over the next 25 years. This compared to 12% and 15% of non-directors.

Most, 85% of directors and 80% of non-directors, held a positive view of the future of their railway over the next 5 years with some general concerns, but capable of being overcome, their being generally sustainable or very sustainable and certain to prosper. The percentage with a very positive view – certain to prosper opinion - was 19% for directors and 17% for non-directors.

Confidence and optimism dropped slightly for the 25-year period, with the certain to prosper group at 12% for directors and 9% for non-directors. Overall, the 85% of directors and 80% of non-directors with a positive view over 5 years dropped to 72% for directors and 68% for non-directors. The conclusion drawn from this question was that generally directors had a more marginally positive view of their railway's future prospects and sustainability.

Question 8 of the directors' survey addressed the wider heritage railway sector. Here directors were slightly less optimistic, there being on average a 10% less positive view expressed than given for the railway they were directly involved with.

The same pattern was seen with non-directors where the difference was even more marked with 15% being less positive, which became more pronounced (20%) for the 25-year period.

The conclusion being that the directors and non-directors questioned, expressed more confidence in the sustainability of their own railway, or the railway they were most associated with, rather than the sustainability of other railways in general.

Question 9 explored how directors had arrived at their response to questions 7 and 8. For their own organisation the key strengths, in equal first place were volunteers and tangible assets, the key weakness being money followed by governance. The same pattern was repeated for the wider sector with no marked significant differences.

For the non-directors the reasons for their opinion for the railway they were most closely associated with was strength in equal measure of assets, property, safety, volunteers, risk and visitors in a range of 173-213 responses and weakness in governance (103 responses) and money (120 responses).

For the wider heritage sector, the results followed a similar pattern though there were some differences - rather than equal weight to assets, property, safety, volunteers, risk and visitors, key strengths were differentiated as assets (163 considering it a strength) and visitors (144 considering it a strength) followed by property, safety, volunteers and risk. Weaknesses were again money (158 considering it a weakness) and governance (140 considering it a weakness).

The summary of the results of Questions 2 – 9 was that the responses confirmed the importance of the eight conditions to operate successfully. One change was made to the list of eight, as a consequence of the responses received and later discussions from the follow-up interviews, in a regrouping of the original eight conditions to include environment and combining risk management within governance.

There were strong opinions expressed that volunteers and assets such as locomotives have been the key strengths of heritage railways. From the responses, there is a recognition that

governance and operational systems could have been better, and that these 'need' to become a strength in the future. A weakness highlighted in the responses was money, and the need to keep raising funds was clear and viewed as ever more challenging. A weakness also highlighted in the non-directors' responses was governance, which would indicate that directors have a higher opinion of how they are governing their railway than do non-directors, hence confirming the views of the Regulator.

Directors questioned in the survey are on the whole, optimistic about their railway's sustainability, certainly over the next 5 years and only dropping marginally over the next 25 years. They were more confident of their own railway's sustainability than the wider heritage railway sector. A slight inconsistency arises in that this confidence appears to stem from regarding their own railway's key strengths of its volunteers and assets which was seen as the critical condition. The reason for the inconsistency is that in the responses to questions 5 and 6, volunteers moved from being a key strength over the last five years to becoming a weakness.

Therefore, if volunteers became a weakness rather than a strength, was some of the confidence then expressed in the railway's sustainability over-optimistic and inconsistent with what has been regarded as their most important condition?

This apparent inconsistency was explored in the follow-up interviews where this was highlighted. All the directors agreed in the follow-up interviews that volunteers had been critical to the success of heritage railways. One comment was "without them nothing would have started, and we could not operate now without them". All the directors highlighted the

issue of ageing and that this represented the biggest challenge to heritage railways going forward. However, 50% expressed a strong optimism that this was a “big challenge, but a solvable problem”, hence in part addressing the inconsistency that although being seen as a problem it was one that there was some measure of confidence in overcoming.

When these positive responses as to how ageing volunteers would be replaced were probed, the responses were vague as to specific measures, the researcher was informed of good practices by several railways that had focused volunteer recruitment on under 30s, for example the Festiniog, KWVR and SVR. Respondents were confident that there are pathways to recruiting a new generation of volunteers though all the directors did acknowledge, when probed further, the scale of this challenge and its increased urgency as time passed without concerted action. Several of the respondents highlighted that the problem of ageing was particularly concentrated within directors. This issue was further confirmed later in an age profiling of directors, see below.

Question 9 of the non-directors’ survey asked respondents how well they considered their railway was performing on a range of measures. These were: “has vision for the future of the railway”; “communication with staff and volunteers and members”; “operation and safe running”; “unity and teamwork at all levels”; “as a place to visit and volunteer at”; “attracting and involving the next generation”; “fund raising and the ability to generate revenue”; “long term programmes for maintenance of all assets – rolling stock, track”; “marketing and general communication with visitors and wider public”; “leadership and management”; “affordable ticket prices”. Respondents were asked to mark on five levels, 1 being poor and 5 being excellent.

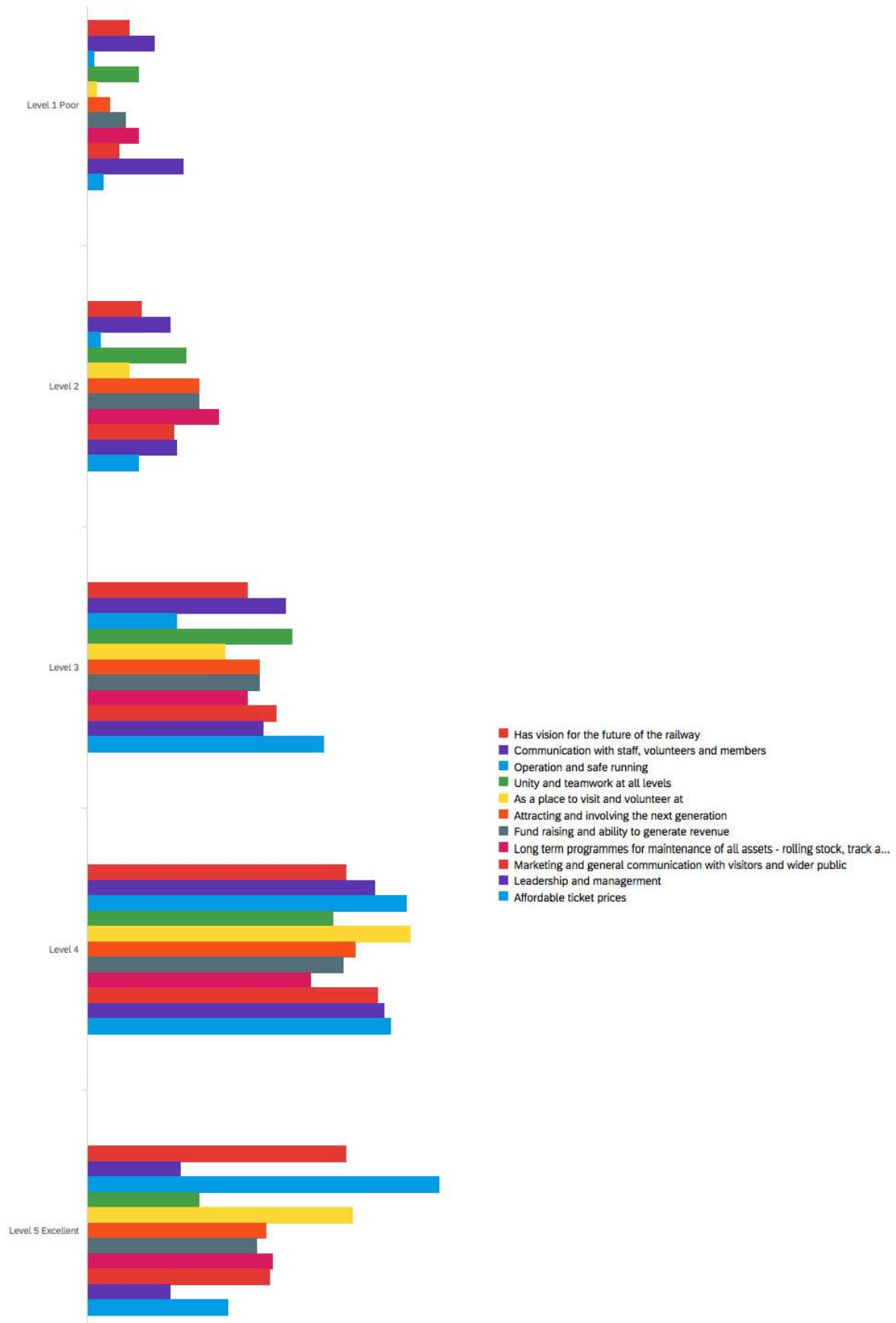


Diagram 6-05 Graph showing responses of non- directors on how they see the performance of their railway.

The mean scores, in order of performance, of the heritage railway with which non-directors were involved were:

Operation and Safe Running	4.29
As a place to visit and volunteer at	4.04
Has a vision for the future of the railway	3.85
Affordable ticket prices	3.75
Attracting and involving the next generation	3.70
Marketing and general communication with visitors and wider public	3.65
Fund raising and ability to generate revenue	3.62
Unity and teamwork at all levels	3.58
Long term programmes for maintenance of all assets – rolling stock, track and infrastructure	3.57
Communication with staff, volunteers and members	3.53
Leadership and management	3.37

The mean scores, in order of performance, of heritage railways in general were:

As a place to visit and volunteer at	3.86
Communication with staff, volunteers and members	3.83
Operation and Safe Running	3.83
Unity and teamwork at all levels	3.71
Marketing and general communication with visitors and wider public	3.58
Leadership and management	3.57
Fund raising and ability to generate revenue	3.54
Has a vision for the future of the railway	3.51
Affordable ticket prices	3.51
Long term programmes for maintenance of all assets – rolling stock, track and infrastructure	3.47
Attracting and involving the next generation	3.45

These are perhaps two of the most interesting tables of the survey for several reasons. To the researcher's knowledge this is the first time that a survey has been undertaken to measure the perception of performance of the heritage railway sector on a range of measures. The

measures relate directly to those conditions both directors and non-directors considered important.

The mean response to a scale of 1 to 5 is 3 so in all cases, non-directors consider the performance on all measures to be above 3. For the railways where the respondents had direct involvement this was 3.72 and for the sector generally 3.62. A few respondents gave responses as 1 and 5, those awarding 5 outweighed those awarding 1 by a margin of more than 2 to 1.

The standard deviation in the table of those with direct experience was in the range 0.80 to 1.30 with variance in the range of 0.87 to 1.69, and for the sector generally a standard deviation in the range 0.92 to 1.34 and variance of 0.85 to 1.80 showing that there was a slightly wider range of views of the sector than railways where they had direct experience.

The largest variances in both tables were in unity and leadership and the lowest, operation and safe running.

The lower score for the heritage railway sector's sustainability (3.62 to 3.72), confirms the non-directors were more optimistic for the railway of which they had direct experience.

The order of performance between the railway with which the respondents had direct involvement and the sector generally shows the following differences:

Table 6-02 Measure of Performance

Measure of performance	Direct experience Position and mean	Sector generally Position and mean	Difference
Operation and Safe Running	(1) 4.29	(2) 3.83	(-1) – 1.12
As a place to visit and volunteer at	(2) 4.04	(1) 3.86	(+1) -0.18
Has a vision for the future of the railway	(3) 3.85	(8) 3.51	(-5) -0.34
Affordable ticket prices	(4) 3.75	(8) 3.51	(-4) -0.24
Attracting and involving the next generation	(5) 3.70	(11) 3.45	(-6) -0.25
Marketing and general communication with visitors and wider public	(6) 3.65	(5) 3.58	(+1) -0.04
Fund raising and ability to generate revenue	(7) 3.62	(7) 3.54	(0) – 0.08
Unity and teamwork at all levels	(8) 3.58	(4) 3.71	(+4) +0.13
Long term programmes for maintenance of all assets – rolling stock, track infrastructure	(9) 3.57	(10) 3.47	(-1) -0.01
Communication with staff, volunteers and members	(11) 3.53	(2) 3.83	(+8) +0.30
Leadership and management	(12) 3.37	(6) 3.57	(+5) +0.20
Mean	3.72	3.62	

The comparison between railways where they have direct experience and the sector generally reveals some interesting differences.

Railways where they have direct experience are regarded as doing markedly better at having a vision, affordable ticket prices and the ability to attract the next generation, but poorer on leadership and management, communication and unity.

There is an insufficient sample size of all the railways to show if a particular railway(s) and their characteristics produce any pattern. For example, is performance ranked higher on

standard, narrow or miniature gauges? Is performance ranked higher on larger, medium or smaller railways? Are there differences of response between the ages of the respondents?

Drilling down into the data obtained, there is some indication that higher overall performance is perceived for the larger railways and the smaller gauges, and there is a higher assessment of performance made by the younger respondents. Leading towards a view that those with direct experience responding with the highest overall mean performance for their railways would be younger (less than 35) and associated with the larger narrow-gauge railways, however due to the small sample little weight should be attached to this but could be tested on a larger sample in future studies.

It is suggested that the overall message from these tables is that there is generally from non-directors a satisfactory with the level of performance for both individual railways and the sector generally, marked as 3.7 and 3.6 out of 5 respectively. With these results Directors of individual railways may wish to question if they are doing enough in respect of their own leadership and management, communicating with members and volunteers and the unity they are creating at all levels as 8.5% of non-directors considered communication poor and 12.3% considered their railway's leadership to be poor, the respective responses for the sector were 1.6% and 4.0%. The sector overall needs to consider a future vision; affordability of tickets; long term programmes for maintenance of all assets – rolling stock, track and infrastructure; and attracting and involving the next generation.

During the follow-up interviews, the responses to these two questions promoted much discussion and fascination from directors. Overall, there appeared to be little surprise at the

responses, most directors took it as confirmation “that they were not doing a bad job”. Three directors stated that it should be a “wakeup call” with a need to better improve communications and build up a team ethos.

There was general agreement by directors on a need to better explain what they did and for greater transparency. However, it should be noted that the very fact that those who were willing to engage in the research already showed a degree of openness which others may not share. The researcher’s own experience in reviewing the WSRA demonstrated that some heritage railway directors have a very different approach, attitude and temperament – which could candidly be described as secretive, standoffish, a strong element of ‘silo thinking’, a desire to micromanage and control.

The next two questions 10 and 11 explored how important other organisations were to the heritage railway and in 11, how well supported heritage railways felt by these organisations and sectors. The organisations highlighted were the HRA, ORR, Charity Commission, Department of Transport, grant funding bodies, the rail industry, other heritage railways, local authorities, members and volunteers, the railway press, the media in general, the local community, plus there was an opportunity for respondents to add further organisations or sectors.

The results from the directors and non-directors surveyed followed a similar pattern. The most important being the ORR, followed by the members and volunteers and local community. Least important was the HRA, other heritage railways, and Department of Transport, the rail industry and media. In terms of being supportive, the ORR and volunteers

and members were seen as being very supportive by 80%. There was a strong correlation that organisations and sectors considered supportive were all considered important and vice versa. Interestingly rail enthusiasts were considered important with 41% but almost the same percentage, 42%, considered they gave little support.

This would appear to indicate, at least from the responses received, that directors differentiate volunteers and members of their own railways from the wider rail enthusiast community, albeit one is a subset of the other. This would indicate, much as in activities such as the following of sports teams, there is loyalty and interest in particular teams or in this case heritage railways.

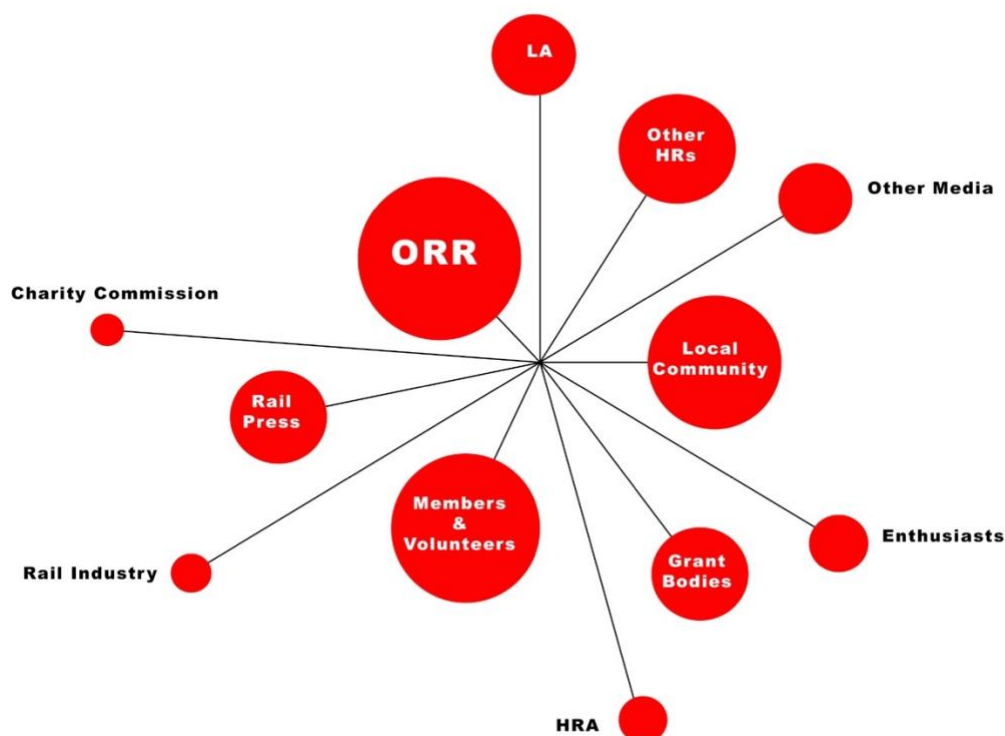


Diagram 6-06 The relative importance and support of organisations - the larger the circle the greater the support, the closer to the centre the more they are considered important.

This is a phenomenon confirmed by Carter (2008) and manifests itself in allegiances and interest in, for example steam / diesel; one of the 'Big Four'; a particular period – early railways/ pre grouping / grouping / post nationalisation; or particular aspects – operation/ engineering/ customer services. Therefore, while a generic term is used for railway enthusiasts it consists of a number of subsets. This is visible in the posts of many railway forums where there is specific interest and loyalty shown to different subject matter.

Question 12 of the directors' survey sought responses on the style of their organisation. Respondents could choose between: "entrepreneurial, innovative and willing to take risks"; "procedural and risk averse"; "focused on public good and preservation of historic artefacts and systems"; "a place to enjoy a hobby and vocation"; "financially orientated, focused on the bottom line"; "implement the policy and aims of members/ owners"; "strongly community based"; "service sector business focused on customers / visitor experience and others". Respondents were asked to click on one predominant style, then up to two descriptions for strong elements and then to click each of the remaining descriptions of: does not apply; some small elements of this; medium elements of this present.

Directors considered that there were some medium elements of the "entrepreneurial, innovative and willing to take risks" style present at their railway. Nobody considered this was the predominant style and 20% said there were no elements of this present. Procedural and risk adverse was seen as the predominant style by 12% of the respondents, 42% considered it was a strong element and only one respondent said it was not present as an element.

For the style “focused on public good and preservation of historic artefacts and systems”, 10% considered this was the predominant style and the remainder considered there were between strong and small elements of this style present.

“A place to enjoy a hobby and vocation”, recorded the highest number of positive responses with 24% considering it the dominant style and a further 60% considering it as having strong or medium elements present.

“A place to visit and volunteer”, also scored highly in non-directors’ assessment of performance, being ranked second in the railways they had direct experience of and first of the overall sector.

“Financially orientated” was considered the dominant style in 10%, with the remaining responses split evenly between small and strong elements. “To implement the policy and aims of members/ owners”, was considered the dominant style in 8% of the responses with a further 30% considering there were strong elements of this style.

“Being strongly community based”, received the lowest number of positive responses, though 40% considered there were small elements of this. There is a slight inconsistency in that in the previous question the local community was considered important.

“Operating in the style of a service sector business focused on customers / visitor experience”, was the second choice for the predominant style and then spread evenly across strong, medium and small.

The summary of the responses is that there is no one overall style that characterises a heritage railway, and there are some elements of all the descriptors at most heritage railways. The three descriptors most selected were a “place to enjoy a hobby or vocation”, “a service sector business” and “focused on public good and preservation of artefacts”. The least common style was “entrepreneurial”.

The result that “entrepreneurship” was the least common style would tend to confirm a sector at the mature stage of its life cycle as this is style critical in the birth / inception and early development stages of a life cycle to get an enterprise up and running.

When this was discussed in the follow-up interviews several directors highlighted that it exposed some of the tensions in policy and vision. Citing that certainly the larger heritage railways see themselves more a service business with a focus on the bottom line, than a place to enjoy a hobby and focus on public good.

Given the longevity of heritage railways it would be informative to know if the spread of such styles had been consistent, or had changed over time as a reflection of their life cycle trajectory. Clearly it cannot be done retrospectively using contemporaneous data, but there are some indications in the published literature and from memories of those involved, being aware that memories are selective and modified by hindsight. From the contemporary literature (Ransom 1973) the tensions that arose between the competing aims of being a business and taking a commercial approach, and having the public good aims of preservation, education and a place to socialise and engaging in a hobby and vocation were visible from at least the late 1960s.

This was discussed in the follow-up interviews, several of those interviewed had been actively involved since at least the 1970s. Directors were asked to speculate as to whether, in their own experience, organisational styles had changed. The consensus was that there was a more entrepreneurial spirit in earlier days, described as “flying by the seat of your pants”, “no idea if something could be done, we believed it could and just got on with it”, “most of us had no idea what we were taking on, we were young and naïve, I’m sure some did but they never said anything”.

All agreed that this spirit had been largely replaced by more bureaucracy and more risk aversion. There was consistency in the responses that their railways were now more commercially orientated though all were also consistent in saying there was always tension between competing objectives.

One respondent described it as “the two sides of the same coin”, “we know we have to act like a business, we need visitors and their money to survive; it would be easier if we could run it just with paid staff, but the numbers don’t add up, we need volunteers and fund raising to make it work and in return they are doing it because they want to get something out of it, and that includes us as directors”. When probed as to what the “something” was, the answer given was “it’s just what we do, we love doing it, and if it was not for us, we wouldn’t have what we have all got, so we make it work”.

Question 13 specifically addressed the condition of governance - *“The way things get done - governance is usually made up of both formal and informal elements. Formal would be policies, directions, control and reporting. Informal would be discussions, networks, relationships,*

persuasion, and agreement. On a scale of 1-10 (1 being totally informal and 10 being totally formal), where would you place your organisation?”. The most common response was ‘6’ on the scale with 27%, followed by ‘7’ and ‘8’ with 15% each. The breakdown between 1-5 on the scale was 22% and 6 – 10 was 78%. This shows a clear indication that heritage railways’ governance is considered a formal condition.

Question 14 addressed the level which proscribed activities of governance was being undertaken within their respective organisations. Respondents were given five levels between ‘1 poor’ and ‘5 excellent’ to choose from.

In terms of the first proscribed activity that *“there are robust procedures in place to identify and regularly review operational risks”*, 24% considered they were at level 3, 51% at level 4 and 17% at level 5 which is the excellent level. The average being 4.2.

The second proscribed activity that *“there are robust procedures in place to identify and regularly review business risks”*, had a greater spread of responses with 20% at level 1 poor, level 2 at 10%, level 3 at 31%, level 5 at 10%. The average being 3.2.

For *“the collective experience and knowledge of the Board could be expected to cope with and mitigate any identified risks”*, there was a similar spread with 37% for level 3 and around 25% for each of level 2 and 4. The weighted average being 3.2.

“That all members of the Board have fully described and documented roles and responsibilities, and undertake training and continuous professional development for these roles”, here was a

marked shift towards poor with level 1 at 24% , level 2 at 41% , 20% at level 3 and only 3% regard their level to be excellent. The average being 2.8.

“The overall competence, knowledge and experience of the Board to fulfil its designated role”, was viewed at level 2 by 13%, level 3 by 44% and level 4 by 34%. The average being 3.7.

The overall results from this question show that generally directors believe that they are managing governance activities, on average, better than the mean score of 3, except where *“all members of the Board have fully described and documented roles and responsibilities, and undertake training and continuous professional development for these roles”,* this having an average score of only 2.8.

Directors considered they are managing operational risks to a higher level than business risks, with the highest level given to identifying and reviewing operational risks. The second highest level was allocated to *“the overall competence, knowledge and experience of the Board to fulfil its designated role”* with a weighted average score of 3.7.

This last score of 3.7 is perhaps inconsistent given that elsewhere in the survey, governance was seen as a weakness and a condition that needed to be strengthened. This inconsistency was explored in the follow-up interviews. There was still an overall consensus and confirmation from the respondents that governance was more of a weakness than a strength and the suggestion was made by three of the respondents that for this question it demonstrated that “Boards have more focus on the day-to-day management of the railway, and they considered they were doing a ‘good’ job but there were greater weaknesses in dealing with business risks, strategic thinking and planning for the long term”.

It was also noted by four respondents that the question did not ask the directors to provide any evidence to justify their opinion and that, if tested, lower scores may have been more likely. No evidence was found that heritage railways had any form of benchmarking in which they could compare themselves with other heritage railways or other organisations. One respondent made the comment that “for some of the smaller railways it could be regarded as the blind leading the blind as they have no idea how good or poor they really are”.

The next series of questions looked at the experience and personal profile of the respondents.

There was an equal balance of experience between 1 and over 20 years as a director, with a slight increase of those in the 1-5 years’ experience category. It was notable that 24% of respondents had over 20 years’ experience, this would indicate significant in-depth knowledge and experience as well as continuity in undertaking their role. An alternative view would be that Boards see little turnover. This depth and level of experience is confirmed by looking at the other roles the directors have performed - 36 % had more than 20 years as operational staff, 19% had 20 years of engineering experience, with 12% having an administrative role for at least 20 years.

The responses to question 15 showed that only 9% of the respondents had been in paid positions with their respective railways, showing the overwhelming majority were volunteers. The experience of respondents outside of heritage railways showed that 53% had held directorships or senior manager positions in private, public or the charity sector, 20% were members of recognised professional bodies, and 17% had professional experience in the rail

industry. None of the respondents had held directorships of large companies, supervisor or craftsman positions.

Directors' motivation was explored in question 17. For 51% of respondents, it was a life-long passionate interest in railways, with a further 14% having a minor interest before their involvement. All other responses were below 7%. An interest in governance was recorded by 5% and also by 'other reasons'.

The responses of non-directors were more varied: 22.2% having a lifelong interest, followed by 19% in a general interest in preservation and history; 17.4% in railway operations; 11.5% in engineering; 9% in volunteering. This demonstrates that the survey population consisted of a wider range of motivation than those obtained from the directors' responses. Respondents also took the opportunity to add a variety of other motivations, these included family reasons; photography; heritage; chance to get involved; industrial heritage; modelling; relaxation; re-enacting.

The time directors devoted to heritage railways was revealed in question 18. Only 3% spent less than 10 hours per month; 20% spent 10 - 40 hours per month; 48% spent between 40 and 80 hours per month; 13% covered the range 80 to 200 hours and a further 14% more than 200 hours.

A typical working month for a salaried employee could be considered to be 160 hours per month. Drilling down into the data showed that all the paid respondents were working in excess of a typical working week but that at least 10% of volunteer directors were working in

excess of a normal fulltime salaried position. And at least 50% were working the equivalent of a part-time position (half an equivalent full-time position). The implication is that these higher levels of commitment mean the respondent would be unlikely to have full time employment outside the heritage railway.

For non-directors, 24% spent less than 10 hours per month; 40% 10 - 40 hours; 23% 40 - 80 hours; 6% up to 160 hours; 4% up to 200 hours and a further 3% over 200 hours. Perhaps not surprisingly this demonstrates the generally higher level of time commitment of directors but show that a significant number (nearly 7% of respondent) are effectively working full time or greater, as volunteers.

In terms of age, for directors no respondent was under 35; 13% were under 49; 34% were between 50 - 64 and 48% over 65. This split matched the age profile data from Companies House, see below.

For non-directors there was a far wider spread of age - more than a quarter (26%) were under 35; 14% between 35 - 49; 32% between 50 - 64 and a further quarter (28%) over 65 years of age. This shows a skewed profile towards younger (under 35) and older (over 50) with the lowest in the 35 - 49 range.

When this question was addressed in the follow-up interviews it was recognised as a long-standing problem for heritage railways. It was described by several directors as reflecting their own career, where they had become interested at an early age but in their mid-late 20's had

drifted away, citing family and career commitments, and only later in life returning to their railway interest.

The quoted 160 hours and above that some volunteers are committing to clearly could only with great difficulty be sustained by a person with a family and a full-time job. Several of the directors recognised that this needs to be better understood – and how volunteering can more easily fit with family and career. All the respondents in the follow-up interviews noted that heritage railways had benefitted from a period of early retirements from careers which appears to be now reversed, with a prospect of needing to work to a greater age before being able to retire and draw a pension, although balanced by a typical comment, “being more fit and active at 70 than my father was”.

90% of director respondents described themselves as male and 10% described themselves as female. 94% of non-directors as male and only 3% as female, the other 3% as prefer not to say or other.

97% of directors were White British, with the remainder preferring not to say or one describing themselves as ‘Brummy’. 94% of non-directors describe themselves as White British with a further 5% as white other, only 1% were Asian, Asian British, black or Black British.

This demonstrates the very low levels of diversity within heritage railways. It is almost an exclusively male, tending towards the older male, and white domain. The population profile of heritage railways is very different to the current profile of the UK population as recorded by the Office for National Statistics. There is an almost even split between male and female

with a slight bias to female. The 2011 Census breaks down the UK population as 80.5% White British and 86% White. Women, and particularly young women, and ethnic groups are therefore significantly underrepresented with involvement on heritage railways.

6.7 Data collection

The results for the data collection exercises were as follows:

Financial Information on turnover, profit and balance sheet value - On the latest year of trading (2017) the average profit / surplus of the companies of the largest 24 heritage railways by visitor numbers (over 100k) was £8,869.00 with an average revenue of £2,896,507.00. The remaining 80 companies achieved an average profit or surplus of only £3.50 (three pound fifty pence) against average revenue of £666,479.00. A number of railways were loss making.

What can be learnt from looking at the Companies House submitted accounts is limited. Some assets (locomotives and rolling stock) fundamental to the operation of the railway are often held and protected in separate charities (example Vintage Trains and 7029 Clun Castle Limited, Bluebell Railway and Bluebell Railway Trust). The research on locomotives demonstrated that more than 50% are held in private ownership not controlled by the operating company.

The average balance sheet worth of railways with over 100k visitors is £3,930,798.00 and for the other 80 it is £711,688.00. Multiplied up this gives a total of around £150m for the 104 railways. To place this figure in perspective, it can be compared to the replacement cost of the population study (excluding the mainline TOCs). There are 401 route miles of standard

gauge, 96 miles of narrow gauge and 36 miles of miniature railway, with all the consequential stations, infrastructure, historic buildings etc.

The cost of the new 31 mile, mostly single track, with loops, Border Railway in Scotland worked out at £11.5m per mile including stations (Railway Magazine 01/2016); the proposal to reopen the 7-mile Wisbech branch gives a figure of reopening an existing plain single line as £4.25m per mile excluding any stations (Railway Magazine 06/2009). Using a nominal £10m per mile for standard gauge and 25% (£2.5m) for narrow and miniature gauge and adding on sufficient rolling stock to operate, the total value exceeds £5bn. This figure demonstrates the scale and value of replacing what has been saved, restored and created over the last 70 years.

Some clue as to this vast discrepancy is explained in the accounts for the Vale of Rheidol Railway (VofR) - "Individual fixed assets of any value are initially recorded at cost, less subsequent accumulated depreciation and subsequent accumulated impairment losses. Owing to the unique nature of the heritage assets, the costs of obtaining valuations would be onerous compared with the corresponding benefits to the charitable company and the users of the financial statements. The heritage assets are therefore shown at original cost and not depreciated."

Therefore, a locomotive bought in the 1970s for a scrap value of a few thousand pounds or coaches purchased for a nominal £1.00 each, are recorded as such, regardless of their restored value which can, for locomotives, be well into the hundreds of thousands of pounds, and for coaches, well into the tens of thousands of pounds, (the full restoration cost of a Mk 1 coach to current mainline standards is approaching £200k) (TLW estimates, 2018).

Age profile of directors- Table 6-03 provides the profile of directors by birth year. This table clearly demonstrates an age profile that is biased to those over 60. The average age being 65. Table 6-04 shows the turnover of directors on three heritage railways, the data is drawn from the date of appointments and terminations recorded at Companies House.

Table 6-03 Age profile by year of heritage railway directors, each square represents one director.

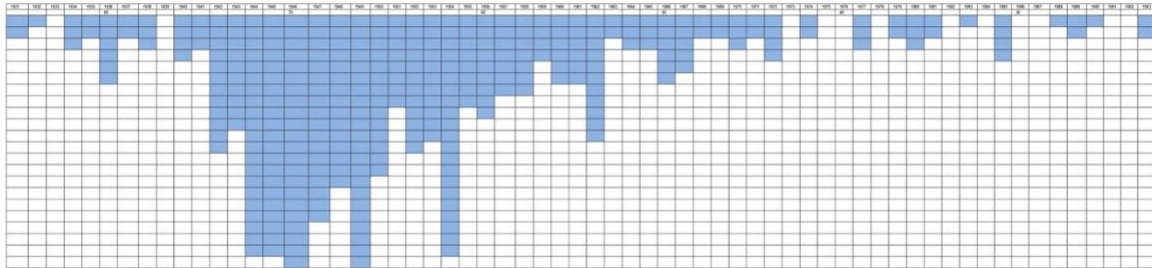


Table 6-04 Turnover of directors on three heritage railways.



The three railways show different profiles - the WSR shows rapid turnover and a complete replacement of its directors over a relatively short period between 2015 and 2019, while the SVR shows a long period of relative stability, only recently beginning a new period of director succession. The NYMR shows a more even level of succession. The degree to which the process was managed or was ad hoc is unknown.

The conclusion from the age profile and turnover tables is that over the next 10 years, to maintain the current average age, and accounting for appointments of a short-term duration, the 104 heritage railways of the study are going to need to find at least 500 new directors with the appropriate skills, knowledge and experience to form the Boards of the Companies. As the total sector is much larger and includes a number of associated groups and companies, the number of required directors for the sector is likely to be in well excess of 1,000.

Data for the steam fleet - As explained in Chapter 5, preserved steam locomotives go through a well-established cycle of restoration, operation, overhaul and operation. Therefore, as long as the current operational fleet can maintain the current service level requirements and there are sufficient locomotives being overhauled and returned to operation at a matching rate and time period to those coming out of ticket, then the system is sustainable under current conditions. Those locomotives entering the fleet for the first time either by being newly restored or as new build can either provide additional resilience and choice or can provide the resource to expand and develop more services.

Table 6-05 *The current steam fleet in numbers.*

Maximum size of the steam fleet 1925	30,600
Date of last British Railways standard gauge steam working locomotive	11 August 1968
Number of preserved BR locomotives	429
Number of locomotives in National Collection	37
Number of locomotives in other Public Museums	10
Number of locomotives bought from BR by private owners/HR	137
Number of ex BR locomotives purchased from scrap yards	245
Number of industrial locomotives saved	730
Number of Heritage Railways operating Steam Services (SG)	75
Number of TOCs Operating steam on the Main Line	4
Number of ex BR steam locomotives with current boiler certificates	114
Number of Industrial locomotives with current boiler certificates	160
Number of ex BR steam locomotives awaiting overhaul	195
Number of ex BR steam locomotives unrestored or as static exhibits	110
Number of ex industrial steam locomotives awaiting overhaul	250*
Number of ex industrial steam locomotives unrestored or as static exhibits	320*
Number of new build steam locomotives in service	1
Number of new build steam locomotives under construction	9

*Note numbers cannot be added to form totals

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Standard Gauge Locomotives GWR Complete others Work in Progress												
2	Ref	Status	Boiler Cert Expires	Number	Name	Class	Wheels	Owner	Private / HR / Museum	Main line	Location		
3	GWR												
4	1	Operational		426	TVR no 85	T+G4:G222v	0-6-2T	Keighley & Worth Valley Preservation	HR	x	Keighley & Worth Valley	2026	
5	3	Operational		813		PTR	0-6-0ST	GWR 813 Preservation Fund	Private	x	Severn Valley Railway	2026	
6	14	Operational		1501		1500	0-6-0PT	1500 Pannier Tank Trust	Private	x	Severn Valley Railway	2022	
7	15	Operational		1638		1600	0-6-0PT	Kent & East Sussex Railway	HR	x	Kent & East Sussex Railway	2026	
8	19	Operational	x	2857		2800	2-8-0	2857 Society	Private	Yes in past	Severn Valley Railway	2028	
9	29	Operational		3802		2884	2-8-0	Privately Owned	HR	x	Llangollen	2028	
10	47	Operational		4247		4200	2-8-0T	4247 Preservation Society	Private	x	Bodmin & Wenford	2028	
11	50	Operational	2024	4270		4200	2-8-0T	Jeremy Hosking	Private	x	Glos & Warwickshire Railway	2024	
12	56	Operational	2023	4612		5700	0-6-0PT	Bodmin & Wenford Railway	HR	x	Bodmin & Wenford	2023	
13	61	Operational	2028	4953	Pitchford Hall	Hall	4-6-0	Roger Wright	Private	Yes	Epping and Ongar Railway	2028	
14	62	Operational	2019	4965	Road Aston Hall	Hall	4-6-0	7029 Clun Castle Ltd	Private	Yes	Tyseley	2019	
15	70	Operational	2014	5199		5101	2-6-2T	5199 Project	Private	x	Llangollen	2024	
16	76	Operational	2027	5526		4575	2-6-2T	Project SS26 Group	Private	x	South Devon Railway loan to Chinnor	2027	
17	80	Operational	x	5541		4575	2-6-2T	Dean Forest Railway	HR	x	Dean Forest Railway	2023	
18	81	Operational	x	5542		4575	2-6-2T	Locomotive S542 Limited	Private	x	South Devon Railway	2022	
19	85	Operational		5619		5600	0-6-2T	Telford Steam Railway	HR	x	Hired to Midland Railway Centre	2025	
20	86	Operational	2020	5637		5600	0-6-2T	5637 Steam Loco Group	Private	x	Based at East Somerset Railway	2020	
21	87	Operational		5643		5600	0-6-2T	Furness Railway Trust	Private	x	Embassy Steam Railway	2021?	
22	100	Operational		6412		6400	0-6-0PT	South Devon Railway	HR	x	South Devon Railway loan to Chinnor	2025	
23	101	Operational	2025	6430		6400	0-6-0PT	Hugh Shipton	Private	x	Llangollen Railway	2025	
24	102	Operational	2022	6435		6400	0-6-0PT	Bodmin & Wenford Railway ?	HR?	Yes in past	Bodmin & Wenford	2022	
25													
26	108	Operational		6960	Raveningham Hall	Mod Hall	4-6-0	Jeremy Hosking	Private	Yes in past	West Somerset Railway	2021	
27	111	Operational	2025	6990	Witherslack Hall	Mod Hall	4-6-0	Witherslack Hall Locomotive Society	Private	x	GCR	2025	
28	114	Operational	2028	7029	Clun Castle	Castle	4-6-0	7029 Clun Castle Ltd	Private	Yes	Tyseley	2028	
29	119	Operational	2026	7714		5700	0-6-0PT	Severn Valley Railway	HR	x	Severn Valley Railway	2026	
30	121	Operational		7753 104		5700	0-6-0PT	7029 Clun Castle Ltd	Private	Yes	Tyseley	2021	

Diagram 6-07 *Extract from the locomotive data base.*

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	Number	Location	Owner	Boiler Cert	Year										
2	30541	Bluebell Railway	Maunsell Locomotive Society	2025											
3	30847	Bluebell Railway	Maunsell Locomotive Society	2023											
4	31065	Bluebell Railway	Lewis-Evans	2027											
5	31178	Bluebell Railway	Bluebell Railway	2020											
6	31263	Bluebell Railway	Bluebell Railway Trust	2022											
7	31323	Bluebell Railway	Bluebell Railway	2021											
8	73082	Bluebell Railway	73082 Camelot Loco Society	2025											
9	55189	Bo'ness & Kinnell Railway	SRPS	2028											
10	4247	Bodmin & Wenford Railway	4247 Preservation Society	2028											
11	4612	Bodmin & Wenford Railway	Bodmin & Wenford Railway	2023											
12	6435	Bodmin & Wenford Railway	Bodmin & Wenford Railway ?	2022											
13	30587	Bodmin & Wenford Railway	NRM Object Number(1978-7018)	2023											
14	32662	Bressingham	Privately Owned	2026											
15	78018	Darlington Railway Centre	Darlington Railway Preservation Society	2026											
16	7827	Dartmouth Steam railway	Dartmouth Steam Railway	2021											
17	75014	Dartmouth Steam Railway	Dartmouth Steam Railway & River Boat Com	2026											
18	5541	Dean Forest Railway	Dean Forest Railway	2023											
19	6023	Didcot Railway Centre	Great Western Society	2020											
20	4144	Didcot Railway Centre	Great Western Society	2025											
21	34092	East Lancs Railway	In process of purchase East Lanc Railway	2024											
22	52322	East Lancs Railway	Andy Booth	2019											
23	80097	East Lancs Railway	The Bury Steam Locomotive Company Limited	2028											

Diagram 6-08 Extract from database of operational locomotives showing maximum years left on boiler certificate.



Diagram 6-09 Red squares indicate number of locomotives in service in each year with a current boiler certificate. Green indicates the minimum number of locomotives required to complete their ten-year overhaul to keep the total number of locomotives constant. Number refer to ex BR locomotives. This shows that fewer locomotives are required to be overhauled than were completed over the last ten years, thus if the same level of activity is undertaken, sustainability of the fleet can be maintained.

The analysis shows that: The total fleet is more than sufficient to provide all likely and foreseeable services. There is considerable redundancy and resilience in the total fleet with the number of static exhibits, stored and under restoration locomotives that could, in time, be made available, if ever required to do so. The current cycle of operation and overhaul is sufficient to meet current needs. The capacity and capability of heritage railways has in the

past proved generally sufficient to maintain the cycle, with just a few short-term crises on individual railways.

Visitor data - No overall or comprehensive visitor information survey was discovered during the research. It is a matter for each individual railway to survey and gather data on its own operations. The HRA produce total visitor figures from their members, but this is not broken down by individual railway. From the interviews with directors, the level and sophistication to which this is carried out varies enormously between railways - as a generality the researcher drew the conclusion that the smaller the railway, the less likely is visitor information to be systematically collected beyond the total number of visitors as shown by the number of tickets sold. From the researcher's visits, many railways provide free access to the station area and only charge for a ticket to ride so those visitors not buying a ticket are not included in overall visitor figures.

