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Social Trust and Open Innovation in an Informal Economy: The Emergence of Shenzhen Mobile Phone Industry

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Abstract: This study examines how social trust facilitates firms' collaborative efficiency in an informal economy. We extend the open innovation theory to explain the straightforward role of social trust in the Shenzhen mobile phone industry. This single case study yields two principal findings. First, social trust fosters the efficient integration of value chains for mobile phone development. Four types of informal entrepreneurs with high social trust built on homogenous sanctioned ethnic groups (i.e., Fujian, Hunan, Chaoshan, and Wenzhou) collaboratively conform to the chip vendors, independent design houses, integrators, manufacturers and channel retailers in the Shenzhen mobile phone industry. These four groups of informal entrepreneurs achieve ethnic legitimacy by organizing the value chains with mobile feature phones built on Shenzhen mobile phone modes. Second, social trust among the four sanctioned ethnic groups is a critical determinant for shortening the time-to-market of new products and catalyzes product specialization to effectively respond to market needs in the Shenzhen mobile phone industry. Finally, we discuss the implications of our findings for research on social trust and open innovation in informal institutions.

Keywords: open innovation; informal economy; Shenzhen mobile phone industry; social trust

1. Introduction

Open innovation offers a new paradigm for firms' collaborative innovation processes, integrating multiple parties with external knowledge (e.g., suppliers, users, competitors) and knowledge flow directions (e.g., inward or outward) [1–3]. Recent studies enrich the open innovation to implement in different ways, such as crowdsourcing [4–7], communities [8,9], and ecosystems [10,11]. Compared to a closed approach to innovation, open innovation can improve a firm's capacity to absorb and integrate external knowledge [12], and maximize its commercialization efforts from absorbing outside sources [13]. Given this importance of open innovation, most existing studies have focused on governance approaches for enhancing outcomes of open innovation [14], search heuristics for external sources and outside knowledge [15], collective learning with different partners [16], and its effects on firm performance [17,18].

However, the current literature has little explored informal economies and the role played by informal cultural norms (e.g., social trust or ties) in improving open innovation outputs [19,20]. Informal economy refers to legitimate commercial activities that do not comply with legal requirements such as reporting income, adhering to labor regulations, and paying taxes [21]; informal cultural norms, particularly social trust, have been defined as the extent to which a system of norms and values structures interacts among people [22]. Beyond the traditional viewpoint, social trust provides the underlying social foundation for rules of the game and governance whose actions are legitimate

in informal economies [23]. Brockman et al., [19] examined the effectiveness of social trust as a key mechanism for improving relational governance among partners and further shaping their collaborative performance in high-tech sectors. Although their empirical study extended the comprehensive findings by focusing on the role of social trust in producing open collaborative outcomes (i.e., co-owned patents), it only explored the developed countries and focused on firms' financial information and patenting activities (e.g., USPTO) in legal environments providing supportive regulatory and protective systems [24]. Investigating financial and patent data cannot provide useful insights into informal economies since firms operating in such informal settings have a limited scope to obtain formal finance from banks or outside investors [25]. Informal economies enjoy high levels of legitimacy within their local communities, despite technically operating outside legal institutions [26]. In addition, Brockman et al., [19] remained unclear on the importance of social trust in informal economies; it is a normative system that binds all firms together through social obligations [27] and operates with legitimacy in guiding social and economic interactions [28]. To address these two research gaps, this study examines how social trust facilitates the firms' collaborative efficiency through open innovation in informal economies, focusing specifically on the Shenzhen mobile phone industry. Against these, the study attempts to answer the following research questions: (1) how does social trust foster the value chain in the Shenzhen mobile phone industry, and (2) how does social trust catalyze the Shenzhen mobile phone development processes?

This study makes two major theoretical contributions. First, it elucidates firms' collaborative efficiency through open innovation by analyzing how social trust with homogenous sanctioned ethnic groups fosters an efficient integration of value chains in Shenzhen mobile phone industries. We examine whether open innovation theory provides an insightful way through which social trust shortens new products' time-to-market and fosters product specialization to effectively respond to market needs in informal economies [29]. Specifically, a specific profit-sharing mode of the value chain model strongly strengthens the sanctioned ethnic groups who conduct their own operation activities in Shenzhen mobile phone industries. Second, we use inductive qualitative analysis to assess the extent to which social trust facilitates collaborative efficiency through open innovation in informal economies. This contributes to the broader institution's literature (e.g., legal institutions and social institutions), extending understanding of how social trust accounts for entrepreneurial activities in informal economies and influences social and economies outcomes from entrepreneurship [30–32].

The study is organized as follows. Section 2 reviews the literature related to key concepts of informal economy, social trust and open innovation. Section 3 explains the methodology, including the research setting of Shenzhen mobile phone industries, data collection, and data analysis. Section 4 reveals the results on how social trust facilitates the firms' collaborative efficiency. Finally, Section 5 discusses the research propositions and future implementation of conducting social trust and open innovation in informal economies.

2. Literature Review

2.1. Legitimacy in an Informal Economy

Informal economy activities are illegal yet legitimate [33]. Legality is determined by formal institutions such as laws and regulations. Although informal economy activities occur outside these formal institutions, and so are illegal, they are legitimate to the extent to which their products and services are approved by certain social foundations [29]. Specifically, Godfrey [21] operationalized informal economy activities by identifying three aspects. First, in terms of economics, informal economy activities are undertaken in rural areas by labor-intensive firms paying low wages. These activities persist because the efficiencies of formal production have not yet displaced families, ethnic groups, and forms of economic organization [21]. Second, from the institutional perspective, informal economy activities reflect the extent of the cognitive and normative social structure. These social norms serve intrinsic bonding, bridging, and social roles that make such activities meaningful and efficient [34]. Third, from the management perspective, on works of both economics and institutions,

informal economy activities are perceived to lead to competitive advantages. A key governance feature to sustain its advantages focuses on the value of social trust [35]. Thus, at its inception, the Shenzhen mobile phone industry was a typical informal economy: unregulated by government, it grew steadily through black markets for unauthorized, hidden, and underground production. Specifically, Shenzhen, with its special geographic location, is far from Beijing but close to Hong Kong. The development of Shenzhen has mainly influenced by Hong Kong, which puts more emphasis on economic and less on regulation, contributing to the formation of informal economies. Under this circumstance, the Shenzhen mobile phone industry initially emerged covertly in the late 1990s, but was gradually operated overtly in the late 2000s. As one of our interviewees, the Secretary General of the Shenzhen Mobile Communications Association, noted that: ‘It was estimated that by 2011, one in every three cellular phones sold in the world was made in Shenzhen’ (interview, 2013).

