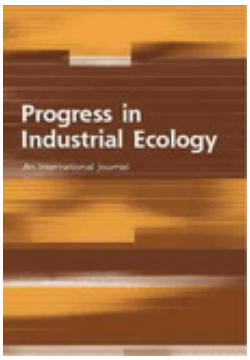

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Exploring the direct and indirect effects of innovation on CSR in pharmaceutical industry in China

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Exploring the direct and indirect effects of innovation on CSR in pharmaceutical industry in China

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Abstract: Previous studies showed increasing evidence that large firms search for radical innovation as a driver of firm growth, particularly in the research and development sector. Proficiency at innovating via new products remains not merely a key priority for many managers but arguably the ultimate dynamic capability within a firm. However, there is limited understanding of how innovation influences CSR in pharmaceutical industry. Following a mixed methods approach, the investigation started with a review of extant literature at the intersection of intellectual property (IP), knowledge management (KM), information technology (IT), open innovation (OI), social capital (SC), innovation capability and CSR. This research adapted a quantitative approach using the structural equation modelling (SEM) statistical technique based on the variance through partial least squares (PLS). The main finding explicit that innovation capability significantly affects CSR directly, while open innovation significantly affects the innovation capability of Chinese pharmaceutical companies.

Keywords: innovation; corporate social responsibility; CSR; pharmaceutical industry; intellectual property; knowledge management; information technology.

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1 Introduction

To a real if limited degree, the present and future health of populations depends on pharmaceutical innovation. In a much more immediate sense, the health of pharmaceutical corporations depends on a flow of new drugs (Horrobin, 2000). The creation of a market for biomedical science and increased vertical competition within the industry are likely to spur innovation and raise productivity, but they also could induce socially wasteful spending and weaken academic science (Cockburn, 2004). Declining innovativeness casts growing doubts about the sustainability of the business model that sustained pharmaceuticals so far (Malerba and Orsenigo, 2015).

Nowadays, corporate social responsibility (CSR) and innovation are the foundation of business competencies. CRS and innovation have emerged slowly over the past decade (Rexhepi et al., 2013). Many Chinese firms hesitate to actively participate in CSR activities as they dread that such practices may not promote firm profitability or performance in the stock market while CSR endeavours can yield sustainable firm performance (Yang et al., 2019). Green CSR as valuable, rare, imperfectly imitable, and

non-substitutable resource can lead to a competitive advantage (Wu et al., 2018). The value of innovation in medicines is clear. Pharmaceutical industry is plagued with long research and development (R&D) cycles and low success rates for innovative treatments; something has to change (Martinez-Grau and Alvim-Gaston, 2019). Investment in and adequate exploitation of biotechnologies holds the future for pharmaceutical productivity, innovation and growth (Fernald et al., 2017). In the set of articles studied about the relationship of CSR and innovation, there were more conceptual than research papers (Ratajczak and Szutowski, 2016). Tough the former researchers tried to figure out the relationship between CSR and the performance of the pharmaceutical industry, they normally concentrated on the sample consists of pharmaceutical companies listed on the Shanghai and Shenzhen stock exchange (Yang et al., 2019). And according to statistical data collected by National Medical Products Administration (NMPA), by now, the pharmaceutical industry in China has formed a huge network of productional and operational pharmaceutical corporations. As of February 2022, the number of pharmaceutical manufacturers in China has reached 8,728, and this number is still growing. In this research, the questionnaire method was used to understand how innovation in Chinese pharmaceutical companies of different sizes affects the performance of CSR in order to fill some research gaps.

This research delves into how knowledge management (KM), intellectual property (IP), information technology (IT), social capital (SC) and open innovation (OI), five values affecting innovation capability (IC) and the performance of CSR in Chinese pharmaceutical industry (Akhavan and Mahdi Hosseini, 2016; Bican et al., 2017; Chu et al., 2019; Michelino et al., 2015; Oktaviani et al., 2020; Ortiz et al., 2018; Toma et al., 2018) and explores the relationship between innovation and CSR. China has stepped up investment in drug innovation in recent years, both in basic research and in industry R&D (Zhang and Zhou, 2017). In recent years society has come to expect more from the 'socially responsible' company and the global pandemic in particular has resulted in some critics saying that the 'Big Pharma' companies have not been living up to their social responsibilities (Leisinger, 2005). As such, the research problem can be state as follows: how does innovation capability affects the performance of CSR in pharmaceutical industry. More specifically, this research aims to explore the direct and indirect impact of innovation capability and its multiple influencing factors on the CSR of Chinese pharmaceutical companies is verified.

To respond to the research problem, this study draws on the stakeholder theory that suggests that organisations should be managed with the interests of all stakeholders in mind, including customers, suppliers, employees, and shareholders, and one the resource dependence theory that suggests that an organisation's success depends upon its ability to acquire and manage resources from external sources. By incorporating these theories into the research model, it is possible to gain a better understanding of how KM, IP, IT, SC, and OI play a role in an organisation's ability to acquire and manage resources. For example, KM can help an organisation to access and share information, while IP can help to protect unique content and processes. IT can help an organisation to store and manage data, while SC can help to create relationships and trust with external stakeholders. Finally, OI can help to create an environment of collaboration and innovation. By taking into account the stakeholder theory and resource dependence theory, the structural equation model can provide insights into how these variables interact and how they influence the overall success of the organisation. This information can then be used to

support strategic decisions (Gusmanov et al., 2020) and create better strategies and practices for KM, IP, IT, SC, and OI.

The questionnaire consists of 7 variables and the measurements of these variables contain 77 items which are adopted by former research (Abbas et al., 2020; Ahn et al., 2013; Akintimehin et al., 2019; Calantone et al., 2002; Huang et al., 2013; Lu and Ramamurthy, 2011; Sweeney, 2009). Subsequently, the SEM model are developed to test the corresponding hypotheses. This research finds that innovation capability has a significant direct impact on CSR, and in addition among the many factors explored, OI has a significant impact on innovation capability in Chinese pharmaceutical companies. Moreover, KM and IT have a direct and significant impact on CSR, while OI has an indirect and significant impact on CSR through the mediating effect of innovation capability.