During the interviews a number of directors were happy to share what information they had available. Across the sector this varied enormously depending on the location and type of events and services operated, so those based in traditional holiday areas would expect a high number of visitors from outside the area. A themed event such as a "Forties Weekend" would attract visitors mainly interested in the subject of the event.

From the published literature reviewed, three target audiences were identified, which, according to the interviews, have not dramatically changed. The first of these are the family groups looking for a day out – something to do and be entertained. The second is what was described by one director as the "National Trust couple", someone looking for an 'interesting

experience', dining on a charter train or visiting the railway for its association with the location or its history. The third group are railway enthusiasts, many of whom will be active volunteers or members on other heritage railways.

These visitor groups are also not mutually exclusive so a family group may include a Grandad who is also a railway enthusiast, a National Trust couple may be on an outing with the grandchildren or one of them may be a railway enthusiast. The railway enthusiast group will also be divided between those that wish to ride, those who are happy to watch and/or photograph trains or spend their time at the engine shed or browsing in the book shop.

Interviewing directors with responsibilities for marketing revealed that their target was to increase visitors from the first two groups. They were often quite disparaging about enthusiasts, the railway made no money from them and they were a "bit of a nuisance to have around".

The researcher's own first-hand experience with visitor surveys undertaken for Vintage Trains confirms this overall picture. The Polar Express run in December is aimed at, and carries, mainly families looking for a Christmas experience. Charter tours to destinations such as York, Chester and Oxford are aimed at attracting the "National Trust couple" for a nostalgic day out and dining experience, with a small element of railway enthusiasts that can increase with the specific locomotive used to haul the train or the interest of the route traversed. The Shakespeare Express which runs between Birmingham and Stratford-upon-Avon on Summer Sundays is a mix of families looking for a day out with an express steam train ride, and those looking to enjoy a Sunday lunch dining experience.

In terms of numbers of visitors, figures increased rapidly during the 1960s to 1980s, both numbers to individual railways and overall, as the number of heritage railways increased. Since the 1990s there have been only modest increases in overall numbers, though there are considerable variations between railways, some reporting significant increases while others have reported a slight downturn. As an example, the West Somerset Railway recorded 50,000 visitors in its first year of operation which increased steadily year by year to 2003 with 187,000, but by 2019 this had only increased to 194,000 after a series of ups and downs.

The North Yorkshire Moors Railway and Festiniog Railway are the two most popular railways with annual figures of around 350,000. The Severn Valley Railway has 250,000 visitors. Twenty-three heritage railways achieve over 100,000 visitors per year. But these are all eclipsed by the National Railway Museum with close to one million visitors, though this is with free entry.

There was no reliable data found for spend per visit and repeat visits.

Product development was raised as a subject area in the interviews and directors were asked to describe how they were addressing it to attract and boost audiences. A comparison was made of annual timetables between the 1970s and 2018. The main and consistent product offered is a 'nostalgic' ride behind a steam locomotive. This basic concept has been developed by themed events. A typical season would close for winter maintenance in January and February, opening for school half term, weekend running until Easter and then daily running with a build-up of services over the high summer period then a gradual reduction through the

autumn until an intense late November – December period of a programme based on Christmas.

To this basic programme would be added a spring and autumn gala directed at the enthusiast market with visiting locomotives and intensive services. Then event weekends, examples being Forties Weekend, Car Rally, Steampunk, Victorian Weekend, Modellers' Meet, and Traction Engine Rally. Additional special trains for dining, themed entertainment trains – Murder Mystery, Fish and Chips, Jazz by Train and Mad Hatters Tea Party. Additional income would be generated by driver experience days where the opportunity to drive a steam locomotive under supervision and photo charters where a group of photographers will hire a train purely for photographic purposes. Income can also be earned by the hire of the railway for filming such as historical dramas.

The Christmas programme is traditionally based around the 'Santa Special' which takes various forms, with children meeting Santa on the train or a ride to Santa's Grotto where they meet Santa. All the directors interviewed stressed the popularity and importance financially to the railway of the Christmas programme. A recent development which started in 2018 and was copied by a number of railways is the Christmas lights train, which features the train decked in lights with further lighting displays along the route. These trains proved immensely popular as almost all were sold out. A number of heritage railways have over the years featured events based around Thomas the Tank Engine usually to coincide with school holidays; the researcher was told by two directors that these have now waned in popularity with the railways as they are run under a strict and, in the railway's view, expensive franchise system by the holders of the copyright. The view of several directors was that the copyright

owners had killed the 'golden goose' as they were onerous to organise for no profit, and a simpler 'home grown' children's theme, although with fewer visitors, was often more profitable.

A comparison of heritage railway timetables shows a gradual increase year by year of more themed events, but the basic operating pattern has remained constant. One director noted that in his view, "although more themed events do attract more visitors, there is a corresponding rise in costs particularly as they were less likely to be staffed by volunteers so overall heritage railways are running faster just to stand still". Other comments from the interviews included the importance of gala events as these were enjoyed not only by the visitors but also the volunteers as it was an opportunity to do different things such as run goods trains or to see and crew visiting engines. But one General Manager did note that "nobody on the Board wanted to look too closely at the costs of running a gala", and that "the large 'spectacular' gala may have had its day".

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It is of note that the latest visitor figures from the HRA of the whole sector are dated 2016, though more recent figures have been collected. It has been impossible to source visitor figures for a sufficient number of railways over time to provide strong evidence of their trajectory. The trajectory of two railways, the Severn Valley and West Somerset, are shown in Diagram 5-02. Both railways show a rapid rise in numbers and then a slow levelling off. The Severn Valley trajectory shows the significant dip in 2009 when part of the line was closed due to storm damage. The West Somerset trajectory reflects a railway that started well but then struggled to overcome operational, financial and governance problems, as described by Parsons (2011), before growing steadily again.



Diagram 6-10 Passenger numbers of Severn Valley Railway and West Somerset Railway, from various sources. Years without figures are not plotted and trajectory estimated.

On the evidence gathered from a varied of sources, such as press releases reprinted in railway magazines for other railways for the period since 2008, there is no evidence that they are growing strongly, or the number of passengers is falling rapidly but there is considerable circumstantial evidence that growth is flat or possibly in slight decline.

There is some evidence of the effects of the external economy, with reports in SVR News of declining numbers on the Severn Valley Railway due to the recession in the early 1990s and again after 2008 – “1991 saw a recession in the UK. The effect was seen on the SVR, where passenger numbers and membership both fell for the first time in some years.” And “a Q&A session on 21 August 2010 reported the recession had truly hit; in the first six months of the year passenger numbers were 13% down and all departments were asked to economise as

much as possible. The Railway Magazine reported the SVR was set to make redundancies.”
(Sources SVR News).

The short 2020 operating season was dominated by Covid 19 and caused those heritage railways that did reopen to re-think their offer, in the words of the Severn Valley Railway General Manager “visitors will enjoy a more curated experience, with a reserved compartment for a journey along the line and time for a planned visit to the Engine House at Highley”.

6.8 Stage 2 Social Capital

The concept and value of a heritage railway’s social capital was investigated initially by using indirect measures such as the contribution of donations and free labour made by the members and volunteers, and to articulate the value of what volunteers and members received in return. This was followed by exploring the importance of trust, reciprocity and networks in unstructured and semi-structured interviews and the role played by key individual benefactors.

The value of labour as a constituent of social capital was calculated from the non-directors’ survey. Respondents were asked to state the amount of time they devoted to volunteering - 59 respondents spent less than 10 hours per month; 98 spent an average of 25 hours; 58 respondents 60 hours; 15 were at 140 hours; 9 at 180 hours and 8 gave over 200 hours, producing an overall average of 47.38 hours per month. If, and it is a big if, this was replicated across 21,000 volunteers it would equal one million annual hours or 125,000-man days. Using

HLF figures for the value of volunteer days of £50 unskilled, £150 skilled and £350 professional, there is little unskilled railway work, so using a figure of £175 per day gives a value of around £25m. This in context would be fairly close to 25% of current total income of heritage railway. Most significantly these figures are not valued or included in the audited accounts of a heritage railway.

An alternative exercise was undertaken using replacement salaries for key position that would need to be paid if they were not occupied by volunteers, the result using the example of Vintage Trains would be an additional 25% of current turnover. While these figures are 'guesstimates' from a single sample, they represent a significant financial value which has been highlighted in the interviews above – the vast majority of heritage railways would not be financially viable and therefore could not currently exist without the contribution of their volunteers.

In terms of funding, the monthly railway magazines usually contain a number of appeals for funds, recent examples include – start-up funding for a Train Operating Company, a new P2 Class locomotive and new station building. There is no estimate of what this funding may be worth but a 'guesstimate', adding up a number of appeals over a year, would place the figure at approaching £50m per annum. The size of the market from which heritage railways can draw is unknown.

As confirmed in the interviews, all the respondents acknowledged, these significant figures are not sums that could easily be replaced from increased revenue. To replace the value of free labour and donations, a 'guesstimate' would be that sales revenue would need to

increase by at least 75% and possibly to double. There are, as previously noted, at least three railways that are achieving a level of income that does not require donations or volunteers. It also should be noted that these three railways are all located in highly popular tourist destinations – Paignton, Snowdon and Lake Windermere – two of these are in National Parks and two are part of larger leisure companies.

One director explained that their railway, as a single-track railway with limited car parking and visitor facilities, did not have the capacity to dramatically increase visitor numbers without significant change which would then destroy its charm as a quiet rural branch line.

The above results provide evidence as to the importance of the contribution of volunteers and members, both in a normal ongoing situation and specifically if there is a crisis that threatens the continuing operation of the railway. The level of support of volunteers can be quantified in a number of ways, the value of labour given, the funding provided, and the skills utilised.

6.9 Stage 3: Effects of Covid 19

Following the imposition of a lockdown, all individual heritage railways, mainly through on-line appeals, invited additional funds and donations from their members and the public. Most heritage railways announced sums raised or kept online tallies. These were recorded in a spread sheet and totalled. The sum raised by September 2020 was £6,500,000. Grants were awarded by the Heritage Lottery Fund totalling £3,200,000 and further grants of £9,000,000 were awarded by the Department of Culture, Media and Sport in England. Other small grants

were made available by local authorities and the devolved administrations. Heritage railways were eligible for the Government's furlough scheme.

Heritage railways began a staggered reopening on a restricted basis with social distancing in place from 23 July 2020. Not all heritage railways decided to reopen. Those that did, reported a strong demand for services over the truncated summer period with full trains albeit on a modified and limited service with reduced capacity.

The Government's regional tier system introduced in the autumn created further restrictions and temporary closures. However, a small number of railways were able to operate modified Santa services and Christmas light trains.

A number of heritage railway general managers (Lewin and Price 2020) recorded statements of the difficulty and threats of the pandemic on future viability and operation resulting from the pandemic. The Festiniog Railway made over 30 redundancies and announced a loss of £6m in revenue in late 2020 (BBC). At the time of writing no financial accounts have been submitted to Companies House showing the financial effect.

It is too early to draw conclusions or predict the longer-term consequences of the pandemic, but two insights are suggested, the first confirming an element of social capital by the money raised and the second that government has been supportive of the sector shown by the level of grants provided.

Key points of the chapter

Using the ethnography method, it was discovered that the operation of a heritage railway regardless of size is a complex and safety critical operation carried out by multifaceted organisations needing a trained, experienced and qualified workforce. There is little or nothing to differentiate between the running of a heritage railway and any other type of railway, with two exceptions - that the Light Railway Act under which they operate limits speed to 25 mph, and the equipment, technology and systems used have been generally superseded on modern railways.

The narrative methodology provided evidence of heritage railways having reached a mature stage in their life cycle and demonstrated the importance of the clear vision and purpose of their originators and pioneers in overcoming significant obstacles to their development, demonstrating the contribution and influence of its mostly volunteer workforce and leadership.

The phenomenological method was the basis for discovery of the existence of the necessary conditions for operation of a heritage railway - property; assets; operational systems; risk management; governance; staff, members and volunteers; visitors and money.

From using grounded theory, it was discovered that heritage railways are dynamic organisations which require intervention at all levels to maintain their balance and stability. The most critical interventions being the need to maintain wearing out and ageing assets,

maintaining an active volunteer workforce and core audience, both of which continue to age.

The case studies provided an insight into the mitigation measures taken when a heritage railway faced a crisis that could endanger its continuation.

The questionnaire and follow up interviews confirmed the importance of the operational conditions with the two alterations - the addition of environment and combining risk management with governance. There was general optimism expressed by both directors and non-directors as to the future sustainability of the heritage railway they were involved in and the wider sector.

There was a strong belief expressed that volunteers and assets such as locomotives have been key strengths. From the responses, there is a recognition that governance and operational systems could have been better and that this 'needs' to become a strength in the future. A weakness highlighted in the responses is money, the need to keep fund raising is clear and is viewed as ever more challenging. A weakness also highlighted in the non-directors' responses was governance, which would indicate that directors have a higher opinion of how they are governing their railway than do non-directors, hence confirming the views of the Regulator.

The surveys also revealed the extent of the hours dedicated by volunteers, with some contributing over 200 hours per month. The survey also revealed a lack of diversity within

heritage railways, it being almost the total preserve of white males, with a small percentage of younger volunteers but the majority being over 60 years of age.

The financial information discovered showed weak or precarious finances, little transparency and balance sheets undervalued when compared to potential replacement value.

The total steam fleet is sufficient, and provided it is overhauled and maintained at the current rate, is sustainable.

Visitor data pre-Covid shows stability of visitor numbers or a slight decline despite several innovations, confirming a sector in its mature stage. Social Capital was investigated through indirect measures of volunteer contribution of free labour and donations. The effects of Covid-19 on heritage railways occurred after the conclusion of the research but confirmed an element of social capital by the money raised and that government has been supportive of the sector by the level of grants provided.

Chapter 7

Validation of the hypotheses

Chapter contents	7.1	<i>Research hypothesis</i>
	7.2	<i>Lifecycle position and trajectory</i>
	7.2	<i>Summary of the validation of the hypotheses and next steps</i>
		<i>Key points of the chapter</i>

7.1 Research hypothesis

The hypothesis proposed in the study is that good governance of railway assets and management is the key determinate of the sustainability of a heritage railway. This hypothesis is tested using Bradford Hill's criterion below.

Hypothesis:	<i>Good governance of railway assets and management was the key determinate of the sustainability of a heritage railway.</i>	
Bradford Hill's Criterion	Findings	Meets Criterion
1: Strength: How strong is the relationship between the conditions and the 3 pillars of sustainability?	It was supported in all the literature and interviews that good governance was considered important and there was a desire and expectation to improve existing standards	Confirmed
2: Consistency: Is the data consistent across multiple measurements, at multiple places and times?	Generally, yes but there are also indications from the cases studied that heritage railways have survived and prospered despite poor governance, rather than because of 'good governance'	Not Confirmed
3: Specificity: Are any changes that we are seeing specific to this point in history?	There is increased scrutiny of the standards of governance by the Rail Regulator	Confirmed
4: Temporality: Is there an effect of time on the condition and outcomes?	There is noted a strong desire to improve governance over time, but its effect is as yet unproven	Partly Confirmed
5: Dose-response: Does the improvement or decline in the conditions scale with the prospect of greater sustainability	As 4 above this considered the wisdom but is as yet unproven	Partly Confirmed
6: Plausibility: Does the causal relationship make sense?	The relationship makes sense where good governance is one of the determinants but not the only determinant of sustainability.	Mostly Confirmed
7: Coherence: Does the data fit in with current theory and knowledge	No, there are example of railways overcoming difficulties not based on good governance but through efforts made by others.	Not Confirmed
8: Experiment: Can we alter, prevent, or improve the situation with an intervention?	Closer observation and bench marking of governance would provide a basis for future measurement	Partly Confirmed
9: Analogy: Is there an analogous, better-understood system that makes the hypothesis plausible?	Precise, measurable determinants of sustainability appear to be few in number, and reliance is placed on general concepts and wisdom. From the information available to the researcher social capital, and all the conditions identified collectively are a better indicator of sustainability	Not Confirmed

From the above assessment, good governance of railway assets and management was validated as one of the determinates, but is not the key determinate, of the sustainability of a heritage railway.

Other hypotheses proposed were: the extent to which the discovered conditions collectively exist and are developed, maintained and managed, being measured as a strength or weakness, gives an indication as to a heritage railway's likely future prospects, in terms of failure, decline, stagnation, sustenance or growth; heritage railways are at the mature stage of their life cycle.

If it follows that these hypotheses are confirmed then: firstly, they can provide an explanation for the past trajectory and the position reached in their current life cycle; and secondly, a theoretical model can be constructed from which tools can be developed that would be of practical use and benefit to heritage railways in managing their maturity and their future prospects.

These hypotheses are tested below.

Hypothesis:	<i>The extent to which 8 conditions collectively exist and are developed, maintained and managed, being measured as a strength or weakness, gives an indication as to a heritage railway's likely future prospects, in terms of failure, decline, stagnation, sustenance or growth.</i>	
Bradford Hill's Criterion	Findings	Meets Criterion
1: Strength: How strong is the relationship between the conditions and the 3 pillars of sustainability?	Correlation is not causation, but it's a good place to start. A heritage railway that has a fleet of owned locomotives and rolling stock, with a costed and funded programme for their overhaul, secure tenure of land, a programme of track renewal, a safety culture, experienced and able directors and management team, with succession planning, detailed risk management and continuity of business in place, a significant volunteer base across a wide age profile with all key skills covered, training in place, increasing visitor numbers from a wide spectrum of different audiences and a cash surplus was the preferred choice of directors, when interviewed, than the opposite of a railway living a hand-to-mouth existence, with none of the above. However, there is no evidence to show that one is any more sustainable than the other. Indeed, potentially a single flaw in one condition, for example, a major unforeseen landslip, could have a disastrous effect on the railway even with all other conditions fulfilled, similar to a 'house of cards' falling, while the hand-to-mouth existence of the other railway, actually makes it good at surviving each crisis. There is a correlation that railways with all the positive attributes above are in a better, but not guaranteed, position and have the potential to grow and develop, whereas the railway with challenging conditions is more likely to, at best, sustain itself but may in future be more likely to decline. The directors' survey responses were analysed and those responses that indicated higher levels (3,4 and 5) of how well they considered their railway was managed across each of the conditions, gave higher levels of optimism as to how sustainable they considered their railway to be; they also mentioned governance as a strength. The opposite also applied - the lower the levels of management capacity and capability, the more pessimistic they were on their prospects for sustainability, and mentioned governance as a weakness. This was similarly confirmed in interviews. This does not provide absolute proof but shows at least that there is a perception among directors that the better the parts of a business are managed, governed and measured as a strength, the more likely the organisation can ride out storms, whereas the weaker, the parts of a business the more it places itself at risk. This is supported by all the literature, an example is Stochino 2019, which states that the greater the levels of redundancy within any system, the more robust and resilient the system is and becomes. This however does not lead to maximising the efficiency of the system. For economic necessity and practicality, a system works on balancing the principles of efficiency and resilience to ensure that risks to, and safety of, the system is within sufficient limits.	Mostly Confirmed
2: Consistency: Is the data consistent across multiple measurements, at multiple places and times?	Other than data gathered for this study there was no other source of independent data found. The data gathered from the two surveys consists of opinions rather than measured verifiable data. The financial data from Companies House is auditable but as discussed, does not present a complete picture on assets or volunteer value, or even a collective picture of all the associated bodies that make up an individual railway. Such data as directors' age profiles or gender are specific measurements but that cannot be transferred to any measurements of experience or competencies, though the survey provides some background.	Mostly Confirmed
3: Specificity: Are any changes that we are seeing specific to this point in history?	In all the interviews carried out there was reference to the challenges currently faced by heritage railways - a change in demographics, difficulties raising funds and shortage of skills. The literature shows that many of these problems have been faced before, though there is some evidence from the age of volunteers, and documented changes from wider social trends, that the challenges are becoming more urgent to address than in the past.	Confirmed
4: Temporality: Is there an effect of time on the condition and outcomes?	This is perhaps the clearest criterion; the passage of time has a significant effect on heritage railways and the 8 conditions. Assets wear out from use or deteriorate if not looked after and maintained. Volunteers have a limited life span and cannot continue indefinitely so must be replaced. For example, using the figure of 21,000 volunteers with an average age, from the non-directors' survey, of 51.5 years, and assuming an upper age limit of, say, 75 and similar levels of capacity, that means that 21,000 volunteers will have to be replaced over the next 23.5 years or around 800 per year on a straight-line basis. This does not take into account any retention rates or time to train to the required levels of skills necessary. Social norms and trends also change over time. Therefore, the sustainability must be regarded as a dynamic model, changing over time. So, changes in the conditions will have an effect.	Confirmed
5: Dose-response: Does the improvement or decline in the conditions scale with the prospect of greater sustainability?	In general terms there was no general evidence found, other than speculation, that the 8 conditions were strengthened, weakened or transferable to a scaling of greater or shorter longevity. There were specific examples, such as the timing of locomotive overhauls - this would produce a scalable effect as to the length of their availability, though these were over relatively short time scales (less than ten years). Similarly, with the age profile of volunteers there is a direct scalable effect.	Mostly Confirmed
6: Plausibility: Does the causal relationship make sense?	All of the directors interviewed considered that strengthening the 8 conditions would improve their railway's prospects for longevity and growth.	Confirmed
7: Coherence: Does the data fit in with current theory and knowledge?	There was a consensus across all the literature that exhibiting good levels of governance makes organisations more successful and resilient, and the opposite that weak governance is a prelude to failure. The ORR is equally convinced of the importance of safety and good governance as shown in its maturity model RM3. Railways that stage events generally increase visitor numbers. Railways able to draw on higher numbers of volunteers are able to undertake more restoration work than others with less volunteers.	Confirmed
8: Experiment: Can we alter, prevent, or improve the situation with an intervention?	This could in the future be possible to arrange if heritage railways benchmarked themselves to common criteria as it would be possible to more easily measure the effect of any specific intervention. For example, interventions to improve the management of track maintenance that effect the longevity of the track before complete replacement. No railway is ever likely to deliberately introduce an intervention to assess the opposite, for example if the safety management system was removed, would more visitors or volunteers be injured or killed?	Confirmed
9: Analogy: Is there an analogous, better-understood system that makes the hypothesis plausible?	The researcher is not aware of such a system, as examples from the world of business tend to be over short timescales. Examples from sectors similar to heritage railways are equally poorly researched.	Confirmed

From the above assessment, the 8 conditions collectively discovered, exist and the way they are developed, maintained and managed, being measured as a strength or weakness, gives an indication as to a heritage railway's likely future prospects, in terms of failure, decline, stagnation, sustenance or growth.

Hypothesis:	<i>The conditions discovered and confirmed fit within the model of the 3 pillars of sustainability – economic, social and environmental</i>	
Bradford Hill's Criterion	Findings	Meets Criterion
1: Strength: How strong is the relationship between the conditions and the 3 pillars of sustainability?	All the conditions fit within a description of each of the pillars – Economic would include: property (partly), assets, systems, governance, money, visitors (partly) staff & volunteers (partly); Social would include: social capital, staff & volunteers, visitors; Environmental would include: property, environment, assets (partly), systems (partly)	Confirmed
2: Consistency: Is the data consistent across multiple measurements, at multiple places and times?	All the data gathered was consistent with some overlap between the three pillars but no other externality	Confirmed
3: Specificity: Are any changes that we are seeing specific to this point in history?	The presence of a global pandemic and a declared 'Climate Emergency' is focusing on the need for sustainability in all decision making	Confirmed
4: Temporality: Is there an effect of time on the condition and outcomes?	As noted under 3 above the importance and urgency to consider the concept of sustainability has increased as measured by the number of news reports	Confirmed
5: Dose-response: Does the improvement or decline in the conditions scale with the prospect of greater sustainability	No change	Confirmed
6: Plausibility: Does the causal relationship make sense?	Yes, the 3 pillars are an accepted framework to consider sustainability, see literature review	Confirmed
7: Coherence: Does the data fit in with current theory and knowledge	Yes, nothing was found to dispute this	Confirmed
8: Experiment: Can we alter, prevent, or improve the situation with an intervention?	None considered	Confirmed
9: Analogy: Is there an analogous, better-understood system that makes the hypothesis plausible?	None known, a purely economic, social or environmental analogy would not fit the complexity of the conditions found on heritage railways	Confirmed

From the above assessment the conditions discovered and confirmed fit within model of the 3 pillars of sustainability – economic, social and environmental.

Lifecycle position and trajectory

An objective of the research was to discover the position of heritage railways on their life cycle trajectory. Diagram 7-01 reproduces the standard lifecycle trajectory shown in Diagram 1-01 with the graph of railway openings and passenger figures for the SVR which, as a major heritage railway, has been used as a proxy. There is a 'good level of fit' between all three trajectories.

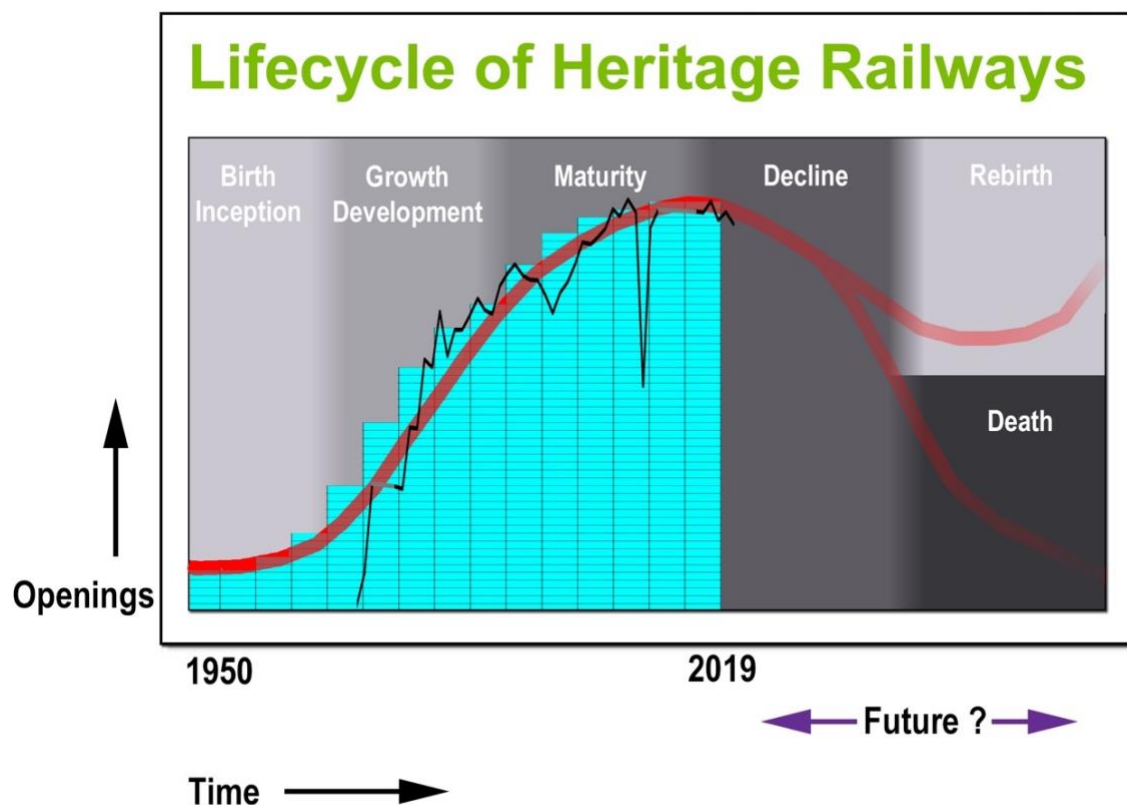


Diagram 7-01 Lifecycle of heritage railways with the graph of railway openings and passenger figures for the SVR which, as a major heritage railway, has been used as a proxy.

The position was again tested using Bradford Hill's Criterion below.

Hypothesis:	<i>Heritage railways are at the mature stage of their life cycle</i>	
Bradford Hill's Criterion	Findings	Meets Criterion
1: Strength: How strong is the relationship between the conditions and the 3 pillars of sustainability?	The positions of individual railways are likely to vary considerably to the date the railway opened, for example a new railway opening now would be unlikely to move directly from birth to maturity without passing through growth and development. However, as the number of openings over time demonstrates, new railways are now likely to have little impact on the overall sector. The trajectory of sector-wide openings and passenger numbers accurately fits the curve and confirms a mature stage, edging towards decline	Mostly Confirmed
2: Consistency: Is the data consistent across multiple measurements, at multiple places and times?	No evidence was found of any strong growth or development, nor was there was no evidence found of rapid decline. The prospect for new railways opening was small	Mostly Confirmed
3: Specificity: Are any changes that we are seeing specific to this point in history?	Prior to Covid-19 heritage railways were repeating their traditional seasonal programmes with the exception of one or two additions to the Christmas programme. There is increasing awareness and reporting of climate change in the mainstream media	Mostly Confirmed
4: Temporality: Is there an effect of time on the condition and outcomes?	The main effect is an ageing of the main target audiences of heritage railways, those with any memory of 'real steam' (pre-1968)	Mostly Confirmed
5: Dose-response: Does the improvement or decline in the conditions scale with the prospect of greater sustainability	More research would be required to uncover additional data. There is no indication that additional data would shift the position, but this is a position that remains unknown	Partly Confirmed
6: Plausibility: Does the causal relationship make sense?	Yes, given an average over 40 years for heritage railways the expectation would be a mature stage, the have been no dissenting voices, with a few nudging towards the position of decline	Yes Confirmed
7: Coherence: Does the data fit in with current theory and knowledge	Yes, all the data fits the knowledge and theory	Yes Confirmed
8: Experiment: Can we alter, prevent, or improve the situation with an intervention?	The impact of Covid-19 may provide such an experiment - the introduction of a radical new product or service across the sector could give such an invention, no new initiative is yet known	Yes Confirmed
9: Analogy: Is there an analogous, better-understood system that makes the hypothesis plausible?	No, there is no evidence for growth or development, and pre Covid, the number of railways and passenger figures were steady or with some minor growth and decline at individual railways.	Yes Confirmed

From the above assessment it is considered that the hypothesis has been validated.

7.3 Summary of the validation of the hypotheses and next steps

Table 7-01 below provides a summary of the validity of the hypotheses put forward.

Table 7-01 Summary of the validity of the hypotheses put forward

Hypothesis	Assessed by	Validated	Implication
The extent to which 8 conditions collectively exist and are developed, maintained and managed, being measured as a strength or weakness, gives an indication as to a heritage railway's likely future prospects, in terms of failure, decline stagnation, sustenance or growth	Bradford Hill's Criterion	Yes	Allows a model of sustainability to be constructed for heritage railways and an assessment tool developed
The conditions discovered and confirmed fit within a model of the 3 pillars of sustainability – economic, social and environmental	Bradford Hill's Criterion	Yes	Provides a framework by which the sustainability of heritage railways can be viewed and assessed
Heritage railways are at the mature stage of their life cycle	Bradford Hill's Criterion	Yes	Allows greater understanding of the life cycle trajectory and provides a context on which to base decisions
Good governance of railway assets and management was the key determinate of the sustainability of a heritage railway.	Bradford Hill's Criterion	No	Consider alternative hypothesis: Social capital (of which philanthropy, reciprocity and trust are key constituents) is the key determinant of the sustainability of heritage railways

The following hypotheses were validated: The extent to which 8 conditions collectively exist and are developed, maintained and managed being measured as a strength or weakness, give an indication as to a heritage railway's likely future prospects, in terms of failure, decline stagnation, sustenance or growth. This allowed a model of sustainability to be constructed for heritage railways and an assessment tool developed.

The conditions discovered and confirmed fit within a model of the 3 pillars of sustainability – economic, social and environmental. This provides a framework for which the sustainability of heritage railways can be viewed and assessed.

Heritage railways are at the mature stage of their life cycle. This allows greater understanding of the life cycle trajectory and provides a context on which to basis decisions.

The following hypothesis was not validated:

Good governance of railway assets and management was the key determinate of the sustainability of a heritage railway. An alternative hypothesis is proposed: Social capital (of which philanthropy, reciprocity and trust are key constituents) is the key determinant of the sustainability of heritage railways. It is recommended that this forms the basis of future research.

Chapter 8

A discussion of the results

Chapter contents	<i>8.1 Heritage railways defined</i>
	<i>8.2 Organisational form and comparison to other SMEs</i>
	<i>8.3 Longevity compared to SMEs</i>
	<i>8.4 Validation of the hypotheses</i>
	<i>8.5 Doing just enough governance</i>
	<i>8.6 Social Capital</i>
	<i>8.7 Sustainability</i>
	<i>8.8 Trust and reciprocity</i>
	<i>8.9 Stage 3 Effects of Covid-19 on further insights into the findings and discussion</i>
	<i>Key points of the chapter</i>

This Chapter discusses the results in terms of the research's core theme and the posing of a rhetorical question; whether heritage railway governance is 'good enough', based on the collected data and information, with numerical quantities and analysis which are set out in Chapter 6.

8.1 Heritage railways defined

The research has provided, from recognised literature sources, a definition of 'heritage railways' which was previously only a vaguely drawn term. The new definition confirms them as multi-faceted organisations established mainly by volunteers for public benefit to encourage and promote interest in the preservation and operation of superseded railway technology, systems, artefacts, buildings and routes through the offer to participate in a living history experience.

8.2 Organisational form and comparison to other SMEs

From Chapters 2 and 4 it was discovered that the prevailing organisational form of heritage railways, as opposed to their legal structures, is a social enterprise or cooperative for the creation of social benefit to their members, volunteers and the wider public. Thus, although their legal structures are similar to commercial enterprises of similar turnover, the business objectives are very different. Commercial enterprises are driven mostly (but not exclusively) by profit and financial return for their stakeholders and owners. For a heritage railway, while profit and financial return is important for viability, there are mostly other social and public good drivers for the enterprise.

Both strictly commercial businesses and heritage railways can be judged successful on the value that their respective Boards create and add for their stakeholders and owners. The difference for a commercial business is that the principle, and in most cases, the only measure, is financial, while for a heritage railway value is measured in more subjective term such as the experience created and enjoyed, the level of authenticity, the overall educational, economic, social and cultural value achieved.

The literature shows, together with split Government responsibility, that heritage railways are primarily positioned at the intersection of the industrial heritage tourism sector and the regulated railway sector, with secondary interjections from the charity sector, as generators of regional economic benefit through job creation and secondary spend and specialist interest groups acting within a social setting.

Published work on organisational forms and systems indicates that heritage railways could also be modelled as a complex dynamic system with a significant social component, and that general principles of governance and sustainability are applicable.

8.3 Longevity compared to SMEs

The review of heritage railway records held by the individual companies and lodged at Companies House demonstrates that they were significantly longer lived than the average small and medium enterprises (SMEs) at a mean of around ten years and that the number of failures, less than 5%, as shown by the timeline, were less than may be expected over such a period when again compared to SMEs, estimated at above 80% of failure over a similar period.

A picture emerges that the survival and organisation of heritage railways defies any easy explanation based on business theory as put forward by academics (Rahim, 2019) and business book authors (Garratt, 1996). The reasons are that they have proved, so far, remarkable in their resilience and longevity: many have existed for more than 40 years, compared to a typical commercial company lifecycle of an average around 10 years.

The reasons must go beyond that they were better funded, better managed, free of regulation, in a limitless market. The exact opposite has generally applied: funding was very constrained; no evidence of better management; no initial market; within a closely regulated industry; and employed no new technology or innovation.

This is set against a background, described in business theory by, for example, Berg & Pietersma (2016), of increased scrutiny, accountability and transparency demanded from

organisations. One director described it as like being on an “ever-spinning roundabout, going faster and faster, the larger you grow, the more you need - more resources, more money - while the world [outside heritage railways] advances and traditional skills and knowledge become in ever shorter supply”.

From the discussions and interviews held, the transition and balance between the two states of commercialism and public good, and between growth and a limitation and disappearance of resource, was described by one director as a “work in progress”. Many of the characteristics of one are not necessarily compatible with the other. The fact that these extremes can be found in parallel, albeit in some tension, leads to the researcher’s conclusion that to achieve any kind of balance, be it by accident or design, may be regarded as a sign of success.

One of the principal balancing acts is between the members’ desire for authenticity of operation to preserve it “just as it was” and the need to appeal to the paying public as a viable tourist attraction. The other great pressure is to continually attract sufficient volunteers with all the necessary skills as existing volunteers retire, since, in most cases, the business model only works with a significant contribution of voluntary labour and external funding.

On the one hand they are organisations set up to run an isolated section of railway that serves no real economic purpose, using out of date technology and assets often rescued from the scrapyard, purely for the pleasure and enjoyment of their owners, participants and visitors. They are owned and managed by enthusiastic and passionate amateurs who freely donate

their time and effort as part of their interest and hobby. In this respect, heritage railways are argued to be similar to charitable and other public good organisations.

On the other hand, many heritage railways are now established as multimillion-pound-turnover organisations employing permanent staff and playing a key role in their local tourism infrastructure. They have an important social and cultural role as well as being the repository of a wealth of historically important assets. They operate in a safety critical environment in a regulatory framework little different to main line railways with a public that may seek “an authentic 1950s living history experience but will expect the safety standards, physical amenities, customer service and facilities of the twenty first century”.

That mostly passionate and enthusiastic amateurs have stuck so far with the extra burdens and responsibilities demanded by these larger, ‘more professionally orientated’ organisations is testament to the levels of motivation and dedication to their hobby interests. This factor has been included under reciprocity within the theoretical model developed. However, the detailed extent of its effect would be an important area for future study.

8.4 Validation of the hypotheses

There was insufficient evidence based on the case studies to prove the hypothesis proposed in the study that good governance of railway assets and management was the key determinate of the sustainability of a heritage railway.

This has been established through this research by demonstrating their longevity through a review of their company records and their being able to withstand a variety of crises that have

affected individual railways, as shown by the case studies. On reviewing the literature and research data it was found that one of the most significant of these explanatory variables is social capital.

Through case study examples, social capital is demonstrated to have compensated and mitigated for failures of organisational governance and weaknesses in operational conditions on heritage railways. In this respect, heritage railways are argued to be similar to charitable and other public good organisations. On this basis the hypothesis was rejected, and an alternative hypothesis proposed: that social capital (of which philanthropy, reciprocity and trust are key constituents) is a key determinant of the sustainability of heritage railways.

However, given their proven longevity and resilience it follows that, regardless of the actual standard exhibited so far, their governance must have been ‘good enough’ to get heritage railways to this point on their lifecycle trajectory.

8.5 Doing just enough governance

“Doing just enough governance” is put forward as a useful description to explain why and how heritage railways have in the past remained resilient in a number of varying circumstances which may have been expected, in similar sized commercial organisations, to lead to failure. It is a more nuanced and ‘forgiving’ approach as to how governance may be judged and assessed.

The question is, for those that govern heritage railways, is doing the same level of “just enough governance” that has ensured survival in the past, good enough to be sustainable in

the future? From the finding above it is recognised by directors that more can and should (must) be done.

The research also confirmed most directors surveyed and interviewed considered improving governance important or very important. The research provided examples of poor governance ameliorated by the availability of social capital, for example in moderating poor policy decisions (Mid Hants), or providing new leaders where old ones failed (WSRA). The question then arises, while it may have been 'good enough' in the past will it be good enough in the future?

The further question arises, will it also good enough to move them forward onto the next stage of their trajectory, taking them to the stage of rebirth rather than the likely statistical probability of the next stages of decline and death? The wisdom from the literature and published research is that governance is critical to successful organisations because it influences and drives all other aspects of the business and was demonstrated by the 'Affect Diagram' in Chapter 5. The survey of directors established that this view is shared among current directors, the regulator and the trade body.

The literature (Dekker, 2011) tells us that safety systems can drift. Further, the literature explains that to prevent system drift, good governance is required, this is set against the statement of the ORR, which considers there is room for improvement. This indicates that good governance of heritage railways is the means to achieve improvement and prevent system drift, as such it needs to be better than before.

8.6 Social capital

From the discoveries in this research, it is now shown that social capital has played a critical role in giving heritage railways their longevity. The building and maintaining of social capital is an outcome of good governance and good governance is an output of having high social capital, making it a scenario where it is difficult to express the sequencing actions where each seems to depend on others being done first – the classic ‘chicken and egg’.

It matters little with heritage railways as to which is the cause and which is the effect, as case studies show, for example, at the Severn Valley Railway and West Somerset Railway, both were integral to success. It follows that there is a virtuous circle of one building on the other. There is insufficient evidence to establish the opposite, though it is an easy scenario to imagine where either poor governance leads to erosion of social capital which takes away any buffer to ride out a crisis, or where social capital is so poor that there is not the capacity or capability on which better governance can be established. Capable volunteer directors may be less likely to step forward if the task to rescue or save an entity is beyond a critical or tipping point of viability, thus creating the vicious circle where one condition damages the other.

8.7 Sustainability

The research has examined other markers of sustainability of heritage railways – their financial viability by analysing the annual accounts lodged at Companies House; the replacement of worn out and ageing assets, by analysing the rate of overhauling locomotive boilers which is required at least every ten years; the people involved by analysing the age profile of directors from information held at Companies House; environmental impact by

analysing the availability and affordability of coal supply and likely restrictions and looking at the possible effects of extreme weather events resulting from climatic change, see also Appendix 6.

The most recent financial information for heritage railways, pre Covid-19, shows on average a break-even position, with few cash reserves. Boilers of locomotives are currently being replaced at a rate sufficient to maintain the required steam fleet, but anecdotal evidence was obtained that indicated the upkeep of infrastructure was falling behind the required replacement rate as seen at the West Somerset Railway. There are no available figures for this to be demonstrated, though the lack of such information is of concern itself, as the position is unknown and therefore a risk.

The age profile of directors has increased over the last ten years from an average 62 to 65 years of age - to ensure succession, around 700 new suitably willing and qualified directors will need to be identified and appointed over the next ten years. UK sourced coal will cease in 2022 with the closure of Ffos-y-Fran mine in South Wales, coal will then need to be imported. Heritage railways are responsible for 0.02 of UK carbon emissions and from Government comments, there is no immediate prospect of tightening of restrictions but this will remain a long-term concern.

Experience and the research undertaken by Network Rail and RSSB show the effect of extreme weather events will be most felt by railways prone to flooding, those with river bridges and with significant earthworks which could be subject to landslip. The analysis of all these markers shows none necessarily present an immediate threat to survival but all must

be considered to be a future threat to sustainability. However, this must be balanced by the evidence produced in the study that heritage railways have had a remarkable ability to escape such threats in the past.

The analysis of visitor figures and dates and rates of opening shows the classic take-off, rapid growth and then a levelling off. Heritage railways are therefore shown to be in the mature stage of their lifecycle. The published works on business life cycle (Kay & King, 2020) show there are only two directions to go, up, by reinvention, or down, either by a long slow slide or a rapid descent. The literature (Cheesewright, 2019) also explains that the path to reinvention is through innovation and for innovation to be delivered, good governance is required to create the right conditions for it to thrive. This reinforces the argument for good governance.

