



Invited Review

Soft OR in China: A critical report

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ABSTRACT

As China's reform steps into the 'deep water zone' where value complexity becomes paramount, general-purpose decision-making aids such as Operational Research (OR) are increasingly confronted with the challenge of dealing with interest conflicts. However, due to historical events and institutional circumstances, OR in China to date is largely constrained by a technocratic approach which is not fit for purpose. Encouragingly, recent OR innovations inside China signify a conscious move to embrace value plurality and tackle social conflicts. OR is not merely a neutral tool for solving technical problems, but a world-building discourse that shapes society. The future of OR, particularly Soft OR, in China will be determined by whether OR workers are willing and capable to act as institutional entrepreneurs promoting scientific and democratic decision-making that deepens the reform toward an open, just and prosperous society. The implications go beyond the OR community and China's borders.

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1. Introduction

China's reform is now in its fourth decade. As the whole world is busy adjusting to the 'China miracle', inside the country there is an emerging consensus across political divides that the reform is at a critical point, though what direction China should be going remains a contentious question. During the past three decades the reform tackled problems mainly at the periphery, now it has to face the difficult core. The easy bit has been done. From now on, every step forward, or backward, will be accompanied with enormous risks. After years of 'crossing the river by touching stones', China is entering the 'deep water zone' (Wu, 2010).

As a body of research and practice embedded in society, what has OR achieved and failed to achieve? How is it doing and where is it going amid China's unprecedented transformation? These questions are relevant and timely, we believe, not only for the fate of the OR community inside China. As China is taken as the model by an increasing number of developing countries and China itself is becoming a big consumer of 'Western' management know-how, OR's China experience has far-reaching implications beyond its borders.

This article is a tentative attempt to investigate those questions from a historical–institutional perspective. In this article 'OR' will be used as a conceptual umbrella to denote the rich body of general-purpose decision-aiding research and practice which includes not only quantitative techniques (linear programming, waiting line

analysis, etc.), but also systems approaches and problem structuring/solving methods. 'Soft OR', accordingly, refers to the systems approaches and problem structuring/solving methods that aim at facilitating the 'framing and definition of issues constituting the problem' in complex social contexts (Mingers and White, 2010). This is a custom initiated by Checkland (1981), Flood and Jackson (1991), Rosenhead and Mingers (2001), adopted by many in the OR community (e.g., Brown et al., 2006; Ackermann, 2012), which is, we expect, familiar to the readers of this journal.

There is no lack of reviews on OR, in fact 'hard' OR, in China (e.g., Li et al., 2000; White et al., 2011), but reviews on 'soft' OR remain scarce. We claim this article adds value on the grounds that (1) whilst previous studies focus on the tenets and applications (e.g., Qian et al., 1993; Gu and Zhu, 1995, 2000; Li, 2010), this article investigates the development of OR in China through a historical–institutional perspective and (2) unlike available reviews which are mainly underpinned by East–West philosophical comparisons (e.g., Wilby, 1996; Midgley and Wilby, 1995, 2000; Zhu, 1998, 2000), this piece examines China-born OR approaches in the specific context of China's reform.

The article is organized into three sections. We begin with an assessment of the inadequacy of (soft) OR in China: analyzing urgent challenges confronting decision-makers, presenting a historical account of the OR metamorphosis, and investigating the impacts of Western Soft OR contributions. We then present three indigenous innovations that aim at facilitating strategic decision-making, presumably with 'Chinese characteristics'. In the final section we reflect on the Chinese experience, expose OR's world-building effects, and argue for value-conscious, interest-sensitive, truly 'soft' and 'systemic' OR that fits the purpose

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of aiding scientific and democratic decision-making in contemporary China and beyond.

2. China calling

2.1. The emergence of interest plurality

Decision-makers are often frustrated by the complexity involved in the decision-making process. Few would disagree with this observation. The question immediately pops up, however, when we tackle problems at hand: what does complexity mean?

Wu (2010), an influential pro-market economist and key adviser on China's reform, distinguishes two complexities: (1) information complexity which is due to bounded rationality and distributed knowledge (Hayek, 1945; Simon, 1955) and (2) value complexity which is associated with interest plurality and power relations (Crozier and Friedberg, 1977; Cyert and March, 1963). Wu further posits that there are costs in dealing with both complexities: information cost to the former and motivation cost to the latter. Central planning as an approach to decision-making fails because it confuses the two complexities. It is based, instead, on the assumptions of full information and a single interest subject (Kornai, 1992). As the assumptions do not fit with real life, central planning in practice faces almost unlimited information cost as well as motivation cost. In this sense, reform is to reduce the costs of dealing with information and value complexities. Accordingly, the historical challenge to OR is to aid decision-makers to tackle the two complexities.