Legitimacy is important to informal economies and informal entrepreneurs [26,29,33,36–38]. It is the generalized perception that an entity’s actions are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions [39]. North [40] categorized legitimacy into formal and informal types of institutions. Specifically, formal institutions are laws, regulations, and their supporting apparatuses, whereas informal institutions are the norms and values that define socially acceptable behaviors. As applied in informal economies, informal institutions offer alternative sources of rule development and social enforcement [23]. Following Kim and Li’s [23] seminal work, we argue that social trust is the embodiment of societal norms and informal institutions, providing the basis for an actor’s expectations that its trading partners will act in a mutually acceptable manner [41]. Social trust serves to lubricate economic exchange and, therefore, is a critical economic source of passing down between generations in similar ethnic and social groups [42]. Therefore, social trust is the legitimacy extent to which informal entrepreneurs place confidence in homogeneous ethnic groups, and presumes that a common moral outlook unites entrepreneurs who, despite their differences, share responsibility for one another’s well-being [43].

2.2. Social Trust and Open Innovation

Chesbrough [1] specifies open innovation as the use of knowledge inflows and outflows to accelerate internal R&D activities and expand markets for external commercialization. This creates a tremendous challenge to the traditional closed innovation viewpoint by shifting the dominant logic of R&D activities away from internal exploration to external engagement. In open innovation, firms not only govern internal R&D practices with inbound external knowledge through product development but manage outflows of internal knowledge to seek new market opportunities through outbound licensing [44]. The open innovation approach can create a collaborative flat network of different parties devoted to knowledge exchanges to favor innovations [45–47].

Reflecting the importance of the open innovation paradigm, many previous studies have revealed that its adoption can enhance organizational openness, the extent of external linkages, and the depth and breadth of knowledge search [16,48–50]. Moving beyond the entrepreneurial perspective, using open innovation to external knowledge is reflected generally in institutional contexts [51]. This indicates that, at firm level, entrepreneurs’ success can be significantly socially embedded in formal institutions and legitimacy [52]. However, there are costs to accessing sources of outside knowledge through open innovation [19]; specifically, external collaboration entails risks of economic opportunism and knowledge spillover [53]. When entrepreneurs regard open innovation as critical to enhance their abilities and facilitate commercialization, collaborating with external partners may expose their core competences and reduce the returns they are able to derive from innovations [54–56]. The major business consideration here is that acquiring external knowledge and accelerating commercialization requires entrepreneurs to disclose some of their own knowledge and commercial ideas to outsiders. Close engagement with a broad set of collaborators thus makes them vulnerable to lose competences and commercial benefits. Consequently, open innovation entails a paradox with double-edged effects [54,56,57].

To mitigate the openness paradox by limiting opportunistic behavior, some prior studies have suggested that an alternative to formal institutions (e.g., express contractual provisions) is legitimacy (i.e., social trust) by ensuring the fulfillment of implicit contractual agreements, it plays an important role in stabilizing collaborative efforts [23,58]. Social trust is regarded as the embodiment of legitimacy extent to which informal entrepreneurs place confidence in homogeneous ethnic groups and similar social expectation, thus effectively helping businesses to cooperate and lubricating economic exchange [41–43]. Furthermore, informal entrepreneurs within similar sanctioned ethnics in areas of high social trust are considered more inclined to cooperate effectively as the transaction risks of economic activities are mitigated, thus enabling them to enjoy low trading expenses and more easily absorb the benefits. Genefke [59] pointed out that a high degree of interaction in trust-based situations makes an easy way of formal system and effective collaboration. Brockman et al., [19] empirically confirmed that firms in high-social-trust countries can produce a higher level of open innovation (co-owned patents), suggesting that social trust is necessary for open innovation when perceived opportunism is higher. Social trust relieves the firms' concerns about collaborative moral hazard, in turn reducing the likelihood of losing abilities and commercial benefits [60]. Greater social trust can increase the higher efficiency of open innovation by reducing opportunism and ensuring predictable transactions during external collaboration [19,23]. Consequently, we treat social trust as an assurance of legitimacy for informal entrepreneurs who effectively conduct open innovation and enhance collaborative efficiency.

3. Methodology

We conducted qualitative research to empirically clarify how social trust facilitates the firms' collaborative efficiency in the Shenzhen mobile phone industry. Qualitative research was considered appropriate for two reasons. First, the Shenzhen mobile phone industry is a part of an informal economy and is characterized by illegal activities on which there are no official data and sources, so it is difficult to gather evidence. Inductive qualitative research can help to overcome such challenges via direct observations in the chosen environment [61]. Adopting an emergent design, we allowed the data to speak for itself and inductively derived our research findings [62]. Second, traditional approaches to open innovation have often neglected the formation process before collaboration efficiency is considered. Our qualitative research method can address this underdevelopment. We especially focused on theory elaboration procedures to address such emerging issues [63,64]. Using qualitative research to search for the formation process during collaborative efficiency through open innovation in the Shenzhen mobile phone industry is frequently considered to achieve the research objectives [65,66].

3.1. Research Setting: Shenzhen Mobile Phone Industry

Globally, mobile phone industries have mainly been dominated by companies based in Western Europe, Japan, and the United State since the 1980s, leading to high entry barriers in terms of technology and capital requirements. During the 1990s, these foreign companies successively entered China and claimed around 83% of its mobile phone market. Promising technology and business opportunities pushed the Chinese government to target developing telecommunication industry in China, and the National Plan Commission and MII specifically announced a regulation entitled “Arrangements for the Approval of Network Access of Telecommunications Equipment”—generally named “Document No. 5”—in December 1998. The regulation required all telecom equipment developed in China to have a Network Access License (NAL) and a 15-digit Network Access Identifier (NAI), both issued by MII. This limited the disruptive penetration of foreign telecom companies, while also supporting the emergence of domestic telecom firms.

