CHINESE RAILWAYS IN THE ERA OF HIGH-SPEED

CHINESE RAILWAYS IN THE ERA OF HIGH-SPEED

ZHENHUA CHEN
University of Southern California, Los Angeles, CA, USA

KINGSLEY E. HAYNES
George Mason University, Fairfax, VA, USA

United Kingdom • North America • Japan
India • Malaysia • China

Emerald Group Publishing Limited
Howard House, Wagon Lane, Bingley BD16 1WA, UK

First edition 2015

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-78441-985-1 (Print)
ISBN: 978-1-78441-984-4 (Online)

List of Tables

List of Figures

Glossary of Abbreviations

AAG	Association of American Geographers
AAGR	Annual Average Growth Rate
Amtrak	National Passenger Railroad Corporation (the United States)
APEC	Asia-Pacific Economic Cooperation
ARAF	Autorité de Régulation des Activités Ferroviaires (Regulatory Authority of Railway Activities)
ASEAN	Association of Southeast Asian Nations
ATP	Automatic train Protection
BDI	Bundesverband der deutschen Industrie (Federal Association of German Industries)
BEV	Bundeseisenbahnvermögen (German Federal Railway Asset)
BJTU	Beijing Jiaotong University
BOSWASH	Boston-Washington
BRICS	Brazil, Russia, India, China, and South Africa
BSchwAG	Bundesschienenwegeausbaugesetz (German Federal Rail Network Extension Act)
BST	Bombardier Sifang (Qingdao) Transportation Ltd.
CARS	Chinese Academy of Railway Sciences
CCTV	China Central Television
CEO	Chief Executive Officer
CNR	China Northern Locomotive & Rolling Stock Corporation
Conrail	Consolidated Rail Corporation (the United States)
CPC	Communist Party of China
CPI	Consumer Price Index
CPPCC	Chinese People's Political Consultative Conference
CRC	China Railway Corporation
CRCC	China Railway Construction Corporation
CRH	China Railway High-Speed
CRIC	China Railway Investment Corporation
CRRC	China Railway Rolling Stock Corp
CRSC	China Railway Signal and Communication Corporation
CRTS	China Railway Track System
CSR	China South Locomotive & Rolling Stock Corporation
CTCS	Chinese Train Control System
DB	Deutsche Bundesbahn (German Federal Railway)

BD AG	Deutsche Bahn Aktiengesellschaft (German Rail Joint Stock Company)
DCF	Direction de la Circulation Ferroviaire (Rail Traffic Control Branch)
DIHK	German Association of Chamber of Commerce for Trade and Industry
DM	Deutsche Mark (German Mark)
DPA	Department of Political Affairs
DR	Deutsche Reichsbahn (German Imperial Railway)
DRG	Deutsche Reichsbahn-Gesellschaft (German Imperial Railway Company)
EBA	Eisenbahn Bundesamt (German Federal Railway Authority)
EBITDA	Earnings before Interest, Taxes, Depreciation, and Amortization
EMU	Electric Multiple Unit
EPIC	State-Owned Industrial and Commercial Enterprise (France)
EU	European Union
GDP	Gross Domestic Product
GMU	George Mason University
GSM-R	Global System for Mobile Communications-Railway
HMRI	Her Majesty's Rail Inspectorate (the United Kingdom)
HSE	Health and Safety Executive (the United Kingdom)
HSR	High-Speed Rail
ICC	Interstate Commerce Commission
ICE	Intercity-Express (Germany)
ID	Identification
IHRA	The International High-Speed Rail Association (Japan)
IPO	Initial Public Offering
JNR	Japanese National Railways
JNRSC	Japan National Railway Settlement Corporation
JR	Japan Railways
kWh	Kilowatt-Hour
LGV	Ligne à Grande Vitesse (High-Speed Line)
LTL	Less-than-Truckload Shipping
MTN	Medium-Term Note
MOR	Ministry of Railways
MOU	Memorandums of Understanding
NDRC	National Development and Reform Commission (China)
NIMBY	Not in My Back Yard
NRA	National Railway Administration (China)
OECD	Organization for Economic Co-operation and Development
OECF	Overseas Economic Cooperation Fund
OPRAF	Office of Passenger Rail Franchising (the United Kingdom)
ORR	Office of the Rail Regulator (the United Kingdom)
P3	Public-Private Partnership
PBKA	Paris-Brussels-Cologne-Amsterdam