It is uncertain as to what are the conditions that will cause a complete failure. Even an operating company ceasing to trade may be recoverable as the assets are often protected in a separate charity or by individuals so a new operating company could be started from scratch. It would take time and there would be hurdles to overcome, not least proving the capacity and capability of the new company to operate and gain a Works Order, but certainly nothing that has not been achieved before.

During the Covid 19 pandemic the researcher discussed with the Department of Transport the procedures that may need to be adopted for a heritage railway to be reconstituted should it fail. The mainline railway has an option of appointing an 'Operator of Last Resort' but this is not a current option open for heritage railways.

The only condition that has so far proved terminal is the failure to secure land tenure. The condition speculated in some of the interviews as the other most likely cause of death is a gradual decline in interest from visitors and volunteers which would produce a slow lingering death, draining all resources, but capable, with the injection of new energy, almost at the last moment, to recover.

To look a little deeper at issues prior to Covid 19, six railways were still trading with negative worth (Avon Valley, Corris, Chinnor and Princess Risborough, Dartmoor, Barry and Weardale)². However, that does not mean that some indicators cannot be drawn. There is evidence, as above, that when heritage railways have got themselves into difficulties, from which they were able to recover, the railway had been able to access help from its members and supporters, through labour or money. This level of support is rarely available in the same way to purely commercial organisations.

The level of support of volunteers can be quantified in a number of ways - the value of labour given, the funding provided, and the skills or expertise utilised.

From case studies (West Somerset Railway) and literature (Rushton, 2017), the effect of any failure of governance is shown not to be instantaneous but develops over a period of time before the effects become visible, particularly as governance has an influence on all other conditions, for example the failure to put in place an appropriate safety management system, failure to establish and enforce a safety culture, or failure to maintain a succession in key

² The Dartmoor Railway owned by British American Railway Services was placed in administration in February 2020 and is for sale. The Weardale also owned by British American Railway Services was sold in February 2020 to the Auckland Project a charity.

posts and skills. An example can be seen from the West Somerset Railway which had ignored the need to regularly replace trackwork that was increasingly wearing out. This was only realised when a new Chairman took over, finding a large backlog of maintenance requiring urgent replacement.

From observation and case studies, there is normally a built-in time lag between cause and effect, from when policy is enacted, or should have been, and the consequences - examples include: WCRC's failure of its safety culture in the lead up to the incident at Wootton Bassett (RAIB, 2016); WSR's failure to address track renewals and safety systems over a long period of time, leading to a voluntary temporary closure (Steam Railway ed 495).

This can perhaps offer some explanation as to why "doing just enough governance" has, in many cases, been all that is needed for heritage railways to continue as consequences lag behind any failure of policy. And the effects of any failure of policy have been mitigated by a degree of external support which has, in the past, proved widespread and flexible, for example, fundraising from members to relieve a lack of cash to fund repairs of infrastructure or rolling stock. This is coupled with the pace of change, which, from anecdotal evidence, is often less intense than experienced in other industrial or commercial sectors.

From the 'Affect diagram', governance can be seen as having the most impact and influence of all the operational conditions necessary for the sustainability of a railway. Therefore, how well or poorly governance is performed will have a consequential effect, over time, on a railway's overall strengths and weaknesses and whether opportunities and threats are grasped, though, as noted, governance alone is not sufficient to determine sustainability.

8.8 Trust and reciprocity

Earlier the researcher posed the question that must be asked - why and how have heritage railway companies so outlived their commercial counterparts?

As will be shown below it is not reliance on good governance as described above but that the sector enjoys and can draw upon amazing levels of reciprocity from the community it serves, and which supports it. For example, although not an SME, the multinational technology company 'Apple Inc' enjoys great brand loyalty and trust (Beattie, 2020). Consumers appear willing to perhaps pay a higher price compared to its competitors and pre-order its products. It is suggested that there may be fewer who would willingly offer to travel to a foreign country and work free of charge for a fortnight at their own expense on the production line, or travel half way around the world just for a glimpse of an iPhone coming off a production line, would be willing to work in an Apple retail store for free, happy to clean and polish the windows, travel to different Apple stores and buy products just to support the company or raise money for research by organising a 'bring and buy' sale. It would be interesting to know how many of Apple's top executives would also give up their salaries and fund themselves through other means.

Absurd?

But that is the level of commitment of many who support heritage railway companies. For example, there is a group of French volunteers who spend their holidays working on the Festiniog Railway in Wales at their own expense; there are enthusiasts who travel specifically from the US, Japan and Australia just to visit Britain's heritage railways or see a particular loco.

There are countless volunteers who tend stations, serve in tea shops for free, spend hours scraping rust from metal in cold draughty sheds, willing to get up in the middle of the night to light a fire and raise steam in a locomotive, clean out ash from a dirty, wet pit, or even act in highly responsible safety critical roles as guards and signalmen, or spend hours running and administering the company's books.

The reciprocity given – only a chance to be part of and experience a steam (and in some cases diesel) heritage railway, without, in many cases a note of thanks (a consistent complaint on internet forums that volunteers are “not valued or under-valued”) yet still turn up.

This reciprocity is confirmed within the non-directors' survey by the responses - out of 252 responses 229, had a long-term interest in railways, 195 had an interest in preservation, 179 in railway operation, 119 in engineering, interestingly 20 said they had an interest in the governance of organisations and only 3 had no prior interest in railways. The community that supports heritage railways does so in a variety of ways - volunteering, donating funds and also visiting other railways. Although there is strong loyalty expressed, much like football fans, there is not only loyalty to particular railways, types of railways or locomotives, but also to heritage railways overall.

Clearly most commercial companies do not, nor could ever, provide the level of reciprocity demonstrated by and to, heritage railways. However, it does demonstrate the importance and power of reciprocity at whatever level it can be tapped into or engaged. This confirms that heritage railways are organisations with a strong public / social good element. Reciprocity and trust are key elements of social capital.

There must be an equally important lesson for heritage railway companies, as the financial models of most show that without a fundamental change they cannot exist without at least the current level of reciprocity demonstrated by their volunteers. How railways display, regard and value this reciprocity is therefore critical to their future, unless they can find an alternative way to operate without it, remembering all heritage railways are governed by individuals (directors) who themselves display enormous levels of reciprocity, being unpaid and doing it only for “love”. From the directors’ survey, 14% of directors are committing more than 200 hours per month and 50% are averaging 60 hours per month.

There are alternative examples, to use a colloquial expression, “if management piss people off enough they will go elsewhere” (recent examples being Peak Rail, Mid Hants Railway, West Somerset Railway), so it is something that permeates the very fabric of how heritage railways operate, and completes a circle between those that first enjoy the experience of heritage railways to becoming involved at every level and potentially with their governance.

A private email given to the researcher shows the depth of feeling and emotion that can be generated:

“I am so upset about this and the way X has spoken to Y about it with such disregard and with no acknowledgement of the issue that I find it unforgivable.

I understand people have priorities and this is miniscule on that list, but it is ridiculous that this should have happened. They all knew – X, B, and C – when the [item] had been delivered and where it was being stored because I told them and asked if it was ok to store it in there

which was agreed so this all beggars belief. It's shoddy and utter thoughtlessness. We had been asking for ages when we could erect the [item] only to be told that we weren't allowed to do so it makes it even more bewildering.

My respect for the organisation is lost and I don't feel I can work for F as a volunteer in the future and therefore, if you have my name on any list of volunteering, I would be grateful if you could remove it."

The directors' survey confirmed more than 50 % had a lifelong, passionate interest in railways and another 17% had a minor or related interest in railways. One had an interest in community, another in volunteering, and two an interest in governance. So those that govern and commit themselves to all the pressures, liabilities and responsibilities must also get some benefit in return, to continue to do what they do as it is not paid employment.

Hence again the classic 'chicken and egg', that trust and reciprocity will be major factors in attracting and maintaining the interest and commitment of those appointed to govern and those that govern will have a significant impact on determining how reciprocity is given and received by, and from, its community, from which future directors will mostly also, although not exclusively, be drawn.

8.9 Stage 3 Further insights into the findings following the arrival of Covid-19

The arrival of the pandemic confirmed the premise that while some identified risks are considered remote, their effects if they manifest can be extremely severe. The pandemic was outside the control of individual heritage railways, but it was clear from the statements of

Lewin and Price (2020) and HRA (2020) that heritage railways were in a weak financial position going into the pandemic at the end of the winter shut down period, and few had business recovery and contingency planning in place for such emergencies.

Despite this, heritage railways reacted swiftly, and within days of the lockdown announcement, had set up fund raising appeals. The raising of over six million pounds confirmed the presence of the railways' social capital in that member and public fund raising was not readily available to purely commercial companies. It could be argued that the amount of money raised by each individual railway was a reflection of the combination of its fund-raising capacity and capability, itself a probable constituent of its social capital when run and administered by volunteers, and the esteem for the railway held by its members and the public.

The awarding of a series of Heritage Lottery Fund grants and grants from Government further demonstrated the value placed on heritage railways as an important cultural sector. The level of grant given would have been unlikely to have been forthcoming if the sector was not considered of value when many different sectors were pleading their individual cases. The observations of the effects of Covid-19 confirm - the presence and importance of social capital to a heritage railway; the sector has developed to the extent that it is seen as important to the fabric of the UK cultural offering; and the need for good governance to identify future risk and navigate crisis events and draw upon the lessons learnt.

Key points of chapter

The longevity of heritage railways does not simply arise from 'good governance' or 'good financial performance' but is in fact the product of multiple interlinked variables and processes. Indeed, many heritage railways have survived and prospered despite poor governance, rather than because of 'good governance', overcoming problems with weak finances and the need for major capital investment in their assets and infrastructure. One of the most significant of these explanatory variables is social capital, a hitherto under-researched governance variable in heritage railways' studies.

Heritage railways are different from purely commercial businesses, insofar as they mostly have charitable objectives and can call upon volunteer labour and donations without which they would be generally financially unviable. The theory proposed is that governance has been at least 'good enough' to get heritage railways to their current position in their lifecycle.

Through the case study examples, social capital (of which philanthropy, reciprocity and trust are key constituents) is demonstrated to have compensated and mitigated for failures of organisational governance and weaknesses in operational conditions on heritage railways and is therefore a key determinant of the sustainability of heritage railways.

Chapter 9

Outputs – a model of sustainability and development of an assessment tool

Chapter contents	<i>9.1 A model of sustainability</i>
	<i>9.2 A heritage version of RM3</i>
	<i>9.3 Stage 3 Effects of Covid-19 Outputs</i>
	<i>Key points of the chapter</i>

9.1 A model of sustainability

One of the consequential objectives of the research was to construct a model of the features and components specific to the sustainability of heritage railways by focusing on all the elements that are critical, both for survival and development.

The model would be designed to assist heritage railways optimise their own sustainability by highlighting strengths and weaknesses and therefore can act as an early warning of factors that could jeopardise, to a greater or lesser extent, an individual railway or the sector more generally.

To begin the process of building a model of sustainability it was necessary to understand the difference between what success and failure / good and poor / thriving and survivability would look like in terms of sustainability.

As has been previously noted the normal single focus, financial criteria for success that apply to commercial organisations is not easily applicable to heritage railways. Each of the

groupings in the 'Affect Diagram' in Chapter 5 was assessed as to its effect on the other groupings, and which was classified as none, weak, some, strong.

A key grouping is the organisational element, as without some sort of structure and governance the entity could not exist, and it has a high influence on all other factors. Finance is a further key element, both in the short term, when it can be affected by cash flow and the service of any debt, and in the long term by ability or inability to repair and renew.

For a heritage railway to keep going, the leadership must effectively manage, in both the short and long term, the availability of assets and resources to provide an attractive offer to the visitor. The assets and resources are principally the infrastructure, the locomotives / rolling stock and the labour. The interviews revealed that most heritage railways are operating on a business model that relies on large donations of time and money from members and volunteers to close the gap between total cost and revenue from sales. The closeness of that gap therefore becomes a measure or indicator of sustainability.

The wider the gap, the greater the reliance on the members and volunteers to make up the difference, with contributions of funding and labour.

The directors must therefore balance the flow of money through revenue generated and funds raised to pay for the operational assets and the availability of labour necessary to carry out the operation.

Any disruption to that flow, either in decrease of funds necessary to carry out critical repairs and renewal or a shortage of labour either in numbers or skills, will increase the risk to the railway continuing on an on-going basis.

It has been previously discussed that mainly volunteers and a small group of professional managers of varying degrees of ability and experience generally carry out governance of heritage railways.

The performance of those charged with its governance have to be at least good enough to keep that balance and flow in place. Pre Covid-19, most railways were on going and the sector had proved generally remarkably resilient, which established that governance has, so far, been good enough.

The question therefore becomes, are there any challenges and/or events that would place a greater risk on the theory of doing just enough governance, which require significant change or adaptation to adjust to new situations and mitigate risk, or are the current models sufficiently robust to cope with most eventualities that can be foreseen?

Table 9-01 (Below) *A table showing for each condition, a threatening event and what an excellent, basic and poor response would each look like.*

Condition	Threatening Event	Response		
		Excellence	Basic	Poor
Money/ Funding	Bankruptcy. However, if assets are held in a separate entity, such as a charity, they may be protected. Operating company may cease to exist but could probably be reborn. Seriously damaging, possibly terminal but also potentially recoverable	Deep understanding of the business model. Sophisticated financial planning models. All aspects of the business fully costed. Management information regularly updated and distributed. Monitoring and control of capital and revenue budgets. Monitoring and control of cash flow. Sophisticated process for approval of capital investment.	Basic understanding of the business model. Fixed costs v operational costs. Simple book-keeping. Checking bank accounts regularly on cash flow. Awareness of all monies outstanding (debt) or due. Measuring overall expenditure over revenue.	Little understanding of business model. All financial matters left to Accountant. 'Hand to mouth', 'make do and mend' attitude in place.
	No funds available to undertake critical work, becomes mainly an issue of timing- the period necessary to raise funds. Seriously damaging, possibly terminal but also potentially recoverable.	Risks identified and costed. Long term repair and renewal programme costed and in place. Dedicated team employed on fund raising, with a range of activities and targets. Knowledge of all available funding sources – grants, high net worth individuals, legacies etc.	Ability to receive gifts and donations. Raise funds as and when needed.	No real idea of what and/or when big-ticket expenditure may be coming up. Reliance placed on a few wealthy individuals, always got by in the past.
Visitors	Failure to attract sufficient visitors to pay for planned operation. Operation can be cut to match reduced visitor attendance. Damaging, possibly terminal in the long term but probably time to turn it around if recognised and action taken.	Marketing concepts fully understood. Dedicated high-level marketing team. Sophisticated marketing plans and targets for all aspects of the business. Range of products and services offered. Targeted advertising campaigns and brand building. Monitoring of visitor spend. Extensive efforts placed into market research of target markets. Competitor analysis, and monitoring of trends.	Leaflets. Basic check that product is considered value for money. Chat to visitors for feedback.	Focus is operations, visitors a necessary inconvenience and distraction.
Operation and safety	Major accident or series of safety breaches such that operation is considered unsafe or action taken through the courts. Damaging, possibly terminal in long term but probably time to turn around it if recognised and action taken.	Full adoption of ORR RM3.	Meet minimum requirements of HSE / ORR.	Few documented systems in place, reliance placed on common sense and experience.
Staff, volunteers and members	Insufficient numbers or skills to maintain operation. Seriously damaging, likely terminal maybe recoverable but likely long lead times.	Human resource management in place. Volunteer programme in place, attraction, retention, refreshing. Training programme. Full skills audit of volunteers' available skills profile. All key skills identified, core competencies, succession in place for all key posts etc. Full consultation and engagement, regular communication. Relationship between permanent staff / volunteers carefully managed. Excellent conflict resolution in place.	Volunteers made to feel welcome and given induction. Key skills identified. Basic training provided. Register of volunteers. Regular forum where everyone can air their views.	Few people skills demonstrated, conflicts unresolved or unaddressed, resolution by walking away. Reliance placed on a few key individuals.
Property	Collapse or failure of any critical element of infrastructure. (see also funding above) Seriousness and cost of repair will determine if terminal or can recover or get around it in some other way.	Full register and condition of all assets and infrastructure. Regular monitoring. Full programme of repairs and renewal with funding identified or in place. Available capability to undertake all planned work, or manage contractors.	Regular checks and monitoring. Programme of 'as and when necessary' and affordable.	'Make do and mend' when it can be fitted in and afforded.
Assets, for example locomotives and coaches	Insufficient operational locomotives to run a service. Damaging in the short term, possibly terminal in long term, available quick fixes by hiring in but could affect cash flow and be unaffordable (see also above).	Control of the fleet through ownership or long lease. Range of locomotives and stock in excellent condition to meet different operating conditions and needs, with contingency to cover failures. All daily maintenance needs can be catered for. Full programme of repairs and renewal with funding identified or in place. Available capability to undertake all planned work.	Sufficient resources and capability to meet minimum timetable service. Basic programme for renewals and repairs identified. Sufficient spare resources to cover any short-term operational failure.	Keeping everything going as long as possible and then worry about what to do.
Governance	Poor governance over a period of time would make the above threatening events more likely, particularly on critical activities – safety, people or finance. Time and ability to respond dependent on degree of shock, ability and willingness to comprehend and recognise danger and damage, ability to plan a turnaround / response with sufficient access to necessary knowledge, skills and resources.	Adopt and put in place a model of good governance (Government's Model of Capability, ORR RM3 or similar)	Meets minimum requirements of Company's Act and/or Charity Act as applicable	Board has lost touch with operation and purpose, exercises little control or influence, power in the hands of a few individuals, without any real accountability.
Environmental and other external events	Could be many and varied – termination, failure to renew lease. Change of control of ownership with different objectives. Commercial opportunity to 'sell out'. Major changes in social trends. Heritage railway offer is no longer attractive or of interest. Major changes with economy making operation unviable or unaffordable. Timing could be over short or long term. Ability of a heritage railway to respond may be outside its reasonable control or influence.	Actively tracking changes and potential change. Actively engage with wider industry bodies. Maintain active business risk register.	Awareness of potential risk areas.	Board out of touch and unaware of risks.

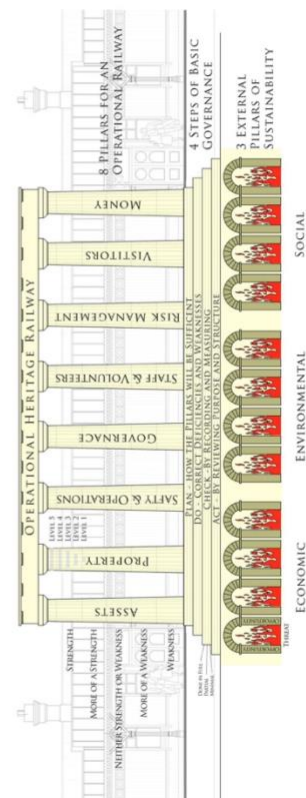
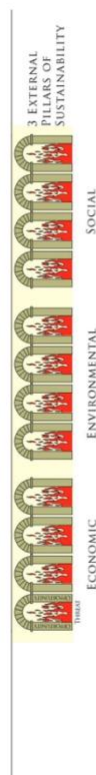
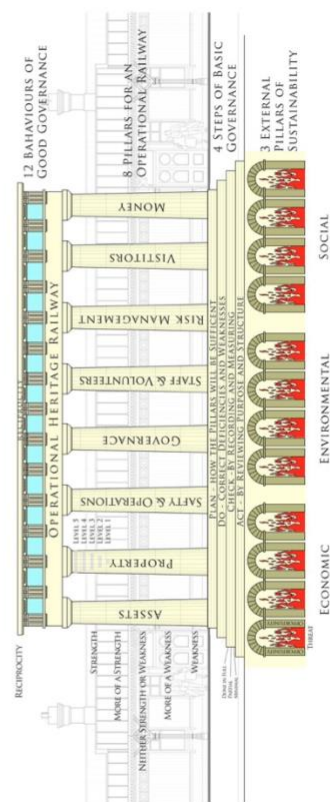
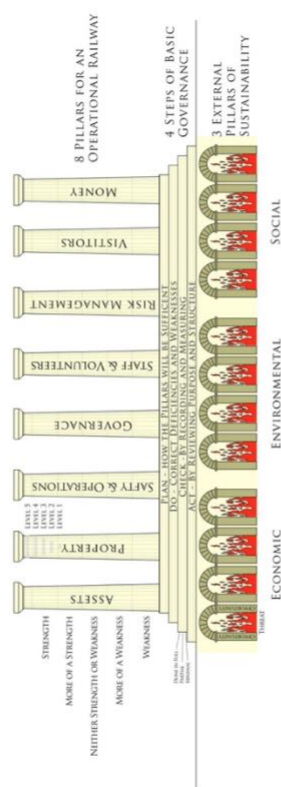


Diagram 9-01 A visual representation of the development of the eight conditions drawn as pillars of heritage railway's sustainability, (note risk management was replaced by environment).

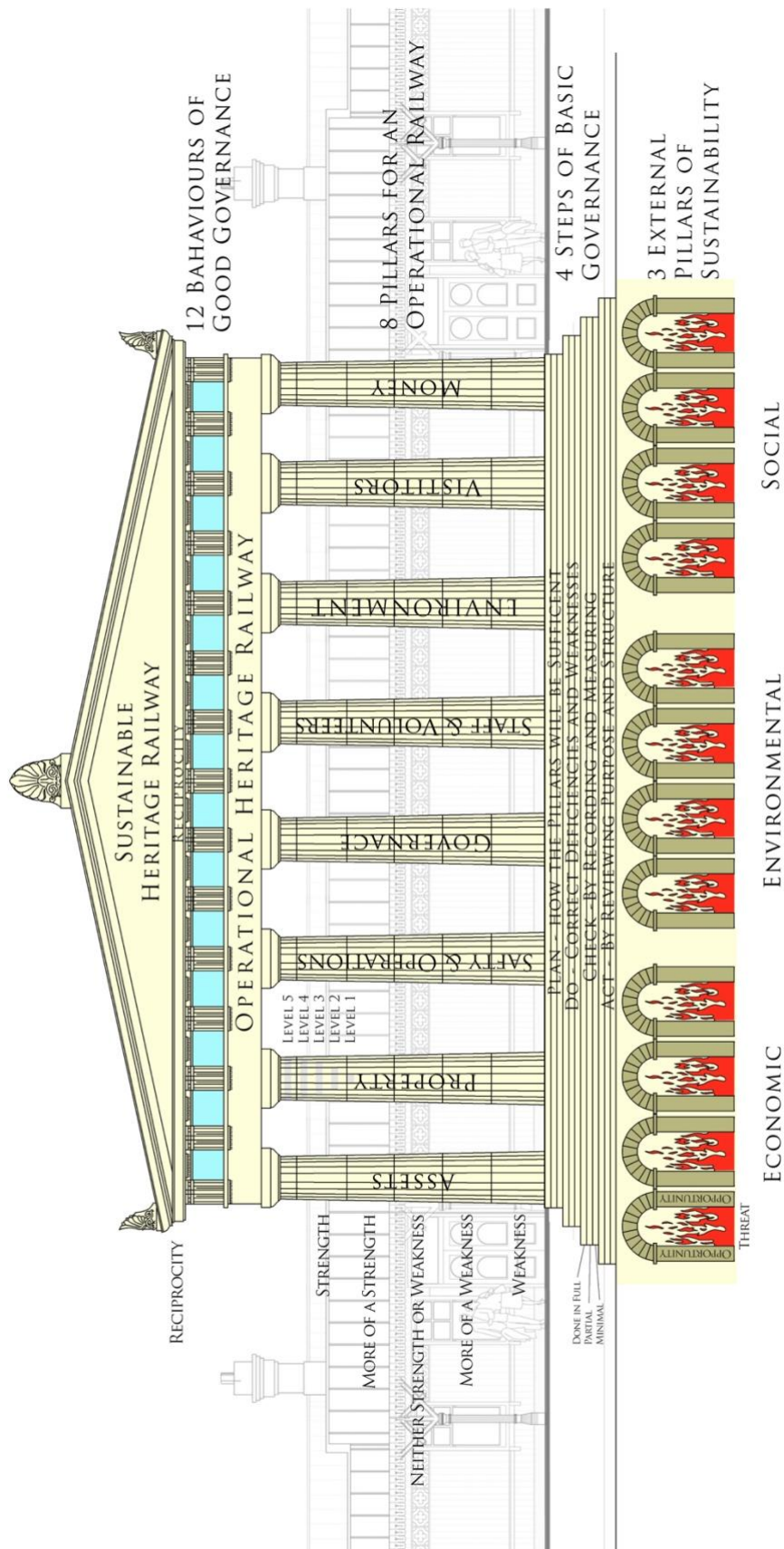


Diagram 9-02 A visual representation of the eight conditions drawn as pillars of heritage railway's sustainability.

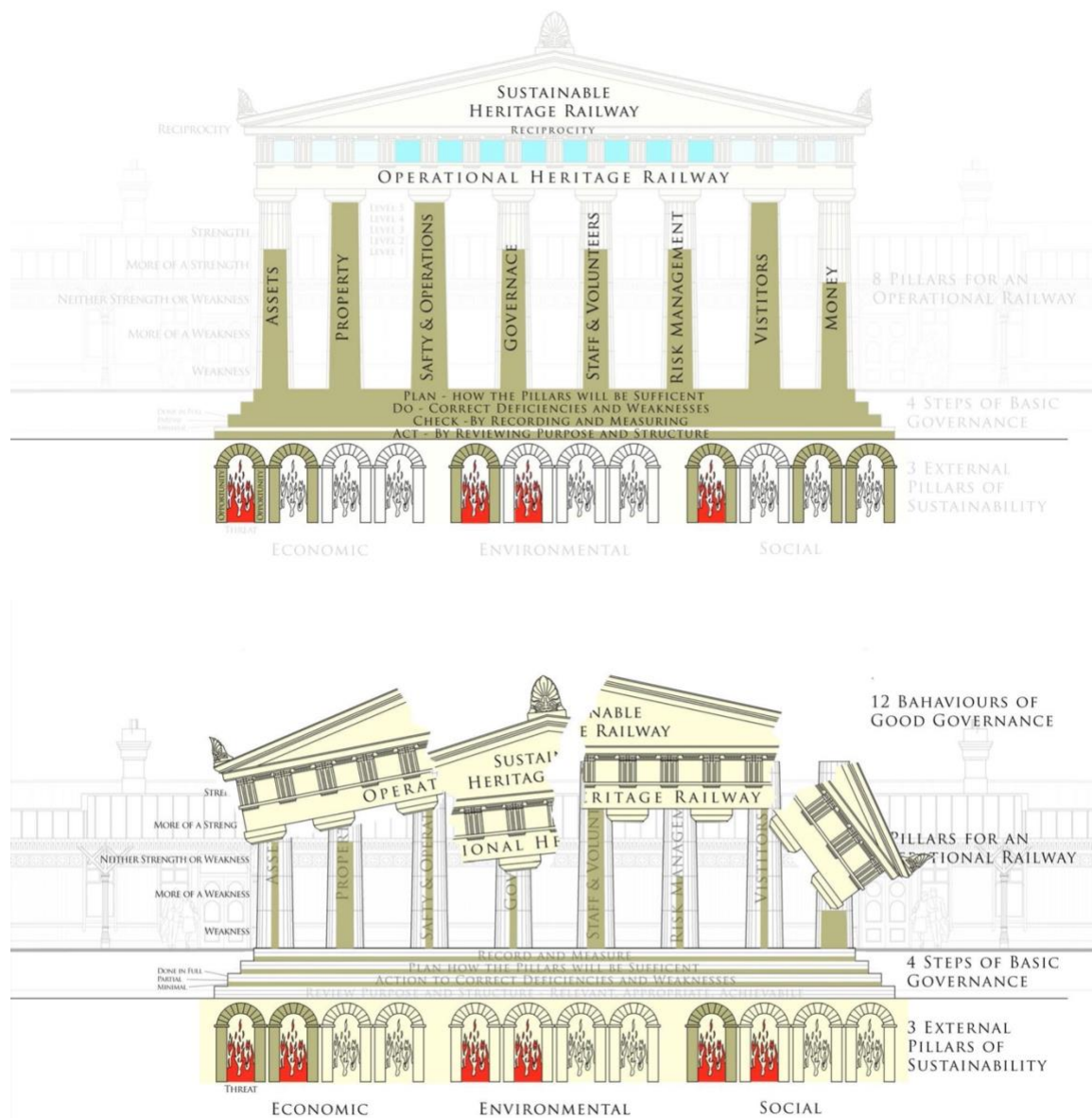


Diagram 9-03 A visual representation of the eight conditions showing the pillars as measured as a strength or weakness, and if any, or all of, the pillars are too weak then the edifice will collapse.

Diagrams 9-01 - 03 place in visual form the eight operational conditions above the 3 pillars of sustainability – economic, environmental and social. The illustrative device used is the architectural classical temple façade, with its foundations, floor, support columns or pillars for the roof, with its entablature and pediment.

The lower two images show the pillars in terms of strengths and weakness; if the pillars are sufficiently weak the edifice will collapse.

Combining recognised standards and assessment models of governance, such as the Cabinet Office's capability model, the Government's Property Asset Management Capability Assessment Model (PAMCAM), the ORR's RM3, CITI's Management Capability Assessment Framework, and the work of Duchek (2019), it is possible to develop an assessment model specific and appropriate for heritage railways, mainly by adopting language and concepts more readily recognised by them, rather than language used in generalised business and organisational settings.

This means that directors are more likely to consider it to be relevant and in a useable form. For example, the ORR's RM3 model has been designed for main line railway companies and is widely used throughout that sector. It is capable of being used by heritage railways, and the HRA encouraged its use, however the researcher was aware of no heritage railway prior to 2019 using RM3. In conversations with directors, it was seen as overly complex and not applicable to small operations, which appears to be as much a problem about presentation as content. This was confirmed in a meeting with the ORR who were also concerned at the lack of take up of the model following a presentation to the sector in November 2016.

Diagram 9 - 04 below shows the initial proposal for an assessment model.

Part 1

Managing the pillars collectively

The pillars being: Tangible assets, Property assets, Safety and Operational systems, Governance, Members Staff and Volunteers, Risk Management, Visitors, Money

Based on the HSE 'Plan, Do, Check, Act a heritage railway, as a minimum, should undertake systematically and regularly the following:

	To what level achieved				Total
	Never	Minimal	Partial	Done in Full	
	Score 0	Score 1	Score 2	Score 3	
Plan - how each of the pillar(s) will be sufficient to meet the future requirements of the heritage railway over defined timescales					
Do - correct any deficiencies or weaknesses identified in any of the pillars above to ensure sufficiency of overall operation					
Check – by recording and/or measuring the strengths and weaknesses, or similar, of each of the pillars above for a sustainable railway					
Act – by reviewing the organisational purpose and structure to ensure relevancy, achievability and appropriateness					
Total					

Part 2

Managing the pillars individually

	Section A Level to which each Pillar is managed						Section B The Strength or Weakness of each Pillar						
	Level 1	Level 2	Level 3	Level 4	Level 5		Weakness	More of a weakness	Neither a strength of weakness	More of a strength	Strength		
Pillars	Score 1	Score 2	Score 3	Score 4	Score 5	Score A	Score 1	Score 2	Score 3	Score 4	Score 5	Score B	Score A x B
Tangible assets													
Property													
Safety and Operations													
Governance													
Members Staff and Volunteers													
Risk Management													
Visitors													
Money													
Total													

Part 3 Behaviours at Board Level						
	Rarely displayed	Occasionally displayed	Sometimes displayed	Mostly displayed	Always displayed	
	Score 1	Score 2	Score 3	Score 4	Score 5	Total
1. Preparedness						
2. Doing the right thing						
3. Faith						
4. Alignment						
5. Bottom line of Governance						
6. Roles and responsibilities						
7. Planning for the best and worst						
8. Leadership and teamwork						
9. Making the best decisions						
10. Vigilance						
11. Communication						
12. On Guard						
Total						

Part 4

External Factors - Threats or Opportunities

		List of up to 4 of best opportunities	List of up to 4 of the worst threats
The Economy , how well trends are understood as treats or opportunities	1		
	2		
	3		
Society how well trends are understood as treats or opportunities	1		
	2		
	3		
Environment how well trends are understood as treats or opportunities	1		
	2		
	3		

Part 5

Reciprocity

	Doubts	Unsure	Maybe	Probably	Certain
Everyone is getting 'something' back in a proportion to the efforts put in or the contribution made					

Part 2 (extended) Managing the pillars individually													
	Section A Level to which each Pillar is managed						Section B The Strength or Weakness of each Pillar						
	Level 1	Level 2	Level 3	Level 4	Level 5		Weakness	More of a weakness	Neither a weakness or a strength	More of strength	Strength		
Pillars	Score 1	Score 2	Score 3	Score 4	Score 5	Score A	Score 1	Score 2	Score 3	Score 4	Score 5	Score B	Score A x B
Tangible assets													
<i>Locomotives</i>													
<i>Coaches</i>													
<i>Track</i>													
<i>Machinery</i>													
Property													
<i>Lease</i>													
<i>Stations</i>													
<i>Loco Depot</i>													
<i>Bridges</i>													
Safety and Operations													
<i>Rule Book</i>													
<i>SMS</i>													
<i>Safety Culture</i>													
Governance													
<i>Board</i>													
<i>Succession</i>													
<i>Communication</i>													
<i>Vision</i>													
Members Staff and Volunteers													
<i>Age profile</i>													
<i>Skills</i>													
<i>Recruitment</i>													
<i>Facilities</i>													
Risk Management													
<i>Risk register</i>													
<i>Risk management</i>													
Visitors													
<i>Numbers</i>													
<i>Offers</i>													
<i>Events</i>													
<i>Research/feedback</i>													
Money													
<i>Cash flow</i>													
<i>P&L</i>													
<i>Fund raising</i>													
Total													

Diagram 9-04 Example of how an assessment tool was developed.

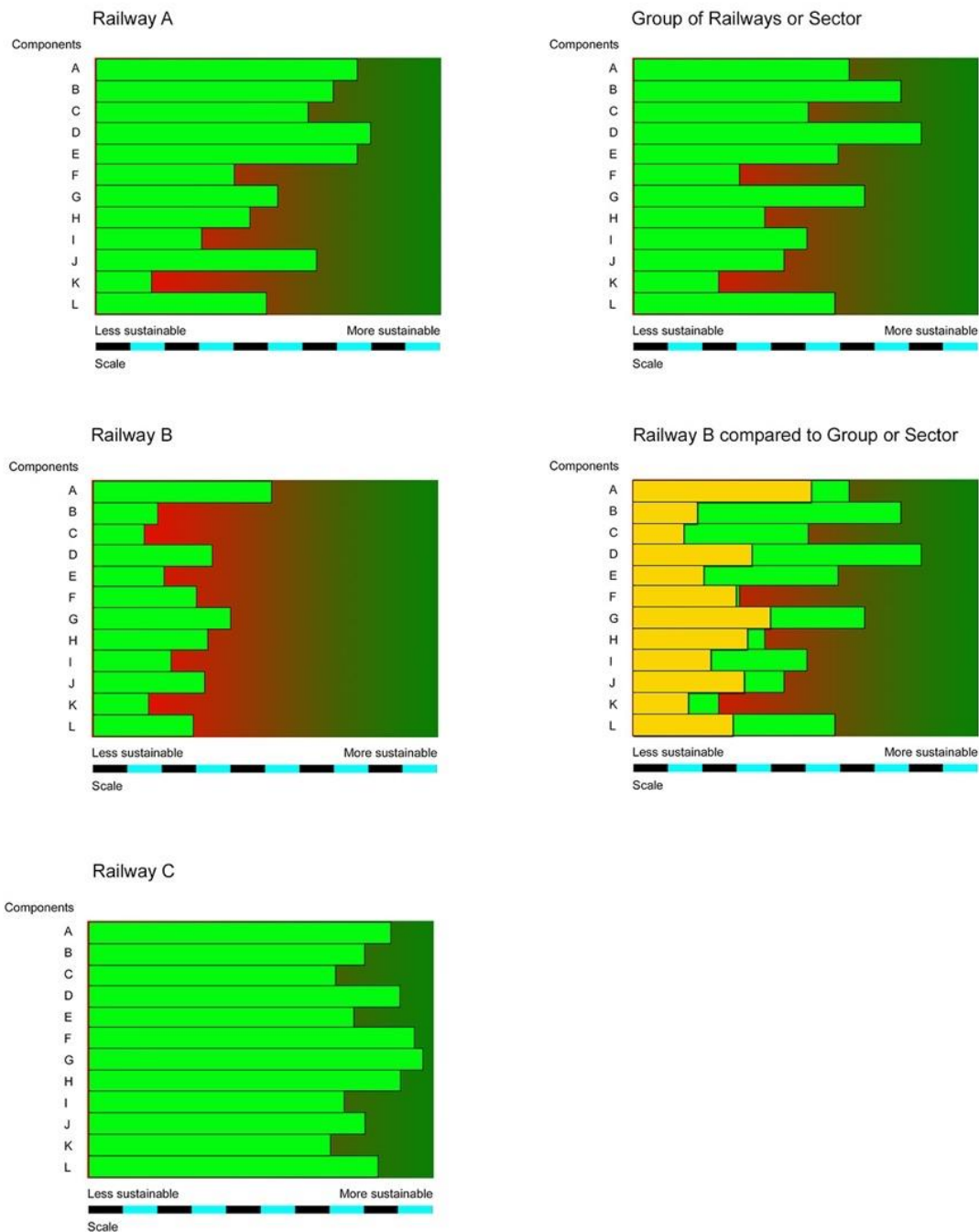


Diagram 9-05 Example results from the proposed assessment tool to allow a heritage railway to assess itself in terms of sustainability, and how cross sector comparisons could be made, and between individual railways by benchmarking.

This was further developed as below:

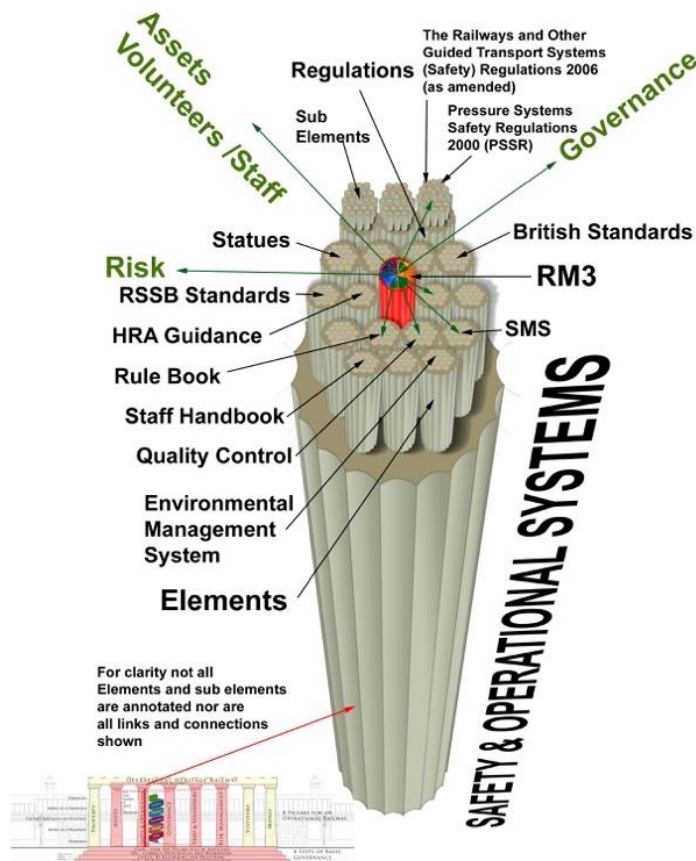


Diagram 9-05 *How the conditions fit within the ORR's RM3 model.*

9.2 A heritage version of RM3

A meeting was arranged with HM Chief Inspector of Railways, Office of Rail and Road in February 2018. The discussion centred around the progress of the research and the use of an appropriate assessment and inspection tool for heritage railways. It was agreed that there was an opportunity to collaborate in designing an effective tool that would also be accepted and adopted by heritage railways. As a result of this collaboration the researcher undertook to modify the existing RM3 model and develop it with suitable language and nomenclature.

This resulted in the production of a RM3 Topic Set for the heritage sector to support the use of RM3 on heritage railways. The intention was to provide meaningful descriptors over nine

criteria: SP1 Leadership; SP3 Governance; SP4 Written SMS arrangements; OP2 Competence management; OC7 Record keeping; PI1 Risk management; RCS2 Asset management; MRA2 Audit; MRA3 Incident investigation; and include 12 tablets of good governance (see below) that reflect the heritage sector railway environment. This was trialled at a series of RM3 heritage seminars held in late 2019 /early 2020 and wider consultation commenced later in 2020/21.

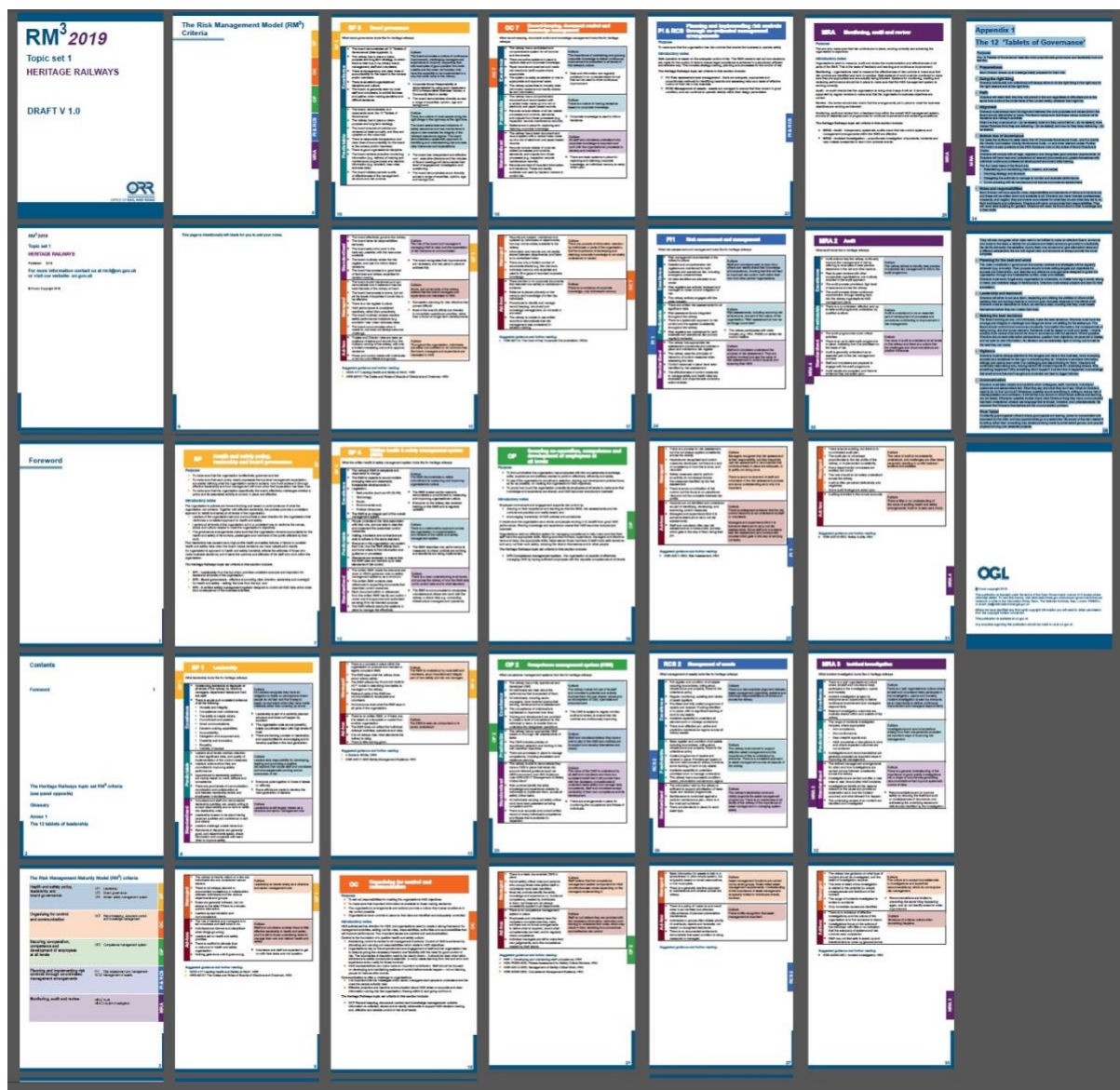


Image 9-01 The Heritage Railway Topic Set of RM3 2019. Due to size the full-size pages are included as a separate document – Appendix 9.