In the early 2000s, a mobile phone required the following to be legal in China: a network access code, phone model number, scrambling code, International Mobile Equipment Identity (IMEI) code, and serial number [67]. Any mobile phone without these licensed codes was illegal and called a “black mobile phone” (or “bandit mobile phone” after 2005). Illegal mobile phones were mainly produced by opportunistic manufacturers based in Shenzhen District where they evaded government

management. Shenzhen District was the first special economic zone (SEZ) in mainland China. It provides political support and advantages to attract firms' investment, such as special economic regulations and policies, infrastructure support, and tax credits. For the past four decades, such advantages have successfully attracted several foreign firms, including Hong Kong companies, to SEZs, together with Chinese state-owned enterprises, domestic high-tech private companies, and Taiwanese high-tech firms. Such extensive investment allowed Shenzhen District to grow rapidly and form a complete electronic supply chain [68]. Having previously supported MP3s and DVDs, this chain began to provide electronic components for cellular phones.

In the late 1990s, when the Chinese government attempted to develop its own mobile phone industry in China, it issued a regulation to foster domestic mobile phone manufacturers. During this period, unlicensed (illegal) mobile phones were known as black or fake phones. In 2004, the Chinese government started to relax license control regulations, and some unlicensed companies applied for licenses and began to run their businesses legitimately. Finally, the state announced the lifting of license controls in 2007, thereby legitimizing unlicensed companies, which started to view themselves as branded companies, and subsequently flourished in the Chinese mobile phone industry. Black phone players, main actors of Shenzhen mobile phone industries, then started to call themselves "Shanzhai" manufacturers to secure the normative appropriateness of their industry, which originally challenged the state's national star policy.

Figure 1 illustrates the changes in the yearly number of articles mentioning "Shanzhai mobile phones" in three major databases. The use of the name Shanzhai in the mobile phone industry clearly increased after 2007. Using "Shanzhai" instead of "black" or "fake" increased the perceived value of the focal industry through a halo effect [69], suggesting that Shanzhai mobile phones became widely familiar. However, such emergence of Shenzhen mobile phone industries, as an "extreme" case [63], provides an analytic opportunity to understand how social trust facilitates the firm's collaborative efficiency in informal economies. Thus, we focus on how social trust fosters the value chain mode and catalyzes the Shenzhen mobile phone development process in Shenzhen mobile phone industries.

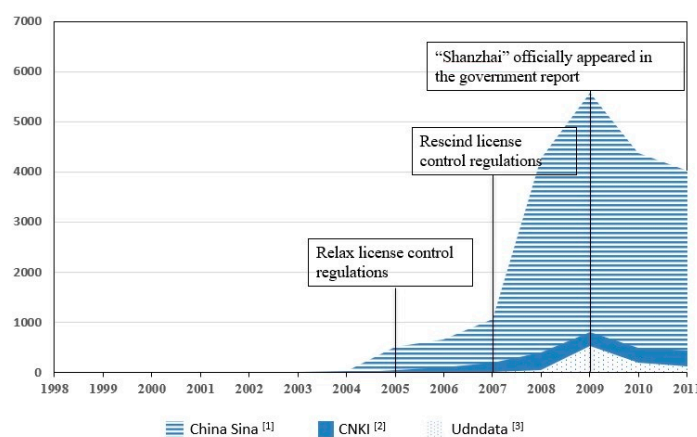


Figure 1. The term "Shanzhai" emerged in Shenzhen mobile phone industries. Source: China Sina¹, China National Knowledge Infrastructure (CNKI)², Udndata³. Note 1: China Sina was established by the mergers of two of the largest Chinese web sites: SINANET.com of Sunnysvale and Stone Rich Sight Information Technology Company of Beijing, and news data cover the period from 1998 to present day. It is the world's largest Chinese-language destination site. The data was retrieved and calculated from <https://www.cnki.net/> on 25 June 2014. 2: China National Knowledge Infrastructure (CNKI) is the database established by the Chinese government in 1996, and news data cover the period from 1915 to now in China. The data was retrieved and calculated from <https://www.cnki.net/> on 25 June 2014. 3: Udndata is the biggest news database established by United Daily News Group in 2001, and news data cover the period from 1951 to now. The data was retrieved and calculated from <https://udndata.com/ndapp/Index> on 25 June 2014.

3.2. Data Collection

To understand the role of social trust played in Shenzhen mobile phone industries, we used a longitudinal case study with focus on multiple data collection [63]. Shenzhen mobile phone industries appeared when informal entrepreneurs began to seek to cooperate and exchange from outside in supporting their framing activities [29]. Such collective cooperation in given Shenzhen mobile phone industries enables embedded informal entrepreneurs to use their open innovation strategies [70]. The collected data cover the period from late 1998 to 2011, beginning with the publication of Document No. 5 and ending when Shenzhen was recognized as the world's biggest mobile phone manufacturing base. We conducted a three-year qualitative field-level study to collect both primary and secondary data from Taiwan and China. For secondary data, we relied on books, consulting reports, official reports, dissertations, documents from three databases (Udndata, China Sina and CNKI), annual reports of MediaTek, official reports, advertisements, yellow pages, and videos. For primary data, we collected through performing 37 open-end interviews, and undertaking 60 days of observations (see Table 1 for details on each data type). Each data source is elaborated below.

Table 1. Summary of multiple data collection.

Source of Data	Data Type	Quantity
Secondary data	Taiwan	
	Books	7
	Consulting reports	6
	Literatures	2 dissertations
	Mass media database	4368 documents from the database (Udndata)
	Annual reports	nine-year annual reports of MediaTek
	Books	11
	Consulting reports	7
	Literatures	5 dissertations
	Government reports	32 'Economic and social development statistical report' (1999–2009) and 'The Yearbook of the China Information Industry' (2000–2010)
	Mass media database	approximately 21 thousand documents from two databases (China Sina and CNKI)
	advertisements	129
	Magazines	10
	Yellow pages	2
	Video	12
Primary data	Taiwan	
	Interviews	5 interviews of 6 informants, approximately 325 min
	Observations	2 forums, approximately 1 day
	China	
	Interviews	32 interviews of 35 informants, approximately 1630 min
	Observations	60 days in Shenzhen

3.2.1. Documents Mainly

To develop an understanding of the Shenzhen mobile phone industry, we collected historical documents from two Chinese mass media databases: China-Sina and CNKI. China-Sina is the only

database covering news from 1984 to the present day, while CNKI is a government-supported database of various magazines and journals from 1915 to the present day. We used “cellular phone” as keywords to search the China-Sina database for items published between 1998 and 2011: this yielded 2.179 million data items. Given the limited time available for screening data, we strategically selected news items published only on Mondays [71]. After removing duplicated and missing data, 0.17 million data items remained. We then conducted the same search in CNKI, which yielded 89 thousand data items. In addition, we gathered other archival data from books, consulting reports, official reports, studies, annual reports, official and unofficial websites, magazine advertisements, and videos. This secondary data collection gave us a preliminary understanding of the Shenzhen mobile phone industry and helped us to construct the case study database.