PDL	Passenger Dedicated Line
PM	Prime Minister
PRC	The People's Republic of China
RSAI	Regional Science Association International
RCF	Railway Construction Fund (China)
R&D	Research and Development
RFF	Réseau Ferré de France (French Rail Network)
RKB	Regierungskommission Bundesbahn (German Governmental Railway Commission)
ROSCO	Rolling Stock Operating Company (the United Kingdom)
RPC	Rail Passengers Council (the United Kingdom)
SCP	Short-Term Commercial Paper
SDA	Special Debt Account (France)
SNCF	Société Nationale des Chemins de fer Français (French National Railway Company)
STFB	Short-Term Financing Bond
SWJTU	Southwest Jiaotong University
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TBM	Tunnel Boring Machine
TER	Transport Express Régional (France)
TGV	Train à Grande Vitesse (High-Speed Train)
TOC	Train Operating Company
UIC	International Union of Railways
UNESCO	United Nations Educational, Scientific and Cultural Organization
USDOT	United States Department of Transportation
USRA	United States Railway Association
USC	University of Southern California
3Rs Act	The Regional Rail Reorganization Act
4Rs Act	The Railroad Revitalization and Regulatory Reform Act

Preface

The development of the Chinese high-speed railway (HSR) system took place on a scale beyond anything the world has seen to date. Since 2004, the network was built at an unprecedented pace. After a decade of steady investment and construction, the trunk lines of the national HSR passenger system have been completed. Chinese railways have evolved into an era of high-speed. This enormous system, which includes a total track length of more than 12,000 kilometers, 425 newly built HSR stations, and more than 1000 HSR train sets, is regarded as a global miracle in infrastructure deployment. The system covers a service area of more than 28 provinces and links more than 28 metropolitan cities, each with a population of over five million. Travel time by railway has been dramatically reduced to such an extent that traveling a distance of a thousand kilometers — for example, between Beijing and Shanghai — takes only 4−5 hours.

The establishment of the new HSR system not only reshaped the Chinese people's impression of railway travel, it also fundamentally transformed their travel behavior. For many years, travel by railway in China on long-distance trips was regarded as a horrible experience, especially during peak travel seasons. Previously, during these peak periods, a regular coach with a maximum capacity of 120 people was usually crammed with more than 250 people, together with their luggage. Moving inside these overcrowded passenger trains, including getting to the restroom, was almost impossible. A trip that would normally have a travel time of around 15 hours often took up to 45 hours during peak travel seasons, due to the train's speed being reduced for safety concerns. All of these negative experiences of railway travel have radically changed since the debut of HSR service. The development of HSR also reshaped people's mind-set regarding time and distance. In the new era of high-speed, the travel time between the two metropolitan cities Guangzhou and Wuhan, with a distance of 1070 kilometers, is only around 3 hours by high-speed train, whereas it would take at least 8 hours on a train traveling at normal speeds. The reduction of railway travel time accelerates competitiveness in the intercity transport market. For example, after the operation of the Guangzhou-Changsha HSR began in 2011, the daily number of flights between Guangzhou and Changsha decreased from 16 to 4.[1] The implications of HSR on both freight and

1. Data are obtained from media report at: http://www.ycwb.com/epaper/ycwb/html/2011-03/31/content_1075872.htm. Accessed on September 27, 2014.

passenger transport are revolutionary, given its potential influence on the improved efficiency of the entire transport system, on energy consumption, and on environmental impact, as well as on socioeconomic welfare.

The evolution of the Chinese HSR has amazed the world, in terms of both the speedy deployment of its infrastructure and the effective utilization of the new technology. The experience of HSR development in China continues to attract an immense amount of attention from many countries, including Russia, Thailand, Brazil, Saudi Arabia, and the United States, which are interested in the HSR system and eager to replicate the Chinese miracle of fast deployment in their countries. Conversely, the world is also very cautious about the Chinese experience, given concerns about its system reliability and the efficiency of project completion. In fact, the technological innovations of the Chinese HSR system remain ambiguous and arguable to the international community, given that China used a different strategy to develop HSR technology (by absorbing, assimilating, and revising) than other countries, such as Japan, France, and Germany, which primarily developed their HSR technologies through independent research and development (R&D).