As part of the process to explain what good governance looks like, 12 'Tablets of Governance' have been produced and are now incorporated in the document. Following a meeting of the ORR RM3 Governance Board these are likely to be incorporated into the full RM3 model.

The Tablets were sourced from the literature on governance and published codes of good governance that related to issues raised during the interviews with directors and the ORR. Each tablet was based on a topic raised as a weaknesses or strength. These were then produced as a draft list and discussed and moderated at a workshop, the Tablets were then trialled and adopted at one heritage railway, with feedback incorporated. They were then assessed by the ORR legal department before incorporation in RM3. The 12 Tablets are shown in Table 9 -02

Table 9-02 12 'Tablets of Governance'.

12 'Tablets of Governance'

Purpose

The 12 'Tablets of Governance' describe what proportionate governance and leadership look and feel like.

1. Preparedness

Each Director shows up to meetings totally prepared for their role.

2. Doing the right thing

Directors individually and collectively will always strive to do the right thing in the right way for the right reasons and at the right time.

3. Faith

Directors will retain faith that they will prevail in the end regardless of difficulties and at the same time confront the brutal facts of the current reality, whatever that might be.

4. Alignment

Directors must always have full alignment between the core purposes and values [which the Board should define/refer to here]. The Board makes sure that these values underpin all its decisions and railway's activities.

What it is they must excel at – [to be stated]; what it is they cannot fail at – [to be stated]; what makes Directors think they are delivering – [to be stated]; and how do they keep delivering – [to be stated].

5. Bottom line of Governance

Our base line is [Board to state here], the UK Corporate Governance Code, and if a charity the Charity Commission Charity Governance Code; and/or other relevant codes. Further information is also available at the HRA Guidance note on the duties of Board Directors & Chairs. Directors will comply with all legal, regulatory and recognised good practice requirements. All Directors will have read and understood all relevant documents and update themselves with individual continuous professional development and board wide training.

The four basic tasks of the Board are:

- Establishing and maintaining vision, mission, and values
- Deciding strategy and structure
- Delegating the authority to manage, monitor and evaluate performance
- Communicating with its members and all internal and external stakeholders

6. Roles and responsibilities

Each Director will have specific roles, responsibilities and standards of ethics and behaviours; these will be written down and available to all. Directors can never tolerate carelessness, incapacity, and neglect; they are forever accountable for what they do and what they fail to do both individually and collectively. Directors will never compromise their responsibilities. They will never take anything for granted. Directors will never be found short in their knowledge and in their skills. They will also recognise other roles need to be fulfilled to make an effective Board: someone who looks to the stars; a stickler for procedure and detail; someone grounded in practicality; the devil's advocate; the sensitive, touchy feely one; someone to give alternative views and a different perspective; the ice-cold logical view; and someone to always provide the moral compass.

7. Planning for the best and worst

The rules / constitution / governance documents / policies and strategies will be regularly reviewed (e.g. annually). Their purpose should include setting targets and objectives for success and intervention, and describe and reference arrangements designed to guide the organisation through any foreseeable conflict, crisis, and disaster. Directors must never forget every organisation is vulnerable, no matter how big or small, strong or weak, and whatever stage of development. Directors must always prepare and plan for their succession.

8. Leadership and teamwork

Directors will strive to act as a team, respecting and utilising the abilities of others whilst realising they are working towards a common goal. Success depends on the efforts of all. Directors must be disciplined to follow, as well as to lead, knowing that they must master themselves before they can master their task.

9. Making the best decisions

The Board working as one, not individuals, makes the best decisions. Directors must have the courage and integrity to challenge how things are done: not settle for the status quo. The Board should confront and overcome complexity, incomplete information, the consequences of being wrong, and the human element. Decisions must be based on truth and reality – what is actually done versus what should be done in accordance with the standard. Where possible, Directors should seek alternative perspectives, question their objectivity, be paranoid to biases and be open to new information. No decision can be absolutely right or wrong, but it must be the best they can make.

10. Vigilance

Directors must be always attentive to the dangers and risks to the business, never accepting success as a substitute for the rigor in everything they do. Directors must share information willingly and openly even when it is challenging and discomfoting for them. Directors will continually ask why, looking behind the incident reports for underlying factors. Why something happened? Why something didn't happen? And the How it happened. Acknowledge that small errors that aren't caught and corrected can lead to bigger failures.

11. Communication

Directors must listen closely and carefully when colleagues, staff, members, volunteers, customers and stakeholders talk. What they say and what they don't say. What do Directors need to do to find out more? Whenever possible record everything in writing to reduce risk of misinterpretation and confusion. It will be the only record on which future actions and learning can be based. Whenever possible double check that what Directors think they have communicated has been understood, always use language that is simple, inclusive, and understandable. Be prepared that Directors themselves are the communication problem.

12. Final Tablet

Constantly guard against a Board where good people are leaving, power is concentrated and exercised by the chair; and key appointments go to a select few. Be aware of the risk created is by telling rather than consulting; key decisions being made by small select groups, and popular projects winning over essential projects.

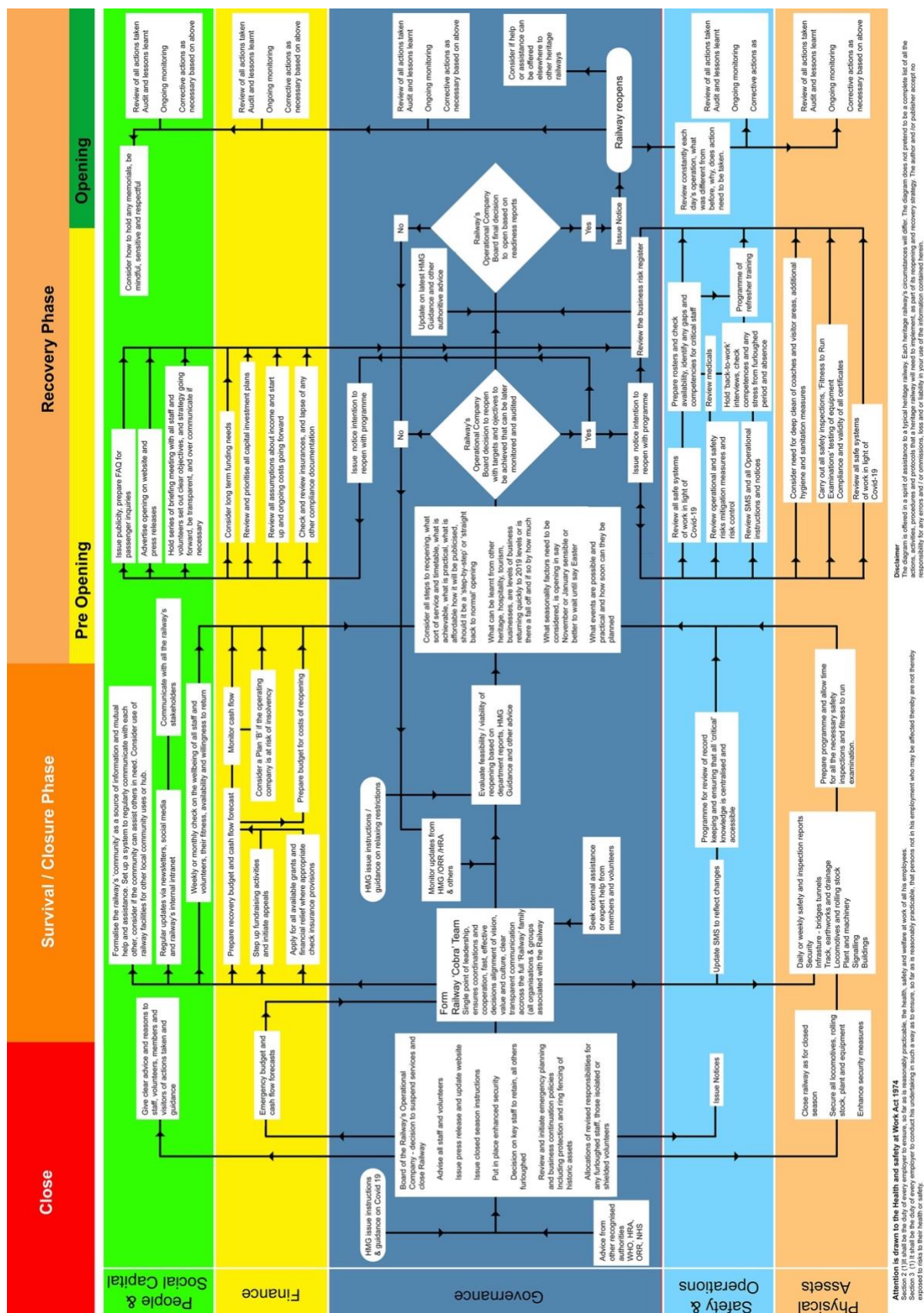
The assessment tool has been further developed in the form of a risk register this is shown at Diagram 9-06.

Risk ID	Risk Category	Risk Description	Risk Assessment	Risk Rating	Risk Owner	Risk Status	Risk Action
101	Operational	Loss of revenue due to reduced passenger numbers	Low	Low	Owner	Open	Monitor passenger numbers and adjust pricing accordingly
102	Operational	Loss of revenue due to reduced freight numbers	Low	Low	Owner	Open	Monitor freight numbers and adjust pricing accordingly
103	Operational	Loss of revenue due to reduced event numbers	Low	Low	Owner	Open	Monitor event numbers and adjust pricing accordingly
104	Operational	Loss of revenue due to reduced membership numbers	Low	Low	Owner	Open	Monitor membership numbers and adjust pricing accordingly
105	Operational	Loss of revenue due to reduced sponsorship numbers	Low	Low	Owner	Open	Monitor sponsorship numbers and adjust pricing accordingly
106	Operational	Loss of revenue due to reduced merchandise sales	Low	Low	Owner	Open	Monitor merchandise sales and adjust pricing accordingly
107	Operational	Loss of revenue due to reduced catering sales	Low	Low	Owner	Open	Monitor catering sales and adjust pricing accordingly
108	Operational	Loss of revenue due to reduced bar sales	Low	Low	Owner	Open	Monitor bar sales and adjust pricing accordingly
109	Operational	Loss of revenue due to reduced parking fees	Low	Low	Owner	Open	Monitor parking fees and adjust pricing accordingly
110	Operational	Loss of revenue due to reduced ticket sales	Low	Low	Owner	Open	Monitor ticket sales and adjust pricing accordingly
111	Operational	Loss of revenue due to reduced refreshment sales	Low	Low	Owner	Open	Monitor refreshment sales and adjust pricing accordingly
112	Operational	Loss of revenue due to reduced gift shop sales	Low	Low	Owner	Open	Monitor gift shop sales and adjust pricing accordingly
113	Operational	Loss of revenue due to reduced train hire fees	Low	Low	Owner	Open	Monitor train hire fees and adjust pricing accordingly
114	Operational	Loss of revenue due to reduced track hire fees	Low	Low	Owner	Open	Monitor track hire fees and adjust pricing accordingly
115	Operational	Loss of revenue due to reduced accommodation fees	Low	Low	Owner	Open	Monitor accommodation fees and adjust pricing accordingly
116	Operational	Loss of revenue due to reduced catering fees	Low	Low	Owner	Open	Monitor catering fees and adjust pricing accordingly
117	Operational	Loss of revenue due to reduced bar fees	Low	Low	Owner	Open	Monitor bar fees and adjust pricing accordingly
118	Operational	Loss of revenue due to reduced parking fees	Low	Low	Owner	Open	Monitor parking fees and adjust pricing accordingly
119	Operational	Loss of revenue due to reduced ticket sales	Low	Low	Owner	Open	Monitor ticket sales and adjust pricing accordingly
120	Operational	Loss of revenue due to reduced refreshment sales	Low	Low	Owner	Open	Monitor refreshment sales and adjust pricing accordingly
121	Operational	Loss of revenue due to reduced gift shop sales	Low	Low	Owner	Open	Monitor gift shop sales and adjust pricing accordingly
122	Operational	Loss of revenue due to reduced train hire fees	Low	Low	Owner	Open	Monitor train hire fees and adjust pricing accordingly
123	Operational	Loss of revenue due to reduced track hire fees	Low	Low	Owner	Open	Monitor track hire fees and adjust pricing accordingly
124	Operational	Loss of revenue due to reduced accommodation fees	Low	Low	Owner	Open	Monitor accommodation fees and adjust pricing accordingly
125	Operational	Loss of revenue due to reduced catering fees	Low	Low	Owner	Open	Monitor catering fees and adjust pricing accordingly
126	Operational	Loss of revenue due to reduced bar fees	Low	Low	Owner	Open	Monitor bar fees and adjust pricing accordingly
127	Operational	Loss of revenue due to reduced parking fees	Low	Low	Owner	Open	Monitor parking fees and adjust pricing accordingly
128	Operational	Loss of revenue due to reduced ticket sales	Low	Low	Owner	Open	Monitor ticket sales and adjust pricing accordingly
129	Operational	Loss of revenue due to reduced refreshment sales	Low	Low	Owner	Open	Monitor refreshment sales and adjust pricing accordingly
130	Operational	Loss of revenue due to reduced gift shop sales	Low	Low	Owner	Open	Monitor gift shop sales and adjust pricing accordingly
131	Operational	Loss of revenue due to reduced train hire fees	Low	Low	Owner	Open	Monitor train hire fees and adjust pricing accordingly
132	Operational	Loss of revenue due to reduced track hire fees	Low	Low	Owner	Open	Monitor track hire fees and adjust pricing accordingly
133	Operational	Loss of revenue due to reduced accommodation fees	Low	Low	Owner	Open	Monitor accommodation fees and adjust pricing accordingly
134	Operational	Loss of revenue due to reduced catering fees	Low	Low	Owner	Open	Monitor catering fees and adjust pricing accordingly
135	Operational	Loss of revenue due to reduced bar fees	Low	Low	Owner	Open	Monitor bar fees and adjust pricing accordingly
136	Operational	Loss of revenue due to reduced parking fees	Low	Low	Owner	Open	Monitor parking fees and adjust pricing accordingly
137	Operational	Loss of revenue due to reduced ticket sales	Low	Low	Owner	Open	Monitor ticket sales and adjust pricing accordingly
138	Operational	Loss of revenue due to reduced refreshment sales	Low	Low	Owner	Open	Monitor refreshment sales and adjust pricing accordingly
139	Operational	Loss of revenue due to reduced gift shop sales	Low	Low	Owner	Open	Monitor gift shop sales and adjust pricing accordingly
140	Operational	Loss of revenue due to reduced train hire fees	Low	Low	Owner	Open	Monitor train hire fees and adjust pricing accordingly
141	Operational	Loss of revenue due to reduced track hire fees	Low	Low	Owner	Open	Monitor track hire fees and adjust pricing accordingly
142	Operational	Loss of revenue due to reduced accommodation fees	Low	Low	Owner	Open	Monitor accommodation fees and adjust pricing accordingly
143	Operational	Loss of revenue due to reduced catering fees	Low	Low	Owner	Open	Monitor catering fees and adjust pricing accordingly
144	Operational	Loss of revenue due to reduced bar fees	Low	Low	Owner	Open	Monitor bar fees and adjust pricing accordingly
145	Operational	Loss of revenue due to reduced parking fees	Low	Low	Owner	Open	Monitor parking fees and adjust pricing accordingly
146	Operational	Loss of revenue due to reduced ticket sales	Low	Low	Owner	Open	Monitor ticket sales and adjust pricing accordingly
147	Operational	Loss of revenue due to reduced refreshment sales	Low	Low	Owner	Open	Monitor refreshment sales and adjust pricing accordingly
148	Operational	Loss of revenue due to reduced gift shop sales	Low	Low	Owner	Open	Monitor gift shop sales and adjust pricing accordingly
149	Operational	Loss of revenue due to reduced train hire fees	Low	Low	Owner	Open	Monitor train hire fees and adjust pricing accordingly
150	Operational	Loss of revenue due to reduced track hire fees	Low	Low	Owner	Open	Monitor track hire fees and adjust pricing accordingly

Diagram 9-06 Risk register template – Mid Fens Heritage Railway, shown as a thumbnail, full size as attachment, Appendix 10.

9.3 Stage 3 Effects of Covid-19 on outputs

The research undertaken in response to the Covid pandemic has been incorporated into the ORR guidance for recovery of heritage railways. This has taken the form of a flow chart which is shown as Diagram 9-07 below.



Key points of the chapter

An objective of the research was to construct a model of the features and components specific to the sustainability of heritage railways by focusing on all the elements that are critical, both for survival and development. The model was designed to assist heritage railways optimise their own sustainability by highlighting strengths and weaknesses and therefore can act as an early warning of factors that could jeopardise, to a greater or lesser extent, an individual railway or the sector more generally.

The model was also designed to address an identified reluctance by directors to use already available assessment tools, these being considered not relevant and overly complex. This issue was addressed by incorporating the research into a modified version of the ORR's Risk Management Maturity Model RM3 for the rail industry in a specific version for heritage railways (RM3-H). This was tested and welcomed by heritage railways in a series of ORR-organised seminars in 2019.

RM3 (H) provides meaningful descriptors over nine criteria: Leadership; Governance; SMS arrangements; Competence management; Record keeping; Risk management; Asset management; Audit; Incident investigation; and includes 12 'tablets of good governance'. The tablets were sourced from the literature on governance and published codes of good governance that related to issues raised during the interviews with directors and the ORR.

The research has also produced a series of outcomes and outputs which are considered to be of practical benefit to the sector. These include: a risk register template; a contribution to the ORR's guidance on the recovery of heritage railways from the Covid-19 Pandemic; and two published articles in the 'Steam Railway' magazine, see Appendix 7.

Chapter 10

Conclusions, recommendations and reflections

Chapter contents	<i>10.1 Core Theme</i>
	<i>10.2 The conditions and recommendations</i>
	<i>10.3 Property</i>
	<i>10.4 Assets</i>
	<i>10.5 Operational systems</i>
	<i>10.6 Governance</i>
	<i>10.7 Staff, Volunteers and Members</i>
	<i>10.8 Environment</i>
	<i>10.9 Visitors</i>
	<i>10.10 Money</i>
	<i>10.11 The overarching condition - Social capital</i>
	<i>10.12 Other identified risks - Externalities</i>
	<i>10.13 Reflective account</i>
	<i>10.14 Has the research and its findings contributed to filling the acknowledged gap?</i>
	<i>10.15 Were the research methods used appropriate?</i>
	<i>10.16 Was the data reliable, and open to scrutiny?</i>
	<i>10.17 Are the findings made independently validated or are they challengeable, are other findings possible based on a different interpretation of the data, what questions remain unanswered?</i>
	<i>10.18 Could additional data change or refine the results?</i>
	<i>10.19 How was bias accounted for?</i>
	<i>10.20 Are the outputs of value to the sector?</i>
	<i>10.21 Key question</i>
	<i>10.22 Final conclusion - Governance for sustainability and building social capital</i>

Eight conditions were discovered as being collectively necessary for a heritage railway to be considered operational. These are: property; assets; operational systems; governance; staff, volunteers and members; environment; visitors; money.

These are termed the eight (operational) conditions. They were discovered through a systematic process of taking all the conditions that could be found through observation of published sources and interviews, and a grouping, filtering and reduction process until the minimum number of practical conditions were reached. The conditions were validated through questionnaire survey and interview. The conditions have formed the basis of an assessment model as an output.

One further overarching condition of social capital was discovered to be critical to overcoming any deficiencies and weaknesses in the eight conditions. This was concluded by the eight conditions not in themselves being sufficient to explain the longevity and resilience of the sector as a whole when compared to a typical commercial enterprise. This condition was found by looking at the case studies of incidents where an individual railway came close to, but survived, a failure in one or more of the eight operating conditions.

It is this condition more than any other that has provided heritage railways with their longevity and ability to survive near death experiences. This condition was validated by reference to case studies and its importance confirmed during the recent Covid-19 pandemic whereby heritage railways were able to successfully appeal to their members and the public for donations to allow them to survive, in ways that purely commercial companies could not. This is termed the sustainable condition.

10.1 Core Theme

The core theme that has run throughout the thesis is that heritage railways have arrived at a mature point on their lifecycle trajectory, not by strategic planning, design or above average

standards of operation and governance but by a clearly defined original purpose and vision based on an emotive need of some to save what they feared would be lost. This has been validated from Chapters 2, 4 and 6 by reference to the motivations of the early pioneers described in the literature, by plotting the spread of openings and rise in visitor figures, the lack of entrepreneurial spirit revealed in the survey, and other markers such as the current (Pre Covid) relative stability of visitor figures which, together, all indicate a mature position.

Chapters 2, 4 and 6 established that they are different from purely commercial businesses, insofar as they mostly have charitable objectives and can call upon volunteer labour and donations without which they would be generally financially unviable. The theory proposed (Chapter 6) is that governance has been at least 'good enough' to get heritage railways to their current position in their lifecycle trajectory but may not, or is unlikely to, be good enough to secure their sustainability through future development and prosperity without improvement.

A conceptual model of heritage railways has been proposed in Chapter 9 describing the importance of governance, and its reliance on social capital to mitigate any shortcomings of funding, resources, leadership, administration and expertise.

The discussion developed in Chapter 8 is that the concepts and theories of governance and the imposition of regulation usually impose tighter frameworks and parameters of operation over time. The literature on governance and risk management in Chapter 4 highlights the importance of knowing and assessing an entity's current and potential necessary conditions of operation and sustainability. Discovering these necessary conditions was covered in

Chapters 5 and 6. The discussion continued with how ready and prepared heritage railways are to face these challenges and adapt to any change and what tools may assist in any transition. Recommendations are set out below.

10.2 The conditions and recommendations

Table 9-01 provides a summary of the conditions and recommendations. The reasoning for each of these recommendations is explained below together with the benefits and cost of implementation. The recommendations were generated by considering the risks and challenges highlighted in the research, and as contained in contemporary magazine articles, observations made, the survey and interviews.

The assessment of risk was reached using the method described in Chapter 8 by the creation of a template for a heritage railway risk register. The researcher produced an initial assessment which was then moderated by a group of four heritage railway directors to form a consensus of opinion.

Table 10-01 *Table of recommendations.*

Condition	Risk	No	Recommendation
Property	Red	1	Heritage railways should review, update and digitise all their property records. In particular, condition surveys need to be in date with appropriate information.
		2	An overarching body such as the Heritage Railway Association or an extension of the remit of the Heritage Railway Trust should coordinate information from individual heritage railways in the form of a master register.
Assets	Amber	3	Heritage railways should review, update and digitise all their asset records. In particular, condition surveys need to be in date with appropriate cost, forward programmes of maintenance in place with identified funding sources.
Operational Systems	Amber	4	Heritage railways continue to give greatest priority to their safety management systems and safety culture.
		5	Heritage railways urgently address the digitisation and improvement of record keeping, including the documentation of skills and crafts.
		6	A Safety and Standards Board for heritage railways is created.
Governance	Red	7	Heritage railways, Boards embark on a plan with definitive timescales to put in place succession and deliver Boards with a more balanced age profile, gender mix and ethnic diversity than current composition. Heritage railways, Boards adopt the ORR's heritage railway risk management maturity model RM3 2019.
Staff, Volunteers and Members	Red	9	Heritage railways improve their collection of data on volunteers to identify and value their input and plan for succession.
Environment	Red	10	If Recommendation 6 is followed, a Heritage Railway Safety and Standards Board is tasked with preparing a risk assessment and mitigation for the environmental challenges facing heritage railways, in particular the efficacy and practicalities of alternative fuel sources and supply.
Visitors	Red	11	Heritage railways pool information on visitor expectations, visit feedback, and any researched and observed trends.
Money	Red	12	Heritage railways place themselves on a financial survival footing and prepare alternative plans for the railway to continue in the event of insolvency, which is to protect and ring-fence assets and ensure the continuance of their Light Rail Order or Transport and General Works Order.
Social Capital	Amber	13	Further research is undertaken into the extent and value of a heritage railway's social capital.
Externalities	Red	14	Heritage railways seek to build resilience by improving their preparedness to face unknown and uncertain risks, in particular emergency planning, access to a war chest, long term investment and building of social capital, good access to data and an open-minded, questioning, accountable and diverse Board.

10.3 Property

The failure of a heritage railway to secure its property has been the cause of several terminations, though this in itself was often insufficient to permanently terminate the organisation and its collection disposed as it was often reformed and relocated to another site. Heritage railways are occupiers of a considerable estate of land, usually of a linear nature between one and over 20 miles in length. This includes urban, rural and national park settings. This landholding also consists of numerous railway related structures and buildings, many of which are of historic importance and listed. First-hand observations show them to be in a mostly restored and operational condition. There is no comprehensive published source of information on this land holding, its status or the condition of its buildings and structures other than records held by individual railways. The quality and comprehensiveness of the records held by individual railways is unknown but from discussions at the interviews there seems to a great variance between good and poor.

An indication of the scale of the problems encountered with the railway's property can be seen with the cost of repairs to the Falling Sands Viaduct on the Severn Valley Railway due to cracks and erosion caused by water seepage. The estimated cost of repair is £1.324m of which £927,000 was granted by the Heritage Lottery Fund and £397,000 as match funding from the Severn Valley Railway Charitable Trust Limited (Steam Railway ed 499). No funds were contributed from ticket revenue. In this case the risk was identified, and a plan put in place to address the problem, which at the time of writing (August 2020) is being delivered. This is one viaduct on one railway, albeit one of significance. The North Yorkshire Moors Railway has 18 miles of railway with more than 30 bridges, together with numerous cuttings and

embankments, one tunnel and several substantial stations, with associated buildings and depots.

Overall sustainability assessed risk: Red

Reasons: The scale and enormity of the problem(s) is unknown and there is uncertainty as to the source(s) of future funding if found to be a significant size.

Recommendation 1: Heritage railways should review, update and digitise all their property records. In particular, condition surveys need to be in date with appropriate cost forward programmes of maintenance in place with identified funding sources.

Why: Buildings and structures, particularly those often in excess of one hundred years old are subject to constant wear and tear and deterioration. Many of the buildings and structures need to be considered in the light of potential extreme weather events due to climate change, as well as their suitability to adapt to ever changing uses and energy conservation. These same risks equally apply to land drainage, cuttings, embankments, water courses, tunnels, bridges and viaducts. It must be noted and stressed that Recommendation 1 is not a new activity to be carried out, it is already, and has been, done since heritage railways commenced. The 'why' is that it has not always been given the priority and funding necessary and there are limits to how far programmes can be reduced or deferred. Only an individual railway can assess its own risk and the priority given to mitigate the risk.

Benefits of recommendation: Ensuring the heritage railway estate is secure and continually fit for purpose; a backlog of outstanding maintenance does not build up; and building and property prepared for increasingly likely future extreme weather events.

Cost: The enormity of undertaking this task cannot be underestimated, both in cost and effort, to improve and continually update records, surveys and work programmes as well as the necessary physical repairs, restorations, adaptations and improvements. No attempt has been made to monetise the value of work in detail, but a guesstimate of an average of only £0.25m for each of the 104 railways in the study with a combined route mileage of some 400 miles for annual property upkeep and building repairs, produces a total over £25m (the NYMR has recently been awarded a HLF grant of £4.6m of a £9.2m sustainability project focused on property investment and repairs. It has a target of raising £2.5m from members, passengers and public over five years). Generally, the higher cost of repairing and maintaining earthworks, infrastructure and buildings cannot be solely funded from operating surpluses which already struggle to meet the cost of day-to-day repairs. It will need significant additional funding and contribution, and although much can be done through voluntary labour, major civil engineering or building construction will need to be carried out by specialist contractors.

Recommendation 2: An overarching body such as the Heritage Railway Association or an extension of the remit of the Heritage Railway Trust should coordinate information from individual heritage railways in the form of a master register.

Why: As noted, the enormity of the task of carrying out Recommendation 1 has not been quantified. The historical and cultural value and importance as represented by the totality of

the heritage railway estate is great, if only by the number of listed buildings and structures it contains. The responsibility for Recommendation 1 falls to the individual heritage railway but based on lessons from the past, some railways will do well, and others will struggle.

Benefits of recommendation: A coordinated national database and register is a first step in understanding the risk and size of the problem. A second step is to be a source of guidance, assistance for heritage railways in tackling Recommendation 1 and provision of an alert mechanism for heritage at risk.

Cost: The cost could be relatively little as it is mostly an administrative task and the generating of guidance, therefore it could be achieved mostly or in part by voluntary input.

10.4 Assets

Heritage railways have a vast array of assets from large Pacific locomotives to small hand tools. As a category this covers everything from signalling equipment to the buffet car tea urn. Many assets are of considerable historic value but in daily use and subject to wear and tear and deterioration. All these assets are, or should be, recorded in the asset register. From first-hand observations they are in a wide variety of conditions - many unrestored, almost unrecognisable rusty hulks of machinery and equipment buried in undergrowth at one end of the spectrum, compared with a recently fully restored, polished and burnished locomotive at the other.

By definition, to operate, a railway must have sufficient assets in a 'fitness to run' condition. However, this situation can quickly change if a particular critical piece of equipment fails, be

it a signal wire, compressor or valve. Railways are responsible for their own record keeping and ensuring assets are available when needed. As with the property condition above, the quality and comprehensive nature of these records held by individual railways is unknown, but from discussions at the interviews there seems to be a great variance between good and poor. The assets of a heritage railway, as shown by the survey and interviews, have traditionally been regarded as a strength, though one under a constant need to invest in repairs.

Several directors noted, supported by contemporaneous articles in magazines, that appeals to raise money for a particular object are more successful than general fundraising appeals and the success of appeals increases by their attractiveness to the public – a new locomotive is more likely to generate donations than a replacement culvert, irrespective of the priority towards its contribution to forming a sustainable railway. There is the danger of ‘surprises’ - the Board of the West Somerset Railway has only recently addressed the urgent need for the renewal of its track as it is considered life expired, at £3,000 per 60ft panel of track that adds up to over £5m for 20 route miles, excluding points, crossings and sidings.

Overall sustainability assessed risk: Amber

Reasons: Generally, this is a condition that has been well managed by heritage railways, however, without comprehensive up to date surveys and programmes for repair this risk could turn red.

Recommendation 3: Heritage railways should review, update and digitise all their asset records. In particular, condition surveys need to be in date with appropriate cost forward programmes of maintenance in place with identified funding sources.

Why: Assets are subject to constant wear and tear and deterioration. Again, it must be noted and stressed that this Recommendation is not a new activity to be carried out, it is already and has been carried out since heritage railways commenced. However, as the need for track renewal on the West Somerset Railway demonstrated, much of the assets, as one interviewee commented “have like me ‘grown old’ with the railway and are becoming increasingly life expired”. It was explained by another interviewee “that a locomotive built by British Railways in the mid-1950s may have been only ten years old or less when scrapped, when it would have a life expectancy of say 40-50 years. And while their use on heritage railways has been less intense, these locomotives are now well over 60 years old and past their original life expectancy”.

Benefits of recommendation: Ensuring the heritage railway’s assets are secure and continually fit for purpose; a backlog of outstanding maintenance does not build up.

Cost: No attempt has been made to monetise the cost of ensuring there are sufficient operational assets available. Notional cost for a ten year overall of a medium sized locomotive is between £250k and £500k. A Mark 1 carriage undergoing extensive repairs would be £100k. To restore a train – locomotive and six coaches – easily reaches £1m. A medium sized heritage railway would expect a fleet of 3 - 4 operational locomotives and a fleet of at least 12 coaches. Unfortunately, heritage railway financial accounts are not sufficiently transparent to identify

all the spending on assets, because, as admitted by one director, many of the assets used are 'not on its books' and hired in or loaned from other organisations often on a grace and favour basis.

10.5 Operational systems

Heritage railways, as all railways, operate through the application of systems. Each and every part of an operational railway is regulated by rules. Both the literature and every interviewee stressed that 'safety is paramount'. Even at the lower speeds of a heritage railway of 25mph the momentum and forces are such that any accident could have fatal outcomes. The recent records of the Rail Accident Investigation Board show 34 accidents for heritage railways compared to 444 for mainline railways and 112 for light railways and metro. Concern has been expressed by the ORR on the safety record of heritage railways and it is accepted from all the interviewees that on safety there can be no compromise on compliancy. In terms of a railway's sustainability the issue is to continue to maintain and implement the current systems to the necessary standards and update these as practice and regulation demand. All the literature and first-hand experience demonstrate that a safe railway, following the laid down systems, also operates generally efficiently and effectively.

Within this category also falls knowledge management, data and record keeping. The research undertaken has identified this as a serious weakness of heritage railways. The problem is to be found at all levels. Individuals often carry very high levels of personal knowledge and experience but rarely is this formally documented. Information is not always shared, even within the heritage railway and little is shared between the wider heritage railway community except through personal networks, despite several attempts at

collaborative working. It was explained by a number of interviewees that much of a heritage railway's archives and records was often held in personal storage in garages and attics. From the interviews held it is a well-recognised and accepted problem.

The issue is that unless this information is digitised and held in centrally accessible storage it will be increasingly lost. An example of a recent problem is that an owning group needed to prove title of ownership. There was no dispute as to ownership, but nobody knew where the original documents were held. Sufficient evidence was eventually tracked down to the home of a retired director. Another example is in the area of craft skills - in the past these were handed on from father to son, from master to apprentice. As highlighted in several interviews, "often there is now no-one to pass these skills on to" or "a person that does want to learn is located in a different part of the country". Much of the craft engineering associated with steam locomotives, such as setting valve gear, is held in an ever-smaller and ageing group. This is a problem that will naturally increase over time unless it is addressed. This problem follows the identified risk under property and assets.

Overall sustainability assessed risk safety: Amber

Reasons: Running a safe railway is the number one priority and there is an ever-present danger from heavy machinery moving at speed. Any failures could have wider consequences beyond the actual incident. For example, a boiler explosion at a station or children killed in a fire on a 'Santa Special'.

Overall sustainability assessed risk information and record keeping: Red

Reasons: Current record keeping, and archiving is often poorly managed, and not always accessible, experience and knowledge is not always recorded and documented.

Recommendation 4

Heritage railways continue to give greatest priority to their safety management systems and safety culture.

Why: Any failure could place at risk a railway's ability to operate, by the issue of an Improvement Notice or Notice to Cease Operating issued by the Regulator - ORR.

Benefits of recommendation: The railway runs safely, efficiently and effectively.

Cost: There is no direct additional cost to this recommendation as safe systems must be in place prior to operation but there could be a significant cost of not following the recommendations and all good practice.

Recommendation 5

Heritage railways urgently address the digitisation and improvement of record keeping including the documentation of skills and crafts.

Why: Loss of information will increasingly place a railway's ability to function at risk.

Benefits of recommendation: The railway will be able to access its information and knowledge efficiently and effectively.

Cost: The required hardware and purchase of proprietary archive and data management system is not particular high, a first-hand quote obtained for the software demonstrated that the cost for a typical railway may be less than £10k. Locating and digitising the records, information and knowledge is a considerable task in time and effort but can be undertaken by volunteers.

Recommendation 6

A Safety and Standards Board for heritage railways is created.

Why: This follows directly from the RAIB recommendation resulting from the Croydon tram crash, for a similar body to be set up for light rail, based on the RSSB for the mainline rail industry. The purpose being to unify standards, share information and increase collaboration across the sector and provide guidance. The Light Rail Standards and Safety Board is seen by the ORR as a successful model to follow.

Benefits of recommendation: Unified standards, improved collaboration and issue of guidance.

Cost of recommendation: The Light Rail Standards and Safety Board was jointly funded by the Light Rail Sector and the Department for Transport (DfT) with a grant of £1.5m (<https://uktram.com/2019/02/07/funding-boost-for-light-rail-safety/>). The cost of setting up

an equivalent body for heritage railways, based on a full time CEO, administration, rent of minimal office space and two part time engineers and the commission of reports is estimated by the researcher to be of the order of £500k pa or an average levy of just over £2.5k across 104 railways if a 50% grant is made available from the DfT - £5k if no grant is forthcoming.

10.6 Governance

All the literature and guidance states the importance of good governance, not just in itself but also the influence and impact it has over all the other conditions as shown by the relationship diagram in Chapter 5. The surveys and interviews confirmed its importance. There was also a recognition that governance of heritage railways could be better, when compared to company Boards run by professional practitioners, rather than by what several interviewees describe as “enthusiastic amateurs”. It was often added that it is not to downplay or criticise the considerable personal experience and knowledge that many volunteers bring as directors to a heritage railway Board, but to recognise “it was a hobby not a paid job”. Most of the larger and medium sized heritage railways now have full time paid and experienced General Managers plus permanent staff to cover key functions such as marketing, finance, operations, engineering and human resources. As demonstrated in the literature, in the press and on internet forums, Board disputes or poor behaviours attract interest and gossip.

The long running problems of the West Somerset Railway stand out, with more than 10,000 internet posts on one thread alone on the internet forum ‘National Preservation’ (<https://www.national-preservation.com>). There is also much speculation articulated in the forum discussions that the problems of the West Somerset Railway are not unique and that

many other railways are “just better at hiding their ‘dirty washing’ (problems)”. It is not the place of this research to speculate but nor can the volume of complaints and accusations be totally ignored. No conclusions are reached as to the current standards of heritage railway governance other than in all interviews only ‘good intentions’ were expressed and a willingness to do the best for railways, even if opinions differed on how that objective should be achieved.

Even with first-hand experience of observing poor behaviours, there was no apparent malicious intent towards the railway, only to other individuals. As discussed in Chapter 6, Boards have exercised at least enough good governance to survive so far, in the proposed theory of ‘doing just enough good governance’, and where there have been problems others have stepped in and the problems have been resolved.

The governance issue identified in the research is not the occasional example of poor governance and behaviour, although they are noted, but board succession and development which, if not addressed, will leave Boards bereft of new people and talent as the age profile of existing Boards rises year by year and directors retire.

The research exercise on the age profile of directors and the personal information provided in the surveys demonstrated that the average heritage railway director is male, white, a retired professional with an average age of mid 60s. The presence of younger (below 40), female or ethnically diverse directors while not unknown, was extremely rare. This is highlighted in the discussion in Chapter 6 as placing, in terms of sustainability, heritage

railways at risk for three reasons - the willingness; ability and timescale of current directors to manage the process of their own succession.

From the literature such as Chamorro-Premuzic, 2019 diverse boards usually are seen as more agile and responsive when faced with a difficult problem or crisis. Neurological research (Burr Johnson and others, 2009) notes that a person's cognitive road map, which guides their attitudes and decision making, is formed in their 20s. This means that for the average heritage railway director, their core thinking is some 40 years out of date, which may be appropriate for an entity based mainly on nostalgia and the recreation of the past but may be less able to grasp the implications of new technologies and social trends.

Overall sustainability assessed risk governance: Red

Reasons: Board succession is identified as a critical risk. Although recognised and accepted as a challenge, little evidence was found that this was matched with active plans and timescales for delivery.

Recommendation 7

Heritage railways Boards embark on a plan with definitive timescales to put in place succession and deliver Boards with a more balanced age profile, gender mix and ethnic diversity than current composition.

Why: Without active succession planning, a Board will become increasingly moribund. A diverse board is better positioned to respond to a range of challenges.

Benefits of recommendation: Ensure the future governance of the heritage railway.

Cost: There is little financial cost to implementing this recommendation but from interviews there was both a nervousness at loss of control, and of the means and methods of how to implement.

Recommendation 8

Heritage railways Boards adopt the ORR's heritage railway risk management maturity model RM3 2019.

Why: It represents an industry-wide standard and benchmark.

Benefits of recommendation: A recognised tool for assessing and improving governance and managing health and safety risks.

Cost: There is little financial impediment to implementing this recommendation.

10.7 Staff, Volunteers and Members

From figures reported by the Heritage Railway Association the number of volunteers as a ratio of staff is around 7:1 and a calculation as to the monetised value of the contribution of free labour of at least £25m demonstrates the key role volunteers play in the continuity of a heritage railway. There are examples - the Paignton and Dartmouth Railway, Snowdon Railway and Lakeside Haverthwaite Railway wholly operate with paid staff, but these are the

exception not the rule. The interviews and literature show that volunteers can be fickle and not easy to manage but properly motivated they will give and show exceptional loyalty and commitment. The key volunteer challenges (as demonstrated by observation, interview and press articles) facing heritage railways are continuity, training and succession.

Little information appears to be gathered, recorded and analysed by heritage railways on volunteer hours, age profile of volunteers or active succession planning particular for key positions in signalling, engineering and train crew, all of which have long lead-in times for training and gaining of competency (see also recommendation 4 on lack of record keeping and information management). The 2018 annual report and accounts of the West Somerset Railway plc simply reports staff costs of £1,410,851 for 54 employees, an average of £26,124 and “In addition, the railway receives support from over 1,000 unpaid volunteers without whose services it could not be a viable commercial operation.”

From observation and interviews, similar to directors, the average volunteer is male, white and over 60, though there is a defined cohort of volunteers in their 20s and early 30s. Although from interviews held, there has been a drift in the replacement of volunteers with permanent staff as a railway has grown to cover increased seasonal loads, the views expressed are that this has reached a financial limit of viability and due to Covid-19 this trend may need to be reversed. These opinions have not been tested or validated.