3.2.2. Individual Interviews

Our field research began in January 2010, and we collected first hand data through interviews and field surveys. To identify respondents who were knowledgeable and neither defensive nor superficial with respect to the Shenzhen mobile phone industry, we initially conducted a telephone survey to confirm interviewees’ role, working experiences, and interpretations of informal activities in the industry. The targeted telephone numbers for the survey were obtained from the “Cell Industry Directory 2009”: A local business directory officially issued by Mobile phone Industry Net of Shenzhen, which lists many suppliers and manufacturers in mobile phone industries and their specific products. The targeted informants comprised 150 individuals ranging from engineers, designers, coordinators, and distributors involved in chip design, cellular telephone accessories, cellular phone design, and distribution in Shenzhen District. Following initial screening, 10 potential informants were selected for in-depth interviews.

We used semi-structured guidelines to conduct field interviews [72]. To enrich for saturation interviews, we also used a snowball technique [73] by asking the 10 interviewees to recommend other key informants who were secretive and feared being exposed [74]. Ultimately, we were able to interview 41 existing or previous participants in the Shenzhen mobile phone industry. Each field interview lasted 30–150 min, and was audio recorded and later transcribed verbatim.

3.2.3. Observations

We frequently visited Shenzhen District between January 2010 and September 2013, attending various meetings, conferences, transaction processes, informal gatherings, and other relevant activities in Hua Qiang Bei—the world’s greatest electronics market. In addition, the first author shadowed as a complete participant to access the physical field, guided by two key informants as practice-based advisors [75], and accessed the virtual field by registering as a member in QQ messenger—a popular social media platform in China. Extended immersion in the field helped to generate “rich and detailed accounts of the daily life for community” [76], and deepened understanding of the habitual thoughts and behavior of the ethnic group [77]. Field notes were written immediately after each observation. Such intensive observation helped us understand and access assurances of social trust and how they facilitate effective collaboration between firms, thus enhancing collaborative performance in the Shenzhen mobile phone industry.

3.3. Data Analysis

The entire data collection procedures involved an iterative process of collecting and analyzing simultaneously. We stopped gathering further data when we reached the theoretical saturation of empirical evidence [78]. In practice, the theoretical saturation arises when the same explanations were repeated, and no more new information would exist. This suggests us stop data collection. Given the empirical paucity on how social trust facilitates the firms’ collaborative efficiency in the Shenzhen mobile phone industry, we pursued an inductive “theory elaboration” approach to address these emerging issues [63,64]. As our interpretations were based on multiple sources of qualitative data,

we moved iteratively between different data sources and between the data and the generated concepts throughout the analysis process [76]. We followed three main steps of interpretation and analysis.

1. Step 1: To answer the research questions in this study: (1) how does social trust foster the value chain in the Shenzhen mobile phone industry, and (2) how does social trust catalyze the Shenzhen mobile phone development processes? We first identified evidence from the primary and secondary data. Because revealing information on illegal activities could damage some individuals' interests, some evidence in the primary and secondary data resulted from dissembling or was purposely misleading. To clean such contaminated data, we utilized triangulation to cross-check data and gather sufficient evidence to understand the facts. We used the note software Evernote to build our evidence database.
2. Step 2: We used the evidence database, comprising 30,457 Chinese words, to chronologically frame the history of the Shenzhen mobile phone industry from 1998 (when it emerged) to 2011. Through this analysis, a clear timeline of major historical events was established, marking the industry's evolution, the relevant actors, and their activities. Through discussing the chronological case with two knowledgeable informants with different perspectives on the phenomenon, we generated detailed insights into the minutiae of the four main social tie groups.
3. Step 3: We moved on to identify the role played by social trust and its relevant operation activities of during product development processes by analyzing different stages in the Shenzhen mobile phone industries. This round of coding revealed the interactions between the mechanisms of social trust assurance that facilitate collaborative efficiency in the Shenzhen mobile phone industry.

4. Results

In considering the importance of social trust in fostering firms' open innovation in Shenzhen mobile phone industries, we found two key ways in which informal entrepreneurs operated collectively to facilitate collaborative efficiency through open innovation: (1) the value chain model, and (2) the time-to-market development process. To specify these empirical findings, we developed narratively by selecting the most representative details of what the informal entrepreneurs did and said. Against the background of illegal transactions in the Shenzhen mobile phone industry, it was difficult to establish binding contracts founded on formal institutions, so informal entrepreneurs tended to cooperate with others who were familiar and highly trusted. Those sharing a common language, religion, and cultural background were considered to be a homogenous sanctioned ethnic group, which significantly contributes to higher social trust and close cooperation. These sanctioned ethnic groups—the Fujian, Hunan, Chaoshan, and Wenzhou—worked together and gradually ganged up with people from the same hometowns:

During the early years of the Shenzhen mobile phone industry, "integrity" was most important. The community was really small but the profit was high ... You made the order today but would pay next week, and I would deliver your order in advance because of trust, rather than formal contract.

(Xu Ming, 2008)

4.1. Value Chain Model

The value chain model in the Shenzhen mobile phone industry divides labor among the sanctioned ethnic groups gathered in Shenzhen District. These ethnic groups operated a value chain to deliver a valuable feature phone that included parts of electronic components, MediaTek chipset (a turn-key solution by MediaTek), independent design houses (IDHs), integrators, manufacturers, and retailers. This set of operations in the value chain involved several specific activities, ranging from mobile phone design to final sale (see Figure 2 for details). These activities were built up by various sanctioned ethnic groups in the Shenzhen mobile phone model, such as Chaoshan, Hunan, Fujian, and Wenzhou. The development of these sanctioned ethnic groups was highly related to the historical evolution of the past. Each of sanctioned ethnic groups is elaborated below.

