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Latecomer's strategy: An assessment of BDS industrialization policy

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ABSTRACT

The successful launch of the Chinese Beidou (Compass) Navigation Satellite System (hereafter refers to as BDS) makes it the third operational navigation satellite system capable of offering regional services after GPS and GLONASS in the end of 2012. Yet considering the dominant role of GPS in global GNSS market, it's a great challenge to maximize the utilization of other systems and cultivate competitive domestic navigation industries for all latecomers in the GNSS community. This paper analyzes the current strategy of BDS industrialization by a detailed review of current policy documents from both central and local government, examines the progress of BDS industrialization based on statistical data and expert interviews, and summarized the current strategy of BDS industrialization as indigenous in key domains and compatible in commercialization. Then a stakeholder analysis is conducted to analyze the consideration behind current strategy. This paper also comes up with several policy recommendations for Chinese decision makers' reference to improve BDS related policies in the future from a latecomer's perspective based on detailed comparison analysis of BDS's advantages and disadvantages.

1. Introduction

Like the Internet, satellite navigation systems are essential element of the global information infrastructure, which is now in everything from cell phones and wristwatches to bulldozers, shipping containers, and ATMs [1]. The well-known and widely used US NAVSTAR Global Positioning System (GPS) and Russian GLONASS system are currently in operation global satellite navigation systems [2]. The successful launch of the Chinese Beidou (Compass) Navigation Satellite System (hereafter refers to BDS) makes it the third operational navigation satellite system capable of offering regional services in the end of 2012 [3].

The Chinese government has made great efforts to promote the application and commercialization of BDS. As early as 2007, related ministries had established satellite navigation industry as a national strategic high-tech industry [4]. The release of the National Medium- and Long-Term Development Plan on Satellite Navigation Industry [5] by the State Council in 2013 further reiterated the practical and long term strategic significance of BDS for adjusting economic structure, increasing productivity, improving social welfare, and strengthening national competitiveness. The Plan also raised the goal of cultivating a 400 billion RMB navigation market with the contribution from BDS based products and services counting for more than 60% (the percentage is expected more than 80% in key domains), as well as a strong global competitiveness.

Though China raised an ambitious plan to industrialize BDS, it is still under a lot of uncertainty and difficulty. According to the European GNSS Agency, the global GNSS market size exceeded 150 billion Euros in 2012, and the installed base of GNSS devices will increase four-fold, almost one GNSS receiver for every person on the planet over the coming decade [6]. Yet currently more than 70% of models available on the market are GPS-SBAS capable (SBAS comprising WAAS, EGNOS, and MSAS). In Chinese market, the market share of BDS based products only counted a negligible share of less than 10% by the end of 2013. With the construction of European Union's Galileo global positioning system, Japanese Multi-functional Transport Satellite Satellite-based Augmentation System (MSAS) and the Quasi-Zenith Satellite System (QZSS) and the Indian Regional Navigation Satellite System (IRNSS), a severe competition in the future is foreseeable.

Current studies on BDS industrialization lag behind the practice of the government and industry. Literature on BDS mainly focuses on the technological aspect of the system, and very limited number of studies considered the policy issues of its industrialization. Li (2013) reviewed the development and decision process of GNSS in China from a historical perspective, and analyzed the policy issues of China's satellite navigation industry [7]. Some domestic scholars summarized the current status and development trends of satellite navigation, especially BDS based industry, such as Han et al. (2010)

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[8], Sang (2012) [9], Wu et al. (2013) [10] and Zhang et al. (2013) [11]. Some attentions are also paid to the experiences and lessons learned from the industrialization of other major GNSS systems, like Wang and Wu (2011) [12], Shi (2013) [13]. But in general, a holistic assessment of industrialization policy of BDS in the context of global cooperation and competition is absent. The release of the National Medium- and Long-Term Development Plan on Satellite Navigation Industry by the State Council of China in 2013 provides an opportunity to follow and discuss the policy issue of BDS industrialization.

This paper tries to shed some light on the problem by taking a policy assessment on BDS industrialization strategy as a latecomer. Three research questions are raised to understand the industrialization strategy of BDS: (1) what strategy is China currently taking to promote the industrialization of BDS; (2) why the strategy is taken? and (3) what measures may be taken to improve the strategy in the future. The research setting is that China attempt to cultivating a BDS based industry under the context that GPS is holding an existing dominant position in both domestic and international market, as well as the emergence of some other global and regional satellite navigation systems. Within this setting, there is no doubt that BDS is a latecomer to the international GNSS community in terms of constellation construction, industry cultivation and market penetration.