During the Covid-19 pandemic it was reported in the media (Steam Railway ed 505) that many of the larger heritage railways placed increased reliance on volunteers during the initial recovery phase, to minimise costs, as many permanent staff remained furloughed.

Overall sustainability assessed risk safety: Red

Reasons: Volunteers are critical to the viability of a heritage railway by providing free labour and a considerable proportion of its skill and knowledge base, including almost all directors. There is uncertainty as to the level of active volunteer succession planning, training and recruitment undertaken by heritage railways.

Recommendation 9

Heritage railways improve their collection of data on volunteers to identify and value their input and plan for succession.

Why: The identification and extent of the problem is uncertain.

Benefits of recommendation: Heritage railways will be better able to manage the succession, recruitment and training of volunteers to ensure continuity of labour, skills and knowledge.

Cost: Cost is relatively minimal as it initially improves the availability of information, recruitment and planning, much of which can be itself volunteer effort.

10.8 Environment

This was a condition introduced as a result of the surveys, assumed to be a result of its recent topical importance, as it does not significantly feature in the literature. Most of the concerns expressed revolve around the availability and security of affordable coal, the increasing importance of the natural lineside environment as a refuge for flora and fauna, the increased frequency of extreme weather events and the part that steam age technology has played in

the industrial revolution, which according to Monbiot (2016) lies as a root cause of the declared current climate emergency.

Overall sustainability assessed risk safety: Red

Reasons: The environmental challenges facing heritage railways are relatively new as a proportion of their lifecycle, they are rapidly increasing in severity and uncertainty of outcome, for example services could be curtailed during a period of warm weather or drought due to fire risk. As highlighted in the Network Rail report

(<https://www.networkrail.co.uk/communities/environment/climate-change-and-weather-resilience/>) and the RSSB report 'Tomorrow's Railway and Climate Adaption Final Report' (2019) bridges and structures could be vulnerable to flash floods and washouts. Increased regulation and collapse of the market for coal could induce a change of fuel source which would involve a conversion cost and possibly less energy efficiency in heat generation terms and thus more expensive fuels.

Recommendation 10

If Recommendation 6 is followed, a Heritage Railway Safety and Standards Board is tasked with preparing a risk assessment and mitigation for the environmental challenges facing heritage railways, in particular the efficacy and practicalities of alternative fuel sources.

Why: At this stage some of the risks are known but they are as yet uncertain and unquantified.

Benefits of recommendation: To provide clarity of risk, mitigation and a way forward.

Cost: The cost of such a report would not necessarily be high and could form, for example, research for a PhD though there would be some level of experimental testing of alternative fuel sourcing required. Network Rail is currently undertaking research into improving the resilience of the rail network to climate change which is likely to be equally applicable to heritage railways, albeit heritage railways are not under the same pressure to provide continuance of a public transport service.

10.9 Visitors

The financial analysis of heritage railways demonstrated that visitor revenue covers the direct operating costs of the railway, day-to-day repairs and maintenance and makes a limited contribution to capital investment. There is shown to be some level of scalability such that if visitor revenue reduces, services can also be reduced and if demand increases more services can be run, though there are physical limits of capacity on a single-track railway and availability of resources, however increasing the length of day services can run, the frequency in off-peak and extending the operating season are all possible.

As reported in the media (Steam Railway ed 506) the scalability of viable visitor loadings has been severely tested during the Covid-19 pandemic with reduced loadings due to social distancing measures and a reinvention of the heritage railway experience from 'a turn up and wander around' to a pre-booked more curated experience. There is evidence from the mainstream media that for 2020 the international tourist market has totally collapsed, partly balanced by a rise in domestic tourism. How the heritage railways' traditional core market

will be affected, how wider tourism and social trends will play out and the implications of a severe recession are unknown and uncertain.

Overall sustainability assessed risk: Red

Reasons: Level of uncertainty

Recommendation 11

Heritage railways pool information on visitor expectations, visitor feedback, and any researched and observed trends.

Why: There is likely more to be gained from collaboration and cooperation than competition.

Benefits of recommendation: Increased ability to respond to market upheaval and uncertainty.

Cost: Minimal cost in sharing information, the HRA, with additional volunteer resources, should act as a clearing house for the sharing and coordination of information.

10.10 Money

As noted by one Finance Director, “money is merely the currency whereby things happen” and almost every Finance Director said a version of, “there is never enough of it, and when we have any, we can spend it at least three times over”. The financial analysis carried out demonstrated the fragile nature of the financial health and well-being of heritage railways.

However, that being said, with one or two exceptions – the Dartmoor Railway being a recent example - very few heritage railways have so far become insolvent. Recent media headlines from the West Somerset Railway describe a severe financial crisis as being so close to insolvency as it makes little practical or legal distinction yet it managed to bring itself back from the brink.

The Covid-19 pandemic only made the problems far worse. Referred to as the “three winters crisis” whereby most heritage railways shut during the winter period, in 2020 most had only just opened or were on the point of reopening, only to be forced to close and denied the ability to generate income from tickets. They started to open from July 2020 but there was little of the season remaining before the next winter season when they were again forced to close.

The imposition of social distancing made the operation of any Christmas programme difficult. Railways have so far survived financially on a mix of commercial loans, soft Government loans, grants, donations and furloughing of paid staff, their current financial health is not known beyond gossip and rumour.

Overall sustainability assessed risk money: Red

Reasons: Reduction and loss of income during the Covid-19 pandemic.

Recommendation 12

Heritage railways place themselves on a financial survival footing and prepare alternative plans for the railway to continue in the event of insolvency which is to protect and ring-fence assets and ensure the continuance of their Light Rail Order or Transport and General Works Order.

Why: Planning for survival.

Benefits of recommendation: Protection of assets and means to operate.

Cost: Costs involved in any professional advice or assistance will depend on individual circumstances.

10.11 The overarching condition - Social capital

This condition was not initially separately identified directly, though it is linked within the condition of volunteer, staff and members. This focused more on the direct physical contribution. Social capital is more comprehensive, taking into account trust and reciprocity. It establishes a transactional relationship in which a person gives labour or money in return for some level of non-financial reward – fulfilment, pleasure and social contact.

It is this condition that explains the longevity of heritage railways such that when they do hit problems which can be fatal for commercial organisations, there is what may be termed a ‘bank of goodwill’ upon which to draw to overcome the crisis. All that can be stated at this stage is that it can be a validated condition by the level of free labour and donations made.

Its full extent and value are unknown. It is noted that social capital exists to a greater or lesser extent in other organisations but is greatest in those engaged in a social purpose or public good.

Overall sustainability assessed risk social capital: Amber

Reasons: It has proved to be the most critical condition to sustain a railway through the giving of skills, labour and monies. Uncertainty exists as to its full extent and value.

Recommendation 13

Further research is undertaken into the extent and value of a heritage railway's social capital.

Why: Clarity and a greater understanding are required of the role of this condition when considering the sustainability of heritage railways.

Benefits of recommendation: Greater understanding could lead to better nurturing of this condition.

Cost: Minimum cost, potentially the sponsorship of a PhD. Though given the current level of challenges faced by heritage railways a shorter timescale than 3-4 years is desirable.

10.12 Other identified risks - Externalities

The lesson from the Covid-19 pandemic is the speed and ferocity that such an event can unfold. Externalities are by their nature beyond the influence of a heritage railway. Even if the event was predicted, there is little planning that could have been done to change the course of events. It was Government that forced closure from 23 March 2020, and all heritage railways were in the same position irrespective of any plans made.

However, the ability to survive a crisis, to adapt quickly and successfully to new conditions and take advantage of new opportunities that are thrown up in a crisis is something that *is* in the control of the heritage railway. It is speculation but based on the literature of what guidance there is to survive a crisis, the 'fitter', 'more agile', 'better resourced' 'open minded to change' 'questioning' and 'having access to good data', the more likely, at least on paper, is an organisation to survive. Add to this the condition enjoyed by a heritage railway of social capital whereby additional resource, both financial and human, can be drawn upon, and the chances improve further.

Overall sustainability assessed risk externalities: Red

Reasons: The current Covid-19 pandemic continues, the UK is facing the deepest recession in living memory and climate change is an increasing risk.

Recommendation 14

Heritage railways seek to build resilience by improving their preparedness to face unknown and uncertain risks, in particular emergency planning, access to a war chest, long term

investment and building of social capital, good access to data and an open-minded, questioning, accountable and diverse Board.

Why: Likely to produce the best chance of survival.

Benefits of recommendation: Survival

Cost: These are not conditions that can be created quickly. A sizeable war chest takes time to build which means having financial reserve policies in place. From the literature, social capital takes a long time to build but can quickly evaporate with lack of trust and reciprocity. Building good, accessible and responsive data systems takes time to create and effort to maintain. Good governance also takes time to build the right 'top table team'.

10.13 Reflective account

The journey of this research study is now close to an end and it is traditional to reflect on the experience and output. The researcher's initial thoughts were that there are neat boxes and boundaries of technology, people, systems and assets that can be explored, and theories developed. The realisation is that heritage railways, as all railways, are a complex system, not only as in 'gosh they are complicated' but something more formal. Complexity is a metric that takes a hard collection of assets, utilises technology, combined, controlled and managed by people in a system capable of creating new patterns from bits and pieces of old patterns.

The relationship between governance, social capital and sustainability is therefore immensely complex and nuanced, as it relies on the aggregate of a series of individuals, with all their

personal differences and traits, coming together in a collective for a unified purpose. That it works so well and that visitors are able to enjoy and have confidence to safely travel is testament to the ingenuity, cooperation and discipline of everyone involved in its organisation and running.

The fundamentals are therefore all in place for a sustainable future despite there being many identified challenges. However, as the researcher has discovered, the system is dynamic and inherently unstable, needing constant monitoring and intervention to maintain its balance and momentum. That is the role of governance, relying on social capital as its primary source of energy to do so.

The outputs of the research will hopefully provide some tools to help those involved to better understand the system and measure its development and improvement.

10.14 Has the research and its findings contributed to filling the acknowledged gap?

The result of the research has produced evidence for the position of the heritage railway sector on its lifecycle trajectory. The position was defined passing birth, growth and development stages, peaking at the mature stage and moving towards decline. The evidence was based on the opening dates of railways over 50 years, physical expansion, growth and peaking in visitor numbers, and the presence or lack of new initiatives and services. Eight operational conditions – property; assets; operational systems; governance; environment, staff, volunteers and members; visitors; and money, were discovered for a heritage railway to exist and continue.

There was evidence in the case studies that a weakness of any one condition could cause a railway to fail or begin to fail, but the presence of a railway's social capital can act as a buffer to prevent or slow any failure. This social capital is in the form of a willingness by volunteers and members to contribute in the form of time, physical effort, finance, skill, expertise and knowledge. Such social capital is rarely available to commercial businesses and that is one of the key reasons put forward for apparent longevity and general resilience of heritage railways.

There was no evidence found that heritage railways are unsustainable, and given a reasonably benign environment, can be considered sustainable in their current form provided there is timely renewal of worn assets and succession of people. There was circumstantial evidence that the relatively benign environment, in terms of extreme economic, social or environmental events or changes, enjoyed for much of the life of the railways is changing.

10.15 Were the research methods used appropriate?

There is no direct means to measure either the lifecycle trajectory or the conditions for sustainability. A number of indirect, or proxy measures were used to build up an overall picture and subject to validation using Bradford Hill's criterion. The indirect and proxy measures included searching the literature, observation, survey and interview. These are put forward as being enough to give sufficient confidence in the findings. It is not considered that a greater quantity of results would change the findings. It is possible, but cannot be quantified, if different methods would have produced significantly different findings given the weight of evidence.

10.16 Was the data reliable, and open to scrutiny?

All the data used is within the public domain, the interviews were held in private but generally used to confirm the data.

10.17 Are the findings made, independently validated or are they challengeable, are other findings possible based on a different interpretation of the data, what questions remain unanswered?

The findings were validated in interviews with practitioners within heritage railways with almost total unanimity. This partly answers the question about a different interpretation of the data. Based on the data there is no reasonable interpretation that states the sector is risk free and enjoying strong growth although it is possible an individual railway(s) could enjoy these factors. The risks identified do vary between individual railways but are viewed by all respondents as widespread and generic. The questions that remain unanswered (though not posed) are: accepting that heritage railway are approaching the decline stage - how long and in what form will it take? Can or will heritage railways reinvent themselves to enjoy a further extended lifecycle?

10.18 Could additional data change or refine the results?

The research attempted to answer a broad question to determine a trajectory rather than precise coordinates of a position. If data was available in the same format for each railway and taken over the same periods, then a much more refined position could be plotted. This would be one of the objectives of a greater sharing and coordination of information.

10.19 How was bias accounted for?

Bias was accounted for through a system of weighting the strength of the evidence. For example, for a test of confirmation, validation or proof that a condition or feature exists, the presence of at least one example of a condition or feature is necessary, and sufficient to show that the condition exists.

A photograph of a volunteer recruitment poster for a heritage railway is sufficient to demonstrate that the concept of volunteering exists and from references in the literature, volunteering is part of social capital. A photograph of a working steam locomotive demonstrates the presence of assets and from reference literature that a steam engine can operate with many other conditions such as a footplate crew, fitters and that safety systems are also in place. The confirmation, validation or proof of a condition present does not provide information as to its importance, limits or extent.

10.20 Are the outputs of value to the sector?

The value has been recognised in the positive feedback from the participants who attended at the ORR - organised series of seminars in late 2019 /early 2020 for the launch of the heritage railway version of RM3 with an audience of that included almost all of the 104 railways of the study population.

10.21 Key question

The key question is - “what is now known, we did not know before?” This pioneering academic study into heritage railways has produced the following knowledge:

Heritage railways are in the mature stage of their lifecycle with some evidence that they are entering the decline phase.

The conditions necessary for the creation, operation and continuance of a heritage railway have been discovered and documented.

The research shows that the longevity of heritage railways does not simply arise from 'good governance' but is, in fact, the product of multiple interlinked variables and processes. Many heritage railways have survived and prospered despite poor governance, rather than because of 'good governance'. One of the most significant of these explanatory variables is social capital, a hitherto under-researched governance variable in heritage railway studies. Social capital is demonstrated to have compensated and mitigated for failures of organisational governance and weaknesses in operational conditions on heritage railways such that an alternative hypothesis is proposed: that social capital (of which philanthropy, reciprocity and trust are key constituents) is a key determinant of the sustainability of heritage railways.

10.22 Final conclusion - Governance for sustainability and building social capital

The researcher puts forward the following as the model for the sustainable development of heritage railways based on the three pillars of sustainability – social, economic and environmental.

Social = People continue to be interested in, and want to experience, heritage railways at first hand, enjoy and learn from the past, any, or all of: visiting and travelling; hands-on operation; the feeling of well-being from being part of a 'community' that keeps it running - including paying admission / membership charges, allocating time and donating voluntary labour. Society through public support continues to place value on its legacies of cultural, social, economic and technological development as they relate to transport in its widest sense and railways in particular.

Economic = Sufficient resources (financial / skills / knowledge / manpower) are available and affordable to keep the assets and technologies employed in a safe working condition, including consumables, infrastructure, property, locomotives, rolling stock and fuel, such that the organisation remains overall financially viable.

Environmental = Minimising the impact of the operation on the surrounding environment – emissions, waste, carbon footprint (visitors and activities) and operating safely and responsibly within a regulatory and legislative framework.

Putting in place methods and systems of governance that address all three pillars in a balanced, cohesive, unified and integrated way and building social capital, of which philanthropy, reciprocity and trust are key constituents; by determining and actively managing and developing all the human needs, relationships, activities and tasks, necessary to ensure the railway's longevity and resilience. Going forward, the railway's vision, mission and operation are regularly reviewed to be appropriate, achievable and sustainable.

END

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Appendix 1 History of the development of heritage railways

In the words of Dylan Thomas' Under Milk Wood which itself would make the almost the perfect setting for a preserved railway, 'to begin at the beginning'.

"The little valley where the railway runs is surrounded by the great and silent heights of the Cambrian Mountains. Man dug slate here and it was carried to the sea on the railway. When the quarries closed the railway was about to be demolished but a little band of enthusiasts showed up and objected. It is too nice to scrap they said please could we have it instead and entire railway and they have been running it ever since."

These are the introductory words to the film 'The railway with a heart of gold'. The date was 1951 and the Talylyn Railway became, as every railway history book will tell, the World's first preserved railway. This the researcher does not seek to challenge, but it is by no means the complete story.

The end of the Victorian Period saw a number of railways built for tourists these included: Hythe Pier Railway in 1881; the Volts Electric Railway in 1883 (the world's first electric railway); the great Orme Tramway in 1902; Snowdon Mountain Railway in 1896; and Rhyl Miniature Railway in 1911 all with the exception of the Snowdon Mountain Railway being associated with the seaside. One other exception was the Sutton Park Miniature Railway (1907) which was housed in Sutton Park Birmingham. There were also temporary exhibition miniature railways – Glasgow in 1901 and Alexandra Palace in 1903 (Tidmarsh, 1990).

In the early years of the twentieth century a 3ft narrow-gauge mineral line in the Cumbrian Mountains taking haematite iron ore to the main line had closed but in 1915 it was bought by a company and converted to 15-inch gauge to run as a tourist line (Davies, 1968). 1915 was significant as it was during the First World War the policy being to allow life to continue as normal. In 1946 the line was sold and in 1958 the line was again on the point of closure but was rescued in 1960 by a group dedicated to its preservation. This was the Ravenglass and Eskdale Railway. The line continues to use locomotive (River Esk) that was built for the railway in 1923 and one (River Irt) converted from an earlier locomotive (Murial which arrived in 1917 but dated back to 1894) in 1927.

Several other 15-inch railways also have important parts to play in the early history of heritage railways. The Rhyl Miniature Railway opened in 1911 and was closed in 1969 but was reopened in 1978 and continues today. The Romney, Hythe & Dymchurch Railway (RH&DR) opened in 1927. It is a 13.75-mile (22.1 km) line running from Hythe to Dungeness. The railway was approved by a Light Railway Order and was incorporated as a statutory public utility so it could acquire land and construct the railway.

It was the dream of two millionaires Captain 'Jack' Howey and Count Louis Zborowski, both larger than life characters and epitomise the 'dashing devil may care' gentleman enthusiast. Both were racing drivers. In 1911 on the death of his mother Count Louis was the one of the World's richest under 21-year olds. He had his own 15inch gauge railway running around his private estate Higham Park. There are uncollaborated, but very believable accounts of wild parties and naked damsels in distress being tied to the railway with the locomotive just stopping

in time (Film footage was discovered in 2014 showing scenes from the railway which lends some credibility to these stories) and the 1960's Avengers TV series based an episode on the myth. Not all PhD research is dull.

Count Louis designed, built and raced cars at Brooklands, one fitted with an aero engine was named Chitty Bang Bang which later became the inspiration for Ian Fleming's book and film Chitty Chitty Bang Bang. Perhaps, not surprisingly Count Louis at only 29 was killed in a car crash at Monza while racing in the 1924 Italian Grand Prix. The reason for describing the life style of Count Louis, is that he was by no means the first larger than life character to play a role in heritage railways and railway preservation. As we shall shortly see the list of personalities connected with heritage railways is long and illustrious which continues to the present day with Jeremy Hosking, David Smith, David Buck and the recently deceased Bill Ford. Some but by no means all (for example Peglar at the Festiniog) of the early railway projects were bankrolled by rich individuals, and it was private individuals who initially purchased steam locomotives directly from British Railways the most famous being again Pegler with the purchase of Flying Scotsman.

In terms of the governance of heritage railway, individuals who if contributing significantly to their funding can be expected to exert some influence if only by force of personality, (for example Bill Ford at the Great Central) inevitably some boundaries could blur between their own personal and private interests as enthusiasts and the railway's interest.

Tonks, 1985 described the years 1950 to 1959 as forming essentially an exploratory period with most of the twenty preservation schemes conforming to the existing pattern, but nevertheless giving a clear indication of things to come. It is hardly surprising that nearly all the locomotives saved were steam, but it is probably not realised that only a few main line locomotives were saved at this time. All the rest were industrial or from independent railways, and indeed it may be said that industry was responsible for the bulk of the preservation programme, both in its own right by helping the efforts of the few individuals or societies they represented.

Five bodies – National Coal Board, Philadelphia, Penlee Quarries, Newlyn, W.G. Bagnall Ltd Stafford, East Midlands Gas Board, Northampton, Head Wrightson and Co Ltd, Thornaby put locomotives on display locomotives formerly associated with their works, a form of preservation that did not continue to any extent. These were the static exhibits of locomotives that had ended their useful working life, locomotives of special historic interest were saved from the scrap yard with no thought of them being anything more than museum pieces. This perpetuated the pattern of events before 1950 as could be expected, but it was not in line with the Talyllyn as a working railway which was to become the increasing future trend.

In 1951, the year that the Talyllyn ran its first train, the British Transport Commission appointed its first Curator of Relics, John Scholes, previously head of the Castle Museum at York. Gwynne 2011 describes Scholes as quickly putting together some roving displays and the search was on for premises for a Museum of British Transport (not exclusively rail) The museum opened in 1961 in Clapham, south London and was later superseded by the National Railway Museum (NRM) which opened in York in 1975

When the demise of the famous Festiniog Railway was seen to be imminent the successful example of the Talyllyn Railway Preservation Society (TRPS) had been clearly established. There was big difference, however, the TRPS were virtually presented by their railway by an

altruistic landowner, all they had to do was restore it to good running order told in the book *Railway Adventure* by Rolt, 1993 and *Railway Pioneers* by Whitehouse, 2014. On the other hand, the Festiniog Railway was nominally a going concern and it was necessary for any preservation body first to purchase a controlling interest. Alan Pegler, a railway minded industrialist, provided the required capital and then came into being the first two tier system, that was later copied elsewhere. In this system a Board of Directors controls finance and general policy, with a great deal of work and day-to-day running provided by a team of volunteers. This blend of commercial and volunteer operation provides the model on which most heritage railways continue to operate. Though as will be seen this has not been without its tensions and disputes.

The success of these two lines could not fail to find a responsive chord in enthusiasts elsewhere, eager to have a go at running their own narrow gauge railway; and the very limited supply left only one alternative to build their own such as the Lincolnshire Coast Light Railway which was built with rails once used to transport Lincolnshire potatoes (Gwynne 2011).

While these working railways were coming into being, there began what was to become one of the biggest factors in the field of saving locomotives – that of the private preservation – which Tonks 1985 refers to as ‘backyard preservation’ and others refer to as ‘garden shed preservation’. With limited resources and limited accommodation, the choice was then (and still is for the vast majority of succeeding private preservers) for the narrow gauge. Locomotives withdrawn from service and in some cases little better than derelict, were taken under care. They were obtained cheaply, the price for No 55 Stepney one of the famous LB&SC 0-6-0T Terriers was £750 (or around £17,000 at 2019 value using the ‘purchasing Power Calculator’), but at the same time requiring their new owners to put in a lot of hard restoration work. One British Railways locomotive was purchased privately with a lot of help from a sympathetic local BR management – the ex-LNER class J52 bought by Captain Smith and housed initially by John Mowlem & Co Ltd. The full story being told in the book *1247 Preservation Pioneer* by its owner, (Smith, 1991) including its 1962 railtour to the Bluebell Railway with the incoming Chairman of British Railways Dr Richard Beeching on board.

In 1958 Noel Draycott founded the Railway Preservation Society with the slogan “Don’t Let Steam Die”. This was an attempt to co-ordinate efforts across the UK and would eventually lead to the creation of the Buckingham Railway Centre, the Chasewater Railway and Scottish Railway Preservation Society.

At the end of the 1950’s, therefore the preservation movement leaned very heavily towards the narrow gauge steam locomotive, but not exclusively; this was simply because such engines were comparatively easier to find space for. But as we know, this situation was soon to radically change as described by Body, 1981. This can be seen with the two standard gauge pioneers the Middleton Railway project just south of Leeds and the preservation of the line between Horsted Keynes and Sheffield Park later the Bluebell Railway. It heralded a new and quite different era. Not only were the costs involved infinitely greater – British Railways’ first asking price for the five miles from Sheffield Park to Horsted Keynes was £55,000 (which at 2019 value ranges between £1.2m as a real price or £4.4m as an economic cost) later reduced to £34,000 by negotiation with only three months in which to raise the money – but they extended to equipping and running the railway as well as purchasing it. Further, the more ambitious the project, the keener had to be the scrutiny by the Ministry of Transport inspectorate. Many lines of this sort had a high property value measured in suburban living rather than sheep pasturing, and they attracted much more interest from the planning authorities at a time when housing and road

improvement schemes seemed to be everywhere. It was not only planning authorities that viewed the development potential, a number of railways had close calls for example the Severn Valley Railway from speculative property developers. The importance of property and ownership has for some railways proved to be their Achilles heel such as the Swansea Vale Railway. In all this the Bluebell Railway had to blaze a trail.

On the opposite side of the coin, standard gauge preservation schemes were to enjoy some advantages that the Talylllyn and Festiniog projects did not. With the pace of line and station closure increasing and a great deal of track being lifted from yards and depots there was no shortage of railway equipment and rails and sleepers were at the time reasonably priced (Body, 1981). Also, schemes tended to be located in areas of relatively high population which meant ease of access for volunteers and, later for the revenue-earning passengers needed to support the activity. Practising, redundant or retired railwaymen, with their many useful talents, were also easy to come by. An example described by Gwynne, 2011 being the Bangor Shedmaster John Dunn, who organised in 1958 an appeal to buy an LNWR Webb 'Coal Tank', a professional railwayman and an active railway enthusiast, he had earlier helped the fledgling Festiniog Railway. It must also be remembered that in 1958 steam locomotives were still being built, the last one 'Evening Star' not entering service until March 1960.

By the end of the 1950's Tonks, 1985 records twenty preservation sites having come into being, a quarter of them only temporary storage locations, namely Northampton Gasworks; Derby BR Works; Edinburgh (Dalry Road) BR shed; Neasden LTE Works; and John Mullett's home. With the exception of the Festiniog, none of these represented much in capital expenditure, for most of the locomotives had been presented free of charge or for their nominal scrap value. But the idea of railway and locomotive preservation was established for all to see and the enormous expansion in the 1960's was evident by the fivefold increase in schemes.

In all some 164 new preservation schemes came into being. The figures are enough to demonstrate the extent to which railway preservation had captured the imagination of enthusiasts and public alike; but there is a lot more to be learnt than is told by the figures. Many of the 164 schemes Tonks, 1985 records would not be included in the definitions used for this study. There was a wide spread of distribution of preservation effort, which in the 1950's had been mainly concerned with the choice of saving of choice locomotives from being scrapped, though with little hope or intention to get them to move. The pleasure of working railways was confined to the trio of Talylllyn, Festiniog and Lincolnshire Coast Railway Light Railway. With British Railways still operating steam services, this was perhaps not so surprising, enthusiasts being too busy chasing working BR steam to bother very much about acquiring and working standard gauge locomotives. (MNA, 2018).

Tonks, 1985 states that the keynote of the 'sixties was the emphasis on operating railways, and even the numerically greater increase in private preservation could be explained by the desire to be able to get locomotives to run. By the end of the decade the three operating systems had swelled to twenty-nine.

There was a net increase of nine in the field of entirely new lines, the remainder falling into two classifications initiated in 1960 – operating railways based on lines formerly worked by British Railways (ten examples see above) or by industry (five examples see above). The British Railway lines were all standard gauge except for the Welshpool and Llanfair (2ft 6in (762 mm)), which in general in general conception could just as easily be put under the same heading as the Festiniog – which shows the difficulty of categorising.

The industrial lines were as might be expected, more heterogeneous in origin and equipment. The first was the Middleton which was purely a colliery railway with a longer history than any other preserved railway (authorised by Act of Parliament in 1758) and was also the scene of the first commercially successful steam locomotive operation by the Murray / Blenkinsop machines *Salamanca* and *Prince Regent* in 1812. A portion of the line closed with nationalisation of the coal industry in 1947 and a proposal to close the remainder of the line came in the year of the railway's bicentenary.

A happier event followed that anniversary with the formation of the Middleton Railway Preservation Society, made up mostly of students, which in 1960 operated the first persevered standard gauge train albeit it was a diesel shunter locomotive coupled to a double-deck tram, the tramcar was later scrapped (Gwynne 2011) beating the Bluebell Railway by a few weeks. There was another colliery line – the Foxfield and three narrow gauge – the sand quarries line at Leighton Buzzard, Bowater's former paper works system at Sittingbourne, and the Llanberis Lake Railway, this was slightly different in being a new line of different gauge -original line 4ft (1,219 mm) rebuilt as 1ft 11.5 (597 mm) - on the existing track bed of what was the defunct slate carrying Padarn Railway.

Amongst the 'new lines' was the Chasewater which could logically be regarded as an industrial revival also – but the line takes a different course from the original.

The net increase of nine new lines hides the fact that ten were opened during the 1960's but one the Woburn Abbey pleasure line was closed. There were also twenty other preservation sites abandoned. The first 'closure' was in 1963 when W.G. Bagnall Ltd (by then part of the English Electric Group) put their exhibit in the hands of Stafford Borough Council for local display; and Neville Melhuish's locomotive, after languishing at his garage at Chipping Norton for some years, was transferred to the Welsh Highland Railway at Kinnerley. Both these instances were of the 1950's outlook of saving the locomotive first and finding a more permanent home for it afterwards.

However, the main growth surge in heritage railways was the consequence of a strategy of consolidation initiated by the chairman of British Railways, Dr Richard Beeching, as set out in his report 'The Reshaping of British Railways' published in March 1963. The report identified 2,363 stations and 5,000 miles (8,000 km) of railway line, 55% of stations and 30% of route miles of the national network were declared as uneconomic and proposed for closure and this created the supply side for the growth in preserved or heritage railways for many years.

As the closures proceeded, some of these lines were identified for an alternative future in private ownership by a mixture of enthusiasts and local people, who either did not wish to see their railway close or wished to preserve both the spirit and ethos as well as the physical infrastructure, locomotives and rolling stock as described by Ransom (1973), Body (1976) and more recently Gwynne (2011) and Brown (2017).

None of the early plans to provide a replacement timetabled community public transport service was realised, although there were many attempts and false starts such as those written about in depth by Parsons (2011) and there are still today, as noted by Brown (2017), several proposals to provide community rail services alongside the heritage services.

By 1965 six preservation bodies were involved in operating passenger services on a regular basis. These were the Talylyn, Festiniog, Welshpool & Llanfair, Ravnglass & Eskdale, Bluebell and Middleton lines. The RH& DR, Fairbourne and Snowdon Mountain Railway were also operating a full service and the Worth Valley and Kent & East Sussex societies were proceeding steadily with their negotiations. There were thirteen general preservation bodies, including the pioneer Railway Preservation Societies and the then smaller Great Western Society. Another line open in 1965 was the short 2ft gauge track operated by the Rev Teddy Boston in the grounds of Cadeby Rectory near Market Bosworth in Leicestershire, with a 1919 Bagnall 0-4-0 saddle tank No 2090 Pixie.

Another even more far-reaching influence came into being in the 1960's too – the commercial approach. As with any other aspect of preservation, it is difficult to draw the line precisely in many cases, but there is no doubt at all about the fact of commercial attitudes in the field; indeed, it was perhaps inevitable in view of the ever-widening scope of and rise of railway preservation. The Dart Valley Railway plc is perhaps the best example, when a group of businessmen, although declared rail enthusiasts took over line between Totnes and Ashburton (later Buchfastleigh), to run on a commercial basis, although there was also reliance on voluntary input.

The group were successful and made a profit in its first year of opening in 1969, the company later took over the Paignton to Kingswear branch in 1972. In 1989 the company announced the Totnes to Buckfastleigh was uneconomic and decided to close it. The volunteers associated with the railway took in over and it was renamed the South Devon Railway. Dart Valley Railway plc continued to run the Paignton to Kingswear branch renamed the Dartmouth Steam Railway, the operation includes ferry and other tourist services and continues to be one of the very few preserved railways that relies little or no input from volunteers.

The first complete departure from the amateur status of railway preservation came with the formation and opening in 1963 of the 1ft 6inch Bicton Woodland Railway, at Bicton Gardens at East Budleigh near Exmouth in Devon, a line wholly commercial in conception, although the locomotives were industrial in origin.

The Festiniog, dating back to 1955, would not have been saved but for the provision of capital to buy the line; but at the same time the climate was purely amateur in spirit and Alan Pegler, a dedicated enthusiast with money to direct into the field. Saving the Festiniog Railway was a worthwhile objective, as was his purchase of the LNER pacific Flying Scotsman with the help of Harold Wilson who was also a steam enthusiast (Alan Pegler". Daily Telegraph. 25 March 2012. Retrieved June 2019). He was quoted as saying 'I was horrified at the prospect of seeing this marvellous class wiped out and resolved that, if the state wouldn't correct the injustice, then I would!' (Whitehouse 2012).

Interestingly at the 1924 exhibition *Flying Scotsman* stood next to GWR *Caerphilly Castle* which was preserved by the Nation, Pegler's impressions are not recorded. He said that he fell in love with Flying Scotsman when his parents took him to the British Empire Exhibition at Wembley in 1924. "I gazed up at this huge gleaming monster and lifted up into its cab. I was spellbound and couldn't stop thinking about it all the way home." (Whitehouse, 2012) He used his connections from his stint as Industry Representative on the British Transport Commission's Eastern Region board to get his own rail-connected shed and an operational agreement to run the locomotive. Pegler was later sacked by Beeching who was unimpressed by this degree of steam enthusiasm.

Pegler's life story perhaps illustrates the type of larger-than-life characters associated with the early days of railway preservation following in the footsteps of Count Zborowski. A Cambridge graduate, Fleet Air Arm pilot, actor, entrepreneur, a Director of the family firm at 21. As noted, he provided the capital for the Festiniog Railway, but it was Flying Scotsman that brought him financial ruin on its tour of the USA in 1970/71. With the locomotive mothballed in San Francisco "he had to work his passenger home on a P&O cruise liner by giving lectures about trains and travel" (Alan Pegler". Daily Telegraph. 25 March 2012. Retrieved June 2019).

His personal life was equally not without controversy, there are many 'mess room rumours' surrounding the suspicious deaths of two of his four wives, all adding to his almost 'cult status' in the railway world (Whitehouse 2017). Flying Scotsman was recused by fellow railway enthusiast Sir William MacAlpine later sold in 1996 to another millionaire Dr Tony Marchington who like Pegler was declared bankrupt in 2003. Like many rich man hobbies owning a locomotive can seriously damage your wealth.

Flying Scotsman regarded by many as the world's most famous locomotive (Steam Railway, 2016) has now only belatedly in 2004 been purchased by the National Railway Museum at a cost of £2.3million although this was made up of a grant from the National Heritage Memorial Fund; £350,00 raised from donations matched by Virgin's Richard Branson and £70,00 raised by the Yorkshire Post newspaper (Steam Railway, 2016). Restoration cost a further £4.5 million finally returning to main line service in 2016 (Steam Railway, 2016). This illustrates the often-complex relationships between private preservation, operation on a nation's railways and preservation by a state body and onward funding.

Alan Pegler, though perhaps the most colourful character was not alone, in 1961 ex-LNER traffic apprentice and future Viscount Garnock brought ex LNER K4 *The Great Marquess*. He restored it to LNER livery and based it at a Leeds shed until 1969. In Scotland John Cameron, once noted as Europe's largest sheep farmer' created the Lochty Private Railway in 1967 so that he could have the pleasure of running his newly purchased A4 No 60009 Union of South Africa. He later purchased *The Great Marquess*. Sir William MacAlpine created his own standard gauge garden railway at his home at Fawley from 1965. The Tallyllyn's first secretary Patrick Whitehouse, purchased his first locomotive, ex GWR Prairie tank No 4555 in 1963 and initially used the ex GWR steam shed at Tyseley as convenient storage.

There are stories of him driving his own locomotive home from work. By 1968 when steam was finished and a growing portfolio of locomotives needed a home, he was able to found the Standard Gauge Steam Trust and take over Tyseley shed as the Birmingham Railway Museum. Patrick Whitehouse was also a driving force in the creation of the Dart Valley Railway.

The entry of men with money to spend on the new hobby enabled a great many more locomotives to be saved than would otherwise have been the case, and this is well illustrated by Sir Billy Butlin when he purchased from British Railways a number of passenger locomotives which were restored and placed on public static display at his various holiday camps; mostly they were former LMS express types - *Princess Margaret Rose*, *Royal Scot*, *Duchess of Hamilton*, and *Duchess of Sutherland* but there were also some SR branch line locomotives – *Newport*, *Granville*, *Knowle* and *Matello*. All these locomotives have now moved on to new owners including the National Railway Museum with many restored and running again.

In 1966 a half mile circle of 1ft 11.5in gauge track was opened at Bressingham Hall. Alan Bloom the owner had been collecting and restoring steam traction engines there for some time. The Bressingham activities has expanded ever since until it now includes two narrow gauge routes of 2.25 miles and a length of standard gauge track and steam museum exhibition (Bloom, Undated).

In the North West Dr Peter Beet, a Morecambe GP, purchased locomotives and encouraged others to do so. Dr Beet was also involved with the planned takeover of the former Furness Railway branch line to Lakeside on Lake Windermere and negotiated the storage of engines at Carnforth shed for the scheme. By the end of steam in August 1968 Carnforth had already become an unofficial preserved steam depot.

The 1960s' relentless destruction of the steam fleet had by 1967 seen Noel Draycott's idea of co-ordinated preservation fragment into many separate preservation schemes. Nevertheless, an energetic former naval officer, Peter Manisty, on behalf of the Association of Railway Preservation Societies, was busy co-ordinating groups and individuals wishing to purchase locomotives and liaising with British Railways. His successes included getting rival schemes to pool their resources to purchase ex-LNER pacific No 60532 Blue Peter. In 1968 Manisty co-ordinated a 'package deal' with British Railways which included David's Shepherd's 9F No 92203 and Standard 5 No 75029; the Merchant Navy Preservation Society's Bulleid pacific No 35028 *Clan Line*; the Bulleid Locomotive Society's West Country No 34023(21C123) *Blackmore Vale* and tank engine No 41290; former Southampton docks 'USA' No 30064; LMS Jinty tank No 47383; NER J27 No 65894; and a number of coaches for £21,125 (£322,000 at today's prices, to purchase the equivalent locomotives in similar condition would be in the order of several million pounds).

In 1968, the Manager of Bulmer's Cider, Peter Prior, offered to take on the restoration of ex-GWR King class No 6000 *King George V* and use it as a sales tool. Later in 1971 Prior negotiated a Return to Steam Special with No 6000.

As the tables show, the number of preserved, railways, tourist railways, museums and steam centres increased dramatically throughout the 1970's 80's, and into the 90's growth only slowing in the 2000s. Today there are still prospective schemes for new railways examples being the reopening of the Sharpness branch and the line between Blaenau Ffestiniog and Transfynydd.

Persevered railways have developed many new innovative products to attract visitors. These include, settings for filming, photo charters, weddings, footplate experience, Pullman and evening dining trains, murder mysteries, Santa specials, railway galas, rallies such as vintage cars and traction engines, food festivals, themed events such as Thomas the Tank days, together with other children's characters, forties and war events, Victorian, 60's steampunk, Peaky Blinders and many others, to the extent that for many railways the operating season is based around these events and products rather than its ordinary services (Conibere, 2017).

Mann, 2006 noted that "over the years the preservation movement has grown up piecemeal. Few of the railways were created with a business plan, as originally it was a hobby and an opportunity to operate steam locomotives. Most railways understand the need for good business planning, and many have moved their respective railways onto the more commercial basis necessary for continued survival; however, some still operate on a day-to-day basis with little regard to their medium- and long-term prospects. In 2019 the research shows little

difference between this and current practice. Mann's opinion in 2006 was that "many railways will not survive more than 10 years unless they take steps to improve their situation." This has not proved to be the case, which leaves the questions, did the railways take the necessary steps, were the problems overstated, or has the day of reckoning been postponed?

Context of development

The heritage and tourism context

The dramatic rise in the number of persevered and tourist railways during the 1970's and 1980's was not merely the actions of a few railway enthusiasts in isolation but was mirrored in saving and preserving other aspects of British heritage, be it collieries, mills, traction engines, canals or country homes.

There are very different views as to the understanding of heritage as described by Merriman, 1991 "On the positive side the word is used to describe culture and landscape that are cared for by the community and passed on to the future to serve people's need for a sense of identity and belonging. In this context, the use of the term 'heritage centre' in for example natural parks, covers institutions, which aim to care for them. These positive values of care for them. These positive values of care and identity are in sharp contrast to the negative and pejorative views of the term heritage. In this sense, as used in the 'heritage industry' the word has become synonymous with manipulation (or even invention) and exploitation of the past commercial ends."

The generality to which the term 'heritage' can be applied is described in the bullet points by Turnbridge and Ashworth, 1996:

- "A synonym for any relics of the past
- The product of modern conditions that are attributed to, and influenced by, the past
- All cultural and artistic productivity produced in the past or present
- Includes elements from the natural environment that are survivals from the past seen, as original, typical and appropriate to be passed on to future generations
- A major commercial activity, loosely recognised as the heritage industry, that is based on selling goods and services with a heritage component
- Adopted by political extremism where heritage is used to disguise ethnic or racial exclusivism."

Zepple and Hall (1992) define it "as an encounter with or an experience of being part of the history of a place through visiting historic sites, monuments, and landscapes. It focuses on learning and includes the experience of local traditions, social customs, religious practices and cultural celebrations. Historical tourism is a form of heritage tourism: its main focus is to stress the experiences of the past."

The Heritage Lottery Fund (HLF) heritage definition includes the following:

- "The "historic environment" (see definition below) A city or town with historic character

- A historic building open to the public (non-religious)
- A historic park, garden or landscape open to the public
- A place connected with industrial history (i.e. an old factory, dockyard or mine) or historic transport system (i.e. old ship or railway)
- A historic place of worship attended as a visitor (not to worship)
- A monument such as a castle, fort or ruin
- A site of archaeological interest (e.g. roman villa, ancient burial site)
- A site connected with sports heritage (i.e. Wimbledon) not visited for the purpose of watching sport
- Museums / galleries (other than those containing modern art)
- Libraries
- Archives
- Historic public parks
- Industrial, transport and maritime heritage
- National Parks, AONB's, Nature Reserves and Country Parks
- Canals and historic waterways."

Have heritage railways benefited from their association with the wider heritage industry and heritage tourism and how has it affected their offer?

The importance of a heritage railway to a nation's tourism industry was recognised by the Wales Tourist Board's award to the Festiniog Railway as early as 1964 for conspicuous service to Welsh tourism. In 1972 the Wales Tourist Board listed the Festiniog Railway as fifth most popular tourist site in Wales, after Caernarfon Castle, the Swallow Falls, the National Museum of Wales at Cardiff and Conwy Castle. The Wales Tourist Board was supportive in the branding and marketing of the Great Little Trains of Wales campaign started in 1970. See also <https://www.greatlittletrainsofwales.co.uk>

The benefits and value of heritage and cultural tourism is contained in a number of reports to English Heritage, Historic England and Visit Britain for example: 'Heritage Counts 2017, which states: "Heritage tourism generated £16.4 billion in spending by domestic and international visitors, 278,000 people are employed in heritage".