At the early stage of the reform, as many have acknowledged, China adopted an 'organic strategy', allowed non-state sectors to develop, bottom-up and outside the systems, so as to gain experience, nurture entrepreneurship, cumulate original capital, and generate momentum for further transformation. During this stage, reformers intentionally tackled problems at the periphery, delayed changes at the core, and avoided offending vested interests, by measures such as 'dual-track mechanisms'. In complexity terms, the growing non-state sectors reduced the demand for central planning and control, resulting in decreased information costs. Meanwhile, value complexity remained insignificant and motivation cost low because the organic strategy managed to benefit the majority of society: farmers in the countryside thrived by running private businesses while city workers and officials improved their lot with decentralized managerial rights. At this stage, it was largely a 'Pareto improvement process', a 'reform without losers' (Lau et al., 2001; Zhu, 2007).

After 30 years of experimentation, tinkering at the periphery is no longer an option. Reform changes economic interest relations via re-arranging socio-political institutions. There are gains in the process, but the gains are not evenly distributed. A halfway reform created a rent-seeking heaven for the few to rob the many. Though annual GDP growth averages 10%, China is today one of the most unequal societies in terms of wealth distribution (Lum, 2006; McGregor, 2007; Sun, 2003). Its Gini coefficient climbed from 0.16 before the reform to the current 0.47 (UNDP, 2010), and the urban-rural income disparity reached 6:1 against the world's normal 1.5:1, with 20–30% of GDP going into rent-seekers' pockets (Wu, 2010, pp. 386, 388, 389). The 'Pareto improvement process' and the Maoist 'single interest subject' are gone. Now there are losers.

Reform has made interest diversity apparent while accelerating the emergence of multiple 'interest subjects', i.e., social groups with divergent, even conflicting, expectations and demands (Sun, 2006). The urgency is for all to see: 280,000 'mass incidents', i.e., public protests, were officially reported in 2010 alone. This shook society from the bottom to the top (Coonan, 2011). 'We must sur-

vey and investigate changes in interest relations, understand and analyze development trends in China's social interest structure, so as to better coordinate interest relations and interest demands of stakeholders,' said President Hu (2012).

In today's China, while information complexity remains, value complexity has become paramount and motivation costs are intolerably high. Dealing with value diversity and interest conflict is now the primary concern of China's decision-makers in governments as well as in enterprises. Can OR, or Soft OR, pass this acid test?

2.2. The ambivalent technocratic competence

OR was introduced into China in the 1950s chiefly by Qian Xuesen. After completing his studies at Shanghai Jiaotong University and the Massachusetts Institute of Technology, Qian briefly worked on the Manhattan Project and then pioneered the ballistic missile industry in the US, quickly establishing himself as one of the brightest minds in the new field of aeronautics. During the McCarthy era, Qian was stripped of his security clearance and kept under virtual house arrest. In 1955, the US let Qian go, trading him for its pilots captured by the Chinese during the Korean War. Within ten years since then, isolated from the outside world, China launched its ballistic missiles and, shortly afterwards, atomic bombs and satellites. In 1956, Qian setup the first OR team in the Chinese Academy of Sciences. In 1978, when the chaotic Cultural Revolution ended, he immediately promoted systems engineering in government projects, industries and universities. Qian emphasized *shili* (conceptions and ways of organizing activities) in addition to *wuli* (science and technology know-how), which resulted in one of the 'Oriental systems methodologies' and inspired others (see next section).

Qian was exceptional in many other ways. He had a life-long, keen interest in art, music, literature and philosophy. His painting was of accomplished quality and his wife was a celebrated opera singer-professor. Qian was critical of those who 'bully with mathematical symbols and equations': 'Mathematics is an important tool. But it cannot change rights and wrongs. You cannot right a wrong concept with mathematics; the right will remain right, however, although it may advance a bit slowly without the help of mathematics' (Qian, 1994, p. 122).

Nevertheless, Qian embodied the constraints of the time. He defined OR as 'technical science', much narrower than his contemporary OR pioneers Churchman et al. (1957) did. He never touched any socio-political thought other than the official Maoist ideology. He was concerned about social systems and human problems, but only within the confines of cognition and life science. He never mentioned interest, value, power or social conflict in 'open complex giant systems'. During the Great Leap Forward campaign that cost tens of millions of lives, he, as the father-figure of science in China, signed articles ostensibly proving Mao's outlandish farm output targets (for an introduction to Qian's life see, e.g., Wang, 2011).

Qian's legacy is thus ambivalent: he was strong in dealing with information-cognitive complexity, yet his contribution to the tackling of value-interest complexity is almost zero. While his systems idea is influential, the idea in effect expels the most important aspects of social life from OR altogether. Whilst we should not judge historical figures through the lens of today's circumstances, it is a critical question whether Qian's information-without-value, brain-without-soul technocratic approach should be pursued as the exemplar of OR, in contemporary China as well as anywhere else.

History supplies answers. Before the reform, OR was a convenient tool for the Chinese state to implement central plans via government and state enterprise projects. OR workers' technical

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