The paper is organized as follows. We start with a detailed description of data collection and analysis methodology. We then summarize the progress of BDS industrialization to explain its industrialization strategy in terms of governance, market and international cooperation. Based on interviews and expert meetings, we discuss concerns of major stakeholders on BDS industrialization, and come up with alternative strategies and policy suggestions for its future development. We conclude by discussing the major findings and possible future research directions.

2. Research methodology

Given the nature of the research question and data availability, an exploratory case study method is hired to investigate the current BDS industrialization strategy. The case method has long been accepted as an important method to develop an understanding of the dynamics that occur within single settings [14]. Especially an exploratory case study focuses to understand what happened within a case by looking beyond descriptive features and studying surround context [15]. Stakeholder analysis and latecomer strategy analysis will be conducted to answer the *why* and *how* questions of the case study. Stakeholder analysis is a widely applied method used to investigate entities such as communities, NGOs, government and the private sector who have a ‘stake’ or an interest to affect, or will (potentially) be affected by a certain decision-making processes [16]. It will be taken into analysis the stakeholders' concerns, networks and their relations which may affected or be affected by the industrialization of BDS, with a view of understanding the current strategy and give a clue for the future development.

Latecomer theory is widely applied to explain the rapid development completion strategy to catch-up of latecomer economies. Literature indicate that advantages of first-mover/incumbent mainly derive from technological leadership, preemption of scarce assets, and switching costs and buyer choice under uncertainty [17]. Studies on consumer behaviors also suggest that the purchasing behavior of consumer is a learning process, within which the brand reputation and previous purchasing experiences are more likely to bring first-mover advantages [18,19]. Besides, distance from major markets is also identified for latecomer firms which are always firms in developing countries [20]. Literature, on the other hand, indicate that the first-mover advantage may be undermined by means of “free-rider” affects, resolution of technological or market uncertainty, shifts in technology or customer needs, and incumbent inertia [21]. At the same time, latecomers in developing countries always benefit from a cheap and well-trained labor supply [22], export promotion policies and indigenous technological development efforts within local firms [23]. Practical evidences show that rapid catching up even overtaking to incumbent multinational enterprises (MNEs) may be acquired in some emerging technology industries if appropriate strategies are taken, such as the cases of consumer electronics and semiconductors industry in Japan and Korea [24], and the telecom equipment industry in China [25]. We will take the methods suggested by latecomer's strategy to catch up to analysis major advantages and disadvantages of BDS, and come up with alternative strategies for the future.

To conduct these analyses, a variety of data collection methods are used. In-depth interviews with related experts, including government officers, industrial experts, entrepreneurs, technical expert, and researchers in China as well as their counterparts in the United States and EU are taken. All interviews take a semi-structured questionnaire to lead the conversation, and we also encourage the interviewees to raise new policy issues. Besides, two expert meetings are held to discuss the concerns of major stakeholders, BDS industrialization strategy, and policy suggestions. Six types of public archival data are also collected and analyzed to support the study, namely: (1) major legal and policy documents issued by Chinese government at both national and provincial level; (2) major legal and policy documents issued by the United States on GPS; (3) international GNSS industry reports and BDS industry reports; (4) official GNSS websites; (5) websites of major GNSS enterprises, both local and MNEs; and (6) journal articles and research reports on GNSS commercialization and industrialization.

3. Strategy of BDS industrialization

As mentioned above, the intention to promote GNSS industry development in China dates back to 2007, and the release of 2013 National Plan make the strategy more clear and comprehensive. Current strategy of BDS industrialization can be summarized as indigenous in key domains and compatible in commercialization, which is implemented by a mixture of three interrelated measures: top-down push, bottom-up pull, and inside-out promotion. The strategy and its progress will be depicted with a descriptive elaboration based on official publications and investigation data.

3.1. Top-down push from government

Top-down push refers to the promotion and introduction of BDS industrialization from both central and local governments, by means of various policy measures, such as construction of industry parks, R&D funding, and government procurement, etc.

The application and industrialization of BDS is governed and regulated by a multi-agency mechanism. Major departments and agencies get involved in BDS industrialization including National Development and Reform Commission (NDRC), Ministry of Science and Technology (MOST), Ministry of Industry and Information Technology (MIIT), State Administration of Science, Technology and Industry for National Defense (SASTIND), General Staff Department (GSD) and General Armament Department (GAD) [26]. The Management Office of Satellite Navigation System is the executive authority to promote the application and industrialization of BDS, which are in charge of the formulation and release of Interface Control Documents, coordination of standard and IPR issues, and promotion of international cooperation. Besides, a Technological