The internet is full of advertisements, blogs, reports and scholarly articles on the importance and growth of heritage tourism. It is easy to see why. The heritage tourist will spend more, is better educated, and will stay longer than the general tourist. The forward to the OECD Tourism Trends and Policies 2018 noted that: "Tourism is one of the largest and fastest growing sectors in the world economy. It plays a key role in job creation, export revenue and domestic value added, and directly contributes, on average, 4.2% of GDP, 6.9% of employment and 21.7% of service exports in OCED countries. Globally international tourist arrivals grew to over 1.2 billion in 2016, with arrivals to OCED countries accounting for just over half and matching the global growth rate of 3.9% as compared to 2015.

Appendix 2 List of heritage railways

Table A2-01 List of heritage railways and those included within the study population

Railway	Within Study pop	More than 100k Visitors
Alford Valley Railway		
Almond Valley Railway		
Aln Valley Railway		
Amberley Working Museum		
Amerton Railway		
Anglesey Central Railway		
Apedale Valley Light Railway		
Appleby Frodingham Railway		
Astley Green Colliery Museum Railway		
Avon Valley Railway		
Bala Lake Railway		
Barrow Hill Roundhouse Railway Centre		
Battlefield Line Railway		
Beamish North of England Open Air Museum		
Bicton Woodland Railway		
Bideford Railway Museum		
Billing Miniature Railway		
Blackpool Zoo Miniature Railway		
Blenheim Park Railway		
Black Country Living Museum		
Bluebell Railway		
Bodmin and Wenford Railway		
Bo'ness and Kinneil Railway		
Bowes Railway		
Brecon Mountain Railway		
Bredgar and Wormshill Light Railway		
Bressingham Steam Museum		
Bridgend Valleys Railway t/a Garw Valley Railway		
Bristol Harbour Railway		
Buckinghamshire Railway Centre		
Bure Valley Railway		
Burseldon Brickworks		
Burry Port and Gwendraeth Valley Railway		
Caledonian Railway		
Cambrian Heritage Railway		
Chasewater Railway		
Chinnor and Princes Risborough Railway		
Cholsey and Wallingford Railway		

Churnet Valley Railway		
Cleethorpes Coast Light Railway		
Colne Valley Railway		
Combe Martin Wildlife and Dinosaur Park		
Conkers Express		
Corris Railway		
Cotswold Wildlife Park		
Craigtoun Miniature Railway		
Crewe Heritage Centre		
Crich Tramway Museum		
Dartmoor Railway		
Dean Forest Railway		
Derbyshire Dales Narrow Gauge Railway		
Derwent Valley Light Railway		
Devon Railway Centre		
Didcot Railway Centre		
Dolgarrog Railway		
Drayton Manor Park		
Drusillas Zoo Park		
Dunaskin Heritage Centre		
East Anglia Transport Museum		
East Anglian Railway Museum		
East Cliff Railway (Bournemouth)		
East Hayling Light Railway (Hayling Seaside Railway)		
East Kent Railway		
East Lancashire Railway		
East Links Family Park		
East Somerset Railway		
East Suffolk Light Railway		
Ecclesbourne Valley Railway		
Eden Valley Railway		
Elsecar Steam Railway		
Embsay and Bolton Abbey Steam Railway		
Epping Ongar Railway		
Evesham Vale Light Railway		
Fairbourne Railway		
Ffestiniog & Welsh Highland Railways		
Fife Heritage Railway		
Flamingo Land Theme Park and Zoo		
Foxfield Light Railway		
Gartell Light Railway		
Gloucestershire Warwickshire Railway		
Golden Valley Light Railway		
Great Bush Railway		
Great Central Railway (Loughborough)		
Great Central Railway (Nottingham)		

Great Orme Tramway		
Guillivers Theme Park, Warrington		
Guillivers World, Milton Keynes		
Gwili Steam Railway		
Heatherslaw Light Railway		
Heaton Park Tramway		
Helston Railway		
Hollycombe Steam Collection		
Hythe Pier Railway		
Irchester Country Park		
Isle of Wight Steam Railway		
Keighley and Worth Valley Railway		
Keith and Dufftown Railway		
Kent and East Sussex Railway		
Kew Bridge Steam Museum		
Kirklees Light Railway		
Knowsley Safari Park		
Lakeside and Haverthwaite Railway		
Lakeside Miniature Railway		
Lappa Valley Steam Railway		
Launceston Steam Railway		
Lavender Line		
Leadhills and Wanlockhead Railway		
Leeds Industrial Museum, Armley Mills		
Leighton Buzzard Railway		
Lightwater Valley theme park		
Lincolnshire Coast Light Railway		
Lincolnshire Wolds Railway		
Llanberis Lake Railway		
Llangollen Railway		
Locomotion, the National Railway Museum at Shildon		
Longleat		
Lynton and Barnstaple Railway		
Mangapps Farm Railway Museum		
Margam Country Park		
Markeaton Park		
Marwells Zoological Park		
Mid-Hants Watercress Railway		
Mid-Norfolk Railway		
Mid-Suffolk Light Railway Museum		
Middleton Railway		
Midland Railway, Butterley		
Milkyway Adventure Park aka Lynbarn Railway		
National Coal Mining Museum for England		
National Railway Museum, York		
National Slate Museum, Llanberis		

Nene Valley Railway		
North Bay Railway		
North Gloucestershire Railway		
North Ings Farm Museum		
North Norfolk Railway		
North Tyneside Steam Railway		
North Yorkshire Moors Railway		
Northampton and Lamport Steam Railway		
Oakwood Theme Park		
Old Kiln Light Railway		
Paignton and Dartmouth Railway		
Paradise Park		
Paultons Park		
Peak Rail		
Perrygrove Railway		
Pleasure Beach Express		
Pleasurewood Hills Leisure Park		
Plym Valley Railway		
Pontypool and Blaenavon Railway		
Ravenglass and Eskdale Railway		
Rhyl Miniature Railway		
Ribble Steam Railway		
Ripon and District Light Railway		
Romney, Hythe and Dymchurch Railway		
Rather Valley Railway		
Royal Deeside Railway		
Royal Gunpowder Mills		
Rushden, Higham and Wellingborough Railway		
Rutland Railway Museum to Ashwell Station		
Saltburn Miniature Railway		
Scottish Industrial Railway Centre		
Seaton and District Electric Tramway		
Severn Valley Railway		
Sherwood Forest Theme Park		
Shillingstone Railway Project		
Shipley Glen Tramway		
Sittingbourne and Kemsley Light Railway		
Snowdon Mountain Railway		
Somerset and Dorset Railway (Midsomer Norton)		
South Devon Railway		
South Tynedale Railway		
Southend Pier Railway		
Spa Valley Railway		
Stainmore Railway		
Steeple Grange Light Railway		
Strathspey Railway		

Stephenson Railway Museum		
Strumpshaw Steam Railway Museum)		
Summerlee Heritage Park		
Swanage Railway (Purbeck Line)		
Swindon and Cricklade Railway		
Talyllyn Railway Co		
Tanfield Railway		
Teifi Valley Railway		
Telford Steam Railway		
Threlkeld Quarry Railway		
Tyseley Locomotive Works		
Vale of Glamorgan Railway		
Vale of Rheidol Railway		
Volks Electric Railway		
Weardale Railway		
Welsh Highland Heritage Railway		
Welshpool and Llanfair Light Railway		
Wensleydale Railway		
West Lancashire Light Railway		
West Midlands Safari Leisure Park		
West Somerset Railway		
Whipsnade Wild Animal Park		
Wicksteed Park		
Windmill Animal Farm Railway		
Wirral Tramway / Birkenhead Heritage Tramway		
Woburn Safari Park		
Yaxham Light Railway		
Yeovil Railway Centre		
Yorkshire Wolds Railway		

In addition, the following mainline steam operators were included with the study population: Vintage Trains (also listed above under Tyseley Locomotive Works), Locomotive Services Limited t/a Saphos Tours and West Coast Railway Company.

Table A2-02 List of Miniature (15inch gauge and above) and Tourist Railways by year of opening.

Opened	Name	Closed
1873	South Cliff Railway (Scarborough)	
1875	Spa Cliff Lift	
1881	Central Tramway Scarborough	
1881	Hythe Pier Railway	
1883	Volks Electric Railway	
1884	Saltburn Cliff Lift	
1885	Leas Cliff Railway (Folkestone)	
1887	Lynton and Lynmouth Cliff Railway	
1889	West Hill Cliff Railway (Hastings)	

1890	Bridgnorth Castle Hill Railway	
1890	Southend Pier Railway	
1894	Snowdon Mountain Railway	
1895	Shipley Glen Tramway	
1896	Aberystwyth Electric Cliff Railway	
1896	Eaton Hall	1946
1902	East Hill Cliff Railway (Hastings)	
1902	Great Orme Tramway	
1908	East Cliff Railway (Bournemouth)	
1911	Lakeside Miniature Railway	
1911	Rhyl Miniature Railway	
1912	Southend Cliff Railway	
1915	Ravenglass and Eskdale Railway	
1916	Fairbourne Railway	
1923	Babbacombe Cliff Railway	
1927	Romney, Hythe and Dymchurch Railway	
1929	St Nicholas Cliff Lift	2017
1931	North Bay Railway	
1931	Wicksteed Park	
1934	Pleasure Beach Express	
1935	Bournemouth Fishermans Walk Cliff Railway	
1935	West Cliff Railway (Bournemouth)	
1947	Saltburn Miniature Railway	
1948	Cleethorpes Coast Light Railway	
1960	Lincolnshire Coast Light Railway	
1963	Bicton Woodland Railway	
1965	Longleat	
1966	Great Bush Railway	
1967	Leighton Buzzard Railway	
1967	Yaxham Light Railway	
1970	Llanberis Lake Railway	
1970	Seaton and District Electric Tramway	
1970	Whipsnade Wild Animal Park	
1970	Woburn Safari Park	
1971	Knowsley Safari Park	
1971	Whorlton Lido Railway	
1972	Bala Lake Railway	
1972	Blackpool Zoo Miniature Railway	
1972	Bredgar and Wormshill Light Railway	
1973	South Tynedale Railway	
1974	Blaise Castle Miniature Railway	
1974	Cotswold Wildlife Park	

1974	Lappa Valley Steam Railway	
1975	Blenheim Park Railway	
1975	Cricket St Thomas Wildlife Park	2009
1975	Gwili Steam Railway	
1975	Old Kiln Light Railway	
1976	Abbey Light Railway	2012
1976	Craigtoun Miniature Railway	
1976	Margam Country Park	
1976	Paradise Park	
1978	Teifi Valley Railway	
1979	Alford Valley Railway	
1979	Brecon Mountain Railway	
1979	Heaton Park Tramway	
1979	Lightwater Valley theme park	
1979	Llechwedd Slate Caverns	
1979	Safari Express	
1980	Pixieland Miniature Railway	
1980	Stevington and Turvey Light Railway	2014
1983	Launceston Steam Railway	
1983	Leadhills and Wanlockhead Railway	
1984	Pleasurewood Hills Leisure Park	
1985	American Adventure Theme Park	2012
1985	North Gloucestershire Railway	
1986	Haigh Country Park	
1986	Pembrey County Park	
1986	Ripon and District Light Railway	
1986	Steeple Grange Light Railway	
1987	Golden Valley Light Railway	
1987	Marwells Zoological Park	
1987	Paultons Park	
1988	East Hayling Light Railway (Hayling Seaside Railway)	
1989	Bure Valley Railway	
1989	Combe Martin Wildlife and Dinosaur Park	
1989	Guillivers Theme Park, Warrington	
1989	Heatherslaw Light Railway	
1989	Markeaton Park	
1989	Thorpe Park	
1990	Flamingo Land Theme Park and Zoo	
1991	Gartell Light Railway	
1991	Kirklees Light Railway	
1991	Legoland, Windsor	
1992	Centre for Alternative Technology	

1993	Oakwood Theme Park	
1993	Pleasure Island Family Theme Park	2016
1995	Conkers Express	
1995	Milkyway Adventure Park (aka Lynbarn Railway)	
1996	Perrygrove Railway	
1997	Windmill Animal Farm Railway	
1999	Guillivers World, Milton Keynes	
1999	Sherwood Forest Theme Park	
2001	Cairngorm Mountain Railway	
2002	East Links Family Park	
2002	Evesham Vale Light Railway	
2003	Drayton Manor Park	
2004	Derbyshire Dales Narrow Gauge Railway	2017
2007	Drusillas Zoo Park	
2010	Apedale Valley Light Railway	
2010	Billing Miniature Railway	

Table A2-03 Number of Miniature / Tourist Railways opening by decade

27															
26															
25															
24															
23															
22															
21															
20															
19															
18															
17															
16															
15															
14															
13															
12															
11															
10															
9															
8															
7															
6															
5															
4															
3															
2															
1															
	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010

Table A2-04 Accumulated number (openings – closures) of Miniature Railways / Tourist Railways

110														105	
105													100		101

100																
95																
90												87				
85																
80																
75																
70											66					
65																
60																
55																
50																
45										39						
40																
35							32	33	33							
30					24	27										
25				19												
20			16													
15		10														
10	3															
5																
	1870	1880	1890	1900	1910	1920	1930	1940	1950	1960	1970	1980	1990	2000	2010	

Table A2-05 List of preserved railways with date formed, opening for public service may be later

Formed	Name	Closed
1951	Talyllyn Railway	
1954	Ffestiniog & Welsh Highland Railways	
1959	Bluebell Railway	
1959	Chasewater Railway	
1959	Welshpool and Llanfair Light Railway	
1960	Middleton Railway	
1961	Welsh Highland Heritage Railway	
1962	Keighley and Worth Valley Railway	
1965	Foxfield Light Railway	
1965	Severn Valley Railway	
1966	Corris Railway	
1967	North Yorkshire Moors Railway	
1968	Battlefield Line Railway	
1968	East Lancashire Railway	
1968	Embsay and Bolton Abbey Steam Railway	
1969	Great Central Railway (Loughborough)	
1969	Midland Railway, Butterley	
1969	Sittingbourne and Kemsley Light Railway	
1969	South Devon Railway	
1970	Dean Forest Railway	
1970	Lakeside and Haverthwaite Railway	
1971	East Somerset Railway	
1971	Isle of Wight Steam Railway	
1971	Kent and East Sussex Railway	
1971	Strathspey Railway	
1973	Avon Valley Railway	

1973	Paignton and Dartmouth Railway	
1973	Ribble Steam Railway	
1973	Tanfield Railway	
1974	Colne Valley Railway	
1975	Bowes Railway	
1975	Gwili Steam Railway	
1975	Llangollen Railway	
1975	Mid-Hants Watercress Railway	
1975	North Norfolk Railway	
1976	Telford Steam Railway	
1976	West Somerset Railway	
1977	Nene Valley Railway	
1978	Bristol Harbour Railway	
1978	Churnet Valley Railway	
1979	Caledonian Railway	
1979	Swanage Railway (Purbeck Line)	
1980	Plym Valley Railway	
1980	Pontypool and Blaenavon Railway	
1980	Swansea Vale Railway	2007
1981	Bo'ness and Kinneil Railway	
1981	Cholsey and Wallingford Railway	
1981	Gloucestershire Warwickshire Railway	
1982	North Tyneside Steam Railway	
1983	Lavender Line	
1984	Bodmin and Wenford Railway	
1984	Lincolnshire Wolds Railway	
1984	Northampton and Lamport Steam Railway	
1985	East Kent Railway	
1985	Spa Valley Railway	
1985	Swindon and Cricklade Railway	
1987	Peak Rail	
1988	Bridgend Valleys Railway t/a Garw Valley Railway	
1989	Chinnor and Princes Risborough Railway	
1990	Appleby Frodingham Railway	
1990	Great Central Railway (Nottingham)	
1990	Mid-Suffolk Light Railway Museum	
1990	Wensleydale Railway	
1991	Anglesey Central Railway	
1991	Derwent Valley Light Railway	
1991	Rather Valley Railway [o]	
1992	Ecclesborne Valley Railway	
1992	Fife Heritage Railway	

1993	Lynton and Barnstaple Railway	
1993	Weardale Railway	
1994	Elsecar Steam Railway	
1995	Aln Valley Railway	
1995	Eden Valley Railway	
1995	Mid-Norfolk Railway	
1996	Royal Deeside Railway	
1997	Dartmoor Railway	
1997	Vale of Glamorgan Railway	
1998	Keith and Dufftown Railway	
2004	Cambrian Heritage Railway	
2004	Dolgarrog Railway	
2004	Epping Ongar Railway	
2006	Helston Railway	
2008	Yorkshire Wolds Railway	
2011	Stainmore Railway	
2013	Metropolitan Water Board Railway, Kempton Steam Railway	
2016	Burry Port and Gwendraeth Valley Railway	
2016	Somerset and Dorset Railway (Midsomer Norton)	
2017	London Post Office Railway	

Table A2-06 *Number of preserved railways formed by five-year intervals*

12															
11															
10															
9															
8															
7															
6															
5															
4															
3															
2															
1															
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020

Table A2-07 Accumulated number (openings – closures) of preserved railways

90														83	86	
85										78	81	82				
80																
75									71							
70																
65								59								
60							53									
55																
50																
45						42										
40																
35					30											
30																
25				19												
20																
15			8													
10	2	5														
5																
	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015	2020	

Table A2-08 List of museums and railway centres by date opened, excluding early state museums such as the Science Museum and individual locomotives persevered by the state/ local authority or railway companies such as the Great Western Railway

Opened	Name	Closed
1940	Hollycombe Steam Collection	
1946	Bressingham Steam Museum	
1963	Crich Tramway Museum	
1963	Dowty Railway Centre	1983
1964	Strumpshaw Steam Railway Museum	
1967	Carnforth (Steamtown)	
1967	Didcot Railway Centre	
1968	Ashford Steam Centre	1976
1968	Dinting Railway Centre	1990
1968	Southport Railway Museum	1999
1968	Tyseley Locomotive Works/ Birmingham Railway Museum	
1969	Buckinghamshire Railway Centre	
1969	East Anglian Railway Museum	
1970	Morwellham Quay Historic Port and Copper Mine	
1971	Irchester Country Park	
1972	East Suffolk Light Railway	
1972	National Slate Museum, Llanberis	
1972	North Ings Farm Museum	
1972	Oswestry Railway Museum	
1973	East Anglia Transport Museum	
1974	Bradford Industrial Museum	
1974	Scottish Industrial Railway Centre	
1975	Buxton Steam Centre	1987

1975	Conwy Valley Railway Museum	
1975	Darlington Railway Centre and Museum	
1975	National Railway Museum, York	
1976	Beamish North of England Open Air Museum	
1978	Black Country Living Museum	
1979	Amberley Working Museum	
1979	Rutland Railway Museum to Ashwell Station	
1980	Abbey Pumping Station Museum	
1980	Great Yorkshire Railway Preservation Society	1989
1982	Leeds Industrial Museum, Armley Mills	
1983	Astley Green Colliery Museum Railway	
1983	Coventry Railway Centre	2017
1983	Museum of Science and Industry, Manchester	
1984	Prestongrange Industrial Heritage Museum	
1985	Rushden, Higham and Wellingborough Railway	
1988	Bideford Railway Museum	
1988	National Coal Mining Museum for England	
1989	Mangapps Farm Railway Museum	
1992	Snibston Colliery Railway	2015
1993	Almond Valley Railway	
1993	Yeovil Railway Centre	
1994	Stephenson Railway Museum	
1995	Wirral Tramway / Birkenhead Heritage Tramway	
1997	Devon Railway Centre	
1998	Barrow Hill Roundhouse Railway Centre	
2000	Royal Gunpowder Mills	
2000	Sherwood Forest Theme Park	
2000	Steam, the Museum of the Great Western Railway	
2003	Dunaskin Heritage Centre	
2004	Locomotion, the National Railway Museum at Shildon	
2004	Lynton and Barnstaple Railway	
2008	Summerlee Heritage Park	
2010	Threlkeld Quarry Railway	

Table A2-09 Number of museums and railway centres opening by five-year intervals

9														
8														
7														
6														
5														
4														
3														
2														
1														
	1940	1950	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015

Table A2-10 Accumulated number (openings – closures) of museums / railway centres

55												48	49	47
50										47				
45								39	41					
40						34	36							
35					28									
30														
25				20										
20														
15			11											
10	2	2	5											
5														
	1940	1950	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015

Discussion on the number of heritage railways

A heritage railway represents a significant venture in terms of its physical, social, commercial and community engineering impact, involving many people formed into legal structure subject to regulatory oversight with complex infrastructure and motive power. It can encompass both rural and urban environments.

The above descriptions of different categories demonstrate that arriving at a definitive number of heritage railways and study population is not a trivial task. Carter (2008), in one of the few academic theses on railway enthusiasm, noted ‘Equally clearly, identifying the stuffed steam (and increasingly stuffed diesel) industry’s precise extent is a challenge’. Carter goes on to describe the same problem of vastly differing lists. He draws no conclusion as to the number of railways, nor does he provide a list. A commonly quoted answer to the number of heritage railways (see for example Gwynne (2011) and Carter (2008)) is 108. However, while a common answer, it is not consistent, and the lists mentioned above all contain vastly differing numbers as described below.

The HRA which, as noted, acts as an umbrella organisation for the movement and styles itself as a trade association, is not a statutory body and membership is voluntary rather than mandatory. Currently the HRA official guide for groups lists 70 heritage railways, which includes cliff railways (<http://www.heritagerailways.com/wp-content/uploads/2017/08/Group-Travel-Guide.pdf>), but publishes a map on its website with 169 sites shown (<https://www.easymapmaker.com/map/HRA-members>), more than twice those listed in its official guide. In its website introduction the HRA notes ‘180 of our member organisations regularly open to the public, and we have over 300 corporate members in total’, and so there is little clarity from the industry’s own Trade Association.

Many of the lists also include railways and museums in the Isle of Man, the Channel Islands, Northern Ireland and Ireland. For the purposes of the study, only railways located in England, Scotland and Wales are considered.

In addition, there are several websites that provide lists, all of which are different. The most comprehensive being Wikipedia to be found at:

https://en.wikipedia.org/wiki/List_of_British_heritage_and_private_railways

has 386 entries, although these include some double counting, and both defunct and proposed railways. Other websites include: <https://www.UKsteam.info> which lists 115 and <http://www.heritage-railways.com> which lists 181.

There are also several lists to be found in the guides noted above. 'Railways Restored', edited by Butcher, ran to 34 annual editions and was last published in 2013. It was advertised as "The Best-Selling Guide to Heritage Railways" and its last edition had 226 entries. Steam Railway, a heritage railways magazine, published 'The Ultimate Guide to UK & Irish Steam Railways' in 2006 which has 205 entries. There are several other published guides such as: 'Best of Britain's Steam Railways, Exploring Britain's Railway Heritage'; 'A Guide to the Steam Railways of Great Britain'; 'Where to see the best of British Steam Trains - The essential Touring Guide for every Railway Enthusiast'; 'Heritage Railways of the British Isles'; and many more, all having differing lists with a common core of around 25. There are only a handful of lines that are common to all, in Kington's book 'Steaming through Britain' (1990) which runs to 190 pages only 9 lines are featured.

Although not an academic study, Brown's '*The Railway Preservation Revolution – A history of Britain's Heritage Railways*' (2017) describes the history of the movement in some detail and lists 109 railways. The number of heritage railways is also not static, heritage railways have started but then closed, some getting no further than a pub discussion and the formation of a group, others got going but then, as Gwynne (2011) notes, failed to sustain themselves, merging and morphing into other groups and relocating to other heritage railways.

The primary reference point used to initiate the authors' study has been the ORR's 'Approved list of systems excluded from the scope of the main line railway requirements', last published in December 2017. Under the section: 'heritage, museum and tourist railways that operate on their own network' is a list that contains 252 entries. This should in theory be an up-to-date, authoritative list published by the Regulator of the sector. However, the list contains railways that are closed and defunct– Abbey Light Railway (closed in 2012), Cricket St Thomas Wildlife Park (closed in 2009) and American Adventure Theme Park (closed in 2012). There are separate entries for the Dart Valley Railway, South Devon Railway and Paignton and Dartmouth Railway, this relates to two physical separate railways – the South Devon Railway and Paignton and Dartmoor Railway which at one stage were both controlled by Dart Valley Railway company and by which the South Devon Railway was originally named.

There are railways included on the ORR list that have little prospect of running anything according to information contained on the railway's website, example Burry Port and Gwendraeth Valley Railway see <https://www.facebook.com/gvrail/> where there is a proposal to become the UK's first Velorail operation - Velorail being bicycles designed to run on rails.

Conversely, there are railways such as the Helston Railway in Cornwall see <https://www.helstonrailway.co.uk> which is a preserved standard gauge railway in operation which would appear to meet the criteria to be included on the ORR approved list but is not.

The Health and Safety (Enforcing Authority for Railways and Other Guided Transport Systems) Regulations 2006 (EARR) allocate health and safety enforcement functions to the ORR in relation to railways, tramways, and other guided transport systems. The regulations are founded on the principle of the 'operation of a railway, tramway and other guided transport system'; which includes preparation, inspection and maintenance. Some activities are explicitly excluded: operation of a cableway (funicular railway) and operation of a fairground; busways, and some railways based in specified geographical locations.

Therefore, the ‘Approved List’ is not necessarily a list that reflects the enforcement responsibilities of the ORR. The ORR and HSE have produced a Memorandum of Understanding to support the regulations to clarify the meaning of ‘operation of a railway’, how it applies to museums and heritage centres, and when such a railway may become a fairground ride:

http://orr.gov.uk/__data/assets/pdf_file/0006/1698/mou-between-hse-and-orr.pdf

Another issue to resolve is whether to include within the study the operation of heritage steam on the main line, which can consist of one-off charters or a timetabled service. For example, the line between Fort William and Mallaig in the summer season sees two daily steam hauled services branded, ‘The ‘Jacobite’, making it, in the eyes of the tourist, very much a ‘heritage line’. In a similar vein, the North Yorkshire Moors Railways runs services beyond its own infrastructure along the Network Rail main line to Whitby. Southwestern Railway, a main line franchise company, runs a summer service (2018) from Basingstoke (on the Network Rail network) to Corfe Castle on the Swanage (heritage) Railway.

A heritage railway may and usually does consist of more than one organisation. For example, Tyseley Locomotive Works – which is a physical entity with buildings and trackwork that can be found on a map and is registered at Companies House. Vintage Trains Charitable Trust is the owning charity of Tyseley Locomotive Works and custodian of a historic collection of locomotives and coaches, it is also registered at Companies House, the Charity Commission and is a member of the HRA, but other than a registered office it does not have a site that can be found on a map. To add further confusion there also exists Vintage Trains CBS which is a Community Benefit Society registered at Companies House and the FCA with control influenced by Vintage Trains Charitable Trust and which is the owner of Vintage Trains Limited a licenced Train Operator on the National Network and regulated by the ORR. There is also Friends of Vintage Trains a separate support group that acts as a club and raises money for Vintage Trains Charitable Trust.

The research focuses on the entity that has legal responsibility for its operation and its continued existence. The operation of the heritage railway is the responsibility of an Operator, referred to as the safety management system (SMS) duty holder while ownership of that company as in the example above may be vested in a charity or trust that is responsible for all strategic decisions and separately owns the assets including land, in other words, a person or organisation with significant control (PSC).

To address these inconsistencies and to produce a definitive population to study, the various lists and sources have been collated and combined all of the lists available from the various sources noted above into a single database.

This database has 408 entries. These include all those categories noted above.

The definition above was then applied to this list which reduced the population to 206 heritage railways as defined above. This is a more accurate version of the ORR ‘Approved List’ The differences being the removal of 48 – closed and funicular railways and 13 new entries.

Appendix 3 Associated definitions and other bodies

Heritage traction, heritage motive power

All steam locomotives (this includes new build locomotives based on or adapted from existing steam technology and designs)

Other locomotives, at least 50 years old, or which has a special or significant historic merit as recognised by an appropriate authority

Heritage rolling stock (including multiple units)

Vehicles or fixed formation trains at least 50 years old, or which have a special historic merit as recognised by an appropriate authority

Heritage structure

A listed building or structure registered under current planning legislation

Non-operational: railway, railway museum, tramway museum, heritage railway centre, heritage tramway centre

An accredited museum or other recognised railway centre preserving, restoring and displaying heritage traction, rolling stock or other railway or tram technology and systems without any means of operation, movement or demonstration of the rolling stock along a railway or tramway.

Heritage workshop

Workshops for any renovation, refurbishment, repair or reconstruction work to locomotives or railway vehicles carried out at heritage railway premises, if the premises form part of the heritage railway and are used exclusively or primarily by the heritage railway.

Heritage Transport Undertaking, Operator, Duty Holder and Person with Significant Control

A 'heritage transport undertaking' is any person or organisation that operates primarily a heritage railway / tramway or heritage traction and rolling stock on the main line. A 'heritage transport operator' is the designated duty holder responsible for the safe operation under ROGS of the specified railway, tramway or type of operation. A person or organisation with significant control (PSC) is someone who owns or controls the heritage transport undertaking.

Preserved Railway

Using the definition of Tonks, 1985 they are: “railways that once severed an economic purpose, which have been taken over or reopened to preserve some aspects of their history or purpose including passenger or freight railway as part of the nationalised British Railways, Privately owned freight only line serving industry; Light railway or other railway not being part of the national network”

Tourist Railway

A physically defined, publicly accessible, currently operational passenger carrying railway / tramway with a gauge of, or greater than, 350mm that is exclusively or primarily used for tourist, educational or recreational purposes, including those designated as heritage railways, heritage tramways, funicular railways and those that operate within fairgrounds or other similar attractions.

This definition for Tourist Railways produces an all-encompassing definition of all non – main line railways and tramways that have a purpose other than those forming primarily a daily passenger service between 2 or more stations such as metros and local commuter services. It is a wider definition that what would have been typically used before the 1980s.

Heritage Railway Sector

All those persons and organisations engaged in, physically preserving, conserving, restoring, rebuilding, recreating administering, promoting, operating or having significant control in whole or part guided rail related artefacts and systems, that have been superseded, taken out of use or not considered current when related to a typical modern operation, and generally accessible to the public.

Railway heritage

This is a very different and wider term than its antonym - heritage railway - meaning all the heritage associated with railways, though reference to railway heritage will include heritage railways as one of many components.

Biddle and Nock (1983) have produced an authoritative account of UK railway heritage. There is specific legislation protecting railway heritage, it is the only UK industrial sector with this level of protection.

The Railway Heritage Act see <https://www.legislation.gov.uk/ukpga/1996/42> “enables historically significant artefacts and records that are operational within today's railway industry to be ‘designated’ – protected and saved for the nation so that future generations will be able to understand the history of the railway in Britain. The Railway Heritage Designation Advisory Board (RHDAB) is the body that decides which artefacts and records are historically significant enough to be designated.”

The following bodies are involved with administering, regulating or have an interest in heritage and tourist railways and museums under the following:

Transport Trust (TT)

The Transport Trust describe themselves as Britain’s only charity dedicated to the preservation of all modes of transport and its infrastructure and maintain a database of transport heritage including artefacts and buildings. Their website can be found at <https://www.nationaltransporttrust.org.uk>.

The Heritage Railway Association (HRA)

The HRA is a voluntary run trade association representing heritage & tourist railways, related museums, tramways, cliff lifts, railway preservation groups and related organisations. They claim 180 of their member organisations regularly open to the public, with 156 of these operating with passengers. They have over 300 corporate members in total. Their website can be found at <https://www.hra.uk.com>.

The Office of Rail and Road (ORR)

The ORR is a non-ministerial government department responsible for the economic and safety regulation of Britain's railways, and the economic monitoring of Highways England. It was established as the Office of Rail Regulation on 5 July 2004 by the Railways and Transport Safety Act 2003, replacing the Rail Regulator. The ORR regulates health and safety for the

entire main line rail network in Britain, as well as London Underground, light rail, trams and the heritage sector. Their website can be found at <https://www.orr.gov.uk>.

The Health and Safety Executive (HSE)

The HSE is Britain's national regulator for workplace health and safety. Their website can be found at <https://www.hse.gov.uk>.

Department for Transport (DfT)

The DfT is the government department responsible for the English transport network and a limited number of transport matters in Scotland, Wales and Northern Ireland that have not been devolved. Their website can be found at <https://www.gov.uk/government/organisations/department-for-transport>.

Department for Digital, Culture, Media and Sport (DCMS)

The DCMS is a department of the United Kingdom government, with responsibility for culture and sport in England. It also has responsibility for tourism and leisure. Their website can be found at <https://www.gov.uk/government/organisations/department-for-digital-culture-media-sport>.

Department for Business, Innovation and Skills (BIS)

BIS is a department of the United Kingdom government, with responsibility for business, innovation and skills. It also has responsibility for training and apprentices. Their website can be found at <https://www.gov.uk/government/organisations/department-for-business-innovation-skills>.

Appendix 4 Regulatory context

The key legislation and regulation that affects heritage railways are:

Light Railway Act 1896 and Transport and Works Act 1992

Prior to 1992 most heritage railways were authorised and subject to the Light Railways Act of 1896. In 1992 the Transport and Works Act was introduced whereby an order made under the act is now the usual way of authorising a new railway or tramway scheme, except for nationally significant rail schemes in England which require development consent under the Planning Act 2008.

The Railways and Other Guided Transport Systems (Safety) Regulations 2006 (ROGS)

ROGS are the key safety regulations, they were introduced to put the requirements of the 2004 European Railway Safety Directive into practice in Great Britain. The Railways and Other Guided Transport Systems (Safety) (Amendment) Regulations 2011 (the amending regulations) came into force on 26 August 2011. The Railways and Other Guided Transport Systems (Miscellaneous Amendments) Regulations 2013 (the Miscellaneous Amendments Regulations) came into force on 21 May 2013. ROGS give transport undertakings and infrastructure managers a duty to develop safety management systems that meet certain requirements. However, ROGS are different for main line and non-main line railways which includes heritage railways, because they recognise that the safety management system can be adapted to fit the size and nature of the business - for a smaller organisation a simpler safety management system is more appropriate.

Regulation 2A of ROGS gives the ORR discretion to determine that a railway or part of a railway such as a heritage railway, tourist railway and museum does not form part of the main line railway. Regulation 2A also gives ORR discretion to determine that a heritage vehicle which operates on the main line railway and complies with national safety rules is deemed not to operate on the main line railway. The ORR publishes on their website an 'Approved List' of those transport systems and heritage vehicles that they determine are not main line railways or operating on the main line railway.

A full list is shown in the accompanying table.

Table A7-01 *Legislation related to heritage railways, demonstrating the increasing level of regulation and governmental oversight that heritage railways are subject to, though most is general legislation applicable to a number of sectors*

Year	Name	Comment
1842	Railway Regulation Act 1842 https://www.legislation.gov.uk/ukpga/Vict/5-6/55/contents	Section 14 creates power to enter adjacent land to repair problems with the railway or take necessary pre-emptive action to prevent failure of the railway.
1861	Malicious Damage Act 1861 https://www.legislation.gov.uk/primary+secondary?title=Malicious%20Damage%20Act%201861%20	Sections 35 and 36 relate to offences to the railway. Enforced by the Police.
1861	Offences Against the Person Act 1861 https://www.legislation.gov.uk/ukpga/Vict/24-25/100/contents	Sections 32,33 and 34 relate to offences to the railway. Enforced by the Police.

1863	Railways Clauses Act 1863 https://www.legislation.gov.uk/ukpga/Vict/26-27/92/contents	Prohibits shunting across level crossings,
1896	Light Railway Act 1896 https://www.legislation.gov.uk/ukpga/Vict/59-60/48/contents	Act under which may minor railways operate
1905 1923	Railway Fires Act 1905 https://www.legislation.gov.uk/ukpga/Edw7/5/11/contents Railway Fires Act (1905) Amendment Act 1923' https://www.legislation.gov.uk/ukpga/Geo5/13-14/27/contents	Gives railways a power to enter neighbours land to clear underbrush that represents a fire risk. Also sets rules on liability for fires caused by railways.
1959	Weeds Act 1959 https://www.legislation.gov.uk/ukpga/Eliz2/7-8/54/contents	
1961	Factories Act 1961 https://www.legislation.gov.uk/ukpga/Eliz2/9-10/34/contents	
1962	Transport Act 1962 https://www.legislation.gov.uk/ukpga/Eliz2/10-11/46/contents	
1963	Offices, Shops and Railway Premises Act 1963 https://www.legislation.gov.uk/ukpga/1963/41/contents	
1974	Control of Pollution Act 1974 https://www.legislation.gov.uk/ukpga/1974/40/contents	The Act was passed to cover a number of environmental issues such as air, noise, water and atmospheric pollution as well as waste on land.
1974	Health and Safety at Work etc. Act 1974 https://www.legislation.gov.uk/ukpga/1974/37/contents	This is the fundamental piece of health and safety legislation. It places general duties on employers, people in control of premises, manufacturers and employees. Health and safety regulations made under this Act contain more detailed provisions. The Act provides the framework for the regulation of industrial health and safety in the UK and is relevant to health and safety regulation for the rail industry.

1981	Wildlife and Countryside Act 1981 https://www.legislation.gov.uk/ukpga/1981/69/contents	
1981	The Health and Safety (First-Aid) Regulations 1981 https://www.legislation.gov.uk/uksi/1981/917/contents/made	Requires employers and the self-employed to make appropriate first aid provisions
1983	The Level Crossings Act 1983 https://www.legislation.gov.uk/ukpga/1983/16/contents	This Act provides for level crossing orders to be made which contain detailed provisions for the protection of level crossing users.
1984	Building Act 1984 https://www.legislation.gov.uk/ukpga/1984/55/contents	
1986	Insolvency Act 1986 https://www.legislation.gov.uk/ukpga/1986/45/contents	
1989	Electricity at Work Regulations 1989 https://www.legislation.gov.uk/uksi/1989/635/contents/made	Electrical safety rules.
1990	Town and Country Planning Act 1990 https://www.legislation.gov.uk/ukpga/1990/8/contents	
1990	Environmental Protection Act 1990 https://www.legislation.gov.uk/ukpga/1974/40/contents	
1990	Planning (Listed Buildings and Conservation Areas) Act 1990 https://www.legislation.gov.uk/ukpga/1990/9/contents	First established in 1990, it controls laws that help to protect listed buildings and conservation areas in the UK.
1990	The Planning (Hazardous Substances) Act 1990 https://www.legislation.gov.uk/ukpga/1990/10/contents	
1990	Food Safety Act 1990 https://www.legislation.gov.uk/ukpga/1990/16/contents	This Act and subsidiary regulations contain provisions for food safety and hygiene
1991	Environmental Protection (Prescribed Processes and Substances) Regulations 1991 https://www.legislation.gov.uk/uksi/1991/472/contents/made	
1992	The Workplace (Health, Safety and Welfare) Regulations 1992 https://www.legislation.gov.uk/uksi/1992/3004/contents/made	Set a range of requirements for workplaces including amongst other topics lighting, temperature, ventilation and sanitary provision.

1992	Transport and Works Act 1992 Part I applies in England and Wales only. Other parts apply to Scotland as well. https://www.legislation.gov.uk/ukpga/1992/42/contents	Part I of the Act creates the process for obtaining Transport and Works Act Orders for new lines etc. Part II of the Act sets the duties on drink and drugs for those in safety critical roles on railways and other transport systems. Part II also permits directions to be given on maximum speeds and axle loads, as well as issues to do with level crossing safety amongst other matters.
1993	Clean Air Act 1993 https://www.legislation.gov.uk/ukpga/1993/11/contents	Prohibition of dark smoke from chimneys. See in particular s43
1993	Railways Act 1993 https://www.legislation.gov.uk/ukpga/1993/43/contents	Much of this Act is relevant to the mainline railway, but for minor railways there are effects from Licencing (and Licence Exemption)
1994	The Railways (Class and Miscellaneous Exemptions) Order 1994 https://www.legislation.gov.uk/uksi/1994/606/contents/made	Sets out which railways and other transport systems are automatically exempt from the requirement to hold a Railways Act Licence or Licence Exemption.
1996	Railway Heritage Act 1996 https://www.legislation.gov.uk/ukpga/1996/42/contents	
1996	Employment Rights Act 1996 https://www.legislation.gov.uk/ukpga/1996/18/contents	One of the most inclusive pieces of employment law legislation, covering a variety of topics such as employment contracts, unfair dismissal, family-friendly leave, and redundancy.
1996	The Private Crossings (Signs and Barriers) Regulations 1996 https://www.legislation.gov.uk/uksi/1996/1786/contents/made	Includes the specific format to be used for level crossing signals, signs and lines on private crossings.
1996	The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 https://www.legislation.gov.uk/uksi/1996/428/contents/made	Sets out duties to provide grants for noise insulation on properties adjacent to the railway.
1997	Level Crossings Regulations 1997 https://www.legislation.gov.uk/uksi/1997/487/contents/made	Makes it an offence for an operator of a level crossing for which there is a level crossing not to comply with that order.
1997	Railway Safety (Miscellaneous Provisions) Regulations 1997 https://www.legislation.gov.uk/uksi/1997/553/contents/made	Regulations on: Brakes, Communications, Points, fencing.
1998	The Provision and Use of Work Equipment Regulations 1998 https://www.legislation.gov.uk/uksi/1998/2306/contents/made	Key safety rules for equipment and machinery.
1998	National Minimum Wage Act 1998 https://www.legislation.gov.uk/ukpga/1998/39/contents	
1998	Working Time Regulations 1998 https://www.legislation.gov.uk/uksi/1998/1833/contents	Sets limitations on the working patterns for employees.

