Routledge
Taylor & Francis Group

Journal of Responsible Innovation

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/tjri20

Framings of innovation, responsibility, and responsible innovation in China: insights from a case study undertaken with Chinese businesses

Fujia Li, Richard Owen & Gareth Shaw

To cite this article: Fujia Li, Richard Owen & Gareth Shaw (2023): Framings of innovation, responsibility, and responsible innovation in China: insights from a case study undertaken with Chinese businesses, Journal of Responsible Innovation, DOI: 10.1080/23299460.2023.2217594

To link to this article: https://doi.org/10.1080/23299460.2023.2217594

Published online: 11 Jun 2023.

JOURNAL OF RESPONSIBLE INNOVATION
https://doi.org/10.1080/23299460.2023.2217594

Routledge
Taylor & Francis Group

RESEARCH ARTICLE

OPEN ACCESS Check for updates

Framings of innovation, responsibility, and responsible innovation in China: insights from a case study undertaken with Chinese businesses

Fujia Li [a], Richard Owen[b] and Gareth Shaw[a]

[a]Department of Management, University of Exeter Business School, Exeter, UK; [b]School of Management, University of Bristol, Bristol, UK

ABSTRACT

The discourse of RI has gained considerable international momentum in both academia and policy over the past decade. Originating in the West, RI has transduced across academic disciplines, policy spheres, and geographical boundaries. There are however very few empirical studies that have explored framings of innovation and responsibility in China and how these intersect with Western framings of RI. This paper attempts to address this gap by conducting an in-depth case study involving companies located in Changsha County, within the Chinese province of Hunan. Our findings suggest that extant framings of innovation and responsibility are underpinned by a mixture of logics and institutional entrenchments that are heavily influenced by the norms, policies, and ideology of the State. These in turn heuristically shape perceptions of RI. We close with some reflections on how these intersect and overlap with Western framings of RI and how they may influence RI's transduction in China in the future.

ARTICLE HISTORY
Received 10 June 2022
Accepted 22 May 2023

KEYWORDS
Responsible innovation; China; framing; industry

Introduction

RI is a discourse that has gained considerable international momentum in both academic and policy circles over the last decade (Fellnhofer 2021; Owen and Pansera 2019). RI implies a reflexive stance to innovation and its governance (Owen and Pansera 2019), critically reflecting on (and some argue seeking to transform) current relationships between science, innovation, and society (Owen, Macnaghten, and Stilgoe 2012). RI is a discourse that has emerged in the West – Europe and North America in particular. But what about non-Western environments such as China? RI has certainly begun to enter the Chinese academic and policy discourse. But how do those beyond academia and policy making, for example within Chinese businesses, conceptualise what it means to be responsible in the context of innovation, how do they make sense of the term

CONTACT Fujia Li F.Li2@exeter.ac.uk University of Exeter Business School, 0.54 Streatham Court, Rennes Drive, Exeter EX4 4PU, UK

'Responsible Innovation', and how do these compare with contemporary framings of RI that have emerged in the West? These are the central questions underpinning our study.

It is important to note from the outset that the Western concept of RI is not one thing. We consider RI as being an umbrella term (Rip and Voß 2013) and a discourse in the making (Li, Owen, and Simakova 2015). In general, RI challenges scientists and innovators to enlarge their responsibilities to society (Douglas 2003), whilst addressing the potential for science and innovation to produce sometimes unsustainable, controversial, and ethically problematic outcomes (Braun et al. 2010; Glerup and Horst 2014). The aspiration is to unite various societal actors to collectively reflect on the motivations, purposes, goals, and entanglements (e.g. ethical, political) associated with innovation, anticipating and reflecting on outcomes, risks, uncertainties, and the impacts of innovation in a timely way in order to cultivate a culture of adaptive responsiveness and responsibility for the future (Caverly 2013). This can be enacted, for instance, by adopting the framework of anticipation, reflexivity, inclusion, and responsiveness proposed by Stilgoe, Owen, and Macnaghten (2013). The past decade has witnessed increasing presence and visibility of RI in both Western academia (Owen 2009, 2014; Owen et al. 2009; Owen and Goldberg 2010; TSB 2012; Wiarda et al. 2021) and policy circles (European Union 2012; Owen, Macnaghten, and Stilgoe 2012; Sutcliffe 2011; von Schomberg 2011).

Given its origins, much of the RI literature has inevitably focussed on Western contexts (Macnaghten et al. 2014), with less regard to its framings in non-Western contexts, and how RI may be *transducing* across borders and cultures (Doezema et al. 2019) (i.e. 'the ways that the introduction of a term, tool, technology or concept into a different context creates new meanings around that entity, transforming both the object and context at the same time' (Doezema et al. 2019, 324)).

Likewise, it has only been in recent years that RI scholarship has made innovation in corporate and industrial settings its central focus (Blok and Lemmens 2015; Brand and Blok 2019). These are lacunae that we attempt to address in this study, by exploring framings of innovation, responsibility, and RI in a Chinese business context. In doing so we need to acknowledge that there will be existing, situated framings of what it means to be responsible in the context of innovation in China, which in turn are likely to be influential for transduction of RI in a Chinese context. Randles and colleagues (2016, 2022) describe these existing framings as 'de-facto rri' or 'what actors already do … to embed institutionalised interpretations of what it means to be responsible; into the practices, processes, organisational structures and outcomes of research and innovation' (Randles 2017, 20). In this respect any exploration of RI must be located in and sensitive to understandings of 'de-facto rri' in particular situated contexts. Understanding such 'de-facto rri' framings in a business context in China and how these intersect, overlap, or conflict with Western framings of RI (e.g. as proposed by Stilgoe, Owen, and Macnaghten (2013)) is a key aim of this study.

In terms of 'de-facto rri', in non-Western environments (and in particular the so-called 'global south' or 'developing world'), an assumption may be that the primary policy objective for innovation (and responsibility of innovators) is to instrumentally foster economic development and growth in a largely unreflexive manner (Drori 1993). But this is an assumption that does not necessarily hold true and is one that misses the richness that characterises innovation in such contexts. Smith, Fressoli, and Thomas (2014) and Pansera and Owen (2018b) point for example to instances of

countervailing narratives of science, innovation and development (e.g. grassroots innovation), which may to varying degrees overlap with the discourse of RI. In South Africa for example, there have been calls for a 'civic science process' where science and the public are 'knowledge partners' (Van Wyk et al. 2007), directly speaking to calls for more inclusion in science and innovation by Stilgoe, Owen, and Macnaghten (2013). In India, the case of the E-rickshaw also demonstrates some overlapping values (e.g. accessibility, gender equity, and social equity) with those of RI in the West (Singh, Mishra, and Tripathi 2021). As Pansera and Owen (2018a) note, given this, understandings of innovation and responsibility, and how these intersect with RI, are best understood through inductive, empirical studies which explore meanings *in practice* (Macnaghten et al. 2014).

That said, given our focus here on China, we must acknowledge that a key macro frame for innovation, and the perceived responsibilities associated with this, may be its centralised political system (Needham 2004), characterised by substantial direct government intervention, sponsorship, and control in terms of the direction, extent, and range of research, development, and innovation activities (Scott et al. 2009). Those exploratory studies that have been conducted on RI in China to date do seem to suggest that scientists view their primary responsibilities as being to the State (government) rather than to society *per se* (Mordan and Skeldon 2016). In addition to the importance of the State, we are also conscious of the dynamic environment of innovation in China and how this may be influencing perceptions of responsibility. Since the policy of opening-up emerged in the 1990s, China has substantially strengthened its innovation capability. It has embraced the market economy, accelerating investment in the development of high-tech industry, and re-imagining itself as a knowledge-based economy (Dai and Chapman 2021; Y. Li, Ji, and Zhang 2020). This in turn has required the establishment of a national science, technology, and innovation system that fits within the market-economy system of socialism (Bao, Su, and Noble 2021; Sigurdson 2002). This hybrid system of an influential State and quasi market economy presents an interesting and dynamic environment to explore 'de-facto rri' and how this intersects with emerging ideas of RI in the West.

RI as a term is one that is almost exclusively restricted to academic and high level, national policy circles in China. Given our study is undertaken in a provincial Chinese business context, this is a term we hypothesised our research participants are unlikely to have encountered. The point of departure for our study was therefore to first analyse existing framings of innovation and responsibility ('de-facto rri'). We did this by adopting an inductive approach that makes no presumptions, allowing us to understand the rich, situated framings of innovation and responsibility in a business context in provincial China. We felt an exploratory, qualitative methodology was the best approach to allow us to understand the heterogeneous meanings of innovation and responsibility in the field, with a view to inductively construct empirical framings of 'de-facto rri'. We then introduced the term 'Responsible Innovation' to our participants, seeking to understand what heuristically this meant to them. In total this allowed us to get a rich sense of how innovation and responsibility ('de-facto rri') were framed, how this shaped and influenced their perception of 'Responsible Innovation' and how these compare with Western framings of RI.

The rest of the paper is set out as follows: we firstly provide a synthesis of RI's emerging presence within China's academic and policy circles. Our attention then turns to

'de-facto rri'. We provide some observations about the extant relationships between science, innovation, and society in China, placing this in a historical context. We then present our findings relating to framings of 'de-facto rri' and RI in a provincial Chinese business context, explored through an in-depth, qualitative field study. We close with some reflections on how these intersect and overlap with Western framings of RI and how they may influence RI's transduction in China in the future.