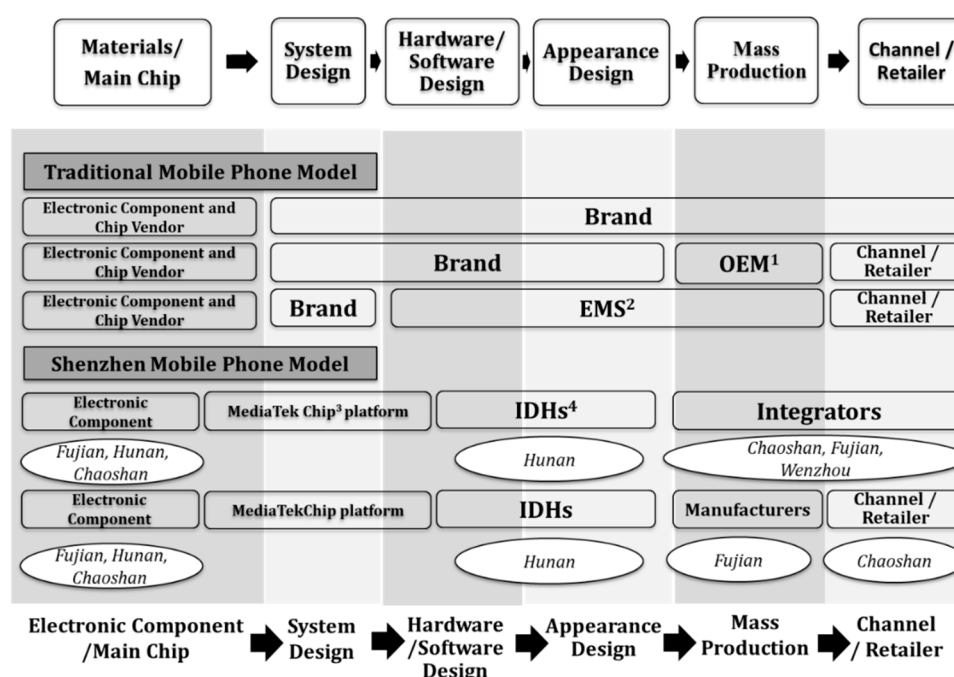


Figure 2. A comparison of the value chain in production (Source: authors modify from [79]). Note: 1: OEM: original equipment manufacturing. 2: EMS: electronic manufacturing services. 3: MediaTek had been the major chip provider of Shenzhen Mobile Phones, and increased to 90 percent in 2010. 4: IDHs: independent design houses.

Among these sanctioned ethnic groups, the Chaoshan were the first to migrate to Shenzhen District, and began arriving in the late 1990s from cities such as Chaozhou, Jieyang, and Shantou. Before then, they engaged in smuggling electronic components or avoiding provincial taxes by taking a fraud of dismantling machines nearby Chaoshan coastal area. When the Chinese government cracked down on these activities, many of those involved relocated to Huaqiang North, where they continued to engage in fraudulent trades. With the emergence of the mobile phone industry in nearby Shenzhen, many Chaoshan people sought refuge with their townsmen from Huaqiang North in Shenzhen and started to work in selling mobile phones and their components. After gaining some advantages, some Chaoshan people formed small and medium-sized mobile phone integrators, and some became Chinese-branded manufacturers in the mobile phone industry. For instance, Liu Lirong—a famous owner of a branded mobile phone manufacturer in mainland China—was oriented toward Chaoshan people. Consequently, most Chaoshan people in the Shenzhen mobile phone industry were involved in electronic components, retailing, and integration (see Figure 3 shows different sanctioned ethnic groups who conform to the Shenzhen mobile phone model based on the geographic area distribution).

Hunan people have tended to develop their own talents and capabilities. They are likely to invest in IDHs and have consistently focused on the production of peripheral components in the Shenzhen mobile phone industry. Hunan people are traditionally conservative and fear taking risks in entrepreneurial activities, preferring to be protective. One of the top-ten mobile phone developers worldwide, G'Five Technology, was founded by five Hunan people. They initially started working in mobile phone component connections and logistics, before deciding to invest in the Shenzhen mobile phone industry. Specifically, the G'Five Technology founders admitted that they were conservative, so that they tended to invest heavily in the mobile phone industry based on careful observation and deliberative analysis.

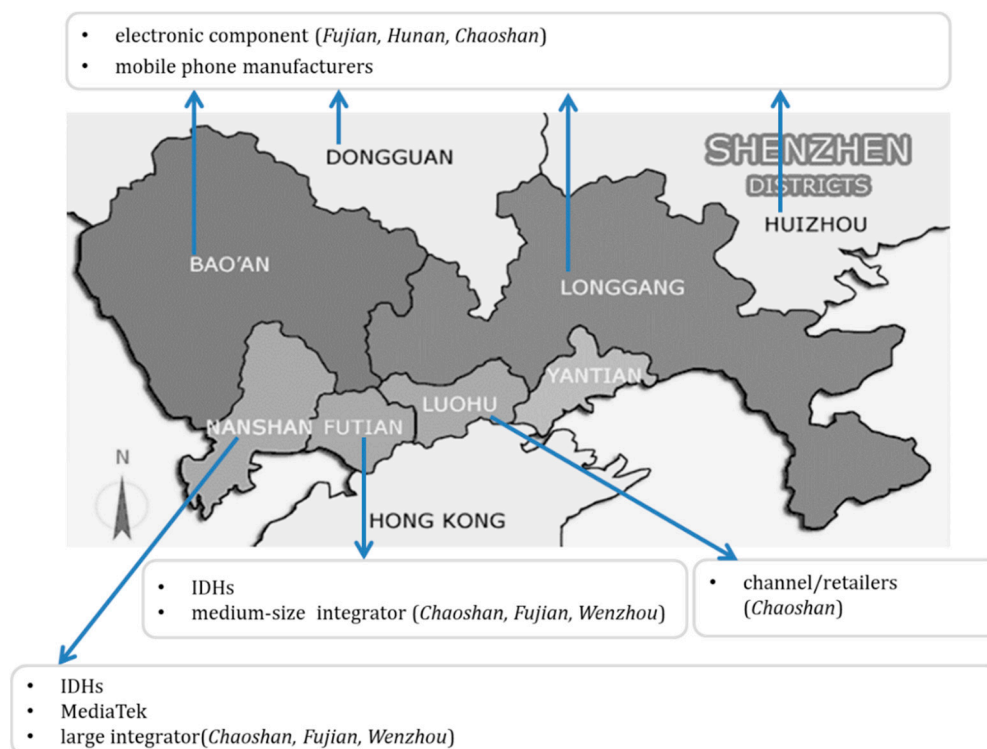


Figure 3. Value chain clusters in Shenzhen District (Source: authors modify from the map retrieved from <http://mapsof.net/china/shenzhen-districts> on 12 November 2019).