1998	Data Protection Act 1998 https://www.legislation.gov.uk/ukpga/1998/29/contents	
1999	The Maternity and Parental Leave etc. Regulations 1999 https://www.legislation.gov.uk/uksi/1999/3312/contents	
1999	Pollution Prevention and Control Act 1999 https://www.legislation.gov.uk/ukpga/1999/24/contents	
1999	Management of Health and Safety at Work Regulations https://www.legislation.gov.uk/uksi/1999/3242/contents/made	Various H&S duties including risk assessment and Principles of Prevention, and treatment of young persons
1999	Pressure Equipment Regulations 1999 https://www.legislation.gov.uk/uksi/1999/2001/contents/made	Relevant to boilers, but also other pressure systems such as compressed air systems and some catering equipment.
1999	The Railway Safety Regulations 1999 https://www.legislation.gov.uk/uksi/1999/2244/contents/made	TPWS on the mainline, Mark 1 carriage prohibition; slam door prohibition. Exemption procedures built in. Relevant to minor railways who need to operate onto the mainline railway.
2000	Part-Time Workers (Prevention of Less Favourable Treatment) Regulations 2000: https://www.legislation.gov.uk/uksi/2000/1551/contents	
2000	Pressure Systems Safety Regulations 2000 https://www.legislation.gov.uk/uksi/2000/128/contents/made	Relevant to boilers, but also other pressure systems such as compressed air systems and some catering equipment.
2002	The Control of Lead at Work Regulations 2002 https://www.legislation.gov.uk/uksi/2002/2676/contents	Relevant to bearings, fusible plugs etc
2002	The Control of Substances Hazardous to Health Regulations 2002 https://www.legislation.gov.uk/uksi/2002/2677/contents	Key safety rules for chemicals, gases, paints etc.
2005	The Regulatory Reform (Fire Safety) Order 2005 https://www.legislation.gov.uk/uksi/2005/1541/contents	
2005	Control of Noise at Work Regulations 2005 https://www.legislation.gov.uk/uksi/2005/1643/contents	Relevant to boiler shops and workshops.
2005	Railways Act 2005 https://www.legislation.gov.uk/ukpga/2005/14/contents	Set up the formal transfer of Safety functions to ORR, also gives duties in relation to closure of mainline rail routes.
2005	The Railways (Accident Investigation and Reporting) Regulations 2005 https://www.legislation.gov.uk/uksi/2005/1992/contents	Powers of RAIB and creates requirement to report certain things to them.
2005	The Regulatory Reform (Fire Safety) Order 2005 https://www.legislation.gov.uk/uksi/2005/1541/contents	Creates the duties to undertake specific risk assessments for fire issues and act on the findings.

2005	The Work at Height Regulations 2005 https://www.legislation.gov.uk/uksi/2005/735/contents	Rules to reduce the risk from falls from height.
2006	The Health and Safety (Enforcing Authority for Railways and Other Guided Transport Systems) Regulations 2006 https://www.legislation.gov.uk/uksi/2006/557/contents/made	Sets out the specific divisions between ORR and HSE for the enforcement of activities.
2006	Companies Act 2006 https://www.legislation.gov.uk/ukpga/2006/46/contents	
2006	The Railway Safety Levy Regulations 2006 https://www.legislation.gov.uk/uksi/2006/1010/contents/made	These regulations give ORR the authority to raise a levy from all railways to fund railway safety functions. The system is based on turnover and the majority of minor railways fall into the noncharging band.
2006	The Railways and Other Guided Transport Systems (Safety) Regulations 2006 https://www.legislation.gov.uk/uksi/2006/599/contents	These regulations set safety requirements for railway operators and infrastructure managers. ROGS states, in outline, that those with responsibility for safety must have a safety management system before operating. The regulations also make provision for the safe design of new vehicles and infrastructure; impose controls on safety critical work. More information can be found on ORR's website.
2008	Climate Change Act 2008 https://www.legislation.gov.uk/ukpga/2008/27/contents	Established in 2008, the Act is an environmental law designed to reduce carbon dioxide emissions in the UK. Binding targets have been set that will reduce these emissions from levels recorded in 1990 by at least 80% by 2050.
2008	The Supply of Machinery (Safety) Regulations 2008 https://www.legislation.gov.uk/uksi/2008/1597/contents	It largely applies to those who 'place on the market' machinery
2009	The Fire Precautions (Sub-surface Railway Stations) (England) Regulations 2009 https://www.legislation.gov.uk/uksi/2009/782/contents/made	Sets specific fire safety rules for stations that are either underground, built over or in cuttings.
2010	Equality Act 2010 https://www.legislation.gov.uk/ukpga/2010/15/contents	Rules on discrimination on grounds of age, disability, gender etc.
2010	The Rail Vehicle Accessibility (Non-Interoperable Rail System) Regulations 2010 https://www.legislation.gov.uk/uksi/2010/432/contents	These Regulations set accessibility standards for disabled persons for passenger vehicles used on noninteroperable railways and transport systems.
2010	Agency Workers Regulations 2010: https://www.legislation.gov.uk/uksi/2010/93/contents	Aims to stop discrimination against any agency workers. Such as ensuring they receive the correct

		amount of pay, along with the right amount of holiday days, and safe working conditions.
2010	Bribery Act 2010: https://www.legislation.gov.uk/ukpga/2010/23/contents	Covers the criminal law relating to any act of bribery. It's a serious issue in any working environment requires vigilance to avoid.
2011	Charity Act 2011 https://www.legislation.gov.uk/ukpga/2011/25/contents	
2012	The Control of Asbestos Regulations 2012 https://www.legislation.gov.uk/uksi/2012/632/contents	Relevant to historic coaching stock and locomotives, joints, roofing, troughing etc.
2013	The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (https://www.legislation.gov.uk/uksi/2013/1471/contents)	Requirement to report certain classes of accidents and incidents to ORR.
2015	The Construction (Design and Management) Regulations 2015 https://www.legislation.gov.uk/uksi/2015/51/contents	Rules for construction work
2015	Small Business, Enterprise and Employment Act 2015 https://www.legislation.gov.uk/ukpga/2015/26/contents	
2016	The Traffic Signs Regulations and General Directions 2016 https://www.legislation.gov.uk/uksi/2016/362/contents/made	Includes the specific format to be used for level crossing signals, signs and lines on public crossings.
2016	The Environmental Permitting (England and Wales) Regulations 2016 https://www.legislation.gov.uk/uksi/2016/1154/contents	Requirement for a license for toilet discharge on track
2018	Data Protection Act 2018: https://www.legislation.gov.uk/ukpga/2018/12/contents	

Appendix 5 Heritage railway Survey

This questionnaire is part of a fact finding and perception study being conducted into the sustainability of heritage railways. All directors and trustees of the nation's 100 or so HRs are being invited to fill it in. The results of the survey will be used in the development of a PhD on the sustainability of HRs and will also be used to help shape follow up investigations and research. No individual response will be identified in any published results. Where data is published it will always be in anonymized format.

Questionnaire

1. Your organisation Name.....

Do you consider your organisation to be:

- Bits in yellow are points of fact – why ask in a perception question?
- I suspect that RC could answer this question for all of the 100 HRs. Will you gain anything by giving people the opportunity to answer the question wrongly?
- Is there sufficient info on each HR website to answer this question?

Description	Tick one
Mainly operating, or supplying related services, to run steam hauled trains on the National Network	
One of the UK's larger heritage railways or attractions with an interface (or proposed interface) to the National Network	
One of the UK's larger heritage railways or attractions without a mainline connection	
A middle ranking heritage railway or attraction	
One of the smaller heritage railways or attractions	

(Note there is no specific definition as to what constitutes 'large, middle or smaller' as this is left to the perception of how the railway presents itself to the public, irrespective of gauge or length of railway.)

2. Operating Successfully

2a. In terms of being able to continue to operate successfully how would you rank the following in importance:

Put one tick in each row representing your judgement as to the importance of each Factor

Factor affecting ability to operate successfully	Not important or N/A	Slightly Important	Medium importance	Very important	Critical
Tangible assets , secure access to the 'physical things' - locomotives, rolling stock, machinery and their respective records/drawings					
Property assets , land buildings and infrastructure, including security of tenure					
Safety and Operational systems , these are all the licenses, acts, approvals, rules, policies - basically the paperwork by which anything and everything operates.					
Governance , the way the organisation is led and governed at the highest level, board or committee					
Members Staff and Volunteers - all those engaged in ownership, funding or operating the railway.					
Risk Management – Both operational and business risk is identified and managed					
Visitors – those that come to visit the railway					
Money – both in terms of cash flow and access to ad hoc funding					

2b. Do you consider there are any other factors necessary for the continued successful operation that have been missed out?

Yes		No	

If yes can you name and rank please?

Factor (Fill in)	Not important or N/A	Slightly Important	Medium importance	Very important	Critical

2c. Of the conditions above is there one condition that is more critical or important than all the others that stands out.

	Tick one	If yes which:	Tick one
Yes		Tangible Assets	
		Property Assets	
		Safety and operational systems	
		Governance	
		Member, staff and volunteers	
		Risk Management	
		Visitors	
		Money	
		Other (Name)	
No		Of similar or equal importance	

2d. In terms of your own railway which do you consider to have been, and will be, a strength or weakness over the last five years, and also into the future.

Factors	a. Last 5 years			b. Next 5 years		
	Has been more of a strength	Has been equal strength and weakness	Has been more of a weakness	Likely more of a strength	Likely equal strength and weakness	Likely more of a weakness
Tangible assets , the 'physical things' - locomotives, rolling stock, archives, machinery						
Property assets , land buildings and infrastructure, including security of tenure						
Safety and Operational systems , these are all the licenses, acts, approvals, rules, policies - basically the paperwork by which anything and everything operates.						
Governance , the way the organisation is led and governed at the highest level, board or committee						
Members Staff and Volunteers - all those engaged in ownership, funding or operating the railway.						
Risk Management – Both operational and business risk is identified and managed						
Visitors – those that come to visit the railway						
Money – both in terms of cash flow and access to ad hoc funding						

3. Managing the above factors

3a. On a scale of 1 -5 (1 Poor, 5 excellent) How well do you consider the organisation manages these factors:

Condition	Level 1 Poor	Level 2	Level 3	Level 4	Level 5 Excellent
Tangible assets					
Property assets					
Safety and operation					
Governance					
Members, staff, and volunteers					
Risk Management					
Visitors					
Money					

3b. Generally, given the nature of your organisation, are you satisfied with the level to which these factors are managed:

Tick one

Satisfied as appropriate for nature of operation	
Appropriate for size of operation but could make some improvements	
Not satisfied and room for improvement	
Recognise need for significant improvement	
Already over managed for the size of operation	

4. The future

4a. Looking forward (on a scale of 0-10) how sustainable do you rate: a) your own railway, b) the sector generally, over the next 5 years and 25 years. Tick one box in each of columns a - d.

Description	Ranking	Your railway /organisation		Heritage railway sector generally	
		a. Over next 5 years	b. Over next 25 years	c. Over next 5 years	d. Over next 25 years
Very sustainable and almost certain to prosper	10	☐	☐	☐	☐
	9	☐	☐	☐	☐
Generally sustainable at current levels	8	☐	☐	☐	☐
	7	☐	☐	☐	☐
Some general concerns but most capable of being overcome	6	☐	☐	☐	☐
	5	☐	☐	☐	☐
At the tipping point of whether it can survive or not	4	☐	☐	☐	☐
	3	☐	☐	☐	☐
Very concerned for the future	2	☐	☐	☐	☐
	1	☐	☐	☐	☐
Don't think there is a future	0	☐	☐	☐	☐

4b. In arriving at your answer for 4a was there one key strength and one key weakness?

If appropriate, tick one key strength from (1) and one key weakness from (2). Or tick (3). and / or (4). if no key strength or weakness stands out.

	Your railway /organisation	Heritage railway sector generally
(1) Key strength		
Tangible assets		
Property assets		
Safety and operation		
Governance		
Members, staff, and volunteers		
Risk Management		
Visitors		
Money		
Other (Name)		
(2) Key weakness		
Tangible assets		
Property assets		
Safety and operation		
Governance		
Members, staff, and volunteers		
Risk Management		
Visitors		
Money		
Other (Name)		
(3) No key strength stands out from the others		
(4) No key weakness stands out from the others		

5. Support and organisational style

5a. How important are the following to your Railway?

	1. None or N/A	2. Little	3. Some	4. Very supportive	Consider could do more Y/N
HRA					
ORR					
Charity Commission					
Department of Transport					
Grant funding bodies					
The Rail Industry					
Other Heritage Railways					
Local Authorities					
Your members and volunteers					
The railway press					
Media generally					
The local community					
Railway enthusiasts generally					

5b. Overall as an organisation how well do you feel supported by:
Tick one of columns 1-4 (green) and Yes / No in column 5 (blue)

	1. None or N/A	2. Little	3. Some	4. Very supportive	Consider could do more Y/N
HRA					
ORR					
Charity Commission					
Department of Transport					
Grant funding bodies					
The Rail Industry					
Other Heritage Railways					
Local Authorities					
Your members and volunteers					
The railway press					
Media generally					
The local community					
Railway enthusiasts generally					

5c. Organisations often have a mix of styles and influences which may change over time, but usually one predominates. What best describes the style and influence of your organisation currently? Tick one row for the predominant style, then up to two rows for strong elements and then tick each of the remaining rows.

Description	Does not apply	Some small elements of this	Medium elements of this present	Strong elements of this present (up to two ticks)	Predominant style (One tick required)
Entrepreneurial, innovative and willing to take risks					
Procedural and risk adverse					
Focused on public good and preservation of historic artifacts and systems					
A place to enjoy a hobby and vocation					
Financially orientated, focused on the bottom line					
Implement the policy and aims of members/owners					
Strongly community based					
Service sector business focused on customers / visitor experience					

5d The ways things get done

Governance is usually made up of both formal and informal elements. Formal would be policies, directions, control and reporting. Informal would be discussions, networks, relationships, persuasion, and agreement. On a scale of 1-10 (1 being totally informal and 10 being totally formal, where would you place your organisation.

Informal					Formal				
1	2	3	4	5	6	7	8	9	10

6. Risk Management

6a As a Director or Senior Manager, on a scale of 1-5 where 1 is poor and 5 is excellent, do you consider:

	Level 1 Poor	Level 2	Level 3	Level 4	Level 5 Excellent
There are robust procedures in place to identify and regularly review operational risks					
There are robust procedures in place to identify and regularly review business risks					
The collective experience and knowledge of the Board could be expected to cope with and mitigate any identified risks					
That all members of the Board have fully described and documented roles and responsibilities and undertake training and continuous professional development for these roles					
Your own personal competence, knowledge and experience to fulfill your designated role					
The overall competence, knowledge and experience of the Board to fulfill its designated role					

6b As an approximation what percentage of time at typical Board meetings is spent on the following (figures should add up to no more than 100%).

	Less than 5%	5-10%	10-25%	25-50%	Over 50%
Long term strategy and planning 1-5 years					
Budgets and finance					
Normal day-to-day operational issues					
Fire-fighting and unexpected problems					
Capital investment and managing / monitoring ongoing major projects					
Compliance issues, safety and risk					
Marketing and communication					
Other matters					

7. About you

Finally a little information about yourself:

7a. In your current organisation what is and has been position(s). More than one box can be ticked, for example, you may be (or have been) a Director (volunteer) and signaller (paid).

Position	Number of years service				Paid	Volunteer
	1-5	5-10	10-20	Over 20		
Director / Trustee						
Manager / Head Of Department						
Operation staff						
Engineering						
Office or station based job						
Other						

7b Your experience outside this organisation. Tick all that apply:

	Tick
Held Directorships of large companies	
Held Directorship (or similar) of small, medium enterprises	
Held Directorships of other charities or not-for-profit organisations	
Held senior manager positions in private, public or charity sector	
Held supervisors positions	
Held Craftsman or similar skilled positions	
Member of recognised professional body	
Professional experience of rail industry (management)	
Professional experience of rail industry (non-management)	
Professional experience of related industry – engineering, transportation, customer service	
None of the above	

7c Motivation for your interest in heritage railways. Tick all that apply:

	Tick
Life-long passionate interest in railways	
Minor interest in railways prior to involvement	
No prior interest in railways	
Interest in engineering	
Interest in customer service	
Interest in preservation and history	
Interest in operations	
Other interest related to the railway	
Interest in volunteering	
Interest because railway forms a part of the community	
Interest in the governance of organisations	
Paid employment	
None of the above	

7c If you hold more than one role on the Railway, for example, you are both a Director and Driver, what percentage approximately is devoted to each role. The total should equal 100%.

Role	100%	80%	60%	50%	40%	20%	0%
Director / GM							
Other role (s)							
[Insert role/s here]							

7d How much time (in hours) approximately do you devote to the railway (all roles) in a typical month?

Less than 10	10 -40	40-80	80-120	120-160	160 -200	More than 200

7e Your age. Tick one.

Under 30	30 -55	Over 55	Prefer not to say

7f Gender. Tick one.

Describe yourself as Male	Describe yourself as Female	Prefer not to say

Other. Please state how you describe yourself.....

7g Ethnicity. Tick one.

Asian or Asian British	
Black or Black British	
Chinese or other ethnic group	
Mixed Heritage	
White British	
White other	
Prefer not to say	

Thanks you for your time and thought in filling in this questionnaire. It is much appreciated

All responses will be held confidentially and any results that are produced will be displayed anonymously and in aggregated form that does not enable any individual to be identified

How Sustainable are Heritage Railways?



This is a question that has occupied much platform-end, messroom and Internet forum discussion. Heritage Railways have grown in size and number since the 1960s and are generally flourishing as a sector. They have overcome many challenges to establish and develop themselves and now play important roles in tourism, leisure, and conservation. There are numerous challenges facing the sector from changing social trends to aging volunteers and equipment, but what really are the essential ingredients to make them sustainable in the future?

A new research project at the University of Birmingham' Centre for Railway Education and Research is seeking to establish the answer to these questions with academic discipline. The three-year research study will initially survey Directors and Managers concerned with the operation of the heritage sector to identify the key factors that influence the sustainability of the heritage sector and the current evaluation of how strong the participants are in each of the areas identified. This will be followed up with targeted information requests and a

further questionnaire to members, staff and volunteers to seek validation and views from alternative perspectives.

Robin Coombes the doctoral student undertaking the research says: “The intention is not only to understand more about how heritage railways are governed but to develop useful tools to enable self-assessment of how sustainable they are and to provide a toolkit for future actions.

Initial questionnaires will be sent out in February 2018 with a request to fill them in by the end of March 2018. The follow up questionnaire with staff and members of Heritage Railways will be conducted in the second half of 2018

This project is endorsed by the Heritage Railway Association and the Office of Rail and Road

For more information, please contact Robin Coombes 

NOTES TO EDITORS

About BCRRE

To find out more about Birmingham Centre for Railway Research and Education, visit the following link: <https://www.birmingham.ac.uk/research/activity/railway/index.aspx>

Professor Anson Jack – who is supervising the research

Professor Jack joined BCRRE in 2015 to promote international railway benchmarking and other research, and to develop the extensive international relationships the University has already established across the globe.

He began his career at British Rail which he joined as a graduate trainee in 1979. He also worked at Railtrack and Network Rail, before joining the Rail Safety and Standards Board (RSSB) in 2003. Prior to his leaving RSSB in 2015 he had Board responsibility for Safety, Standards, Research, Commercial and Innovation and was also deputy chief executive. His

experience also includes membership of: the Technical Advisory Board of the International High Speed Rail Association, based in Tokyo; the Transportation Research Board Committee for the review of the Federal Railroad Administration research and development programme, based in Washington; and has been: an adviser to the Board of SNCF and the World Bank on railway safety, a member of the Organising Committee for the World Congress on Railway Research, and the alternate chair of the UK rail industry's Technical Leadership Group.

Robin Coombes

Robin is a doctoral student at the University of Birmingham studying Governance of Heritage Railways. He is a Director of Vintage Trains Community Benefit Society and was recently the Independent Chairman of the governance review of the West Somerset Railway Association. He is a retired Chartered Architect and Consultant and was a Rail Manager for 8 years at Network SouthEast and partner with a national architectural practice for 25 years, the last ten years as Chairman, a founding partner of the environmental and economic consultancy ERES, and has served as a magistrate for 29 years. He has a lifelong passion for steam railways, travelling over one million miles, and is perhaps best known for his innovative photography for which he has won several awards and been widely published.

Questions for interviews with Directors, Senior Managers

Introduction

Introduce myself, thank you for giving up your time and agreeing to see me

Purpose

Follow up interview to the questionnaire

Thank you for filling in the Online Questionnaire

Warnings and information

All responses will be anonymised, unless by permission. Data held on University of Birmingham servers subject to usual safeguards

Name of Interviewee

.....

Position

.....

Perhaps we could start with an introductory question;

1. *How has the recent season been?*

.....
.....
.....
.....
.....

Summary (Interviewer based on discussion, tested by – “would it be reasonable to summarise as.....” (note agreed or not)

Better than expected	Worse than expected	Too early to say

Agreed

Yes	No

The first topic I would like to discuss in how you manage your assets

2. *Firstly, the locomotives and rolling stock, can you describe what level of planning and documents you have in place to manage the fleet going forward?*

Prompts – How long planning, what details, costed?

.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

- Level 1** *No documented evidence to demonstrate the component is being measured or governed*
Level 2 *Basic level of documented evidence to demonstrate compliance with statutory regulations*
Level 3 *Appropriate level of documented evidence to demonstrate the component is being managed sufficient for current operation*
Level 4 *Well documented evidence to demonstrate sufficiency of governance including evidence of planning for future security of operation*
Level 5 *Sophisticated business systems and all components sufficiently managed to ensure long term continuity, evidence of a cohesive organisation and buy-in to a vision and values demonstrated throughout the organisation*

Agreed

Yes	No

3. Next looking at your track and infrastructure, what level of planning and documents you have in place to manage the infrastructure going forward?

Prompts – How long planning, what details, costed, land owned - leased?

.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

4. I would like to turn to Governance, how the Railway is lead, governed and managed. Could you start by briefly describe how it works and structured?

Prompts – Where does power lie, who has most influence, does everyone respect and understand the structure?

.....
.....
.....
.....
.....

Specifically, do you have a formal reviews of all the governing documents and policies?

Prompts – Vision, Business Plans, Budgets?

.....
.....
.....
.....
.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

5. Next managing risks, can you describe your approach to managing risk?

Prompts – Risk register, who owns, frequency of review, business risk?

.....
.....
.....
.....
.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

6. Turning to Operation and Safety, can you describe the level of planning and practice you undertake for disaster and crisis management?

Prompts – fire, accidents, lines of communication, PR, security, child protection?

.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

7. On Staff and Volunteers, I would like to ask about the level of succession planning and the identification of critical skills, could you describe what level of succession planning is undertaken?

Prompts – Age profile, key skills, training plans, lead in time, recruitment?

.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

8. Visitors, do you regularly seek feedback from your visitors and how does it influence future plans?

Prompts – questionnaire, survey, social media?

.....

.....
.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

9. The last topic I wish to discuss is Money? Firstly, do you know the percentage of total funding that you need comes from tickets and how much comes from subscriptions fund raising and grants?

Prompts – revenue streams, grants, legacies, support organisations?

.....
.....
.....
.....
.....

Then secondly, can you describe the level of detail with which you manage the business cash flow?

Prompts – Frequency, forward planning?

.....
.....
.....
.....
.....

Summary

Level 1	Level 2	Level 3	Level 4	Level 5

Agreed

Yes	No

10. My final question, what you think are the most critical issues facing your railway and the sector generally?

No Prompts

Your railway

.....
.....
.....
.....
.....

The sector

.....
.....
.....
.....
.....

Thank you again for your time.

I will forward you a summary of the report.

Appendix 6 Heritage railways and climate change



Image A -01 Flooding on the Great Central Railway in 2020

Nations, organisations and individuals are increasingly being urged to recognise climate change and adopt policies and behaviours to reduce its impact. For heritage railways this presents some unique challenges.

The principal attraction of heritage railways is to feature working steam locomotives that burn fossil fuel (coal) producing smoky carbon emissions and plumes of white steam, from evaporating large quantities of water. They take passengers on a journey with little purpose other than the journey itself, are mostly run and operated by volunteers, many of which having retired from full time employment. They use equipment and performs tasks that are outdated or superseded on the modern railway. Enthusiasts are particularly attracted to those railways which have gradients on which the locomotive is required to exert maximum effort in moving its train, producing both visual and aural effects and as a measure of its technical performance. Visitors are attracted to those railways that traverse areas of outstanding natural beauty and to themed events such as Thomas the tank or recreations of World War II.

Railways for the past 200 years have suffered, responded to and recovered from extreme weather events. Government predictions are that the frequency and severity of extreme weather events is likely to increase and that the UK climate, unless the gulf stream changes, is for an overall warming.

The question is what this in reality and practicality means for the UK's heritage railways? This paper presents a discussion and register of the risks faced by heritage railways resulting from the potential effects of climate change. The research is based on a survey of heritage railway directors and follow up interviews as part of wider research into their sustainability.

Methodology

Two questionnaire surveys were carried out, the first of directors and senior personnel within heritage railways, the second of enthusiasts. The purpose of the survey was to assess what respondents considered to be the necessary and sufficient conditions that allowed heritage railways to exist and continue in operation. Respondents were given a choice of eight conditions and an option to add additional conditions of their choosing. The eight conditions given were - assets, property, governance, operational systems, money, visitors, staff and volunteers, risk management.

The responses to the questionnaires were explored further with in-depth interviews of directors and senior personnel. From the responses obtained, certain necessary conditions were highlighted, and these were the subject of further research and analysis. In the case of those conditions that could be related to the environment / climate change this was researched further as a desk top study of the literature and then developed into a risk register. This risk register was validated by presenting to a further group of directors and senior personnel as an iterative process. From this risk register potential scenarios were drawn up for heritage railways based on established (IPCC) models of climate change.

Methodology

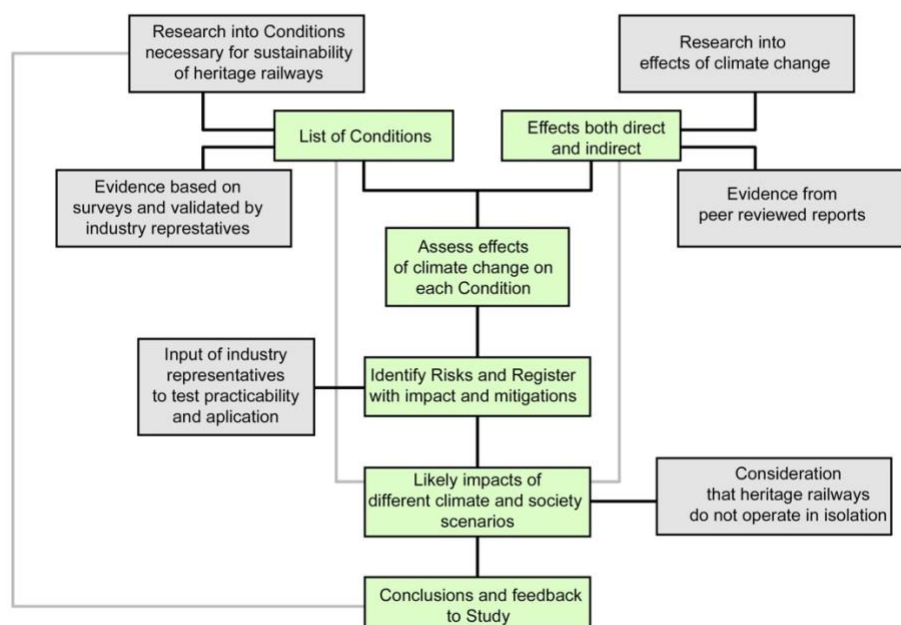


Diagram A15 -01 Methodology

Results

Thirty four percent of Directors added environment / climate change and 31% of enthusiasts added the same. Other related conditions added were availability of coal and legislation on pollution and emissions (22% of Directors and 19% of enthusiasts). It must be noted that these were unprompted answers that respondents added themselves and therefore may be regarded

as significant. In the follow up question to rank the conditions in importance. All those adding environment/ climate change or related topics ranked them as important very important or critical.

The follow-up interviews of directors and senior personnel produced a mix of responses, from denial that climate change existed or was caused by human activity; mild concern but a sense that it was something outside the scope or worry of a heritage railway, there being other more pressing issues; to those who expressed great concern and considered heritage railways to be very vulnerable to a variety of its effects. These effects were articulated as direct climate / weather events, secondary effects such as tighter and more restrictive legislation in particular consequences for the availability and supply of coal and its future price and finally changes in wider social attitudes that could turn against heritage railways because of its real or perceived emissions and association with the Industrial Revolution. The concern for a change in social attitudes was mainly from the younger generation that had grown up without a connection to the past Steam Age and who would be the pool upon which heritage railways would ultimately derive the next generation of visitors and volunteers.

Although the answers drawn from these interviews was qualitative rather than quantitative, they mirrored a survey by UK's Department for Business, Energy & Industrial Strategy (BEIS) in the general UK population in March 2019. Those expressing; not at all concerned or not concerned 18%; fairly concerned 45% and very concerned 35%. It should be noted that at the time of the survey and interviews climate change has increasing exposure in the media and there were a number of protests by the campaign group Extinction Rebellion and the Swedish school protestor Greta Thunberg. In the railway press there were several articles about the future availability of coal and a number of press releases from the Heritage Railway Association (the sector's trade body).

In the interviews there was expressed, by those that were concerned and who have begun to think through the potential consequences, a tangible sense of frustration that others on their Boards, in management and in the wider movement were not taking the potential effects of climate change seriously. The expression "burying their heads in sand" was recorded several times. There is some research notable Milford and other (2015) that "results support and extend a "conservative white male" effect in doubts concerning the science of human-caused climate change. Uniformly high beliefs in climate change reality and human cause were observed among respondents who were younger, female, educated, politically liberal, belonged to minority groups and who perceived that they were able to influence environmental outcomes." The research of Carter 2008 shows that the typical rail enthusiast fits the 'conservative white male' profile with a marked, or almost total absence of younger educated, politically liberal females.

The frustration of those directors apart from their own experience has clearly some basis in the research and in the words of one "they are going to take a lot of persuasion to wake up, by which time it will probably be too late." There is also considerable, but unquantifiable, evidence of climate denial and aggression towards Greta Thunberg in particular on many internet forums related to heritage railways.

Three areas of the concerns expressed were researched further – direct climate effects, availability of coal and social attitudes. These are discussed below.

Climate

For the national rail network, Network Rail has produced a Weather Resilience and Climate Change Adaption Strategy 2017-2019. Climate and weather will have the same physical impact on the main line as heritage railways. However, the difference is that the mainline is operating a 364-day public transport service, whereas heritage railways are operating, often seasonally for leisure and are not part of the critical national infrastructure.

In bad weather a heritage railway can simply close, ride out the storm, with no impact on the travelling public. However, it is not that simple, and the physical effects may mean damage to track and infrastructure that can result in a suspension of services for repairs. Landslips on the Severn Valley Railway in 2008 and Gloucester and Warwick Railway in 2011 resulted in many months of closure, with a need to also raise funding of around one million pounds before work could be commenced.

These were headline incidents, but railways suffer many smaller weather-related events, the Churnet Valley Gala in 2019 was cancelled due to flooding of the track on the first morning. Storms in 2020 have already affected several railways. There are and will continue to be a myriad of blocked culverts and minor movements in earthworks, erosion along riverbanks, under bridges, and along seacoasts.

Storms produce the most immediate danger, from fallen trees and flooding. As reported by the BBC it was just over thirty years ago a railway bridge near Llandeilo collapsed, plunging a passenger train into the River Towy and leaving four people dead. Glanrhyd bridge had been partially washed away in the swollen river before the accident, early on Monday 19 October 1987. Three passengers and three staff escaped but the driver and three passengers drowned. The disaster happened on the single-track Central Wales Line in rural Carmarthenshire, something similar could befall a heritage railway as there are many similar river crossings. Lessons should have been learned to prevent a train with passengers being placed at such risk again, but the loss of the bridge constructed in Victorian times is harder and more expensive to prevent. Railways such as the original Corris Railway then part of British Railways never reopened after a flood in August 1948 when the River Dyfi undermined the embankment. The loss of a major bridge or tunnel on a heritage railway would likely see it closed for years rather than months, even if it could raise the money to reopen.

Heat stress on rails can cause buckling, and while there is no legislation on what safe working temperatures on a locomotive footplate are, Czech Railways suspended all its steam charter trains once the temperature was over 30 degrees C. Without air conditioning travelling in a Mark 1 carriage or in the cab of a heritage diesel locomotive is also going to be very uncomfortable over 30 degrees C.

There are other effects of weather that also need to be considered. The UK does not suffer the wildfires of California or Australia, but forest fires and moorland fires are not unknown. In the summer of 2018, the UK suffered a series of wildfires. Major fires on Saddleworth Moor and Winter Hill in north west England were widely reported. On 26 June 2018 in the Vale of Rheidol a large grass fire broke out. The fire caused the suspension of the Vale of Rheidol Railway, 'with 150 passengers stuck on a train close to Devil's Bridge railway station having to be rescued and returned to Aberystwyth by bus. Rail services remained suspended the following day'.

Mainline steam running has been curtailed over several summers due to lineside fire risk. The longest being a 3 month ban in 1997. This can result in a loss of revenue for the operator. Steam bans on heritage railways have been rarer as the risks are lower from spark emission at 25 mph but in extended periods of drought, risks could rise, and bans increase. Drought can also mean that security of and access to water facilities and use could also be placed at risk over long hot summers.

Given the current fragile financial strength of heritage railways, the sort of multi-million-pound investment envisaged and necessary to increase the weather resilience of the mainline railway are not going to be available for heritage railways, as it is unlikely to be State funded and will have to be raised from members. Overall, the heritage sector is therefore much more at risk from the effects of such weather events and will mostly be in a position where it becomes reactive rather than proactive. This does not mean that each individual railway does not carry out its own individual risk assessment and emergency planning. Indeed, it should, it is important and increasingly urgent, and expertise should be pooled and shared between railways.

Prevention, and solutions to extreme weather events are principally in the realm of technology and engineering. Solutions do exist and if enough money could be invested theoretically it could make any railway sufficiently resilient to almost any extreme weather event.

Climate change also could bring other more subtle effects. Lineside vegetation and wildlife will be subject to stress and change. In response the North York Moors Railway has in November 2019 appointed its first lineside conservation officer - Kerry Fieldhouse. There may be changes in leisure trends, if summers become hotter and drier, focus will need to switch to spring and autumn as the main running seasons. International tourism and its sub sector of heritage tourism is forecast to continue to grow, which is already a major source of revenue for heritage railways. However, restrictions and cost of flying could dramatically increase under certain climate change scenarios placing at risk this revenue. It may not only be international tourism that could suffer, travel within the UK could become increasingly restrictive if draconian measures are adopted to reduce carbon emissions, any increase in cost of travel will equally affect both visitors and volunteers getting to the railway.

Coal

It may be perhaps obvious to state but while it may be possible for the locomotives to use a form of bio-fuel and all visitors arrive by electric powered vehicles using renewable sources and all other energy needs met using similar sources to achieve zero carbon emissions, would in practice still be very difficult to meet as bio fuels also produce carbon dioxide. However, heritage railways will still need to bring all greenhouse gas emissions to net zero by 2050 to meet the UK Government targets by 2050. Therefore, heritage railways will have to balance any admissions it makes by schemes such as tree planting.

There has been much discussion with the heritage railway sector and in July 2019 the All-Party Parliamentary Group on Heritage Rail produced a report "Steam Ahead? Heritage railways, coal and the future of steam locomotives in the United Kingdom". The report noted that 'there was no practical alternative to the use of coal for steam locomotives, the economics of heritage railway operation are fragile and are not well placed to absorb any significant increase in the price of coal, as supplies become more difficult to obtain as coal production is decreased when coal fired power generation ceases in 2025'.

There is very little research into the environmental impact of steam locomotives. Jicheng He and Yaozeng Li, 2010 estimated the carbon emissions from steam locomotives operating in China in 1975 to be of the order of 40Mt. A guesstimate of 10,000 locos were in operation at the time, across a full range of services, which would give an average of 4,000t per loco. Thompson in his *Railway Statistics 1915* which could be considered at the peak of steam operation states 187,530 locomotives in operation worldwide. If the average figure of 4,000t per locomotive was applied to the peak in 1915 this would give a global figure of 750Mt or around 2% of current (2018) global carbon emissions.

The 2019 All Party Report on Coal estimates heritage railways burn about 26,000t per year across 158 railways. Assuming say 500 active steam locomotives that is around an average of 50t per locomotive, which demonstrates the seasonal operation, intermittent use and light duties of a typical heritage railway when compared to a 24/7 national rail service.

Coal with a carbon content of 78 percent and a heating value of 14,000 Btu per pound emits about 204.3 pounds of carbon dioxide per million Btu when completely burned. Complete combustion of 1t (2,000 pounds) of this coal will generate about 5,720 pounds (2.86t) of carbon dioxide.

Therefore, the total emission of carbon dioxide from steam locomotives in the UK is around 75,000t. Perhaps world-wide given the high proportion of UK steam it would probably still be less than 200,000t or 0.2Mt. Globally we are currently producing 38.2 billion tons of carbon dioxide per year (2018), therefore steam's total contribution is probably less than 0.0005%.

As noted with an annual emission of 75,000t of carbon dioxide, if one tree is assumed to absorb seven tons of carbon, therefore the sector would be required to plant 10,000 trees per year to offset its carbon emissions and met the Government 2050 target of carbon neutral. In terms of land take 2000 trees to the hectare requires 5 hectares of land. On the mainline railway, for around each 85 miles travelled would require one tree planted, for heritage railways this figure would increase due to lower speeds and lighter loads to just over each 110 miles travelled.

The UK Government confirmed on 18 September that 2017, they will proceed with action to regulate the closure of unabated coal power generation units by 2025. In October 2018 the Government concluded its consultation on cleaner domestic burning of solid fuels and wood. It is likely that there would be a strong lobby for coal burning to be exempted for heritage uses, which would include steam locomotives and traction engines. However, a scarcity of readily available UK sources and likely reliance on imported coal could increase the price and therefore cost of operation.

Alternative fuels are under active consideration and it is likely that one main line registered locomotive GWR Castle 5043 Earl of Mount Edgcumbe may be converted to burn biofuel (oil), currently available and being used by West Midland Trains in their drive to reduce their traction carbon in kgCO₂e/vehicle-km by 49% (vs 2015/16 baseline) by the end of their franchise.

Oil burning was common in many parts of the world. In the UK the GWR converted a number of locomotives, including a number of Castle Class locomotives after the Second World War for oil burning due to increasing cost of coal. There was little difference noted in performance. The experiments were abandoned when it was realised the cost of imported oil became even greater. The Festiniog and Vale of Rhediol Railways have both successfully tried periods with oil firing but again converted back to coal on cost grounds. According to Steam Railway

Magazine the Barry Tourist Railway and South Tynedale Railway have reported success with using biomass fuel logs, but so far, the cost is much higher than coal with lower thermal efficiency and energy density, it also needs to be stored dry, which would have further implications on practical use.

The website of the Coalition for Sustainable Rail in the USA claims using a fuel as the “same energy, density and material handling properties of coal, without the associated carbon footprint, heavy metal or sulphur content. The University of Minnesota's Natural Resources Research Institute, a leader in the efficient processing of cellulosic biomaterial into carbon neutral biocoal, has engineered such a fuel. Known as torrefied biomass (or biocoal), the fuel conversion process is a derivative of coffee roasting technology originally designed in the early 20th century in France (torrefaction = "to roast" in French).” The process is only in the early stages of development and has not been fully tested on a steam locomotive.

Social attitudes

However, even if cost, availability and suitability concerns can be overcome, trends in social attitude may play a large or larger part of any discussion on the future of steam locomotives.

Part of the attraction steam locomotives for enthusiasts are the towering plumes of steam and smoke produced from a steam locomotive working hard. Steam as water vapour, is pollution free, and the smoke or ‘clag’ is produced from unburnt coal particles so there is little carbon emission from what can be seen, it is the things that you can’t see which are the more damaging. This distinction is not so readily appreciated by the public and the steam locomotive as something so visibly emitting carbon emissions unlike a car or plane where there is only a faint trail of exhaust may attract greater attention from those seeking banning of anything that is harmful to the environment or be a potential cause of climate change.

It is the steam locomotive’s association with the industrial revolution and its visible presence and legacy that could make it as acrostic and unloved in public perception as say fox hunting. How the narrative develops will depend much on how heritage railways present the history and relevance of the steam locomotive in the twenty first century. Vintage Trains has recognised this and is presenting a positive story to engage the next generation, whether it succeeds will depend on many factors outside its control.

Risk register

From the issues raised in the interviews and research the following risk register has been produced, this was validated by further interviews with heritage railway directors and versions of this are likely to be adopted by at least three heritage railways dealing with their own particular circumstances.

The risk register highlights three red risks and one red risk to specific heritage railways. These are ensuring an adequate, affordable supply of coal; a change of social attitudes both from a rejection of the ideals and purpose of a heritage railway which will place in jeopardy both future visitors and volunteers upon which heritage railways rely and the loss of a major piece of infrastructure such as a bridge which could be prohibitively expensive to replace.

This will only affect a small number of railways that may be termed vulnerable to such flooding. It is perhaps of note that there are 27 railways with the word “Valley” in their title which assumes that they follow the route of a watercourse.

Heritage Railways Climate Change Risk Register

Date 17 January 2020 Issue: 1 / Status: Draft for Discussion

Likelihood score	Likelihood score
5	Almost certain
4	Probable
3	Possible
2	Remote
1	Improbable

Severity Score	Severity description
5	Risk of business failure or multiple injury or fatality
4	Risk of £50k + loss, serious injury or fatality
3	Business disruption resulting in loss of income £10k - £50k or more
2	serious reputational damage
1	Disruption / lost income up to £10k
0	No significant impact

RISK RANKING SCORE GUIDE (Likelihood Score x Severity Score) LOW= 1-8, MEDIUM 9-19, HIGH=20-25

Type	Description of risk	Likelihood score	Severity score	Risk score	Mitigations
Flash flooding	Flooding of track work, depot and station areas - impacts will be severe but localised and will be depend and vary on location, will cause disruption and damage but recoverable except in extreme cases	5	3	15	Maintenance of water courses and drainage systems
	Landslips - cutting and embankments effects will be severe but localised and will be depend and vary on location, will cause disruption and damage can be recoverable but in extreme cases capital may not be available to reinstate	4	4	16	Maintenance of water courses and drainage systems
Fluvial flooding	Bridges washed away, consequences likely to be very severe and replacement may not be possible due to high capital cost	3	5	15	Measures to protect abutments
Increased storminess and higher wind speeds	Damage to buildings will cause disruption and damage but generally recoverable	5	3	15	Maintain buildings in good repair, and ensure measures to remove items that may become windblown debris
	Trees blown down, potential cause of collision with moving train	4	3	12	Cease operation during periods of storm weather or high winds
Heat wave/ hotter summer temperatures	Buckling of trackwork could cause derailment	3	3	9	Adjust tolerances and cease running when risk is high
	Extreme heat on footplate leading to heat stress and making an unsafe environment	3	5	15	Cease operation during periods of high temperatures
	Uncomfortable conditions to travel in non air conditioned coaches	4	3	12	Cease operation during periods of high temperatures
	Dry conditions and line side vegetation leading to fire risk from sparks emitted from chimney	4	3	12	Spark arresting chimneys, explore oil (bio fuel) burning as alternative to coal, cease running in dry weather conditions, for steam on the mainline bans likely to be imposed by Track Authority (Network Rail)
	Uncomfortable conditions in non air conditioned buildings and workshops	4	3	12	Replan working day for cooler periods
	Drought conditions lead to water shortage	3	3	9	Ensure adequate and or alternative water supplies
	Change in holiday and lifestyle patterns away from high summer periods	3	2	6	Replan operating days to cooler parts of the year
	Forest or moorland fires, effects could be severe but localised, recovery probable, fire damage of building likely to be an insured risk.	3	4	12	Ensure undergrowth and trees well maintained and cut back from track, see also above risk from sparks
Other factors - climate enforced immigration, social disorder, spread of disease	Heritage railways will have little or no influence	2	1	3	Good local TLW knowledge of locomotive certification requirements. Hire alternative locos.
Coal supplies become difficult to obtain and therefore expensive	This would have a significant impact on the cost structure, it is unknown if there is sufficient price elasticity to absorb higher costs, could result in extreme being unviable to operate, or have effect of reduction of services	4	5	20	Seek alternative supplies and sector combine to bulk purchase, continue to investigate alternative fuels
Coal burning full legislation ban	Alternatives are possible (conversion to bio fuels) but as yet unproven on widespread use, likely to have severe impact	2	5	10	HRA have so far been effectively lobbying Government and no immediate prospect of ban in short term, heritage sector may be seen as special case and exempted due to its economic, social and cultural benefits
Ban on fuel oil	This would have a significant impact on the running of heritage diesels	1	4	4	Unlikely in short to medium term as diesels used for mainline rail services
Protests	Campaign groups target heritage railways, may have short term consequences of preventing running, but have longer term reputational damage on visitor attraction	2	3	6	Heritage railways to proactively promote green credentials, have minimum effect and their social, cultural and economic benefits. Actively demonstrate importance of lineside environments for biodiversity
Changing social attitudes of next generation	This would be a longer term change but with increasing significance if there was a consequential effect on visitor numbers	4	5	20	Heritage railways to proactively promote green credentials, have minimum effect and their social, cultural and economic benefits. Actively demonstrate importance of lineside environments for biodiversity
	Resistance by current directors / members to recognise the need for change	4	5	20	Highlighting risks of doing nothing

Scenarios

What might this all mean for heritage railways? The following scenarios are developed.