Theoretical background

RI emerges in the Chinese academia and policy discourse

In China, the western concept of RI has been increasingly discussed in academic circles (Z. Liu 2015; Mei, Chen, and Sheng 2014, 2017; Mei and Chen 2014; Pan et al. 2022; Yang and Han 2017). This has included Chinese scholars from fields as diverse as genetic modification (Xue 2015), aerospace (Fan 2017), brain-computer interface and medical research and governance (L. Chen and Wang 2019; W. Zhang et al. 2020), artificial intelligence (Fei and Liu 2021), and business studies (X. Liu et al. 2022; Tian and Tian 2021). Others have discussed RI in context, in light of China's unique manner of decision-making and its approach to handling value tensions (Ravesteijn, Liu, and Yan 2015; Yan and Wang 2015), and specifically its top-down approach to innovation governance (Arnaldi et al. 2015; Fan, Christmann-Budian, and Seus 2014; Y. Zhao and Liao 2017).

Although the Chinese science, technology, and innovation system, which privileges scientism, developmentalism, and top-down management, may seem unlikely at face value to be compatible with RI (Daimer, Fan, and Teufel 2017), these papers suggest Chinese academics are engaging in a reflexive debate relating to science, innovation and responsibility. There is the possibility that this may reflect an emerging shift in the attitudes of the Chinese scientific community, enterprises, and even government towards a more reflexive and critical stance that may in turn offer a fertile environment for RI (PRC State Council 2016; Y. Zhao and Liao 2017). While this remains a matter of debate, it is notable that RI as a term has recently been included in China's latest five-year science, technology, and innovation development plan (Mei, Rodríguez, and Chen 2020; Y. Zhao et al. 2018), indicating at least an initial commitment to the concept at a top governance level.

Findings from some European funded projects such as the ProGReSS[1] project also suggest that, at a national level, China is increasingly keen on fostering a form of socio-economic development which considers societal desirability, ethical acceptability, and sustainability (Coles et al. 2014), issues that are prominent in the definition of responsible research and innovation presented by von Schomberg (2012). However, there is some way to go. Societal engagement, research integrity, and gender equality in science and innovation for example are major issues that need addressing (Schroeder et al. 2014). Since the State is the most dominant actor in China, much science communication and governance has followed a one-way, top-down approach (Cheng Fan, Christmann-Budian, and Seus 2014), primarily in the form of policies (Gao and Yuan 2021; Wang and Li 2019). This has led to distant public relations with science and, historically, low direct public participation and engagement (Sleeboom-Faulkner and Hwang 2012; Wu and Qiu 2012). The NUCLEUS[2] project has reported that lack of societal and public engagement is in part rooted in the government's approach to funding research

and innovation, which hinders more direct forms of public engagement with and inclusion in science and technology (Mordan and Skeldon 2016). Other EU projects such as the JERRI[3] project have stressed China's narrow policy emphasis on scientific popularisation (rather than public engagement and debate), and highlighted issues of research integrity and combating scientific fraud.

Scholars within the RRI-Practice[4] project, in their analysis of RI within a number of countries across the globe, including China (Y. Zhao, Zhang, and Liao 2017), have emphasised the need for more understanding of both national and local, situated framings of innovation and responsibility (i.e. 'de-facto rri') and the norms and other legitimating factors that influence them. Despite this, there has been little empirical research investigating framings of 'de-facto rri' in local Chinese contexts and how these compare with framings of RI as a Western intellectual and policy discourse. Existing research on RI in China, informative as this is, has been conducted at a broad, national, or macro level (Y. Zhao and Liao 2019). If, as Needham (2004) suggests, China is going to be a source of inspiration for the world with regard to science, technology, and innovation in the future, then empirical understanding of framings of responsibility with respect to ST&I is we argue important.

Modernisation in China – the national context

If the importance of the State is one known macro frame for innovation and responsibility in China, then another is its policy of opening-up, modernisation and embracing of the free market economy in recent decades. We are only able to briefly summarise China's recent history of socio-economic development and, associated with this, relationships between science, innovation, and societal responsibility. As a country,[5] China has experienced some 75 years of development since its establishment in 1949. Whilst science and technology have been significantly implicated since establishment of the PRC (e.g. as an element of industrialisation in Mao's 'Great Leap Forward' between 1958 and 1962), it was not until 2006 that these became an explicit policy focus for the central government (Fu 2015), manifested by several milestone policies that represent a strong political drive to promote economic growth through science and technological advancement (Chen, Shi, and Xu 2009).

In such context, technological determinism would appear to be prevalent in China. The impacts and entanglements of emerging science, technology, and innovation on society have arguably remained largely unquestioned in light of the pursuit for economic development, efficiency, and productivity as the dominating political and ethical stance (Dafoe 2015; MacKenzie and Wajcman 1999; Oliver 2011). Rooted in the idea that human beings must follow the internal logic and trajectory of an inevitable and impersonal technological force for progress and national cohesion, science and technology are still viewed in the main as being the engine for large scale socio-economic transformation (Heilbroner 1994; Zhou et al. 2021). Led by the central government, Chinese society appears to date to have largely followed an instrumental, technological deterministic path in this regard.

At the same time, public attitudes to science and technology appear to be changing (L. Zhao et al. 2022). As China has modernised, techno-optimism and faith in progress driven by science and technology appear to have increasingly become the subject of

scepticism and reflection (Lü 2009). This suggests a dynamic environment in which potentially conflicting logics (some more dominant that others) may exist. These in turn might influence and configure situated framings of what it means to be responsible in the context of science, technology, and innovation, i.e. the nature and practice of 'de-facto rri' and the degree to which this intersects with Western notions of RI. Understanding how this is being manifested in situated practice is the focus of the remainder of the paper.

Research design and methods

Research setting

During our research, we were privileged to be able to gain access to companies in Changsha County, via the local Labour Union.[6] The lead author originates from the locality of the research setting, providing informed awareness and insights of the local context. Importantly, the lead author fully understands and speaks the local dialect,[7] which is spoken by many of the interviewees, allowing them to speak in their own words. The data we obtained on the ground[8] would have been very difficult for outsiders to access. The cultural embeddedness and removal of language barriers[9] allowed us in this way to obtain rich data at a local level.

Changsha County (also known as Xingsha) is located on the east side of Changsha City (capital city of Hunan Province in central-south China), hosting a population of 1.5 million across 1756 square kilometres of land with a gross regional production of 180.83 billion CNY recorded in 2020 (approx. 20 billion GBP) (Office of the People's Government of Changsha County 2021). Despite boasting a long history of over 2200 years, its modernisation only began in the early 1990s (L. Liu 2018; Office of the People's Government of Changsha County 2021). Its rapid economic growth benefitted from the fact that it hosts one of the National Economic and Technological Development Zones (ETDZs). These were established by the central government to facilitate urbanisation via international cooperation and industrialisation as part of China's opening-up policy (MOFCOM 2020; Y. Zhang 2019). ETDZs attract foreign direct investments to China by offering incentives such as tax exemptions or rebates, low rental fees, and support for facilities and services (Percy 2020). Benefiting from this, Changsha County is ranked 5th in the top 100 counties across China, enjoying steady economic growth in the past few decades (China Daily 2019). Although the companies in our study are not based in the ETDZ *per se*, their proximity to it enables them to learn from those who are (e.g. via supplying for or collaborating with ETDZ-based companies). In this context, some foreign (mostly Western) business or managerial concepts are not alien to local business owners or managers.

Of particular note for our study is that the local Labour Union has initiated an annual countywide campaign promoting Corporate Social Responsibility (CSR) since 2011. Each year an assessment of a selection of local companies is conducted by various county government departments, coordinated by the Labour Union. These cover six areas of (corporate social) responsibility: health and safety (e.g. safe production; health check), environment (e.g. recycling; emission), employment (e.g. salary and benefits; education and training), management (e.g. quality; tax; credit rating), ethics (e.g. pricing;

philanthropy), and public perception (e.g. scandals; accidents). Top scoring companies are awarded with certificates, cash incentives, and local media coverage. Consequently, awareness of CSR was found to be high amongst those companies interviewed as part of our study, with interviewees making direct reference to CSR as a meta-frame for their perceptions of what it means to be responsible.

Research design and methodology

We adopted an in-depth case study research design (Flyvbjerg 2006) that incorporates a range of complementary, qualitative data collection methods. These included participant observation, semi-structured interviews, and the collection of field artefacts and relevant documents (Cohen and Crabtree 2006; Gillham 2000; Tellis 1997a, 1997b). Our choice of a case study design has allowed us to capture and explore the views of various relevant stakeholders to illicit rich and context-sensitive data, such as perceptions and expectations, for which a qualitative case study design is appropriate (Baxter and Jack 2008; Kothari 2004; Lund 2012). We position this case as an exploratory, interpretive study as there is no previous study on 'de-facto rri' or RI in this field locus. The study incorporated a significant element of ethnography, which is particularly useful for gaining locally contextualised insights (Lambert, Glacken, and McCarron 2011; Maeder and Eberle 2011). Specifically, we utilised a compressed mode of ethnography (Jeffrey and Troman 2004), in which the lead author worked and lived in the dormitory of a high-tech company (hereafter referred to as 'CfO') continuously for two months, observing work-related activities, collecting relevant documents and artefacts, and conducting interviews (see Table 1 for an overview and Table 2 for profiles of participant businesses).