The rest of the research is organised as follows. Section 2 elaborates the literature review and develops corresponding hypotheses. Section 3 describes the data and methodology. Section 4 reports results of analysis and unfolds discussions. Section 5 concludes the research.

2 Literature review

2.1 Conceptual development

The concept of CSR has been developed for decades (Carroll, 1979), and the definition of CSR is constantly evolving. Carroll (1991) states that the social responsibility of business has four dimensions: legal, economic, ethical and discretionary (philanthropic). And CSR does not merely imply between institutions. The shift in thinking about CSR has turned from interaction between society's institutions inward, toward thinking about CSR in terms of an internal management system (Sheehy, 2015). This means CSR may imply for business organisations. A firm's CSR policy is multi-dimensional and includes numerous aspects, such as environmental, business, and social factors (Lee and Huang, 2020).

According to Damanpour (1996), "Innovation is the generation, development, and adaptation of an idea or behavior, new to the adopting organization". Innovation literature claims that innovation is the most fundamental source for firm's success and survival. There are various definitions of innovation describing it as the generation of creative ideas, acceptance and implementation of such creative new ideas within the organisation into processes, products or services (Ologbo and Nor, 2015). Most academic and industry is widely recognised innovation as pinnacle factor for gaining competitive advantage and sustaining the competitiveness and growth (Rajapathirana and Hui, 2018).

The concept of KM is constantly being expanded with the development of enterprises. KM is the process of continually managing knowledge of all kinds to meet existing and emerging needs, to identify and exploit existing and acquired knowledge assets and to develop new opportunities (Quintas et al., 1997). The objectives of KM are:

1 to make the enterprise act as intelligently as possible to secure its viability and overall success

2 to otherwise realise the best value of its knowledge assets (Wiig, 1997).

From the business perspective: KM is a business activity with two primary aspects: the first one is treating the knowledge component of business activities as an explicit concern of business reflected in strategy, policy, and practice at all levels of the organisation (Gusmanov et al., 2020); and, making a direct connection between an organisation's intellectual assets – both explicit (recorded) and tacit (personal know-how) – and positive business results (Dalkir, 2005). An emphasis on the element view of KM can lead to an approach to CSR that is merely driven by compliance. Since not all kinds of knowledge are amenable to codification to the same degree, there is also a danger that codification encourages a one-size-fits-all approach as well as a box-ticking mentality. Such a development would be as unhelpful for CSR as it has been found for KM projects (Aagaard-Tillery et al., 2008; Carrillo et al., 2004).

IP is a generic term that probably came into regular use during the twentieth century. And a definition of IP that moves beyond lists or examples and attempts to deal with the essential attributes of IP has to focus on two elements: the property element and the object to which the property element relates (Drahos, 1999). The concept of IP has drawn much more attention in the worldwide arena than before, and the protection of IP all over the world is now at a dynamic stage of transformation (Wang, 2004). IP pertains to any original creation of the human intellect such as artistic, literary, technical, or scientific creation. Intellectual property rights (IPR) refer to the legal rights given to the inventor or creator to protect his invention or creation for a certain period of time (Singh, 2008). More than any other technological area, drugs and pharmaceuticals match the description of globalisation and need to have a strong IP system most closely (Saha and Bhattacharya, 2011; Silva et al., 2022).

The capabilities of IT range from the development of better measures of the efficiency and effectiveness of organisational functions, to major changes in the structure of the organisation itself (Bakos and Treacy, 1986). High IT capability tends to outperform a control sample of firms on a variety of profit and cost-based performance measures (Bharadwaj, 2000). IT as an organisational capability and empirically examines the association between IT capability and firm performance (Bharadwaj, 2000). Innovating with IT is at one level an organisational process (Fichman, 2000; Gallivan, 2001). Information systems and ITs are often inextricably linked and, since it has become conventional to do so, Dewett and Jones (2001) refers to them jointly as IT.

Whole notion of SC is centred on social relationships and its major elements include social networks, civic engagement, norms of reciprocity, and generalised trust. Broadly speaking, it is defined as a collective asset in the form of shared norms, values, beliefs, trust, networks, social relations, and institutions that facilitate cooperation and collective action for mutual benefits (Bhandari and Yasunobu, 2009). The importance of SC for the founding, survival, and success of entrepreneurial firms in general, and new biotechnology firms in particular, has been widely acknowledged and demonstrated empirically (Maurer and Ebers, 2006). Prior research suggests resources and SC are crucial alliance formation factors that can influence the amount of financial capital biotech firms acquire when partnering with other firms (Gopalakrishnan et al., 2008).

OI emerged as a concept about in 2003. According to Chesbrough and Bogers (2014), OI is a distributed innovation process that relies on purposively managed knowledge flows across organisational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organisation's business model to guide and motivate knowledge sharing. From Chesbrough's (2017) opinion, OI will extend beyond technology to business models, and it will embrace both product and services innovation. Hughes and Wareham

(2010) suggests OI as an established phenomenon in Pharma, and a rich setting for research, despite limited OI studies in this industry.

2.2 Research on the influencing factors of enterprise innovation capability

Regarding the empirical research on enterprise innovation capability, most of them are related to exploring its influencing factors. According to literature review, the influencing factors of innovation capability are divided into the following two aspects: external environment and internal organisation:

For the external environment, two factors, SC and OI, were selected for analysis. SC (relational, cognitive and structural) as an important precursor to tacit knowledge sharing, which in turn, influences innovation capability of an organisation. The contribution of SC to innovation is achieved by reducing transaction costs between firms and between firms and other actors, notably search and information costs, bargaining and decision costs, and policing and enforcement costs (Maskell, 2000). OI can be defined as distributed innovation processes based on purposively managed knowledge flows across organisational boundaries, using pecuniary and/ or non-pecuniary mechanisms in order to enhance innovation (Wikhamn et al., 2016).