Although the completed HSR system has begun to benefit China's society and economy by enabling rapid travel connections among cities, the fast pace of HSR technology deployment has outstripped the capacity of institutions and organizations to effectively manage it. As a consequence, system reliability and operational safety were unavoidably affected. On July 23, 2011, a catastrophic HSR accident happened when two high-speed trains collided on a viaduct in the suburbs of Wenzhou in Zhejiang province. The accident, which killed more than 40 people and injured 192, shocked the world and exposed deficiencies in the structure of former bureaucratic railway institutions. The turmoil was exacerbated by the disclosure of a series of scandals involving former railway officials. Passion for HSR development was dampened by a loss of confidence in system reliability and the investment merit of HSR. A retrospective looking back at emerging system-wide challenges has become necessary. Despite China's achievement in establishing a gigantic infrastructure network, critical questions remain unanswered concerning its HSR system. Does the deployment of HSR promote regional and social equity? Is the system sustainable with respect to economics, finance, operations, and societal impact? What are the emerging institutional challenges, and how should these challenges be appropriately addressed?

The answers to these questions, as well as evaluations of the effectiveness of Chinese HSR deployment, require an understanding of the issues that exist in the market, in operations, and in railway institutions. Railway service in China primarily is operated and managed by national agencies in a monopolistic market. The government plays dual roles, as both a market participant and a market regulator. The inefficiency of the railway transport market not only harms public welfare and causes public dissatisfaction, but also creates a negative ripple effect on the domestic transport system. Issues exist with railway operations as well. On the passenger side, the ticket reservation system has received enormous amounts of public criticism, due to the lack of transparency in the ticket distribution process, especially during peak travel seasons. On the freight side, the inefficient railway dispatching system,

as well as redundant regulatory policies, severely reduces the competitiveness of freight rail services. Institutional defects in the railway system are another challenging issue. During the last half century, the former Ministry of Railways (MOR) was widely regarded as the "the last fortress of the planned economy" in China. This meant the institution gave an inadequate response to high cost overruns, had poor internal supervision, and had powerful internal operational silos, resulting in little external review and culminating in a major accident on the primary high-speed line in 2011. Although institutional systems were significantly reorganized in 2013, with the separation of operational and regulatory duties, issues such as lack of system transparency, lack of competition, and insufficient supervision remain.

How should these institutional problems with the Chinese railway system be addressed? One logical approach is to seek solutions from the best practices of railway reforms in other countries, especially those involving an HSR system. In fact, quite a few developed countries have become exemplary in instituting railway reform. The privatization of the railway in Japan in the 1980s demonstrates one way to manage a financial crisis with public railway debt, caused by massive HSR investment. The railway franchising case in the United Kingdom provides another case of introducing competition into the railway sector; the UK's experience may be helpful to the existing Chinese railway system, in terms of organizational restructuring. The French and German railway reforms offer other examples of integrating railway operations and management concerns in both regular rail and HSR services. The United States doesn't possess a true HSR system, but its freight rail system is recognized as the most efficient in the world and may provide an appropriate context for Chinese decision makers to explore strategies in deregulating Chinese freight railways.

Last but not least, determination is the key to achieving effective operations in the Chinese railway system. Commitment to continuing institutional reform is fundamental, but it also requires more involvement from a wider array of stake holders. Strong leadership is essential but is not sufficient in itself. A transparent institutional structure is crucial but requires more public participation in the process of institutional restructuring.

The development of HSR has expanded the capacity of railway infrastructure to support the fast-growing Chinese economy. However, the high-speed infrastructure deployment also created institutional and organizational challenges, because the old railway organizations have proved to be unsuitable in managing such an innovative and complex system. This book was written with two objectives. The first is to introduce the Chinese railway system and document the evolutionary process of railway development in China. For the first time, a comprehensive view is being presented to an international audience to help clarify the Chinese experience with HSR deployment, including the economic and physical achievements and related managerial issues and institutional challenges. The second objective is to discuss and analyze critical concerns regarding Chinese railway operations, management, and institutional structure. Through an analysis of the best practices of railway reform and considerations of how to improve China's institutions, based on experiences in other countries, policy implications for the Chinese railway system, as well as

concerns about reform strategies, are raised and discussed. The goal is to improve the capability and capacity of institutions and organizations as necessary, in order to achieve sustainable development.

Railway industrial managers and researchers interested in understanding the deployment of Chinese HSR will find this book useful. Scholars, faculties, and graduate and undergraduate students who specialize in transportation planning and policy, social policy, and Asian studies may also find this book helpful, in terms of understanding the Chinese transportation system.

Zhenhua Chen and Kingsley E. Haynes