Data collected were processed and analysed as follows: First, we transcribed the data into simplified Chinese and then translated them into English (van Nes et al. 2010) to establish an English database for analysis. The data were then coded with the assistance of NVivo which allows conceptualisation of different levels of abstraction (Creswell and Poth 2018). Themes emerged from the coding were induced through a process of iteration, contextualised within an emerging data structure and theoretical reasoning (Pansera and Owen 2018a) to, firstly, categorise informant-centric first order codes into second-order themes, and then to aggregate these second-order themes into several overarching dimensions (Gioia, Corley, and Hamilton 2012; Maclean et al. 2019). We present our findings in a narrative manner as follows.

Table 1. Overview of data collected in Changsha County, Hunan Province, China.

Workshop		Conducted with three business leaders and two local government officials
Interviews	Within CfO	10 with employees at various levels within the company 1 conducted by local news agency
	Outside CfO	14 including thirteen with business representatives and one with a government official
	Newspaper	1 with a local business obtained from a local newspaper
Observation	Within CfO	Over 22,000 words of notes, including transcribed materials and conversations
	Talk Tour[13] (TT)	3 live TT events and accompanying notes
Documents and Physical Artefacts	Within CfO	Brochures, handbook, newspapers
	TT	32 speech drafts, 1 policy book, 1 seating plan, and 1 entrance card

Source: authors.

Table 2. Information on companies interviewed.

Industry	Code	Business Size (Registered Capital)	Year Founded
Vehicle Decoration	YT	30 Million CNY	1997
Technology	YD	500 Million CNY	1988
Printing	HF	18 Million CNY	1993
Packaging	KL	8 Million CNY	1999
Manufacturing	LEP	15 Million CNY	2002
	PJA	2.3 Million CNY	2002
	SX	3 Million CNY	1992
Retail	LK	10 Million CNY	2004
Education	TZ	840 Million CNY	2003
Construction	WX	310 Million CNY	1998
	XD	220 Million CNY	1993
Environment	XC	5 Million CNY	2000
Materials	ZX	64.5 Million CNY	2002
	CfO	10 Million CNY	2006

Source: authors.

Research findings

De-facto rri: framing innovation

The point of departure for our analysis was to explore meanings of innovation and responsibility for our research participants in the field (i.e. 'de-facto rri'). In order to do this, we first sought to understand how the concept of innovation was framed. Participants were found to frame this in terms of originality and novelty, as innovation being the key to achieving business success, to ensuring the development of companies and society, and to surviving in an increasingly competitive environment. The overarching framing of innovation that emerged inductively from the data can be constructed around three aggregate themes: originality and novelty, business orientation, and a pro-innovation culture. We now describe each of these in turn:

Innovation as originality and novelty

Participants provided a range of views concerning what innovation entailed to them. Some described it as having both radical (disruptive) and incremental qualities. On the one hand, innovation can 'create something that does not exist before', 'destroy existing things and build brand new things', 'make a breakthrough', and 'embark on a journey that no one else has explored before'. On the other hand, it was viewed as being about seeking improvements based on an existing foundation, building on something and making it better. These are in line with typologies of innovation proposed by Tidd and Bessant (Tidd and Bessant 2009).

Innovation was also described in terms of novelty and newness,[10] placing an emphasis on originality or 'an unusual, special, and irregular way of thinking', which enabled them to 'adapt to and be responsive to new situations'. But our respondents thought of this as being limited as 'it is rarely seen that something is solely created in China' and 'a lot of great inventions in the development of physics, science, especially mechanics, are not from China'. This, according to them, can be explained partly by the innovation for survival phenomenon where innovators are more concerned about survival and security than the need for indigenous innovation *per se*. Strong resistance from vested interests and the differentiated capabilities of individuals in attracting support and resources for

indigenous innovation were, amongst others, factors described by respondents behind such limitations.

Business orientation

Our data suggest that innovation is perceived as a predominantly market and business-oriented notion. In this regard, respondents first described innovation as a form of management practice. Businesses are not only placing a premium on innovating via technology development but also through managerial processes, organisational structures, and new business models aimed at enhancing productivity, to achieve higher efficiency and product quality as well as reduction in labour intensity and costs. Reducing labour intensity was described as being driven by two factors. On the one hand, it is increasingly difficult to find labour among younger generations as they favour lighter ways of working. On the other hand, giving employees labour-intensive work can be regarded as a way of exploitation. Second, respondents described business-oriented innovation in terms of customer-driven service *(innovate to serve)*. As businesses strive to serve and satisfy customer needs and demands, the everchanging market environment calls for constant innovation in the products and services they offer. Innovation in this context becomes a customer-centric discourse that drives business activities and shapes corporate behaviours. Third, and linked to this, respondents described innovation in terms of Schumpeterian competition *(innovate to compete)* (Schumpeter 2003). Innovation was perceived as the means to ensure core competitive advantage that allows firms to maintain their leading positions in market. There was a commonly felt urgency to keep innovating to avoid falling behind in competition, reflected in the mindset of 'Ju An Si Wei' – to be prepared for danger in times of safety. Innovation was described as being indispensable for businesses to develop as it helps them break down restricting factors and limitations, ensure business continuity and sustainability, and cope with the everchanging environment – 'the core is if a company does not innovate, there is only going to be a dead end'. Four, innovation was linked to the idea of entrepreneurship. This was viewed as being closely tied with innovation in that entrepreneurial endeavours are both regarded as innovative practices and a means to encourage and enable innovation itself. Finally, innovation was framed in terms of success *(innovate to succeed)*. Innovation was described as being 'the key to success' – linked to ideas of 'economic benefit', 'strategic thinking', 'improvement', and 'profitability'.

A pro-innovation culture for economic and social development

This strong business orientation links to the third major theme emerging from our data relating to how respondents framed innovation: a pro-innovation culture rooted in developmentalist and survivalist ways of thinking, aimed squarely at economic and social development.

Our respondents described two broad groups of actors influencing this pro-innovation culture: businesses and policy makers. On the business side, participants placed emphasis on creating a favourable and failure-tolerant corporate culture for innovation where innovators are encouraged to persevere in the face of difficulties and vested interests. In this context, employees' talent, ideas, and initiatives are highly valued. Policy makers meanwhile promote and foster innovation, creating a favourable ecological environment for innovation by 'breaking barriers' and 'tolerating failures', formulating

policies and regulations to establish mechanisms conducive to innovation, empowering regional and local governments to promote innovative and entrepreneurial activities, and building innovation capability through cultivating and importing talents. This is underpinned by the prevalent discourse of economic developmentalism and survivalism.

The pursuit of development received high premium by our participants – development was seen by them as being 'the top priority'. This incorporated social and technological aspects. Innovation was taken as the key force that 'sustains the progress of a society' and drives economic and social development, rendering it the solution for issues such as unemployment and low productivity. Development was the ultimate goal of innovation – 'the essence of innovation is to better the development of things'. Technological development and advancement were perceived as being realised by innovation through both managerial and technical means. Managerial and organisational innovation, or the innovation of systems and institutions, help provide incentives and motivating mechanisms to promote technological development. Technical innovation, by means of 'filing patents, publishing journal articles, and drafting industrial standards', directly injects fuel for developing new technologies that improve product quality and efficiency.

The imperative to survive was seen as being a fundamental driver for innovation by our participants – 'innovation is forced by the need to survive rather than a pure pursuit'. Innovation was largely perceived in instrumental terms, with the linear perception that due to the social development stage of China, the primary goal of innovation is to make money and survive – 'creation serves the purpose of busy running about for survival'. However, participants also acknowledged this survival-driven innovation is somewhat limited in its capacity to make groundbreaking changes:

> Great scientists such as Newton, are from noble families who had an easy and comfortable life, who doesn't need to care about trivial matters in life, let alone worry about survival. It is in this kind of easy and comfortable environment that a genius can flourish. (President of CfO)

Innovation was also positioned as a means for people to serve their country, linked to ideas of patriotism. Innovation was closely related by respondents to 'the China dream' and 'the great rejuvenation of the Chinese nation'. The strive to transform Chinese industries from 'made in China' to 'created in China' attached innovation closely to national dignity and pride.

De-facto rri: framing responsibility

Having explored the framing of innovation, our exploration of 'de-facto rri' continued with an analysis of how responsibilities in the context of innovation were framed by our participants. Our data suggest that responsibility (in the context of science, technology, innovation, and society) is a multi-faceted notion configured around three key themes: business centricity, social collectivism, and the innovation imperative.