For internal factors, three factors were selected for analysis: IP, KM and IT. Innovation activity may be hindered by different factors. Certain markets or sectors may underestimate innovation due to common-weal philosophy, for this reason, IPRs set the path for organisations to participate as part of the innovation dynamic (Acosta-Prado et al., 2020). The identification of valuable knowledge by using inter-organisational relationships and networks is an essential issue, especially in innovative industries characterised by continuous change (Ortiz et al., 2018). Knowledge sharing is positively associated with diminishing in production costs, faster completion of new product development projects, team performance, firm innovation capabilities, and firm performance. According to Baines et al. (2009), “Servitization is the innovation of an organizations capabilities and processes to better create mutual value through a shift from selling product to selling product-service systems (PSS)”. The use of information and communication technology (ICT) development facilitate new methods and applications (such as groupware, online databases, intranet, virtual communities, etc.), and allow firms to expand available social networks by overcoming geographical boundaries and thus achieving more effective collaborative activities (Pan and Leidner, 2003).

2.3 Research on the relevance of corporate social responsibility and innovation capability

CSR theory (Bowen, 2013) suggests that companies are part of a social network of stakeholders. Companies should not only focus on generating profits for their shareholders, but also on their social responsibility towards their stakeholders. Unlike the traditional theory, which only targets shareholders, the modern theory targets not only shareholders, but also all stakeholders, including government, employees, communities and customers. The diversification of the targets of responsibility makes the implementation of social responsibility by contemporary enterprises more diverse and complex, and requires coordination to ensure that the rights and interests of all stakeholders are safeguarded and their needs are met.

1 innovation is the core driver of economic growth
2 innovation is a revolutionary change
3 innovation determines the rise and fall of economic entities
4 creating new value is the purpose of innovation
5 innovation is the inevitable choice for economic development
6 entrepreneurs are the main body of innovation
7 entrepreneurs' profits are derived from innovation.

The above is Schumpeter's summary of innovation. For example, innovation in organisational structure can enhance the internal management processes of the organisation, and help foster its sustainability and growth in the long-term. By introducing more effective ways of working, a company can stay competitive and increase its chances of success. Based on Schumpeter's innovation theory, it is believed that innovation is an organic combination of various resources, including talent, capital, information, knowledge and entrepreneurship.

And stakeholder theory suggests that the enterprise should not be a shareholder-centred organisation, but is by nature an organisation influenced by a variety of social factors and should therefore take into account the aspirations of multiple parties and protect the interests of other parties in addition to ensuring the rights and interests of shareholders in order to maximise the overall benefits. Edward Freeman and Phillips (2002) give the definition about stakeholders, and they argue that "Stakeholders are considered to be individuals, groups and organizations that are influenced by and in turn influence the development of a company's strategic objectives". According to this definition, the scope of stakeholders has been expanded to include stakeholder groups or organisations external to the business, such as government, the environment and the community. Shareholders are not the only source of capital contribution to the enterprise; employees, consumers, suppliers and creditors can provide a special and rich source of human and capital investment (Pereira et al., 2021).

The core concept of the theory is that the enterprise is a link between stakeholders, and the rights and obligations of multiple groups are regulated in a variety of implicit and explicit contracts, with an uneven distribution of residual claims and residual control between owners of physical and human capital, decentralised symmetrical distribution and effective wealth creation for stakeholders and society.

The basic assumption of resource dependence theory is that an organisation must survive by accessing resources in its environment. According to resource dependence perspective (Pfeffer and Salancik, 1978), there are four important assumptions:

1 the most important issue for an organisation is survival
2 the resources that sustain an organisation's survival cannot be generated from within the organisation
3 if an organisation wants to obtain the resources it needs to survive, it has to establish effective links with the outside world
4 the ability to establish relationships with other organisations is crucial to the organisation's survival.

Based on the resource dependency theory, companies must conduct innovative activities with resource support from outside activities. By actively fulfilling their social responsibilities, enterprises are conducive to safeguarding the corresponding rights and interests of their stakeholders and coordinating the social relations of all parties, thus facilitating the acquisition of rich social networks and resources from them. And the theory has been tested in other studies. For example, Benabou and Tirole (2010) revealed that a firm with superior corporate social responsibility (CSR) performance can end up with lower capital constraints. What's more, only government shareholders positively and significantly relate to a firm's environmental performance because government shareholders will be more likely to request that companies fulfil their social responsibilities (Huang et al., 2013). However, literature has argued that based on the agency cost theory, Brown et al. (2006) stated that top executives may benefit themselves utilising their corporations' inherent resources through philanthropy while shareholders incur a loss by such spending on charity.

From the CSR point of view, interest has focused increasingly on certain corporate actions and processes where companies have no choice but to innovate on several levels, including products (where they have to satisfy the demand for socially responsible products) and processes (where they must pay attention to the implications of social responsibility across the whole supply chain). The presence of innovation, as a main driver of CSR, occurs in the majority of papers and is connected with the last or one of the last stages of CSR, described as the most advanced and most suitable to use in companies (Ratajczak and Szutowski, 2016).

2.4 Research hypothesis

2.4.1 Hypothesis 1 (H_1): in the Chinese pharmaceutical industry, all values influence innovation capability

Competitive advantage in today's advanced economies is driven by innovation and the ability to manage ever-increasing forms of knowledge on a sustained basis. Knowledge intensive industries compete primarily on their capacity to innovate and thrive on cutting-edge knowledge, which drives both research and innovation (Gloet and Samson, 2020). KM improves the conditions for strategic action by way of appreciating and treating problems and challenges by the company (Curren et al., 1992). Organisations in general and particularly small and medium-sized enterprises facing constantly changing environments seek to innovate in order to survive and gain competitive advantages. To do so, they need to manage knowledge required for innovation, that is, the development of new products, production processes, administrative changes and marketing improvements (Dias and Lages, 2021). Moreover, according to Ferry's (Ferry Koster, 2022) opinion, investing in learning capabilities enhances innovation performance. meanwhile, organisations based on general knowledge can grant work autonomy to employees to enhance their ability to learn (Mendes et al., 2022).