Fujian people living in nearby Guangdong began migrating to Shenzhen District in the early 2000s. Those who entered the mobile phone industry typically invested in factories producing stable components, such as molds. These Fujian people are called pirate merchants, who characteristically risk-taking advantages by focusing on integrators in the Shenzhen mobile phone industry. In addition, Wenzhou people started to invest in this industry after 2006. Initially, Wenzhou people focused on product-trading (e.g., leather shoes), but subsequently formed small and medium-sized integrators of mobile phones. These four types of informal entrepreneurs with high social trust built on homogenous sanctioned ethnic groups collaboratively conform to the electronic components, IDHs, integrators, manufacturers and retailers in the Shenzhen mobile phone industry.

It should be noted that the profit-sharing mode of the value chain is tightly connected with each sanctioned ethnic group in the Shenzhen mobile phone industry. Table 2 compares a profit-sharing of three mainstream mobile phones in Shenzhen District during 2008–2010. Compared to MT6225 (US\$100 price), as a feature phone in Shenzhen mobile phone industries, the traditional branded mobile phone developers, like Apple, Nokia mainly dominate a greater part of mobile phone profits, achieving almost 50% of product sales, but sanctioned ethnic groups make an average profit from 16% to 30% of phone sales. This profit-sharing mode strongly takes these four sanctioned ethnic groups, who consistently conduct their own operation activities in the value chain. Specifically, MediaTek developed a turn-key solution to unleash chip design: a key component for mobile feature phones, it is similar to the Qualcomm Reference Design developed by Qualcomm Technologies, Inc. MediaTek's turn-key solution, as a chipset reference offering for mobile phones developed and manufactured in Shenzhen, integrates memory, camera, music, and radio chip connectivity. This provides a collaborative base for each sanctioned ethnic group to deliver valuable features included in different parts of mobile phones. Based on MediaTek's turn-key solution, each sanctioned ethnic group contributes to their abilities for profits and benefits; thereby such a Shenzhen mobile phone model built on four sanctioned ethnic groups challenges the long-term dominance of traditional branded mobile phone developers.

Table 2. Profit Comparison of Three Mobile Phones in Shenzhen District during 2008–2010.

Mobile Phone Type Retail Price	iPhone 3GS ¹ USD 599	Nokia N95 ² USD 730	MT 6225 ^{3,4} USD 100	
• Materials	28.0%	31.0%	20.0%	Fujian, Hunan, ChaoShan
• Printed Circuit Board Assembly (PCBA) board with Processor			20.0%	MediaTek
• IDHs	0.0%	0.0%	10.0%	Hunan
• Brand/Integrator	45.0%	49.3%	20.0%	ChaoShan, Fujian, Wenzhou
• Manufacturer/OEM/EMS	2.0%	2.0%	10.0%	Fujian
• Channel	5.0%	4.0%	5.0%	Chaoshan
• Retailer	10.0%	10.0%	15.0%	
• Other (CTA/IPR)	10.0%	3.7%	0.0%	

Note 1: The profit structure is based on the IHS Markit (technology.ihs.com). 2. The profit structure is based on [80]. 3. The profit structure is based on the interview of Jiu-tang, Pan (29 June 2011), secondary data collected from [81], and ICT web forum (www.52rd.com). 4. MT6225 is the GSM/GPRS Baseband Processor launched in 2003, and wildly used during the 2000s. Shenzhen mobile phones adopted MediaTek chips were generally named after the MTK chip.

4.2. Time-to-Market Development Process

Three parts of the value chain in the Shenzhen mobile phone industry are involved in initiating a new feature phone project: (1) integrators, (2) IDHs, and (3) manufacturers. Specifically, integrators comprise Fujian, Hunan, and Wenzhou sanctioned ethnic groups, which have to decide on a phone's features based on investigation of customer needs and preferences. They often use social media techniques—e.g., Tencent QQ—to understand customers' requirements and determine what functional chips and components to access specification of features they need to include. Meanwhile, IDHs operated by Hunan people are similar to the phone design houses in the traditional mobile phone industry. The Hunan sanctioned ethnic group only undertakes simple tasks of phone design, such as industrial, mechanical, or user interface (UI) design. They play the role of feature phone project managers, proposing new mobile phone projects that not only have specification to upstream of components but also integrate the downstream of integrators or manufacturers. Finally, the Fujian manufacturers produce prototypes and feature phones, and closely collaborate with meticulous division of labor in Shenzhen District to cover a multi-product line of simple, medium, and complex mobile phone designs.

We were able to interview Jiu-tang Pan, a famous Shenzhen mobile phone industry analyst who, as a partner of the Xiaomi Industry Investment Department, has conducted field analysis and industrial observation for decades. He shared the following observations:

If a person wanted to start a mobile phone business, he would need to hire only two core employees: a project manager and a salesperson. A project manager must be equipped with moderate technical knowledge, ... while a salesperson is required to have great networks with retailers. ... The person has to decide the product's features by referring to the existing top-selling mobile phones, ... then [the project manager] would choose the motherboard design company [IDHs] ... to seek the motherboard suitable for the product's required features. ... Most of the time, [the project manager]

could find a suitable motherboard, ... pay the 20% deposit, ... [with a] minimum order quantity of five to ten thousand pieces per order. ... Then the motherboard design company would provide the motherboard layout, ... and the project manager would then choose an appearance design company [IDH]. ... The appearance design company designs the appearance based on the motherboard layout, ... [and] the project manager then approaches the mold factory to produce the prototype. ... The salesperson would show the prototype to potential customers [retailers] to seek their opinions. ... If the potential customers like the prototype, ... the project manager would move to the open molding process. ... It takes roughly 20 days from starting the product project to the open molding stage. ... Meanwhile, based on specifications provided by the motherboard design company, the project manager purchases the peripheral components [around Shenzhen]. ... The project manager would work with the motherboard design company to ensure the selected peripheral components are compatible with the motherboard. ... [After] around 20 days, the first mold is finished, the motherboards are ready, and the peripheral components are delivered. ... The person could start to assemble the mobile phones by hand for the pilot run ... trials involving dozens of mobile phones. ... For low-quality mobile phones, these pilot run mobile phones would be used to test the market, ... after collecting feedback from retailers, the person would then decide the amount of production.