The effect of three climate (1-3) and three society responses (A-C) scenarios are considered to 2050. They are related but could have different timescales.

Scenario 1 Little change

Forecasts of increased extreme weather events and climate change are proved over exaggerated and there is no or minimal change to current pattern.

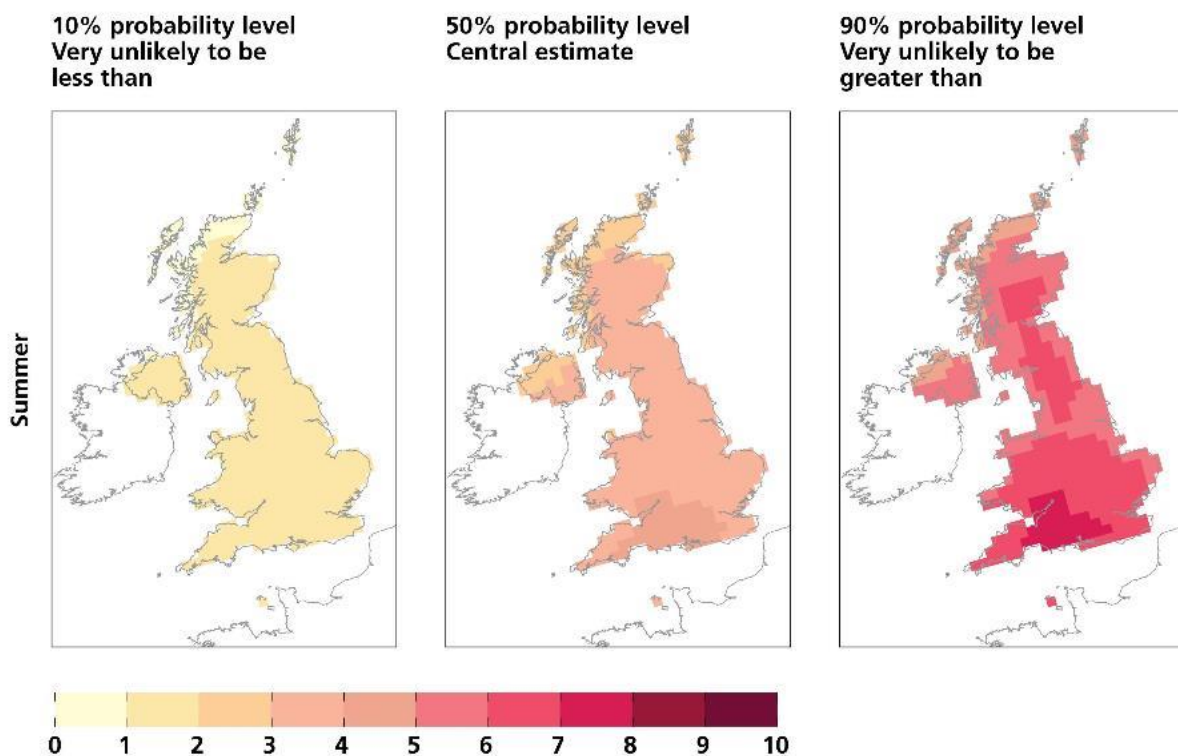
Scenario 2 Medium Change

Forecasts fit the model's medium models proposed by the IPCC, increased extreme weather events and noticeable climate change.

Scenario 3 Dramatic Change

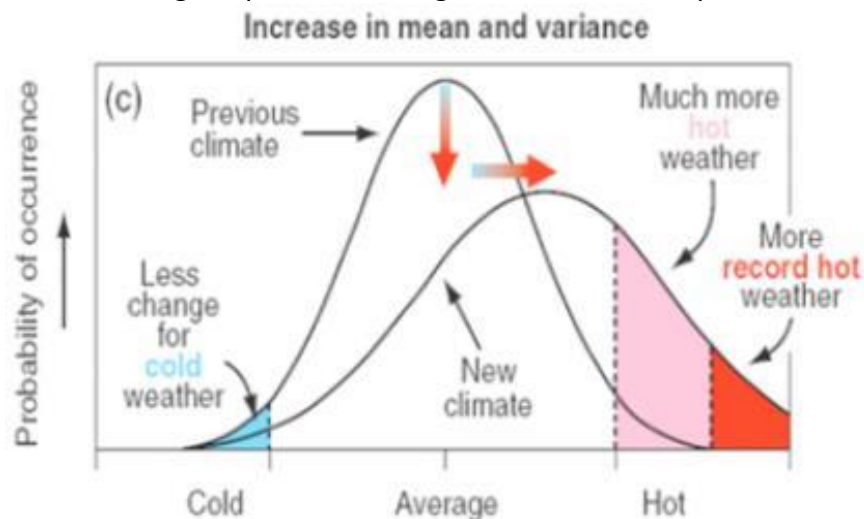
Forecasts are underestimates and there is a dramatic increase in frequency and severity of extreme weather events, climate change becomes serve and unpredictable, equivalent to the upper end models of the IPCC.

Change in summer mean maximum temperature (°C) for the 2050s, high emissions scenario



Source: UK Climate Projections 2009

Climate change impacts on average and extreme temperatures



Source: IPCC (2012) Managing the risks of extreme events and disasters to advance climate change adaptation

Scenario A No Change

Society makes little or no fundamental changes to its way of life, globally most national measures are of little effect or substance.

Scenario B Medium Change

Nations implements international treaties and society begins to make major lifestyle changes.

Scenario C Large Change

Global climate emergency recognised and coordinated draconian national responses made, society forced to change if not already done so.

When these are placed in a matrix clearly 1A would be a logical outcome and the belief of the climate change deniers, 1C is unnecessary, 2B is the most likely but many argue this is too little too late, 3A is possible and some would argue most likely. 3C would result only because 3 was happening by which time it's all too late.

The effect on heritage railways.

Climate Scenario 1

Represents little change and other aspects of business would have greater effect.

Climate Scenario 2

Heritage railways will suffer an ever increase in weather events, there will be those more at risk because of their physical geography, expect some in the range (20- 40) to for some period suspend services while recovering, with a smaller number (1-10) to close permanently.

Climate Scenario 3

The most vulnerable railways will be closed already due to infrastructure failure, because geography will play the critical part, being located on a flood plain or coast. All forms of travel to get to heritage railways will become increasing difficult and curtailed under this scenario.

Society Scenario A

Represents little change and other aspects of business would have greater effect.

Society Scenario B

Changing visitor patterns due to weather will put pressure on revenue and costs of fuel will increase significantly together with recovery costs from storm damage even if only minor damage and disruption, likely changes in how heritage perceived could be positive or negative but possible to ‘blame’ problems on ‘industrial revolution’ of which heritage railways are closely associated with.

Society Scenario C

Any draconian legislative measures are likely to make the operation of heritage railways very restrictive, even with dispensation and grandfather rights, public perception is likely to turn against heritage railways.

Combining these scenarios produces the following matrix.

		Society response scenarios		
		A	B	C
Cimate scenario	1	Unlikely to happen	Unlikely to happen	Very unlikely to happen
	2	About as likey as not to happen	Likely to happen	About as likey as not to happen
	3	Very unlikely	About as likey as not to happen	About as likey as not to happen

The matrix demonstrates that the greater effects on heritage railways (4 boxes) are all towards the likely to happen or about as likely or not. The lesser effects (3 boxes) are 66% unlikely to happen. Therefore, climate change is likely to have a significant or very significant effect on the sustainability of heritage railways.

Heritage railways could continue under 1A, slightly more difficult under 1B and 1C is very unlikely to happen. 2A become more difficult and a few likely to close, 2B Very difficult with

both weather events and society pressures both combining would expect most to struggle and many to close. 2C very few to survive. 3A is unlikely, 3B only a few to survive, 3C none expected to be able to operate.

It must be noted that there are a number of steam operated railways outside the UK that operate successfully in much higher temperatures than that experienced or likely to be in the UK until at least 2050. However, surviving damage from fire and or flood is more difficult. The Zig Zag Railway in Australia was first hit by a bushfire in 2012 when equipment was lost and then matters made worse by floods a year later which damaged the track, the railway hoped to reopen in late 2019, a gap of seven years for it to replace and repair damage and then a longer period to fully recover unfortunately the railway was once again ravaged by fire in 2020. The railway in Eretria which operates heritage steam trains found it impossible to operate when coal costs became too expensive due to difficulty in transporting from port to the depot and is effectively closed, though direct payment for coal supplies by international enthusiasts has allowed some operation. In response to community complaints, the Durango & Silverton Narrow Gauge Railroad in the USA had to spent \$500,000 on installing scrubbers on the roundhouse to filter smoke (ref). It should also be noted that although these three railways have suffered or experienced challenges, they have also proved remarkably resilient too in overcoming their problems.

Conclusion

The future is of course unknowable and therefore any predictions have little status or validity. However, what the analysis shows is that the future for heritage railways in respect of climate is at the very least going to be challenging, with only business as usual continuing if climate change deniers are correct and there is little or no response from society. The most likely scenario of an IPCC medium forecast is that heritage railways will need to adapt and change to a major extent. From the red risks identified this will include obtaining an available and affordable supply of coal, addressing changes in social attitude both to attract the next generation and ensuring existing members recognise the risks of doing nothing. Certain railways due to their physical location will face particular risks from potential damage to infrastructure from storms, floods or fire. All railways will need to consider different patterns of operation from a changing climate, they will also need to continue to research alternative fuel sources other than coal and will have to continue to persuade legislators they represent a special case and gain exemption from any further restrictions on emissions. Whether these are possible is not considered here. It is concluded that any further significant climate change and/or societal response will make the continued operation of heritage railways more difficult in the medium term (2030 – 2050) and very unlikely to operate in long term (by 2050 and beyond) without significant change which is only 30 years into the future.

Illustrations of possible effects on heritage railways

I am sitting on Hampton Loade station on the Severn Valley Railway on a hot July day in 2031. At 76 years old it is an opportunity for me to wallow in a little nostalgia and forget about some of the World's problems, what were once regarded as natural disasters now seem increasing like normal events. There is much the same feel and atmosphere as in 1951, 1981 or 2011. A Western Region Manor No. 7819 Hinton Manor gently slips into the platform with a rake of former Great Western coaches, the fireman and signaller exchanging the single line token. The locomotive having just restarted, as the signaller had

struggled to pull off the home signal due to the slack in the heat induced expanded wires despite the original wire adjuster being at maximum. The locomotive is at the end of its ten-year boiler certificate and one of the few engines not converted from coal to biofuel. The smell of coal smoke brings back many happy lineside memories, but the use of coal is now seen as very sensitive and the crew are under strict instruction to avoid any black smoke, it is also very expensive and has to be specially imported under licence. At 35 degrees C the day is warmer than ever it was in the 1950 or 60s, but no worse than a Mediterranean holiday of a few years ago and well short of the UK record of 44 degrees C achieved last year. The Severn is running as low as anyone has seen it and the countryside is looking parched again this summer. The railway has so far escaped a fire risk ban on steam hauled trains, but one is now expected to be made next week if there is no significant rain. The crew take a welcome break from the cab stepping onto the platform and drinking from their water bottles. They chat about the perennial problems of immigration as yet more people flee from famine and war in Sub Saharan Africa, closer to home, it is the severe shortage of young trained engine crew volunteers leaving it to the 'old uns' to carry on. There are fewer passengers than one would have expected on a summer's day of the past, increasing fares, and a long recession as well as the need to escape the summer heat are putting people off. Even with all the windows all open, travelling on such a hot day is becoming an experience to endure rather than enjoy. The only other difference to three years ago, the train is only going as far as Arley. The Severn that looks so benign today experienced a one in a thousand-year flood in the winter of 2029 and damaged the Victoria Bridge, there is little prospect of early repairs as an application to the HLF was turned down due to other priorities.

If one then moves the clock forward to the Summer of 2061 then although I would be very unlikely to around one could imagine the building and track still being there but there would be no trains running instead there are velorails (pedal powered light vehicles) they have become popular with local families though it is far too hot today at 39 degrees for their use and mosquitos have also become a recent problem not just the bites but climate conditions are now suitable for Plasmodium vivax malaria transmission. There is a small museum of the old Severn Valley Railway which ran its last steam train in 2051 finally forced to close due to spiralling costs, dwindling passengers, lack of volunteers and increasingly restrictive regulations on emissions even allowing for dispensations for heritage railways, five years previously to this, a 74-year volunteer fireman died of heat stroke on the footplate and there was a permanent summer steam ban introduced due to fire risk along the lineside.

An alternative optimistic scenario is put forward for the Winter of 2045. The station platforms at Hampton Loade were heaving again this evening for the Winter Solstice Express. Each year the experience has become more immersive and attracts ever greater numbers of visitors. Participants can relive different periods of the past and learn how problems of climate change are starting to be rolled back. Although the Severn Valley Railway has undergone much change, it is still trading profitably and attracts a wide range of volunteers, particular young people who wish to learn the lessons of past mistakes and causes of climate change. Many services are now operated by solar powered, battery trains converted from former Pacers. However, dispensation still allows steam to make limited appearances and tonight is such an occasion and the train is hauled by recently restored 8F No 48773 converted to run on both biofuel and battery power.

Appendix 7 Covid 19

First published article - Steam Railway 504 April 2020

“Even before the Coronavirus outbreak, the business risk register of Vintage Trains contained an entry for ‘Pandemic’. It was given a probability of “possible (3/5)” and a severity rating of “risk of business failure or multiple injury or fatality (5/5)”. That resulted in a ranking of 15/25 - in other words a medium risk.

It is likely to be little different for others. In my own academic research on the sustainability of heritage railways I have drawn up a risk register for the entire sector - and the entries are the same.

So now that a pandemic has arrived, what are the implications for railways behind a simple maximum ranking of ‘5/5’ and overall risk of ‘25/25’?

Are there measures in place - or that need to be put in place - to mitigate effects that are largely outside our control or influence?

And can we avoid the collapse of railways - something that genuinely seems likely if the crisis continues?

Long-haul fight

Consider the risk factors for heritage lines that need to be taken into account in the current situation. These include:

- Sitting in a coach within the recommended distance of two metres (6ft 6in) of strangers, a similar risk to being on public transport - train or bus. Narrow gauge coaches mean smaller distances between passengers.
- The ability and capacity of heritage railways to undertake deep cleans of rolling stock and stations, with the added complication of a variety of traditional surfaces and materials as opposed to modern surface wipe materials.
- The age profile of the core audience, as well as volunteers and leaders, tending towards the elderly - with many over 70.
- The discretionary nature of a visit or volunteering, during a time of potential national emergency.

In my modelling, I considered three different cases for the period in which any restrictions or changes of behaviour will last:

- Short - the crisis quickly evaporates and business as usual returns from late Spring.
- Medium – the crisis continues during the summer and into the autumn.

- Long – the crisis continues with further waves for at least a year.

There is little evidence to suggest the crisis will be short-lived. Indeed on March 19 Boris Johnson, flanked by the UK's Chief Medical Officer and Chief Scientific Advisor, said he expected the peak to be 12 weeks away.

Just days before that, on March 16, the Prime Minister had announced that everyone should avoid gatherings and crowded places, such as pubs, clubs and theatres; that they should work from home if they can; and that by the following weekend (March 21/22), people with the most serious health conditions must be "largely shielded from social contact for around 12 weeks".

Those over 70 should be "particularly stringent" in minimising that contact.

Most railways closed rapidly thereafter.

The aim of the Government's move was to bear down on the spread of the Coronavirus, and in doing so to drop the number of deaths to the thousands or tens of thousands. Scientific predictions suggested that the alternative, of letting the disease progress quickly, could have meant more than 1/4m people would die.

While the Government's chosen course of action may therefore be the right one, a problem with 'battening down the hatches' is that it will take longer to achieve immunity among the population. It means cases will soar when you lift the restrictions, unless there is a vaccine. However, a vaccine could be up to 18 months away.

Given all this, the most likely outcome is that the pandemic continues for more than six months - into what I have designated the longer term. In addition, there have already been marked effects aside from the directly clinical ones: dramatic falls on stock markets, panic buying, sporting events being cancelled, retail outlets closing, and a near ceasing of international travel. The inescapable conclusion is that we have not faced or reacted on this scale to a crisis of such magnitude since the Second World War.

Railways should therefore plan to either close completely or only provide a very limited service in 2020.

Will railways survive?

No heritage railways operate a full daily year-round service, and they are well versed in the storage, mothballing and restoration of equipment and infrastructure. The main problem from temporary closure will therefore be in lost revenue.

Annual accounts show that most preserved lines do not have robust funding or deep financial resources, relying instead on volunteer labour and donations to make up shortfalls. That means that if a railway is not running it should be able to downsize rapidly to minimise

operating costs - potentially laying off paid staff. Aside from any human considerations, this also carries a risk that they will seek other employment. But it can be done.

However it seems likely that lines with debt or significant fixed costs that can't easily be removed (or mitigated) will quickly face a cash shortfall. This problem is not unique to railways, but likely to be faced by many in the travel, hospitality, tourism and heritage sectors. The UK Government has said it will support businesses, although the practical effects of that commitment are as yet unknown.

In reality, some railway companies may not survive in their current form. However, the equipment and infrastructure will remain and could be utilised or reopened by another organisation; the collections of vehicles and artefacts on many lines are protected in separate charities from the operating company.

There can be less confidence in the 'software' - staff, volunteers and visitors. If the crisis were to play out quickly with a low number of deaths, railways would be quickly able to recover. However if it instead drags out, with a high number of deaths, lines will increasingly struggle to survive. In any severe outbreak, railways could lose not only key individuals but a percentage of the core audience.

The impact of such a major outbreak on changes in social behaviour and attitudes is unknown, but it would be surprising if an event of such global magnitude did not have lasting consequences; given the already severe economic impact in China, the world might enter a deep recession.

In addition, since railways form essentially a hobby or leisure activity, we may also be given lower priority - both at a personal level and from Government - during a period of national recovery.

However, while not a pleasant thought, railways might also benefit from a quick succession of personal legacies that will help towards any near-term financial shortfalls. This though, is unquantifiable.

What can we do?

What can railways do to help get through this? I offer the following practical advice:

- Safeguard and take care of staff, volunteers and visitors (assuming there are any) as far as is reasonably practical, follow all government advice regarding safety, gatherings, protection measures and employment.
- Formalise the railway's 'community' as a source of information and mutual help and assistance. Set up a system to regularly communicate with each other, consider if the community can assist others in need. Consider use of railway facilities for other local community uses or hub.
- Plan on the basis of closure or very limited operation until at least the mid-summer period and possibly longer.

- All events to considered if they should be cancelled or postponed, if not already imposed by government restriction.
- Give clear advice and reasons to staff, volunteers, members and visitors of actions taken and guidance.
- Where closure advocated or imposed, store all equipment as for the closed season.
- Check insurance conditions.
- Seek professional advice where necessary.
- Ensure historic collection and assets are protected as well as they can be through charity ownership and ring fencing.
- Put in place a skeleton team to maintain storage conditions, oiling/ inspections, key infrastructure etc.
- Take the opportunity of stopped or reduced railway operation to improve governance, compliance and risk and urgently document personal knowledge/information of history, systems, skills, etc into centrally available digital records; this may become critical during a recovery period.
- Those that can work from home to do so, with meetings via video conferencing.
- Postpone Society Meetings/AGMs or hold online.
- Work on restoration or closed season projects can continue as restrictions, funding and availability of people allow.
- Implement any additional security measures for stored equipment.
- Rework the financial model, reduce all but essential costs, working on the assumption of little or no revenue for the 2020 operating season. If debt or fixed costs need to be serviced contact the bank, funder or provider at the earliest opportunity.
- Commercial activity such as engineering, retail should continue if allowed and be enhanced if possible.
- Keep track of events as it is a rapidly unfolding and changing situation.
- Plan a recovery programme and fund-raising activity to be implemented at short notice.

The situation needs to be taken seriously, beyond the obvious priority of saving lives. For it is not too dramatic to state that Covid-19 should now be considered an existential threat to the survivability of heritage railways.”

Scenario period of time from March 2020	Likelihood	Impacts	Ability to recover
Short – 1 to 3 months	Low	No or limited operation Reduction in revenue Staff and volunteers mostly remain	Possible to recover reasonably quickly no lasting damage to majority, possibility of failure of some weaker railways

		Those above 70 years isolated for short period	
Medium – 3-6 months	Medium	Limited but increasingly no operation. Loss of most of planned revenue Cash flow pressure Likely staff layoffs, and non-availability/ loss of some volunteers	Possible to recover, but recovery period much longer to return to 2019 levels. Likely failure of all weaker railways
Long – longer than 6 months	Medium	No operation for significant period, loss of all planned annual revenue Most railways will experience cash flow pressure to some degree, in many cases extreme. Staff laid off. Loss of a number of volunteers and core audience	Possible to recover but projected to be a long struggle, likely to be significant failures which will require restructuring/ refinancing to continue.

Second published article - Steam Railway 505 May 2020

Covid-19 poses stark questions for steam

“Railway preservation expert Robin Coombes looks deeper into the massive challenges that preservation faces and considers the serious ramifications of a likely long-term shutdown, arguing that our heritage will never be the same.

Many preserved railways have come close to failing before. But what has seen them through every time is the strength of their community: people doing whatever they can by more effort, coming together or digging deeper into their pockets.

Covid-19 will sadly, however, present heritage railways biggest threat.

There is some positive news, but there are also some brutal scenarios that we may also have to face if we are going to be able to continue to enjoy steam (and diesel) hauled trains on our heritage railways.

The stark reality is that we must now, collectively and individually, consider a scaled down future for railway preservation. Perhaps even re-setting the clock to our founding era.

None of us, be it governments, big business or steam railways prepared well for this crisis, despite clear warnings from history and experts in how pandemics can develop and overwhelm society. But what is becoming clear is there are different ways to respond and some are showing themselves to be more adapt and successful than others.

Workforce at risk

But first, the positives. We are almost certain to get over this current crisis.

Throughout human history we have regularly experienced disease, epidemics and pandemics from Black Death to Spanish Flu.

In all cases, humankind has survived by a variety of circumstances and actions, such as gaining immunity, the virus becoming less virulent or application of a vaccine. We can be confident in planning for a future.

Second, Covid-19 has no effect on the historic artefacts or infrastructure. Physical assets will deteriorate over time by natural aging processes, the timescale of this crisis, be it anything from a few weeks to a few years is unlikely to have any significant long-lasting consequences from this crisis.

This is important, as in any ‘restarting’ of the sector, it will find itself in a much better position than when railways started out, who were often faced with trackbeds, but no track, and inoperative locomotives in scrap condition.

However, the same may not be said of the people involved.

When preserved railways first started there was a lot of youth, energy and unbridled passion to get them going. There was also much readily available expertise from people who had worked on steam locomotives and British Railways, which they were willing to give and share on a voluntary basis.

Preserved railways, while still having their original purpose and no shortage of passion, are now quite different. They survive and prosper as a mixture: part tourist attraction, part museum, part living history, part hobby, part social, funded through a further mix of visitor revenue from tickets and other activities such as catering, retail and event staging together with other commercial activities such as heritage engineering, grants, legacies, member subscription, donations, share issues and other fund-raising activities.

There is a blend of permanent, part time and seasonal staff, together with a large volunteer workforce which covers all levels from directors to carriage cleaners, sales staff to boilermakers. The sector is regulated by the Office of Rail and Road (ORR) as well as having to comply with a host of other regulations and legislation.

They are also, as found in my recent research, underpinned by their social capital; defined as the networks of relationships among the people who are part of a particular society, enabling that society (railways) to function effectively.

Most important many of the volunteers and visitors fit into the group who may be most at risk for Covid-19: older males, particularly those over 70 or with underlying health issues. Figures from Companies House show the average age of a heritage railway director is over 65.

Economic slowdown

Before thinking about how the crisis will affect railways, it is important to remember our natural bias. As humans we are conditioned with the Status Quo Bias: we like things the way they are, we can accept change, but only slowly and where we feel in control.

The second is Normalcy. This is a tendency for people to believe that things will function in the future the way they normally have functioned in the past and therefore to underestimate both the likelihood of a disaster and its possible effects. This may result in situations where people fail to adequately prepare themselves for disasters, and on a larger scale, the failure of governments to include the populace in its disaster preparations. About 70% of people reportedly display Normalcy bias during a disaster.

At the moment, the reaction of most preservation organisations has been: ‘We did not see that coming. Batten down the hatches, see if we can survive on donations and get to the other side of this crisis and life can return to normal again’.

Who can blame them?

I am however, strongly of the view that the world will be different and will require a complete resetting of our ideas and behaviours.

We may only be at the start of what maybe a very long drawn out crisis. The full economic impact has as yet not been thought through, as the imperative is to first deal with the health crisis keeping people safe and alive.

What we might expect from both the health crisis and an economic crisis for heritage railways over a range of different infection and mortality rates is shown in the table below. Together with the normal mortality rate without Covid-19 and the effects of an economic slowdown.

The numbers – how Covid-19 will affect heritage railways

Populations	Covid-19		Covid-19 Mortality rate					Normal mortality rate		Economic slowdown loss of visitors		
	Infection rate	Number infected	0.1%	1%	2%	5%	10%	UK age standardised rate 0.9%	Older Age weighted 3%	-10%	-30%	-50%
Volunteers	80%	18,400	18	184	368	920	1,840	207	690			
All heritage railways	50%	11,500	11	115	230	575	1,150					
23,000	20%	4,600	4	46	92	230	460					
	10%	2,300	2	23	46	115	230					
Volunteers typical railway	80%	400	1	4	8	20	40	4	15			
500	50%	250	1	2	5	12	25					
	20%	100	1	1	2	5	10					
	10%	50	1	1	2	2	5					
Visitors to larger railway	80%	160,000	116	1,160	2,320	8,000	16,000	1800	6,000	20,000	60,000	100,000
200,000	50%	100,000	100	1,000	2,000	5,000	10,000					
	20%	40,000	40	400	800	2,000	4,000					
	10%	20,000	20	200	400	1,000	2,000					
Visitors to smaller railway	80%	40,000	40	400	800	2,000	4,000	450	1,500	5,000	15,000	25,000
50,000	50%	25,000	25	250	500	1,250	2,500					
	20%	10,000	10	100	200	500	1,000					
	10%	5,000	5	50	100	250	500					

Yellow boxes represent most likely based on best available information, red indicates likely worse case, but not the maximum worst case.

Summary

Loss of visitors arising from an economic slowdown is likely to have a greater impact than direct loss from Covid-19.

Natural loss from normal mortality rate is likely to only be made marginally worse by the effects of Covid-19.

However, if infection and mortality rates for Covid-19 are high then this added to the normal mortality rate will significantly increase the loss of volunteers and visitors

In summary, the table illustrates that the loss of visitors arising from an economic slowdown is likely to have a greater impact on the fortunes of railways than direct loss from Covid-19.

Natural loss from normal mortality rate is likely to only be made marginally worse by the effects of Covid-19.

However, if infection and mortality rates for Covid-19 are high, then this, added to the normal mortality rate, will significantly increase the loss of volunteers and visitors.

Depending on how the pandemic develops, we will sadly lose people, but we are also losing people naturally, which we have always to overcome by encouraging younger people.

For heritage railways, it is therefore nothing that they have not faced before but will bring the need to find new people into much sharper focus and will become more urgent.

Heritage railways have also proved themselves remarkably resilient to crises in the past. However, nobody has in living memory faced such a crisis as this which affects everyone worldwide – and at the same time.

The priorities

My advice is that railways need to focus and prioritise three things:

1.Looking after their community of staff, volunteers, supporter and passengers by keeping them safe, staying in touch and helping wherever and however they best can.

This is obvious and most are now doing it as best they can.

2. Surviving the crisis in as best shape as possible

This is well underway. All railways, centres and museum are now closed and mothballed as they would be for the closed season. All non-essential staff have been furloughed and guidance given to volunteers. Most railways have appealed to their supporters for funds to keep them going. There are some grants and assistance available and more are being announced. There is little, beyond fundraising, most can do now do other than wait it out and most importantly plan for recovery.

Given the hiatus in society generally, railways, like many businesses, will go into suspended animation. Even running out of cash may not be fatal, as it would normally mean going into insolvency, as the rules are changing and the practicality of thousands of business facing the same circumstances will overwhelm the system.

Therefore, there is every possibility that businesses and charities will exist at the point we exit from the crisis. I must stress that this is not guaranteed and the circumstances of every individual business will be different.

Assuming they do, or can survive, what happens next quickly becomes the most urgent issue.

3. Planning a recovery in a range of different circumstances

It is this next step: surviving after the crisis long enough to recover.

The fundamental problem is the uncertainty of how things may develop.

We know some of the means Covid-19 spreads; by droplets in the air and from surfaces, but they may be others.

We don't know the mortality rate compared to the total number of cases, as we have not fully tested populations and we don't know where it is lurking geographically because we are not widely testing yet or if those that have it are then immune or if it can flare up again. Whether there is a seasonality to it, how it might mutate – and a million and one other questions. Our only defence is currently 'low tech' and was much the same as for the 1918 Spanish Flu. The only difference being between 1918 and now is better healthcare facilities and science's ability to develop a vaccine.

Therefore, we have no idea how long this crisis is going to last. There are all sorts of predictions ranging from weeks to years.

Wide ranging scenarios

What does that mean for preservation? Since we don't know all we can do is plan for a range of scenarios. The primary scenarios are:

Scenario		Consequences for railways
1	Covid-19 miraculously and rapidly disappears. All restrictions quickly lifted	Focus on restarting as quickly as possible and attracting visitors to return. Address shortfall from period of closure
2	There is some easing of restrictions, phasing opening of economy, small business, and	It would effectively be too difficult for normal reopening while social distancing guidance remains in place owing to physical

	construction first, hospitality and events last, but social distance advice stays in place until a vaccine is discovered	configuration of coaches, particularly narrow gauge, some may try innovative ways to get something open (static museum or steam demonstration) to earn some revenue
3	Smart testing and quarantining, phased lifting of restrictions, but shielding of elderly and vulnerable remain in place	Railways would be capable of reopening, but likely to be in the later phases and would have to do so with depleted volunteers and a segment of visitors missing. Railways would need to operate with a revised financial model
4	Covid-19 still present, but Government lifts restrictions to get economy restarted (the 'herd immunity' strategy). Organisations have responsibility for their own measures	This would be a dilemma. Reopening decisions would need to be a balance between the mood of the public in their willingness to take up again leisure activities, and the risk of opening knowing it would be placing volunteers in vulnerable positions in a non-essential industry
5	No restriction for those with immunity, others advised to take care	Similar to 4 above. The worst position for heritage railways as they are on their own, with no support and the remaining risk to volunteers and passengers
6	Treatments and vaccine become available	Railways restart but this could be sometime before it happens (6-18 months)
7	No effective vaccine discovered but Covid-19 gradually accepted in same way as seasonal flu with some level of herd immunity	This would further prolong the period before any meaningful reopening. Similar risks and dilemma to 3, 4 and 5
8	Mortality and transmission rates prove to be lower than originally predicted, so fears recede and phased reopening with no rebound or second waves	As for 1 but heritage railways likely to be in later phases of gradual return to normal, so need to make up for longer period of closures

All scenarios are expected to see some level of economic downturn.

The longer the period before the economy opens up, the deeper the likely recession.

All railways will need to factor in higher costs, and lower revenues, plus other unexpected and other unforeseen circumstances.

What if the crisis lasts only a matter of weeks; by early summer the all clear is given and normality quickly returns? Railways would restart, much like after a closed season and although taking a financial hit, they would be able to get back on their feet with no lasting damage.

If you believe this, you can stop reading here.

Unless the virus miraculously disappears, this is an unlikely scenario, though one we all desperately hope comes true.

But lockdown restrictions are more likely to be eased in phases.

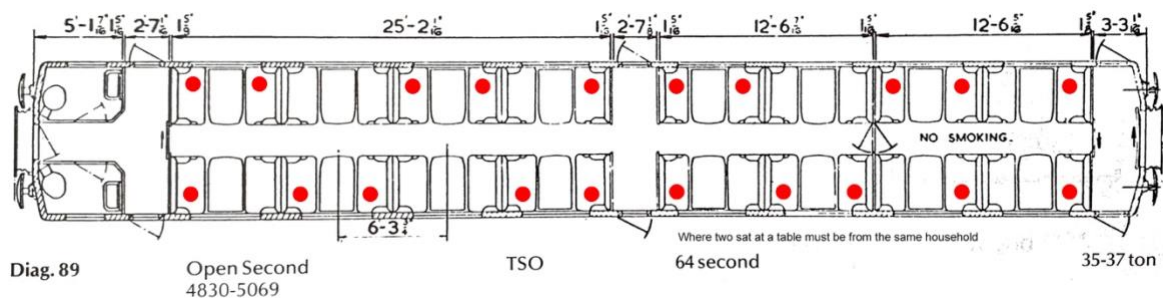
For example, manufacturing may be allowed to start before cinemas can open again. If social distance rules apply at all then steam railways are going to find it difficult to operate.

The reason is because we will not be classed as essential businesses, and there is the impracticality of people travelling in close proximity to each other, as shown by the diagram of a Mark 1 coach interior layout.

There would have to be pre booked seat reservations, yet still being difficulties of getting people on and off in the right order; not allowing walking along the aisles and gangways during the journey; and deep cleans between each trip. Already, it becomes almost impossible to achieve.

Then, there is the need and ability to supervise it and how do you keep the driver and fireman two meters apart?

Therefore, until we have a vaccine or smart testing, we are unlikely to see the resumption of any meaningful operation.



That means we are in for the long haul, maybe months, maybe years. It does not really matter exactly how long as the situation heritage railways will find themselves in will be similar regardless of time unless it ends swiftly.

Balancing Act

Assuming a heritage railway has survived and is still extant, then it is going to face a number of challenges.

The most pressing will clearly be financial.

To have made it that far, every last penny will have likely been spent just to survive, and supporters will already have donated everything they can afford. The cupboard will probably be bare, and any loans taken out will only be and become an extra burden.

There will be some start-up costs, perhaps key paid staff being reemployed, advertising, restocking cafés and so on.

If the assumption is that normality can return quickly then perhaps a short-term loan will be able to bridge the gap until visitor revenue reflows again. This is not necessarily an unreasonable assumption; people will be longing to revisit heritage railways and from past

experience visitors quickly flowed back for example after the closures for 'Foot and Mouth' in 2001.

This appears to be the view of the cruise industry that believes passengers will quickly forget past horrors and be attracted by discounts to book cruises again. So be prepared for massive advertising campaigns and temptations, and a rewriting of history that it was all not so bad. There are reasons why the horrors of the 1918 Spanish flu are remarkable for their absence from popular history, or we only vaguely remember SARS.

Heritage railways could benefit from an explosion of nostalgia and desire to return to normal. Nostalgia is our stock in trade after all. This may well be true under normal circumstances. However, Covid-19 is not normal and its affects may be amplified by the economic recession. It is also easy to attract the market back with loss leaders, but unless figures, income and costs quickly balance, it will not be sustainable for long.

Much more important is what people are thinking and feeling.

Everyone is feeling nervous, uncertain, and/or scared for their loved ones, how they will get through it and what the future holds.

Most families either know of or have within them people who are vulnerable and will naturally be very anxious about going out while there is a very real, or at least, perceived risk. As the lockdown continues, their nervousness will grow.

Furthermore, several will just give up their skill set and heritage railway positions after being isolated at home for weeks (or months) as their confidence, and possibly even enthusiasm, diminishes.

Indeed, it is quite feasible that people on the vulnerable list will be required to lockdown for much longer.

The world is likely to be in a very deep recession, and clearly it is not just heritage railways that will be suffering.

There are likely to thousands of job losses and how the public sector is going to pay for all the trillion-pound stimulus and support packages is as yet unknown. So even if the desire is there, affordability may not be. The long and lingering downturn resulting from the financial crash of 2008 is likely to be surpassed this time by a very large margin.

What this means is that passengers are unlikely to flow back at the same levels as in 2019.

Therefore, planning for recovery will need to take this into account. Anticipating and predicting the likely market size is going to be the key risk, see the above table to show the impact of a range of market reductions.

Overestimate and run quarter empty trains with a 'Pacific' over the full length of the line will only make a bad situation even more dire if losses are then incurred.

If heritage railways cannot maintain the previous number of passengers or the same revenue by higher charging, then to survive will require equivalent savings.

The West Somerset Railway which was on the brink of recent financial collapse was only able to continue by drastic cost cutting measures.

For many of the larger outfits, staff costs are the biggest cost and that is where savings will be looked for first. It will be in the first few months that railways will be most vulnerable if cash runs out.

Those railways that can restart needing only voluntary labour will be in the strongest position.

Shared resources

Recovering railways will also mean all capital investment stalls. Unless it is the difference between running and not running, such expenditure will have to be postponed, which only pushes the perennial problem of maintenance and renewals further down the road.

There will be little or no room for pet projects or ‘wouldn’t it be nice to have ideas’, which will be on the back burner for some time.

Perhaps it might be best for railways to think in terms of turning the clock back to the early days of preservation and how they started with no resources. Then, it was then a step by step process using volunteers with often just an industrial saddle tank with one or two coaches over a short stretch of track.

It was no less enjoyable, and people came and came again, and more volunteers and funds arrived to help to grow the railway.

As noted, earlier preserved railways have grown in all sorts of ways since then and become all things to all people. Perhaps then, it will be a time to fundamentally reappraise, what do we want to do, why and then how can we do it.

If the larger railways are going to be unable to afford their costs from a smaller market, then their operating systems will need to be reconsidered if there are fewer or no paid staff.

This will have implications for governance, safety, risk, competency and compliance. This will not be something that can be quickly cobbled together on start-up and if there is down-sizing it needs to be considered well in advance.

Having common systems and that wonderful word ‘interoperability’ between preserved railways is not currently the norm as most are fiercely independent.

It would help in future for organisations to be in a position to more easily assist and support each other. The Heritage Railway Association (HRA) could, if it chooses, play an important and critical leadership and coordination role.

Worryingly, it could be that we cannot save all railways after this crisis. If that is the case, if, or how, can it be best decided what are the priorities to save? Should it be by historical importance and relevance, geographic spread, serendipity, or competitive survival of the fittest?

It could be that the principles of triage will need to be applied: deciding the priority of saving someone or something based on the severity of their conditions and likelihood of recovery.

And who could, would, or should make these decisions?

This is a debate and discussion that needs to happen *now*.

Is the Talyllyn or Bluebell a more worthy recipient of the collective efforts of the movement, or a 'Johnny come lately' railway that might be better able to unlock finance?

The Talyllyn is named only as the first preserved railway and the 'Bluebell' as the first steam powered standard gauge preserved railway, but 'Johnny come lately' may be very well run and have an amazing historic and authentic collection and an important socially responsible vision. The point is how do we decide, or do we just not bother to worry?

Clear purpose

The most positive outcome of the crisis could be a coming together of the movement, focusing on what is really important, letting go of the trivial, the non-authentic and superfluous, and get back to a clear vision, a core purpose, share values, a safe, reliable and professional operation. A community that is truly cross generational, passionate and joyful cares about each of its members, passing on knowledge and skills and benefiting from the exuberance of youth, with a thirst for new experiences and as a way of helping those less fortunate.

Ensure that we make the knowledge to run every part of a heritage railway available is critical. Even if there is a long delay to reopening, there will remain the opportunity for a new generation to walk through the shed door and find a treasure trove of the past inside that they will want to operate again. [SR]

This is a list of practical questions considerations for railways to prepare for recovery:

- Check the wellbeing of all staff and volunteers, their fitness, availability and willingness to return
- Consider how to hold any memorials, be mindful, sensitive and respectful
- Prepare recovery budget and cash flow forecast what can be afforded
- Review all assumptions about income and start up and ongoing costs
- Consider all steps to reopening. What sort of service and timetable, what is achievable, what is practical, what is affordable how it will be publicised? Should it be a 'step-by-step' or 'straight back to normal' opening?
- What can be learnt from other heritage, hospitality, tourism, businesses? Are levels of business returning quickly to 2019 levels or is there a fall off, and if so, by how much?
- What seasonality factors need to be considered? Is opening in say November or January sensible, or better to wait until Easter?
- What events are possible and practical and how soon can they be planned?
- Check and review insurances, and lapse of any other compliance documentation

- Prepare rosters and check availability, identify any gaps and competencies for critical staff
- Programme and allow time for all the necessary safety inspections and fitness to run examination.
- Review the risk register
- Review Safety Management System and all operational instructions and notices
- Review medicals
- Issue publicity, prepare FAQ for passenger inquiries
- Hold briefing meetings with all staff and volunteers set out clear objectives, and strategy; be transparent and over-communicate if necessary
- Review each day's operation. What was different from before; why does action need to be taken?
- Consider need for deep clean of coaches and visitor areas, additional hygiene and sanitation measures
- Consider a Plan B if the operating company is at risk of insolvency
- Communicate with all the railway's stakeholders
- Consider if help or assistance can be offered elsewhere to other heritage railways
- Consider long term funding needs
- Review and prioritise all capital investment plans"

ENDS

Appendix 8

Thumbnail of partial document only. Available as a separate document.