The intellectual capital for Innovation capability in advance of motivation should lead to superior performance and the components of intellectual capital are positively related to the innovation capability and organisational performance (Xiaobo and Sivalogathasan, 2013). With support from China's macro- and micro-policies, the hi-tech industry has advanced rapidly. As a vital institutional arrangement and indispensable resource,

intellectual property protection (IPR) can promote knowledge production and technological innovation (Wan et al., 2023).

IT systems can help firms to cope with the complexity and inefficiency in managing innovation when R&D investments scale (Ravichandran et al., 2017). For an organisation to develop the capacity for sustained innovation, as well as incorporating innovation as a meaningful component of strategy, it must make resources available for new products and provide collaborative structures and processes to solve problems creatively and connect innovations with existing businesses. IT is seen as vital to building this capacity. Firm performance is enhanced, therefore, when innovative activity is complemented by IT initiatives that result in the systematic introduction of new processes and products that fit with existing processes, promoting increased customer loyalty, and stimulating demand for other products (Dibrell et al., 2008).

The immersion of a firm in a network participates with the investment in internal R&D in the technological performance of the firm (le Bas et al., 1998). It is now assumed that the acquisition of knowledge by firms does not only depend on the market or the hierarchy, but also on the SC accumulated within regions through networks of interaction and learning (Landry et al., 2002). Additionally, this closed innovation model is reaching its limits. Increasing mobility of knowledge and highly-skilled employees, rapid alternations in consumption and production functions and the shortening of product lifecycles are central factors of why industrial R&D is undergoing a paradigm shift toward practicing OI (Inauen and Schenker-Wicki, 2011). Trough the pass of years, innovation ecosystem has suffered changes regarding protection coming out into a wide promotion of OI (Acosta-Prado et al., 2020). Meanwhile, Lyu et al. (2022) argue that SC can help digital firms implement cross-border knowledge search and develop absorptive capacity. Thus, digital firms can effectively utilise heterogeneous knowledge to enhance their innovation performance.

H1a KM positively influences innovation capability.

H1b IP positively influences innovation capability.

H1c IT positively influences innovation capability.

H1d SC positively influences innovation capability.

H1e OI positively influences innovation capability.

2.4.2 Hypothesis 2 (H_2): in the Chinese pharmaceutical industry, all values directly influence CSR

Where internal CSR knowledge is found to be insufficient, an element view of KM can aid identifying the gaps that are to be filled through external CSR experts (Preuss and Córdoba-Pachon, 2009). KM can therefore contribute to the achievement of CSR. What's more, Liu and He (2022) find that CSR disclosures are positively related to users' knowledge-sharing behaviours, and this relationship is mediated by CSR identification.

The pharmaceutical industry considers the focus on patents in the access to medicines debate to be misleading and counterproductive, and does not consider the current IPR regime to be a serious obstacle, arguing that a strict level of IPR protection is essential to stimulate R&D, even in developing countries. The over-emphasis on IPRs has created an image of a lack of social responsibility on the part of pharmaceutical companies, which

affects their long-term overall development, as Torres (2013) argues that the tension between access to essential medicines and IPRs in developing countries has affected the CSR strategies of multinational companies in the pharmaceutical industry over the past few years.

Paul's research extends and integrates the literature on strategic IT alignment and organisational agility at a time when both alignment and agility are recognised as critical and concurrent organisational goals (Tallon and Pinsonneault, 2011). The spread and popularity of IT has greatly transformed the management model of Chinese pharmaceutical companies. IT has broken the constraints of time and space, facilitating intelligent production and management to improve production efficiency. On the other hand, the precise calculation of IT helps enterprises to reduce material waste, eliminate outdated production capacity more quickly, track waste, effectively protect the environment and improve CSR (Jayakrishna and Raj, 2022). According to Popowska's (2022) finding, open and technological innovation (process and product) have a positive effect on CSR strategies.

As Fieseler and Fleck (2013) discussed, a case in point in the data is the Google CSR blog, which is heavily dependent on only a few actors, which means that conversations in this network are only possible with the goodwill of those actors. Particularly in this case, borrowing SC might be a potential strategy recommendation from a structural point of view. Community SC facilitates positive CSR activities that benefit non-shareholder stakeholders and constrains negative CSR activities that are detrimental to non-shareholder stakeholders (Hoi et al., 2018). Moreover, Green governance performance belongs to CSR specific practical sections, and Yun et al.'s (2020) research shows that the organisational entrepreneurship leading culture for OI dynamics and the mechanism of the impact of the board power hierarchy on green governance performance through the influence of green governance conduct which additionally focuses on green regional innovation policy and the notion of taking advantage of its emergence for complex innovation ecosystems. Andriosopoulos and Tanzila Deepty's (2022) findings show that firm-specific SC, captured by CSR reputation, has a statistically and economically significant mitigating effect on stock return volatility during political uncertainty, but not on cash flow volatility.

H2a In the Chinese pharmaceutical industry, KM directly influences CSR.

H2b In the Chinese pharmaceutical industry, IP directly influences CSR.

H2c In the Chinese pharmaceutical industry, IT directly influences CSR.

H2d In the Chinese pharmaceutical industry, SC directly influences CSR.

H2e In the Chinese pharmaceutical industry, OI directly influences CSR.