(interview date: 29 June 2011).

In the traditional mobile phone industry, by contrast, a new mobile phone project is typically initiated by either a branded company, such as Apple and Sony, or an original design manufacturer (ODM) (e.g., Pegatron and Wistron); both types of companies are capital-and technology-intensive. A branded company decides the standards for a new mobile phone, including its features, the phone's operating behavior, its chip, and many other aspects; it then outsources the new phone project to the ODM, which focuses on the phone's industrial design, system design, radio-frequency design, mechanical design, software design, and UI design, thus delivering complete product design services to the branded company. After a prototype phone has been completed by the ODM and approved by the branded company, the model is sent to an electronics manufacturing service company, such as Foxconn or Flextronics, for mass production. Finally, the new mobile phone is always launched in the market through distributors selected by the branded company, as shown in Figure 4.

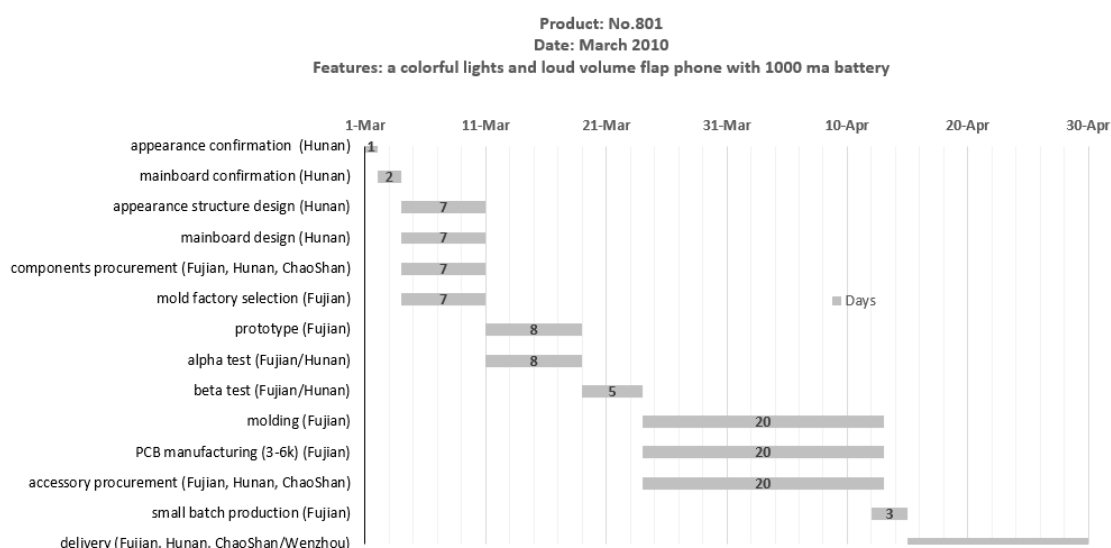


Figure 4. Gantt Chart of a Shenzhen Mobile Phone Project. Note: The Gantt Chart is created by authors on the basis of the document provided by the integrator (interviewee No. 17), and this chart has been confirmed by interviewee No. 17 twice in 2011.

Due to the homogeneity of the sanctioned ethnic groups in the Shenzhen mobile phone industry, a high degree of cooperation in the division of labor enables the efficient development of functional

products. On average, a traditional mobile phone manufacturer such as Nokia, Motorola, or Samsung takes approximately 1 year to fully develop a new mobile phone, and can gauge the market reaction in 3–6 months. To evaluate how the Shenzhen mobile phone industry compares, we consider the time-to-market development schedule of a mobile feature phone with colorful lights, a loud volume flap, and a 1000 ma battery. Through the efficient coordination of homogeneous sanctioned ethnic groups, the process of developing the product's appearance and confirming the mainboard takes just 2 days; the process of structure, mainboard design, components procurement, and mold factory selection takes 7 days; creating the prototype and conducting the alpha test takes 8 days; conducting the beta test takes 5 days; molding, PCB manufacturing (3–6 k), and accessory procurement takes 20 days; and, finally, small batch production and delivery takes 3 days. Overall, then, the product development schedule of such a feature phone in the Shenzhen mobile phone industry is only 61 days (see Figure 4). Such an efficient coordination of Shenzhen mobile phone model is followed by a prior observation of Lee and Hung [29], which suggested that those informal entrepreneurs with higher social trust built on similar sanctioned ethnic groups who come up with novel feature phone ideas, build new customer bases, and raise the first working capital could all trigger a new product cycle.

5. Discussion and Conclusions

This study's objective was to examine how social trust among sanctioned ethnic groups facilitates the firms' collaborative efficiency in the informal economy. To the best of our knowledge, our study is the first of its kind to extend an insightful way of open innovation theory through which the social trust among different homogeneous ethnic groups shortens the time-to-market and fosters product specialization, enabling effective responses to market needs in the Shenzhen mobile phone industry. Studying this case enabled us to better understand informal economies despite of a set of legitimacy.

First, we reveal that different sanctioned ethnic groups operating in the value chain to build up the Shenzhen mobile phone industry that performs in order to deliver the valuable feature phones. These various ethnic groups vary in different operation activities in the value chain of Shenzhen mobile phone industries. For example, Chaoshan people were involved in electronic components, retail, and integration, Hunan people mainly focused on IDHs of feature phones, and Fujian and Wenzhou people were two ethnic groups to operate in integrators of Shenzhen mobile phones. These four types of informal entrepreneurs with high level of social trust built on homogeneous sanctioned ethnic groups collaboratively foster an efficient integration of the value chain in the Shenzhen mobile phone industry. These findings are consistent with those of Lee and Hung [29] who confirmed that Shenzhen mobile phone industries appeared when those different sanctioned ethnic groups began to seek to cooperate and exchange their own operation activities from outside partners. Such collective cooperation and activities exchange due to social trust built on homogeneous sanctioned ethnic groups enable these informal entrepreneurs to use their open innovation strategies [70]. Moreover, against the background of illegal transaction of Shenzhen mobile phone industries, social trust is necessary required when perceived opportunism is higher [60]. Brockman et al., [19] confirmed that firms in the high-social-trust context are likely to produce a higher level of open innovation. Greater social trust increases the higher collaborative efficiency by reducing opportunism and ensures predictable transaction during external cooperation [23]. The high degree of interaction in the trust-based situations can make an effective way of collaboration [59]. Therefore, we summarize our agreements in the form of a research proposition (also see Figure 5).