Business centricity

From a business perspective, responsibility for our participants involved a wide range of stakeholders: employees, companies, customers, partners, and shareholders. Being responsible for employees, the most mentioned stakeholder, is manifested in ways

such as paying salary, improving their quality of life, providing career development, buying social insurance,[11] and protecting their health and safety. Related to this, there was an emphasis on employees fulfilling their role duties as their primary responsibility. Being responsible referred to the need to maintain and develop the company underpinned by the imperative to survive. Evident here is the sense of interconnectedness between employers and employees which calls for mutual responsibility to ensure survival and development:

> Employees should have a sense of responsibility, so that their company can develop better, which in turn benefit employees themselves. (R&D Manager of LEP)

Other aspects of business responsibility related to actors such as customers – 'to pursue customer satisfaction', 'to produce high quality, advanced, and mature products to customers', and 'to help customers succeed and to create maximum value for them'; partners – 'to achieve win-win outcome via sincere cooperation and mutual respect' and 'to strive for a healthy and harmonious business environment with business partners'; shareholders – 'to bring longstanding returns'. The multi-stakeholder approach of framing responsibility depicts a business-centric typology where the need for corporate survival and development is the fundamental pursuit. This is however accompanied by a collective sense of social responsibility, which we now consider below.

Social collectivism

Reinforced by the local CSR campaign, there was a heightened sense of social responsibility conveyed by our participants. Serving the country, protecting the environment, and ensuring employees' safety were the most dominant manifestations of social responsibility described by them. Taking up the responsibility to serve the country indicated a sense of duty whereby companies contribute to society by paying corporate tax, employing more people, helping and supporting the poor, and donating to charity. The responsibility of environmental protection was a prevalent discourse which instigates a series of commitments such as energy saving, waste recycling, emission reduction, and resource conservation. Ensuring safe production was also a key priority for companies which is 'not only in the interest of employees but also in the interest of the company'. Social responsibility reflected a broader sense of collectivism that comprised of three tiers. Tier 1 represents employees, tier 2 businesses or employers, and tier 3 society. Corporate social responsibility was intertwined with the idea of mutual responsibility:

> Responsibility depends on people; a company needs to bring employees together. Everyone should have a sense of responsibility to the company, then the company can be responsible to the society. (President of LK)

The innovation imperative

An 'imperative to innovate' was a key responsibility described by respondents, deeply rooted in the economic deterministic framing of innovation described above, whereby innovation is driven by the responsibility to survive:

> This can drive innovation, as one needs to find a new industry, a new growth point, to feed oneself and one's family. Under such responsibility, innovation is motivated. (Foreign Business Manager H of CfO)

Following this logic, 'creating a good environment for innovators' to 'support and encourage innovation' (the pro-innovation culture described above) becomes a key aspect of this responsibility imperative. This is reflected in Chinese government's policy that 'all levels of government … (should) improve employment by supporting innovation … ' which suggests advocating innovation has become a responsibility of the government. In this context, innovation has become a form of social responsibility as it 'can be a way to contribute to the society'.

Framing responsible innovation

Having explored de-facto rri, we then introduced the term 'Responsible Innovation' and explored what, heuristically, this meant to our participants. None of our participants had encountered Western concepts of RI and for them the term 'Responsible Innovation' was a new concept. Our respondents displayed a cognitive process of sense making in their first encounters with RI in this study in which we observed aspects of problematisation, contextualisation, and prospection, each of which we now discuss in turn.

Problematisation

Initial responses to questions around the notion of Responsible Innovation fell into what we term a 'problematisation' stage, whereby participants attempted to heuristically extrapolate meanings from their own experiences and perceptions. They described RI as being an alien concept to them that is 'not yet articulated' and 'yet to be known' in China, where 'the definition of it is not clear' and 'what this concept really means is not easy to describe'. To make sense of this they talked about Responsible Innovation in terms of ideas of social responsibility, personal virtue, and the purpose of innovation.

Social responsibility. The most common framing of Responsible Innovation by participants was in terms of social responsibility, whereby innovation 'needs to be responsible for society, do no harm to society and people' and should not bring 'side effects' or 'negative impacts' to society. Participants described this in terms of innovation meeting societal challenges such as energy saving, environmental protection, and resource conservation as part of the broader goal to achieve sustainable development, as well as product safety and improvement, observing laws and regulations, and caring about employee's safety and welfare (see section above relating to CSR):

> I think RI is a requirement of CSR. RI requires companies to shoulder all of its social responsibility during its development. (Vice President of LEP)

> Our innovation is focused on energy saving and environmental protection. Energy saving means less energy consumption, which is good for society. Environmental protection means less pollution, less impacts to people and the environment. These are socially responsible, and hence RI. (Vice President Y of CfO)

> Our company produce powder materials, I think it is RI in many ways, because the better we make the powders, the better we can repair things like driving media in a car with much lower cost and less waste. (Vice President D of CfO)

> I assume that sustainable development might need RI. I think that our company uses a responsible approach [to innovation] in working towards the direction of energy saving,

> environmental protection, and reducing the consumption of … resources. (Vice President T of CfO)

It is evident that the meaning of RI has been informed by participants' prior engagement with the concept of CSR, connecting this to RI and framing the latter in terms of social responsibility.

Personal virtue. Participants also saw RI as reflecting a virtue that indicates a high level of ethical standards, integrity, and honour which 'raises innovation to the level of sense of responsibility'. To this end, RI was viewed by them as being less about economic benefit but more about personal reputation, a sense of fulfilment and mission, rooted in people's conscientiousness – 'taking one's own initiative in doing something new which is good for society'. In such a context, those who innovate for personal gain at the expense of other people's benefits are deemed irresponsible innovators. This perspective opened up a moral dimension of responsibility in which participants situated the notion of RI.

Purpose. What innovation should be used for, in terms of its motivations and purpose, was seen as being a key criterion for judging whether innovation and its products and outcomes are responsible or not – 'how to use innovation is the key issue rather than what the innovation product actually is'. A frequently referenced example here was the invention of nuclear power: 'if it is used as weapons, it is not RI, but if it is used for generating power or other things that benefit human beings, it is RI'. There was awareness of taking responsibility for the innovation outcome or product as 'RI should mean that the outcome of innovation is well used, so that the whole society can benefit from it'. It was frequently mentioned that 'everything has two sides', particularly with emerging risks and ethical entanglements. The duality of innovation and its capacity to co-produce risks were also mentioned. Examples included the innovation of explosives, addictive drugs, unmanned aerial vehicle, reverse engineering etc. Notably, while participants described innovation itself as being apolitical, agnostic and value-free, what mattered was how innovation was used and to what ends (responsible usage): 'innovation as an advancement of technology is not wrong, but how innovation is used is open to judgement and questioning'. Here participants called for stricter management and governance concerning the applications and uses of innovation.

Contextualisation

Following the initial problematisation stage, discussions concerning the meaning of Responsible Innovation to respondents tended to move to a phase of contextualisation, whereby participants began to unpack RI further in the context of business and society.

RI in the context of business. From a business perspective, RI tended to align with the de-facto framings of innovation and responsibility presented earlier, in total aspiring to responsible management of business and a commitment to CSR. It indicated a continued commitment to fulfil the requirements of customers through innovation. This was accompanied by the devotion to incentivise innovators with benefits and good social status so that innovation is sustained. Thus, creating a favourable and failure-tolerant

atmosphere within companies was seen as another manifestation of RI. Caring for employees, protecting their health and safety, ensuring their job security through innovation were deemed responsible. This was coupled with the presumption that companies should be able to maintain steady operations, create profit and value, hence employment opportunities as ways to realise RI. Broadly, RI for those in business meant innovation that creates value for businesses whilst also avoiding negative impacts for stakeholders such as customers and competitors.

Collectivism. From a societal viewpoint, the contextualised meanings of RI reflected a collectivist mindset amongst participants. With such a mindset, RI's ultimate role is to serve social development and advancement of the country, drawing on the 'wisdom of the mass'. Participants described this in terms of 'a responsibility for the country', a way of 'giving back to society', and making sure innovation 'is more suited to meet the needs of society' and 'exert positive energy to society and nature'. This requires collective effort across all levels of society: individuals should take up responsibility to serve their employers (fulfilling their role duties), companies should shoulder their responsibility for the country (paying tax, increasing employment, and protecting environment), a country should behave responsibly to another country (i.e. contributing to cross boarder regional economic development). It is through the relationality of individual-business-society underpinned by a logic of collectivism that participants felt RI can materialise.

Determinism meets collectivism. As part of a process of contextualisation our data suggest RI to be approached by participants within a deterministic–collectivist frame, i.e. where emphasis is given to ensuring the success of innovation (determinism) which has its main instrumental purpose to serve for the collective good. In this frame, participants described the overarching responsibility dimension of innovation as being about bringing economic and social gains for China. This view embeds economic, social, and environmental motivations. To ensure this, anticipating possible scenarios and assessing risks become important to avoid failures and problems. Conducting feasibility analysis for innovation serves as one tangible way of achieving this:

> Innovation involves lots of thinking. When we start a project, we need to discuss, deliberate, and demonstrate whether our innovation plan is feasible or not. We need to consider the risks and difficulties during the implementation process. This is RI. Without this kind of consideration, there is no such thing as responsibility, and there will be waste of human resources, material resources, and financial resources, more importantly the waste of time. (Corporate Development Manager D of CfO)

In line with our earlier findings, determinism and collectivism were linked by our participants to a survivalist mindset, whereby ensuring survival (economic, ecological, societal) provides a clear rationale for an innovation imperative. As innovation is seen as playing such a deterministic role in this regard, the capability to innovate becomes overtly important – the lack of which would lead to 'waste', 'loss', or 'failure' which are deemed irresponsible innovation. In essence, this sense of being responsible in the context of innovation means the successful realisation of innovation i.e. innovating successfully is Responsible Innovation.