2.4.3 Hypothesis 3 (H_3): in the Chinese pharmaceutical industry, all values indirectly influence CSR through the mediating effect of innovation capacity

Integrating HRM with KM in the organisation leads to organisational superior performance, efficiency, effectiveness, productivity and survival in today's competitive advantages which can be named as the ultimate goals of all organisations (Lapiņa et al., 2014). Then, indicators related to the interests and needs of employees as an important

stakeholder group in a company are also used in the evaluation of corporate social responsibility, such as commitment, satisfaction, engagement, knowledge development, etc. When a more comprehensive assessment of the effectiveness of human resource management is carried out, the needs of the stakeholder group are attended to and met. In this context, KM's is aligned with the objectives of CSR through an indirect approach, which provides satisfaction to all stakeholders of the organisation, not just the interests of the owners/investors. According to Nguyen et al. (2022), socially responsible firms, due to their enhanced relationship with stakeholders, could foster innovation performance through the improvement of knowledge acquisition.

According to Andayani et al. (2008), CSR rating and the institutional ownership were positively related to the company's work, revealing that the IP had important role towards the values of the company. At the same time, IP as an important positive contributes to a firm performance (Shahzad et al., 2022). The IP could improve the values of the company and investors considered the variable of IP as an important thing. As Li and Wu (2022) argue that China's technology development has entered a new stage, one of technology-driven cross-border mergers and acquisitions (TC M&A), which has become an important channel for emerging markets to achieve a technological leap. Xu et al. (2022) distinguish between IT-enabled absorptive capacity (IT-AC) and IT-enabled social integration capacity (IT-SIC), which may exert divergent effects on firms' abilities to create competitiveness and they argue that IT-AC and IT-SIC play distinct roles in shaping effective CSR by strengthening a firm's abilities related to absorptive capacities, which subsequently leads to improved CSR value creation.

The high SC of the managers of firms in high SC regions means that the managers of these firms are more likely to be altruistic (Holland, 1976; Jha and Cox, 2015). Because ultimately the views of the top management matter in deciding to what extent the firm should pursue CSR (Graafland and van de Ven, 2006), the firms in high SC regions are likely to engage in more social responsibility. And research shows that firms hire and retain employees that share their values, and employees prefer to work for firms that share their values (Holland, 1976). In summary, the above literature suggests that high SC positively mediates CSR performance. Besides, according to Roszkowska-Sliz (2014), four themes:

1 employee engagement

2 external stakeholder involvement

3 knowledge sharing

4 openness to corporate social responsibility underpin the relationship between the concepts of OI processes (outside-in, inside-out and coupled) and strategic corporate social responsibility (CSR) focused on creating shared value.

H3a Innovation capacity mediates the relationship between KM and CSR.

H3b Innovation capacity mediates the relationship between IP and CSR.

H3c Innovation capacity mediates the relationship between IT and CSR.

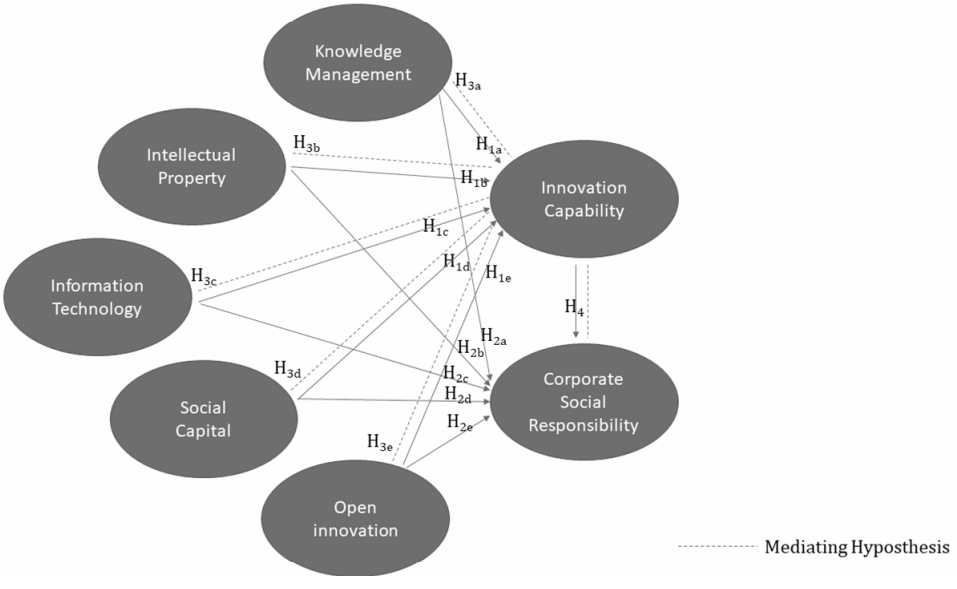
H3d Innovation capacity mediates the relationship between SC and CSR.

H3e Innovation capacity mediates the relationship between OI and CSR.

2.4.4 Hypothesis 4 (H_4): in the Chinese pharmaceutical industry, innovation capability influences CSR

According to Mortreu's research, since CSR implies numerous changes from companies, research has shown that innovation can constitute as a tool to support both the implementation process and achievement of CSR objectives. As a result, companies should carefully consider what kind of innovation is the most important in particular sector and choose these dimensions of CSR that will enhance desirable innovations (Ratajczak and Szutowski, 2016). Additionally, Nows (2022) paper seeks to advance a new theory – large corporations that support entrepreneurial ventures or internal projects do so to make their existing business more environmentally sustainable over time. Besides, Liang et al. (2022) argue that as the primary component of implementing a CSR strategy, employee innovation behaviour affects the quality and efficiency of enterprises' green growth.

Figure 1 Conceptual model



Source: The authors

2.5 Conceptual model

Based on the above theory and hypotheses development, a conceptual model can be proposed as depicted in Figure 1. As can be observed the model comprises the direct and indirect effects of innovation on CSR in pharmaceutical industry as previously elaborated in the literature review.