Proposition 1a. *Under informal economies, social trust built on the sanctioned ethnic groups collaboratively fosters an efficient integration of value chain in Shenzhen mobile phone industries.*

Second, we also reveal that social trust among the four sanctioned ethnic groups (e.g., Fujian, Hunan, Chaoshan, and Wenzhou) is critical for shortening the time-to-market of feature phones and fostering product specialization to respond to market needs in the Shenzhen mobile phone industry.

To compare the branded (traditional mobile phones) and Shenzhen mobile phones, on average, the Shenzhen mobile phones are four times faster than the branded ones in response to market needs and preferences (e.g., NOKIA, Motorola, Samsung). Specifically, through an efficient coordination of homogeneous sanctioned ethnic groups in the Shenzhen mobile phone industry, the process of developing the product's appearance and confirming the mainboard takes just 2 days; the process of structure, mainboard design, components procurement, and mold factory selection takes 7 days; creating the prototype and conducting the alpha test takes 8 days, etc. Overall, a feature phone in the Shenzhen mobile phone industry only takes 61 days on product development schedule. Such an efficient integration of value chain in Shenzhen mobile phone industries (e.g., chip vendors, IDHs, integrators, manufacturers and retailers) successfully challenges the long-term dominance of traditional branded mobile phone developing process and (re)structure economic exchanges in the subsistence markets [82]. These findings are line with the prior studies which suggested that social trust is regarded as the embodiment of legitimacy extent to which informal entrepreneurs place their confidence in homogeneous ethnic groups and similar expectation, thus effectively helping businesses to cooperate and lubricating economic exchange [41–43]. Social trust built on homogeneous sanctioned ethnic groups relieves informal entrepreneurs' concerns about collaborative moral hazard, in turn reducing the likelihood of losing abilities and commercial benefits in the Shenzhen mobile phone industry [60]. Therefore, we summarize our agreements in the form of a research proposition (also see Figure 5).

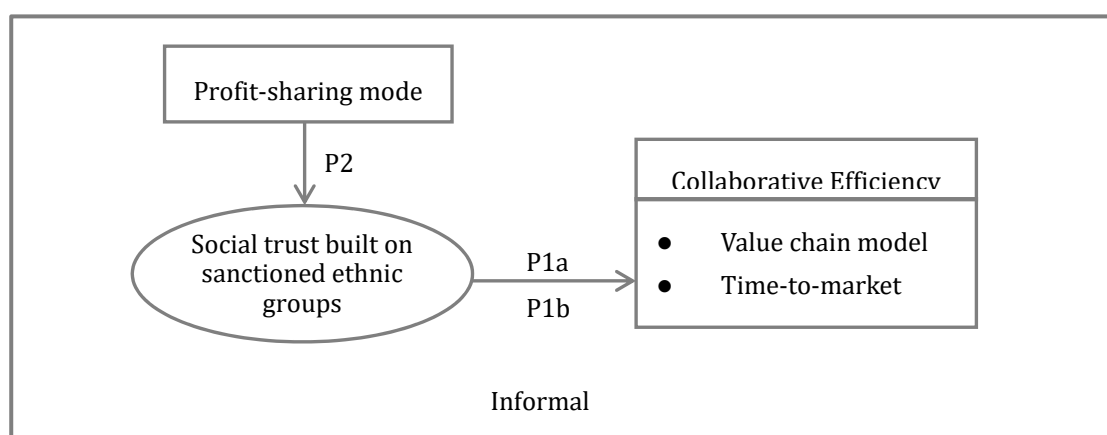


Figure 5. Research Proposition on Social Trust and Open Innovation in Informal Economies.

Proposition 1b. *Under informal economies, social trust built on the sanctioned ethnic groups catalyzes to shorten the time-to-market development process and foster the product specialization to respond to market needs in Shenzhen mobile phone industries.*

Third, we reveal that the profit-sharing mode of the value chain model strongly strengthens the sanctioned ethnic groups who conduct their own operation activities in Shenzhen mobile phone industries. To compare the traditional mobile phones like Apple and Nokia (see details in Table 2), these branded mobile phone developers dominate the mobile phone market by capturing almost achieving 50% of mobile phone profits but in contrast, sanctioned ethnic groups command an average share of mobile phone profit from 7%–33%. Specifically, such a profit-sharing with Fujian ethnic group's 23%, Hunan ethnic group's 17%, Chaoshan ethnic group's 33% and Wenzhou ethnic group's 7% is widely distributed. This finding is line with the prior studies which suggested that in informal economies, social trust built on sanctioned ethnic groups that it is more efficient to operate in the value chain because the benefits provided by its collaborative efficiency are more than the costs of operation incurred to obtain them [83]. Such collective efforts among sanctioned ethnic groups yield a number of advantages (e.g., access to a more established facility, develop trusting group-based credit relations) to allow informal entrepreneurs to increase their capacity for resource allocation, thereby enhancing their

ability to exploit profits and benefits [84]. Therefore, we summarize our agreements in the form of a research proposition (also see Figure 5).

Proposition 2. *Under informal economies, a profit-sharing mode of the value chain strengthens the sanctioned ethnic groups (e.g., Fujian, Hunan, Chaoshan, and Wenzhou) who conduct their own operation activities of the value chain in Shenzhen mobile phone industries.*

This study has a number of research limitations, some of which may present new opportunities for future works. First, the main limitation of the study focuses on an empirical retrospective, which may limit the accuracy and completeness of data collection, in particular, at the early phases of the Shenzhen mobile phone industry in 1990s. Several secondary data (e.g., documents, archives) are difficult to gather retrospectively in the early of 1990s, known as unlicensed (illegal) phases, when it confines the chronological sequence and causal relation of Shenzhen mobile phone development. Second, recent studies have paid attentions on issues of informal entrepreneurs change or informal economies transition (e.g., Lee and Hung, [29]), suggesting that Shenzhen mobile phone industries may call for transit to the maker industries [85]. Such informal economy transition boosts lots of new makers or creative entrepreneurs who aggregate themselves to be formal entrepreneurs. A future research can exam how these makers or entrepreneurs create their own business or how to leverage resources in the Shenzhen mobile phone ecosystems.

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