Prospection

The final stage of framing RI is what we term prospection, whereby participants iterate their thoughts on its future development in China. Here two major themes emerged from our data: strategic approach to RI promotion and multi-actor engagement.

Strategic approach to RI promotion. When envisioning the future development of RI in China, participants suggested this could be promoted through both 'soft' moral and 'hard' regulation approaches. Soft promotion for our participants entails raising people's ethical standards and a sense of responsibility to a stage where irresponsible innovation will not be connived, and moral integrity is highly upheld – sometimes termed as 'public spirit' or 'civic virtue'. To this end, education serves as the primary foundation. Yet, this has to be accompanied by laws and regulations, making RI a social norm so that fairness and justice can be effectively achieved: 'laws and regulations are rules to monitor and regulate responsibility in and around innovation'.

Multi-actor engagement. Our participants suggested that such approaches could be facilitated by engaging various societal actors. Amongst these, the central government was seen as taking an overwhelmingly important and extensive role. Government should 'encourage positive innovation that contributes and is beneficial to society', play 'directing and constraining roles' to supervise large scale matters such as nuclear power, 'support innovation, in policy, financially, and technically', formulate and strictly enforce 'laws and regulations' and 'fair competition environment', advocate, promote, and incentivise the society towards RI:

> Now we have many policies to encourage innovation, if policies about RI can be encouraged by the government, this concept would enjoy great momentum. We need policies first; the government needs to lead us and direct us. It cannot only rely on non-governmental forces. Only when the government takes the lead, companies will then follow. (Business Owner of ZX)

> The government should supervise society. The functions of the government should be carried out effectively. Government should take initiatives in supervising innovation problems. (Vice President of HF)

Additionally, mass media were viewed by participants as contributors to the publicity and propaganda of RI to help it become mainstream in society. Industrial associations should also be empowered by the government to take a leading role in advocating RI while the government takes control of its general direction. Companies should reward responsible innovators and behaviours so that RI will be valued, and a responsible corporate atmosphere can be cultivated. Parents and educators should also play guiding roles in shaping a 'morally sound outlook on responsibility' for the next generation.

Underpinning the call for multi-actor engagement was the belief in government-led collective effort, whereby a wide range of actors each has a unique role to play. In addition to the engagement above, government was viewed as needing to monitor and mobilise various societal actors such as the mass media, schools and universities, chambers of commerce, industrial associations and fora to establish systems and mechanisms that 'limit irresponsible innovation, both at national legislation level and social organisation and governance level'. To ensure a virtuous development for RI in China, a government-

led collective commitment on both enhancing people's moral standards and improving institutional provisions of regulations and mechanisms were found by our participants to be indispensable.

Discussion

In this paper, we set out to empirically explore meanings of innovation and responsibility ('de-facto rri') and RI in businesses in a Chinese context, which is distant both geographically and culturally from RI's Western origins. Our findings reveal distinct, situated framings of 'de-facto rri' (Owen et al. 2021; Randles et al. 2016) which in turn heuristically influenced perceptions of RI when this term was introduced to our participants.

In terms of 'de-facto rri', innovation was framed by our respondents in relation to originality and novelty, and as a notion pivotal for businesses to improve management, better serve customers, and stand strong in a competitive environment, overall to ensure corporate success. Such a business-oriented approach is rooted in a logic that combines determinism, collectivism, competition, and survivalism, with development for the collective good of China being held as the overarching goal for innovation. It reflects a rather linear, deterministic, and instrumental way of thinking that positions innovation as an imperative and the solution to progress and addressing problems – the ultimate and inevitable saviour or a 'sacred mission' (Băzăvan 2019).

Responses from our participants suggest framings of responsibility to be centred on the role of business, underpinned by determinism and survivalism, and associated with these the imperative to innovate as a central and overriding business responsibility. Responsibility was also significantly influenced by the discourse of Corporate Social Responsibility promoted through the local government's CSR campaign, in which the Labour Union was an important source of legitimation. This we found to be a prevalent institutional influence, heightening awareness of social responsibility. As 'de-facto rri', these framings provided the cues for how participants made sense of RI as a new concept when this was introduced to them. While RI was a term they had not encountered, we found participants embarked upon a sense making process which we were able to relate to aspects of problematisation, contextualisation, and prospection. This was strongly influenced by extant framings of innovation and responsibility ('de-facto rri') and in particular the strong influence of the local and national institutional environment, which in turn reflects a culture of strong, top-down governance and control in China (Arnaldi et al. 2015; Fan, Christmann-Budian, and Seus 2014; Y. Zhao and Liao 2017). Our findings suggest that such situated framings of 'de-facto rri' are likely to be influential in terms of the nature and form of any future transduction of RI as a discourse in China, and that the role of the State is likely to be key in terms of its legitimation and institutionalisation.

A salient question is how framings of 'de-facto rri' in our study compare to those in other geographical contexts, including those in the West where RI has emerged. While this is not a question we set out to explore, the work of Randles et al. (2016) is both relevant and helpful in this regard. These authors describe six 'grand narratives' of 'de-facto rri' to which our findings can be tentatively compared. Of these, we see overlaps with two: first the narrative of the 'citizen firm' in which companies act as both social and economic actors, mobilising concepts such as CSR, and second the narrative of 'Technological

progress: weighing risks and harms as well as benefits of new and emerging technologies' (p.33). This latter narrative places emphasis on ideas of precaution, and the balancing of innovation's opportunities with risks and harms, through concepts such as risk assessment, health and safety etc. These, as Randles et al. describe, are not mutually exclusive, with the potential for hybridisation and 'boundary crossing' (p. 35).

In terms of the intersection and overlap of our findings with Western framings of RI, we found this to be evident but rather limited in nature. Our participants' discussions of their perceptions of RI did extend to a general desire for social responsibility, but this was mainly described in terms of CSR that was familiar to them. They also stressed reflection on the purposes, ethics, and risks of innovation, which at face value seem to overlap with the reflexivity dimension of RI as proposed by Stilgoe, Owen, and Macnaghten (2013). But we suggest the measure of reflexive capacity to be rather limited, with the purpose of innovation still being largely couched by our participants in instrumental and utilitarian terms, i.e. a focus on innovation utility and performance (Xiong and Xia 2020), set within a pro-innovation culture aimed at promoting the national effort and common good. We were struck in our study by the fact that the 'innovation imperative' was rarely questioned by our participants. These observations, in a Confucius sense, we suggest may reflect a culture of obedience to authoritarianism and the State (Xia 2014). Our participants interestingly also framed RI as a virtue which implied for them a high level of ethical standards and integrity. This does overlap to some extent with RI (von Schomberg 2011) and implies traces of a communalist ideology (Moemeka 1998), rooted in Confucian familism (Xia 2014) – although the nuances between communalism and collectivism are a matter of debate (Moemeka 1998).

Overall, our findings suggest that a combination of instrumental determinism, collectivism, utilitarianism, and communalism, underpinned by a pro-innovation culture and both a nationalistic and survivalist mindset are important factors influencing responsibility norms in the context of innovation in a Chinese context. This may reflect China's current development stage. Having enjoyed rapid economic growth over a very short period of time, framings of innovation and responsibility may reflect unfaded memories of a struggling past.[12] Legalism (a school of philosophy from ancient China) and Western utilitarianism appear to combine in order to promote 'the wealth and strength' for a country (Li 1996, 115), re-enforcing a strong belief in innovation as the ultimate driver of progress. Framing what it means to be responsible, this intertwining of both Chinese and Western ontologies may reflect what Xia (2014) suggests to be a process of multiculturalisation that has in fact long existed in China. Whilst these provide an important frame for innovation and responsibility, our findings also suggest glimmers of a nascent, more critical, and reflexive engagement with innovation that was evident through the responses of our participants when prompted to think about the meaning of Responsible Innovation to them.

Conclusion

We have conducted a study in a rarely accessed research field locus in China which aimed to make visible situated framings of innovation and responsibility, how these shape local perceptions of RI and how they overlap with Western RI frameworks. It is important not to generalise from one case study. Our study however serves to emphasise the importance

of being sensitive to both local and national, political, economic, and cultural contexts (Macnaghten et al. 2014). We suggest that an inductive approach that seeks to explore extant framings of 'de-facto rri' in such contexts to be helpful. Such an approach we contend is valuable for understanding how RI as a term and concept might be transduced in particular situated contexts. We argue that the findings from such inductive studies should be contextualised by an understanding of the broader political, social, and cultural context which will serve to legitimise particular interpretations of innovation and responsibility and associated practices. In our study, the status and influence of the Chinese national government ('the State') and its associated policies at a national and local level (here for example CSR) are notable.

Our study highlights a number of interesting avenues for further research relating to RI's transduction. The potential influence of Chinese framings of responsibility and innovation on RI's transduction in the West may for example be an interesting topic that was beyond the scope of our study. Similarly, our study highlights the value of exploring of how culture and associated norms (e.g. collectivism) influence both 'de-facto rri' and RI's transduction. We recommend further empirical exploration of situated framings of innovation and responsibility in a Chinese context: if China at a high policy level is committed to promoting a discourse of RI (a concept which has seemingly been embraced by the national government and is increasingly the subject of scholarship by Chinese academics), then studies of this kind in other Chinese settings seem to us to be useful for understanding the nature and form of its future transduction in China. In this sense, we call for more domestic and international collaborative research that empirically explores the evolution of the discourse of RI in China and relates this to the extraordinary modernisation project that the country has embarked upon.