3 Methodology

This research adapted a quantitative approach. For the analysis and validation of the results, this research used structural equation modelling (SEM) statistical technique based on the variance, through SMART PLS (partial least squares).

3.1 Sample selection

The target population of this research is pharmaceutical companies registered in China. The sample for this research consists of 130 Chinese pharmaceutical companies of different sizes. A list of the sample pharmaceutical companies is provided in Appendix A. For this study, it is important obtaining accurate and reliable data from experienced managers, since they are better equipped with the knowledge and resources to provide a more comprehensive understanding of the current market. To ensure that, it was asked to respondents to reveal their current position in the organisation, being selected the top positions (e.g. CEO, General Director, Operations Directors, or CFO).

3.2 Variables of the study

This study adopted existing scales to measure all variables. By comprehensive analysis of existing literature, the questionnaire consisting of seven independent variables and the measurements of these variables contain 77 items was collated and designed. The acquisition of innovation capability was measured using six items adapted from Calantone et al. (2002). CSR scale was separated into four parts: environment, community, employee and customers, separately containing three-, five-, six- and five-item, which was adapted from Sweeney (2009). Expectations of associations, rewards, contributions and attitude toward KM and KM behaviour were adapted from Abbas et al. (2020) to measure KM. Five items were adopted from Davoudi et al. (2018) measuring IP. IT was separated into IT infrastructure capability, IT business spanning capability, IT business spanning capability and IT proactive stance four dimensions, which dimension was containing four items, adapted from Lu and Ramamurthy (2011). Inbound OI containing four items and outbound OI containing six items were used to measure OI, adapted from Huang et al. (2013). SC was measured by two dimensions: internal and external, separately containing thirteen- and eight-item, adapted from Akintimehin et al. (2019). The questionnaire is provided in Appendix B.

3.3 Data collection

Data is collected from questionnaire results. All the questionnaires were created through the Wenjuanxing website, distributed, and collected through alumnus, corporate e-mails, offline visits, and WeChat groups.

Of the respondents, 66.15% were male, and 33.85% were female. The population of age between 30–49 years old of respondents were 68.46%. And 60.77% corporate operating time were more than eight years. 63.08% of the corporate were non-family operating. 70% of these pharmaceutical companies were R&D and manufacture. 65.38% of the corporate employees were more than 250.

4 Results

4.1 Statistical analysis

SEM was used to test the conceptual model. PLS, a variance-based SEM technique, and software Smart PLS 3 was used. Following a two-stage approach, the reliability and validity of the measurement model were firstly evaluated and then assessed the structural model. To test the reliability of the measures used, we examined the individual indicators of reliability, convergent validity, internal consistency reliability, and discriminant validity. And if the standardised factors were more than 0.6 (with a minimum value of 0.668) and when $p < 0.001$, they were significant, which proving that the individual indicator reliable. Table 1 provides an output of the PLS-SEM software regarding the quality checks of the several constructs used in our model. The values present that the constructs can be considered of good quality since the values of Cronbach alpha and composite reliability (CR) values were above 0.7. Moreover, the convergent validity was valid when the notes of constructs' loadings were positive and significant. Besides, CR value of each item surpassed 0.7, meanwhile the average variance extracted (AVE) should exceed 0.5. Finally, the discriminant validity would be proven as Fornell and Larcker criterion, which were satisfied when the construct's square root of AVE is larger than its biggest correlation with any construct. Then the heterotrait-monotrait ratio (HTMT) criterion should be lower than 0.85. However, the construct's square root of AVE of IC is smaller than the correlation, and HTMT ratios of IC and KM are above 0.85. These values indicated discriminant validity of IC and KM in this model may have multicollinearity.

Table 1 Composite reliability, AVE, correlations, and discriminant validity checks

Latent variables	α	*CR*	*AVE*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
CSR	0.962	0.965	0.595	*0.771*	0.790	0.753	0.814	0.825	0.538	0.611
IC	0.873	0.904	0.612	0.853	*0.782*	0.613	0.720	0.698	0.635	0.541
IP	0.882	0.913	0.679	0.819	0.688	*0.824*	0.688	0.634	0.488	0.593
IT	0.971	0.974	0.757	0.839	0.772	0.738	*0.870*	0.727	0.508	0.541
KM	0.908	0.931	0.731	0.877	0.775	0.708	0.771	*0.855*	0.537	0.630
OI	0.928	0.939	0.606	0.541	0.687	0.524	0.515	0.569	*0.779*	0.708
SC	0.911	0.927	0.615	0.640	0.601	0.659	0.566	0.687	0.752	*0.784*

Notes: CSR – Corporate social responsibility; IC – Innovation capability; IP – Intellectual property; IT – Information technology; KM – Knowledge management; OI – Open innovation; SC – Social capital; α – Cronbach's alpha; CR – Composite reliability; AVE – Average variance extracted. Italics numbers are the square roots of AVE. Below the diagonal elements are the HTMT ratios. Above the diagonal elements are the correlations between the constructs.

Source: The authors based on PLS-SEM outputs

Sign, magnitude, and significance of the structural path coefficient were used to assess the structural model; the magnitude of R^2 value or each endogenous variable as a measure of the model's predictive accuracy; Stone-Geisser's Q^2 values as a measure of the model's predictive relevance. But the VIF values of this model ranges from 2.102–2.857, being lower than 5, which means that there is no collinearity. The

coefficient of the determination R^2 for the two endogenous variables of innovation capability and corporate social responsibility were 65.6% and 81.7%, respectively. These values were above 10%. Moreover, the Q^2 values for all endogenous variables (0.384, 0.474 respectively) were above zero indicating that the predictive relevance of the model. Above all, we believe that variables and the model are of quality.

Table 2 Structural model assessment

Path	*Coefficient*	*Standard deviation*	*T statistics*	*P values*
IC -> CSR	0.308	0.092	3.337	0.001
IP -> IC	0.115	0.124	0.928	0.354
IT -> CSR	0.317	0.062	5.127	0.000
IT -> IC	0.330	0.176	1.880	0.061
KM -> CSR	0.359	0.095	3.773	0.000
KM -> IC	0.277	0.157	1.766	0.078
OI -> CSR	–0.088	0.073	1.215	0.225
OI -> IC	0.356	0.091	3.897	0.000
SC -> CSR	0.109	0.069	1.566	0.118
SC -> IC	–0.133	0.120	1.113	0.266

Source: The authors based on PLS-SEM outputs

Table 3 Bootstrap results for indirect effects

Indirect effect	*Estimate*	*Standard deviation*	*T statistics*	*P values*
SC -> IC -> CSR	–0.041	0.038	1.088	0.277
IP -> IC -> CSR	0.036	0.037	0.953	0.341
OI -> IC -> CSR	0.110	0.046	2.396	0.017
IT -> IC -> CSR	0.102	0.070	1.450	0.148
KM -> IC -> CSR	0.085	0.047	1.817	0.070

Source: The authors based on PLS-SEM outputs

4.2 Quantitative results

The results of the bootstrapping procedure of the PLS-SEM software for the direct relationships are presented in Table 2. The results show that OI significantly influences innovation capability ($\beta = 0.356$, $p < 0.001$) This result provides support for H_{1e}. KM ($\beta = 0.359$, $p < 0.001$) and IT ($\beta = 0.317$, $p < 0.001$) significantly influences corporate social responsibility, which supports H_{2a} and H_{2c}, respectively. Innovation capability significantly influences corporate social responsibility ($\beta = 0.308$, $p < 0.05$), thus, H_4 has support.

To test the mediation hypotheses (H_{3a}–H_{3e}), bootstrapping procedure was used to test the significance of the indirect effects via innovation capability. The results of the PLS-SEM software are described in Table 3. OI indirectly influences corporate social responsibility through innovation capability ($\beta = 0.110$, $p < 0.01$). This result supports H_{3e}.

5 Discussion

The above analytical studies have confirmed that innovation capabilities contribute directly or indirectly to CSR. Mainly, the innovation capability of Chinese pharmaceutical companies can be improved through OI, in addition, KM and IT can directly and significantly influence CSR, and innovation capability plays a positive moderating mediating role in the process of OI promoting CSR, and the above mediating and moderating effects will be discussed separately in this thesis below based on stakeholder theory.

5.1 Result discussion

5.1.1 Analysis of the factors influencing innovation capability based on resource dependence perspective

According to resource dependency theory (Pfeffer and Salancik, 1978), companies carry out innovation activities with the support of external activities. As a knowledge-intensive industry, the pharmaceutical industry needs to accelerate its internal innovation momentum by continuously engaging in OI with the outside organisations in various aspects of technology, product, business model and service innovation (Chesbrough, 2017). After receiving guidance and incentives from OI for knowledge sharing, pharmaceutical companies' innovation capabilities are significantly and positively influenced.

5.1.2 Analysis of the factors influencing CSR based on CSR theory

As the result states that KM directly and significantly influence CSR. Pharmaceutical companies have complex and diversifies channels (Bowen, 2013) to promote corporate social responsibility, during this process, KM identifies gaps that need to be filled by external CSR experts so that corporate social responsibility is achieved in an orderly and efficient manner. On the contrary, the result refutes the opinion of Aagaard-Tillery et al. (2008), that KM has a framework mentality that will encourage a one-size-fits-all approach in codification, which is not conducive to the development of CSR.

The development and application of IT allows shareholders to easily access corporate information, and according to CSR theory (Bowen, 2013) and stakeholder theory (Edward Freeman & Phillips, 2002), customers also play roles as stakeholder, as a result, companies gain the trust of shareholders while attracting new CSR-sensitive investors, ultimately improving Corporate social responsibility. More importantly, in pharmaceutical industry, the convergence of IT and healthcare is another area that would impact the big pharma model over the coming years (Gautam and Pan, 2016).

5.1.3 Analysis of the mediating role of innovation capabilities based on innovation theory

According to the results in Table 3, innovation capability has a significant coefficient with OI ($p < 0.0001$). This result indicates that the innovation capability of the firm can increase when OI increases. However, according to the model, the coefficient between corporate social responsibility and OI is negative, which indicates that the singular OI

that is not transformed into the actual innovation capability of the firm in the Chinese pharmaceutical industry is hard to help pharmaceutical companies to improve corporate social responsibility. The innovation theory considers innovation as a revolutionary change, explaining this phenomenon as purposeful management knowledge flowing across organisational boundaries (Chesbrough and Bogers, 2014) will be transformed into the resources needed for the firm's survival in the form of organisational change or actual technological updates, etc. On this basis, pharmaceutical companies are able to form good partnerships with other social organisations, strengthening the interaction between social institutions for the purpose of corporate social responsibility enhancement (Bowen, 2013).

5.2 Theory development

This paper examines the direct and indirect effects of innovation capabilities on CSR in the Chinese pharmaceutical industry, exploring in depth KM, IP, and IT. The moderating role of SC and OI, as well as the mediating role of innovation capability in it, are explored in depth. The article attempts to explore how companies can improve the science of decision making, integrate external resources, and then actively fulfil CSR while enhancing their innovation capabilities.

This empirical study complements the gaps in previous research, particularly by finding through the model results that OI has a non-significant negative moderating effect on CSR, but a significant positive moderating effect on CSR when mediated by innovation capability.

6 Conclusions

6.1 Originality

In this research, by using quantitative method, we exploit the direct and indirect effects of innovation on CSR in Chinese pharmaceutical industry. Based on former studies, we build up the conceptual model and construct. Based on the above empirical study, this paper mainly draws the following conclusions:

1 The realisation of OI in Chinese pharmaceutical companies is conducive to the improvement of innovation capability and shows a significant positive impact on innovation capability.