Notes

1. http://www.progressproject.eu: PROmoting Global REsponsible research and Social and Scientific innovation
2. http://www.nucleus-project.eu: Bringing RRI to Life in Universities and Research Institutions
3. https://www.jerri-project.eu/jerri/index.php: Joining Efforts for Responsible Research and Innovation
4. https://www.rri-practice.eu: Responsible Research and Innovation in Practice
5. The People's Republic of China
6. The Labour Union in China, which is different from the West, is a department of the government that focuses on protecting health, safety, and wellbeing of the labour force.
7. All transcription was conducted by the lead author to ensure data accuracy.
8. While Mandarin Chinese is the national standard language advocated by the national government, it has not necessarily always been used at a local level in regions such as Changsha County.
9. The first author is a certified interpreter and translator between English and Chinese, which reduces the need for a third-party translator, hence avoiding misunderstanding or missing of information.
10. When translated to Chinese, the word innovation is broken down to two characters: Chuang, which means 'create', and Xin, which means 'new'.
11. In the past, not all Chinese companies would pay social insurance for employees. Social insurance includes five categories: medical, injury, unemployment, pregnancy, and pension. Businesses who pay social insurance are seen as good and responsible.

12. Some participants have been through early years of not having sufficiency in basic living needs such as food supply, clothing, and transport.
13. The 'Talk Tour' is organised by the Hunan Provincial Government (see text for more details).

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by University of Exeter.

Notes on contributors

Fujia Li is a Lecturer in Entrepreneurship at the Centre for Entrepreneurship, University of Exeter Business School. He is interested in the situated framings of innovation and responsibility in different national contexts such as China and other developing economies as well as academic fields such as Responsible Entrepreneurship and Entrepreneurship Education.

Richard Owen is a Professor of Innovation Management in the School of Management, Faculty of Social Sciences, University of Bristol. He is interested in the power of innovation and techno-visionary science to create futures in profound and uncertain ways, how we can engage as a society with those futures and how we can take responsibility for them. He is interested in the politics, risks, ethics and governance of innovation and new technologies in society. His research sits at the intersection of innovation governance and science and technology studies as a critical, interdisciplinary scholar.

Gareth Shaw is a Professor of Retail and Tourism Management in the University of Exeter Business School. He has held grants as an Innovation Fellow at the former Advanced Institute of Management funded by the ESRC and is a current member of the Innovation Caucus funded by UKRI Innovate UK. He has researched and published on innovation in the service sector. His particular interest is on Knowledge Transfer and Knowledge Absorption within SMEs.

ORCID

Fujia Li http://orcid.org/0000-0003-4060-4899

References

Arnaldi, S., G. Quaglio, M. Ladikas, H. O'Kane, T. Karapiperis, K. R. Srinivas, and Y. Zhao. 2015. "Responsible Governance in Science and Technology Policy: Reflections from Europe, China and India." *Technology in Society* 42: 81–92. doi:10.1016/j.techsoc.2015.03.006.

Bao, Y., Z. Su, and C. H. Noble. 2021. "Determinants of new Product Development Speed in China: A Strategy Tripod Perspective." *Technovation* 106 (November 2019): 102291. doi:10.1016/j.technovation.2021.102291.

Baxter, P., and S. Jack. 2008. "Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers." *The Qualitative Report* 13 (4): 544–559. doi:10.46743/2160-3715/2008.1573.

Băzăvan, A. 2019. "Chinese Government's Shifting Role in the National Innovation System." *Technological Forecasting and Social Change* 148 (August). doi:10.1016/j.techfore.2019.119738.

Blok, V., and P. Lemmens. 2015. "The Emerging Concept of Responsible Innovation. Three Reasons Why It Is Questionable and Calls for a Radical Transformation of the Concept of

Innovation." In *Responsible Innovation 2: Concepts, Approaches, and Applications*, edited by B.-J. Koops, I. Oosterlaken, H. Romijn, T. Swierstra, and J. van den Hoven, 19–35. Springer International Publishing. doi:10.1007/978-3-319-17308-5_2

Brand, T., and V. Blok. 2019. "Responsible Innovation in Business: A Critical Reflection on Deliberative Engagement as a Central Governance Mechanism." *Journal of Responsible Innovation* 6 (1): 4–24. doi:10.1080/23299460.2019.1575681.

Braun, K., A. Moore, S. L. Herrmann, and S. Könninger. 2010. "Science Governance and the Politics of Proper Talk: Governmental Bioethics as a new Technology of Reflexive Government." *Economy and Society* 39 (4): 510–533. doi:10.1080/03085147.2010.510682.

Caverly, R. W. 2013. Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society. *Journal of Research Administration* 44 (2): 127–129. https://uoelibrary.idm.oclc.org/login?url=https://www.proquest.com/scholarly-journals/responsible-innovation-managing-emergence-science/docview/1503137511/se-2.

Chen, F., Y. Shi, and F. Xu. 2009. "An Analysis of the Public Scientific Literacy Study in China." *Public Understanding of Science* 18 (5): 607–616. doi:10.1177/0963662508093089.

Chen, L., and D. Wang. 2019. "Research Progress in Responsible Innovation of Brain-Computer Interface." *Journal of Engineering Studies* 11 (4): 390–399. doi:10.3724/SP.J.1224.2019.00390

China Daily. 2019. *Changsha County shows the Way for Rural Development*. Chinadaily.Com.Cn. https://www.chinadaily.com.cn/a/201905/23/WS5ce64ca0a3104842260bd681.html.

Cohen, D., and B. Crabtree. 2006. *Qualitative Research Guidelines Project*. RWJF. http://www.qualres.org/HomeCase-3591.html.

Coles, D., M. Davis, M. Engelhard, B. Han, A. Kumar, K. Laas, M. Ladikas, et al. 2014. *Innovation for Society - How Innovation is Driven Towards Societal Desirability through Innovation Policies, Report for FP7 Project 'Progress'* (pp. 1–101). progressproject.eu.

Creswell, J. W., and C. N. Poth. 2018. *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. 4th ed. Thousand Oaks: SAGE Publications, Inc.

Dafoe, A. 2015. "On Technological Determinism: A Typology, Scope Conditions, and a Mechanism." *Science, Technology, & Human Values* 40 (6): 1047–1076. doi:10.1177/0162243915579283.

Dai, X., and G. Chapman. 2021. "R&D tax Incentives and Innovation: Examining the Role of Programme Design in China." *Technovation* (*February*): 102419. doi:10.1016/j.technovation.2021.102419.

Daimer, S., C. Fan, and B. Teufel. 2017. Case Study Part 1: RRI Goals and Practices - Deliverable D9.1.

Doezema, T., D. Ludwig, P. Macnaghten, C. Shelley-Egan, and E.-M. Forsberg. 2019. "Translation, Transduction, and Transformation: Expanding Practices of Responsibility Across Borders." *Journal of Responsible Innovation* 6 (3): 323–331. doi:10.1080/23299460.2019.1653155.

Douglas, H. E. 2003. "The Moral Responsibilities of Scientists (Tensions Between Autonomy and Responsibility)." *American Philosophical Quarterly* 40 (1): 59–68. doi:10.2307/20010097.

Drori, G. S. 1993. "The Relationship Between Science, Technology and the Economy in Lesser Developed Countries." *Social Studies of Science* 23 (1): 201–215. doi:10.1177/030631293023001007.

European Union. 2012. *Responsible Research and Innovation: Europe's Ability to Respond to Societal Challenges*. European Union Publicaions Office. doi:10.2777/11739

Fan, C. 2017. "Double Closed Loops and Responsible Innovation: The Case Research in China Space Industry Quality Assurance." *Journal of Engineering Studies* 9 (5): 465–473. doi:10.3724/SP.J.1224.2017.00465

Fan, C., S. Christmann-Budian, and S. Seus. 2014. "*Research and Innovation Cooperation Between the European Union and China*." *Fraunhofer Institute for Systems and Innovation Research*. doi:10.2777/4860.

Fei, Y., and C. Liu. 2021. "Research on the Heterogeneity of AI Policy Between Central and Local Governments in China from the Perspective of Responsible Innovation." *Forum on Science and Technology in China* 11: 40–50. doi:10.13580/j.cnki.fstc.2021.11.006.

Fellnhofer, K. 2021. "Entrepreneurial Alertness Toward Responsible Research and Innovation: Digital Technology Makes the Psychological Heart of Entrepreneurship Pound." *Technovation* (*August*): 102384. doi:10.1016/j.technovation.2021.102384.
Flyvbjerg, B. 2006. "Five Misunderstandings About Case-Study Research." *Qualitative Inquiry* 12 (2): 219–245. doi:10.1177/1077800405284363.
Fu, X. 2015. *China's Path to Innovation*. Cambridge: Cambridge University Press.
Gao, K., and Y. Yuan. 2021. "The Effect of Innovation-Driven Development on Pollution Reduction: Empirical Evidence from a Quasi-Natural Experiment in China." *Technological Forecasting and Social Change* 172 (October 2020): 121047. doi:10.1016/j.techfore.2021.121047.
Gillham, B. 2000. *Case Study Research Methods*. London: Continuum.
Gioia, D. A., K. G. Corley, and A. L. Hamilton. 2012. "Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology." *Organizational Research Methods* 16 (1): 15–31. doi:10.1177/1094428112452151.
Glerup, C., and M. Horst. 2014. "Mapping 'Social Responsibility' in Science." *Journal of Responsible Innovation* 1 (1): 31–50. doi:10.1080/23299460.2014.882077.
Heilbroner, R. 1994. "Technological Determinism Revisited." *Does Technology Drive History*, 1: 67–78. http://www.f.waseda.jp/sidoli/Heilbroner_1994.pdf
Jeffrey, B., and G. Troman. 2004. *Time for Ethnography* 30 (4), doi:10.1080/0141192042000237220.
Kothari, C. R. 2004. *Research Methodology: Methods and Techniques*. New Age International (P) Ltd. doi:10.1017/CBO9781107415324.004
Lambert, V., M. Glacken, and M. McCarron. 2011. "Employing an Ethnographic Approach: Key Characteristics." *Nurse Researcher* 19 (1): 17–24. doi:10.7748/nr2011.10.19.1.17.c8767
Li, Q. 1996. "The Principle of Utility and the Principle of Righteousness: Yen Fu and Utilitarianism in Modern China." *Utilitas* 8 (1): 109–126. doi:10.1017/S0953820800004751.
Li, Y., Q. Ji, and D. Zhang. 2020. "Technological Catching up and Innovation Policies in China: What is Behind This Largely Successful Story?" *Technological Forecasting and Social Change* 153 (May 2019): 119918. doi:10.1016/j.techfore.2020.119918.
Li, F., R. Owen, and E. Simakova. 2015. "Framing Responsible Innovation in Synthetic Biology: The Need for a Critical Discourse Analysis Approach." *Journal of Responsible Innovation* 2 (1): 104–108. doi:10.1080/23299460.2014.1002059.
Liu, Z. 2015. "Responsibility Finitude and Its Enlightenment for Responsible Innovation." *Studies in Dialecties of Nature* 31 (10): 41–45. doi:10.19484/j.cnki.1000-8934.2015.10.009.
Liu, L. 2018. "How Did It Become Number One County in the Central and Western Region? - Decoding the 'Model Student' in County Economy: Changsha County, Hunan Province." *Economic Information Daily*. http://www.jjckb.cn/2018-11/09/c_137593582.htm.
Liu, X., X. Tan, A. J. Zhou, and S. S. Zhou. 2022. *Building the Culture of Developing Responsible Innovation: A Case Study of FOTILE* (pp. 151–162). doi:10.1007/978-981-19-4480-2_8
Lund, T. 2012. "Combining Qualitative and Quantitative Approaches: Some Arguments for Mixed Methods Research." *Scandinavian Journal of Educational Research* 56 (2): 155–165. doi:10.1080/00313831.2011.568674.
Lü, L. 2009. "The Value of the use of Biotechnology: Public Views in China and Europe." *Public Understanding of Science* 18 (4): 481–492. doi:10.1177/0963662507082892.
MacKenzie, D., and J. Wajcman. 1999. "Introductory Essay: The Social Shaping of Technology." In *The Social Shaping of Technology*, 1–25. doi:10.3987/Contents-03-61-01
Maclean, M., G. Shaw, C. Harvey, and A. Booth. 2019. "Management Learning in Historical Perspective: Rediscovering Rowntree and the British Interwar Management Movement." *Academy of Management Learning & Education*, doi:10.5465/amle.2018.0301.
Macnaghten, P., R. Owen, J. Stilgoe, B. Wynne, A. Azevedo, A. de Campos, J. Chilvers, … L. Velho. 2014. "Responsible Innovation Across Borders: Tensions, Paradoxes and Possibilities." *Journal of Responsible Innovation* 1 (2): 191–199. doi:10.1080/23299460.2014.922249.
Maeder, C., and T. Eberle. 2011. "Organizational Ethnography." *Qualitative Research: Issues of Theory, Method and Practice* 464. doi:10.4135/9781412950589.

Mei, L., and J. Chen. 2014. "Reflection and Reconstruction of Innovation Paradigm: The Emerging Research on Responsible Innovation." *Science and Management* 3: 3–11. doi:CNKI:SUN:JXYG.0.2014-03-002.

Mei, L., J. Chen, and F. Li. 2017. "Responsible Innovation: Connotations and Implications." *Studies in Dialectics of Nature*, (02): 49–53. doi:10.19484/j.cnki.1000-8934.2017.02.009.

Mei, L., J. Chen, and W. Sheng. 2014. "Responsible Innovation — Emerging Paradigm of Research and Innovation." *Studies in Dialecties of Nature* 30: 81–87. doi:10.19484/j.cnki.1000-8934.2014.10.016.

Mei, L., H. Rodríguez, and J. Chen. 2020. "Responsible Innovation in the Contexts of the European Union and China: Differences, Challenges and Opportunities." *Global Transitions* 2: 1–3. doi:10.1016/j.glt.2019.11.004.

Moemeka, A. A. 1998. "Communalism as a Fundamental Dimension of Culture." *Journal of Communication* 48 (4): 118–141. doi:10.1111/j.1460-2466.1998.tb02773.x.

MOFCOM. 2020. "The Ministry of Commerce Holds the Press Conference on the 2019 Review and Evaluation Results of the Comprehensive Development of National Economic and Technological Development Zones." English.Mofcom.Gov.Cn. http://english.mofcom.gov.cn/article/newsrelease/press/202003/20200302942188.shtml.

Mordan, C., and K. Skeldon. 2016. "NUCLEUS Field Trip Report: Beijing - RRI & Public Engagement Deliverable 4.3."

Needham, J. 2004. *Science and Civilisation in China: General Conclusions and Reflections: Vol. VII:2 (K. G. Robinson, Ed.)*. Cambridge: Cambridge University Press.

Office of the People's Government of Changsha County. 2021. *Introduction of Changsha County*. Www.Csx.Gov.Cn. http://www.csx.gov.cn/mlxc/xygk/202103/t20210315_9829818.html.

Oliver, M. 2011. "Technological Determinism in Educational Technology Research: Some Alternative Ways of Thinking About the Relationship Between Learning and Technology." *Journal of Computer Assisted Learning* 27 (5): 373–384. doi:10.1111/j.1365-2729.2011.00406.x.

Owen, R. 2009. *A new era of Responsible Innovation*. Planet Earth; NERC. http://planetearth.nerc.ac.uk/features/story.aspx?id = 460.

Owen, R. 2014. "The UK Engineering and Physical Sciences Research Council's Commitment to a Framework for Responsible Innovation." *Journal of Responsible Innovation* 1 (1): 113–117. doi:10.1080/23299460.2014.882065.

Owen, R., D. Baxter, T. Maynard, and M. Depledge. 2009. "Beyond Regulation: Risk Pricing and Responsible Innovation." *Environmental Science & Technology* 43 (18): 6902–6906. doi:10.1021/es803332u.

Owen, R., and N. Goldberg. 2010. "Responsible Innovation: A Pilot Study with the U.K. Engineering and Physical Sciences Research Council." *Risk Analysis: An International Journal* 30 (11): 1699–1707. doi:10.1111/j.1539-6924.2010.01517.x.

Owen, R., P. Macnaghten, and J. Stilgoe. 2012. "Responsible Research and Innovation: From Science in Society to Science for Society, with Society." *Science and Public Policy* 39 (6): 751–760. doi:10.1093/scipol/scs093.

Owen, R., and M. Pansera. 2019. "Responsible Innovation and Responsible Research and Innovation." In *Handbook on Science and Public Policy*, edited by D. Simon, S. Kuhlmann, J. Stamm, and W. Canzler, 26–48. Edward Elgar Publishing. doi:10.4337/9781784715946.00010

Owen, R., M. Pansera, P. Macnaghten, and S. Randles. 2021. "Organisational Institutionalisation of Responsible Innovation." *Research Policy* 50 (1): 104132. doi:10.1016/j.respol.2020.104132.

Pan, X., S. Yuan, M. Song, M. Li, and Y. Wang. 2022. "Decomposition of the Growth Drivers and its Spatial Distribution Characteristics of Responsible Innovation: A Study of Chinese Industrial Enterprises." *Asia Pacific Journal of Management*, doi:10.1007/s10490-022-09821-0.

Pansera, M., and R. Owen. 2018a. "Framing Inclusive Innovation Within the Discourse of Development: Insights from Case Studies in India." *Research Policy* 47 (1): 23–34. doi:10.1016/j.respol.2017.09.007.

Pansera, M., and R. Owen. 2018b. "Innovation for de-Growth: A Case Study of Counter-Hegemonic Practices from Kerala, India." *Journal of Cleaner Production* 197: 1872–1883. doi:10.1016/j.jclepro.2016.06.197.

Percy, J. 2020. "Where to Invest in China: A Primer on its Economic Development Zones." China Briefing. https://www.china-briefing.com/news/chinas-economic-development-zones-types-incentives/.

PRC State Council. 2016. *State Council Notice on the Publication of the National 13th Five-Year Plan for S&T Innovation*. https://cset.georgetown.edu/publication/state-council-notice-on-the-publication-of-the-national-13th-five-year-plan-for-st-innovation/.

Randles, S. 2017. "Deepening 'Deep Institutionalisation': Elaborating a Concept and Developing a Typology to Analyse and Contrast the Institutionalisation of De-facto responsible research and innovation (rri)." https://www.jerri-project.eu/jerri-wAssets/docs/deliverables/wp-1/JERRI_Deliverable_D1_2_Deepening-Deep-Institutionalisation.pdf.

Randles, S., P. Laredo, A. M. Loconto, B. Walhout, and R. Lindner. 2016. *Framings and Frameworks: Six Grand Narratives of de Facto RRI*. Fraunhofer Institute for Systems and Innovation Research (ISI). https://www.researchgate.net/publication/300032552_Navigating_towards_shared_responsibility_in_research_and_innovation_Approach_process_and_results_of_the_Res-AGorA_Project.

Randles, S., E. Tancoigne, and P.-B. Joly. 2022. "Two Tribes or More? The Historical Emergence of Discourse Coalitions of Responsible Research and Innovation (rri) and Responsible Research and Innovation (RRI)." *Journal of Responsible Innovation* 9 (2): 248–274. doi:10.1080/23299460.2022.2061306.

Ravesteijn, W., Y. Liu, and P. Yan. 2015. "Responsible Innovation in Port Development: The Rotterdam Maasvlakte 2 and the Dalian Dayao bay Extension Projects." *Water Science and Technology* 72 (5): 665–677. doi:10.2166/wst.2015.272.

Rip, A., and J.-P. Voß. 2013. "Umbrella Terms as Mediators in the Governance of Emerging Science and Technology." *Science, Technology & Innovation Studies* 9 (2): 39–59. https://ris.utwente.nl/ws/files/6445369/128-562-1-PB.pdf.

Schroeder, D., E. R. Aus, P. Ahrweiler, B. Guoxue, B. Han, D. M, E. Srinivas, et al. 2014. *Innovation for Society: Funder Reports*.

Schumpeter, J. A. 2003. *Capitalism, Socialism and Democracy*. London and New York: Routledge. https://periferiaactiva.files.wordpress.com/2015/08/joseph-schumpeter-capitalism-socialism-and-democracy-2006.pdf.

Scott, N., L. Hennen, M. Ladikas, X. Zhu, M. Decker, and Z. Li. 2009. "Embedding Society in Science & Technology Policy European and Chinese Perspectives." In *Governance An International Journal of Policy And Administration*, edited by M. Ladikas. European Commission. doi:10.2777/21028

Sigurdson, J. 2002. "New Science, Technology & Innovation Developments in China." New Science, Technology & Developments in China for Proceeding of the Strata Consolidating Workgroup, 1–39.

Singh, D. R., S. Mishra, and K. Tripathi. 2021. "Analysing Acceptability of E-Rickshaw as a Public Transport Innovation in Delhi: A Responsible Innovation Perspective." *Technological Forecasting and Social Change* 170 (June): 120908. doi:10.1016/j.techfore.2021.120908.

Sleeboom-Faulkner, M., and S. Hwang. 2012. "Governance of Stem Cell Research: Public Participation and Decision-Making in China, Japan, South Korea and Taiwan." *Social Studies of Science* 42 (5): 684–708. doi:10.1177/0306312712450939.

Smith, A., M. Fressoli, and H. Thomas. 2014. "Grassroots Innovation Movements: Challenges and Contributions." *Journal of Cleaner Production* 63: 114–124. doi:10.1016/j.jclepro.2012.12.025.

Stilgoe, J., R. Owen, and P. Macnaghten. 2013. "Developing a Framework for Responsible Innovation." *Research Policy* 42 (9): 1568–1580. doi:10.1016/j.respol.2013.05.008.

Sutcliffe, H. 2011. *A Report on Responsible Research & Innovation*.

Tellis, W. 1997a. "Application of a Case Study Methodology." *The Qualitative Report* 3 (3): 1–19. doi:10.46743/2160-3715/1997.2015.

Tellis, W. 1997b. "Introduction to Case Study." *The Qualitative Report* 3 (2): 1–14. doi:10.46743/2160-3715/1997.2024.

Tian, H., and J. Tian. 2021. "The Mediating Role of Responsible Innovation in the Relationship Between Stakeholder Pressure and Corporate Sustainability Performance in Times of Crisis:

Evidence from Selected Regions in China." *International Journal of Environmental Research and Public Health* 18 (14), doi:10.3390/ijerph18147277.
Tidd, J., and J. Bessant. 2009. *Managing Innovation: Integrating Technological, Market and Organizational Change*. 4th ed. Chichester: John Wiley and Sons.
TSB. 2012. *Responsible Innovation Framework for Commercialisation for Research Findings* (6).
van Nes, F., T. Abma, H. Jonsson, and D. Deeg. 2010. "Language Differences in Qualitative Research: Is Meaning Lost in Translation?" *European Journal of Ageing* 7 (4): 313–316. doi:10.1007/s10433-010-0168-y.
Van Wyk, E., C. M. Breen, T. Sherwill, and D. Magadlela. 2007. "Challenges for the Relationship Between Science and Society: Developing Capacity for Ecosystem Governance in an Emerging Democracy." *Water Policy* 9 (S2): 99–111. doi:10.2166/wp.2007.138.
von Schomberg, R. 2012. "Prospects for Technology Assessment in a Framework of Responsible Research and Innovation." In *Technikfolgen Abschätzen Lehren*, edited by M. Dusseldorp and R. Beecroft. VS Verlag fär Sozialwissenschaften. doi:10.1007/978-3-531-93468-6_2 pp. 39–61.
von Schomberg, R. 2011. "Towards Responsible Research and Innovation in the Information and Communication Technologies and Security Technologies Fields." *In Publications Office of the European Union*, doi:10.2777/58723.
Wang, P., and F. Li. 2019. "China's Organization and Governance of Innovation – A Policy Foresight Perspective." *Technological Forecasting and Social Change* 146 (July 2017): 304–319. doi:10.1016/j.techfore.2019.05.029.
Wiarda, M., G. van de Kaa, E. Yaghmaei, and N. Doorn. 2021. "A Comprehensive Appraisal of Responsible Research and Innovation: From Roots to Leaves." *Technological Forecasting and Social Change* 172 (October 2020): 121053. doi:10.1016/j.techfore.2021.121053.
Wu, G., and H. Qiu. 2012. "Popular Science Publishing in Contemporary China." *Public Understanding of Science* 22 (3): 521–529. doi:10.1177/0963662512445013.
Xia, G. 2014. "China as a "Civilization-State": A Historical and Comparative Interpretation." *Procedia - Social and Behavioral Sciences* 140: 43–47. doi:10.1016/j.sbspro.2014.04.384.
Xiong, Y., and S. Xia. 2020. "Mechanisms Behind China's Innovation Achievements: A Multi-Level View." *Technovation* 94–95 (April): 94–96. doi:10.1016/j.technovation.2020.102123.
Xue, G. 2015. "RRI on GM Tree Technology in the Perspective of Ecological Risk." *Studies in Dialecties of Nature* 31 (7): 32–37. doi:10.19484/j.cnki.1000-8934.2015.07.006.
Yan, P., and Q. Wang. 2015. "Mode and Cases of Responsible Innovation in Dalian Port." *Studies in Dialecties of Nature* 3 (03): 122–126. doi:10.19484/j.cnki.1000-8934.2015.03.027.
Yang, P., and B. Han. 2017. "Responsible Research and Innovation and Its Implications for China." *China & World Economy* 25 (6): 120–138. doi:10.1111/cwe.12224.
Zhang, Y. 2019. *New Measures to Boost National Development Zones for Further Opening-up*. English.Gov.Cn. http://english.www.gov.cn/premier/news/2019/05/08/content_281476651099020.htm.
Zhang, W., G. He, Y. Zhao, and X. Zhang. 2020. "Discusion on Ethical Responsibility in Medical Research: From the Perspective of Responsible Research and Innovation (RRI)." *Medicine and Philosophy* 41 (6): 7–10. doi:CNKI:SUN:YXZX.0.2020-06-002.
Zhao, Y., and M. Liao. 2017. "Responsible Research and Innovation in China." *China Soft Science* 3: 37–46. doi:CNKI:SUN:ZGRK.0.2017-03-005.
Zhao, Y., and M. Liao. 2019. *Chinese Perspectives on Responsible Innovation*. Cheltenham: Edward Elgar Publishing. doi:10.4337/9781784718862.00039
Zhao, Y., W. Zhang, and M. Liao. 2017. *China National Workshop Report*.
Zhao, Y., W. Zhang, M. Liao, L. Huang, F. Teng, R. Song, Y. Wu, and Y. Yao. 2018. *Report from National Case Study: China*.
Zhao, L., L. Zhang, J. Sun, and P. He. 2022. "Can Public Participation Constraints Promote Green Technological Innovation of Chinese Enterprises? The Moderating Role of Government Environmental Regulatory Enforcement." *Technological Forecasting and Social Change* 174 (September 2021): 121198. doi:10.1016/j.techfore.2021.121198.
Zhou, X., Z. Cai, K. H. Tan, L. Zhang, J. Du, and M. Song. 2021. "Technological Innovation and Structural Change for Economic Development in China as an Emerging Market." *Technological Forecasting and Social Change* 167 (February): 120671. doi:10.1016/j.techfore.2021.120671.