2 The application of KM and IT as well as the establishment of IPR, although positively related to innovation capability, do not have a significant moderating effect. In addition, the accumulation of SC shows a negative correlation with innovation capability and its moderating effect is not significant.

3 The direct moderating effect of corporate KM and IT application, which can directly contribute to the improvement of CSR, is significant. While the establishment of IP and the accumulation of SC show positive correlation with CSR, their moderating effects are not significant. OI exhibits a special nature. When OI directly affects CSR, a non-significant negative effect emerges. However, when OI affects CSR

through the mediating effect of innovation capability, it shows a significant positive effect.

4 Innovation capabilities can directly and positively and significantly influence the main contributions of CSR review. In contrast, KM, IP, IT, SC and OI do not influence CSR through the mediating effect of innovation capability.

6.2 Implications of the research

Modelling can be applied to help companies cover several specific aspects. Our model provides a reference for how companies can use their limited resources to maximise their innovation capacity while fulfilling their corporate social responsibility in their corporate strategy. Modelling is essentially a system image, which shows how by whom, and in what direction to take steps to achieve the desired result.

In summary, from the perspective of Chinese pharmaceutical companies, the improvement of CSR relies on the application of IT, KM and the improvement of innovation capabilities. When an OI model is adopted, there is a more obvious CSR performance promotion effect mediated by innovation capability. In contrast, a single OI negatively moderates the contribution to CSR. Firms can adjust the strategy of using limited resources according to this model to achieve the optimal solution between innovation capability and CSR resources.

6.3 Limitations and future perspectives

In this research, 130 Chinese pharmaceutical companies were selected as samples, though, the study is not without limitations, the number of currently registered pharmaceutical manufacturers in China is 8,728 (data source from NMPA), so in the future study, there is still more space that interviews and surveys with larger samples of Chinese pharmaceutical companies need be exploited in a more detailed way. Furthermore, the fact of focusing on Chinese firms may constitute a limitation. Different countries and cultures have different social, cultural, and economic contexts that can significantly affect the way companies approach corporate social responsibility. Additionally, different countries may have different regulations, guidelines, and laws related to corporate social responsibility that would need to be taken into account when conducting the research. As such, future research can expand our results through cross cultural comparison by collecting samples from other countries.

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Appendix A

S/N	Corporate name	S/N	Corporate name
1	Tianfu Pharmaceutical Co., Ltd	66	Shijiazhuang Pharmaceutical Group Co., Ltd
2	Nanding Guangdong Group Co., Ltd	67	Northeast Pharmaceutical Group Co., Ltd
3	Concentrated preparations	68	Xi'an Janssen Pharmaceutical Co., Ltd
4	Taian Dafan Shennong Pharmaceutical Co., Ltd	69	Dyne Marine Biopharma Inc
5	Tai'an Hong'en Tang Pharmaceutical Co., Ltd	70	Shanghai Lei Yunshang Pharmaceutical Co., Ltd
6	Bailing Pharmacy	71	Shenzhen Haiwang Group Co., Ltd
7	Akeso	72	Tianjin Zhongxin Pharmaceutical Group Co., Ltd
8	Guangzhou Jena Pharmaceutical Technology Development Co., Ltd	73	Guangzhou Baiyunshan Pharmaceutical Co., Ltd
9	Chuangxing LLC	74	Shanghai New Pioneer Pharmaceutical Co., Ltd
10	Yongchuntang Pharmaceutical Chain Co., Ltd	75	Beijing Tongrentang Group Co., Ltd
11	New Manze Pharmaceutical Co., Ltd	76	Huiren Group Limited
12	Red Coral Pharmaceuticals Limited	77	Shanghai Fuxing Industrial Co., Ltd
13	Suzhou Kangchun Pharmaceutical Technology Co., Ltd	78	Zhejiang Hisun Group Co., Ltd
14	Yongke Pharmaceutical Limited	79	Lizhu Pharmaceutical Group Co., Ltd
15	Parexel	80	Shandong Lukang Pharmaceutical Group Co., Ltd
16	Tai'an Qianshan Pharmaceutical Co., Ltd	81	HealthYuan Pharmaceutical Group Co., Ltd
17	Taian Ruitai Cellulose Co., Ltd	82	Northeast Pharmaceutical General Factory
18	Taian Hengchang Medical Technology Co., Ltd	83	Jilin Ao Dong Yanbian Pharmaceutical Co., Ltd
19	Shandong Likang Medical Device Technology Co., Ltd	84	Jilin Amendment Pharmaceutical Group
20	Shandong Zhenyi Pharmaceutical Co., Ltd	85	China (Hangzhou) Qingchunbao Group Co., Ltd
21	Baochuntang Pharmacy, Feicheng, Shandong Province	86	Shenzhen Wanji Pharmaceutical Co., Ltd
22	Yanyantang Pharmaceutical Co., Ltd	87	Hengdian Group Kangyu Pharmaceutical Co., Ltd
23	Junshi Biomedical Technology Co., Ltd	88	Lijun Group LLC
24	Lunan Pharmaceutical Group Limited	89	Shandong Huaifang Haiwang Pharmaceutical Co., Ltd
25	Shandong New Times Pharmaceutical Co., Ltd	90	Jinhua Enterprise (Group) Co., Ltd

Appendix A (continued)

S/N	*Corporate name*	*S/N*	*Corporate name*
26	Shandong Wohua Pharmaceutical Technology Co., Ltd	91	Zhuhai Federal Pharmaceutical Co., Ltd
27	Guangdong Red Coral Pharmaceutical Co., Ltd	92	Sichuan Kelun Industrial Group Co., Ltd
28	Shandong Geen Pharmaceutical Technology Co., Ltd	93	Changzhou Pharmaceutical Co., Ltd
29	Guangzhou Speed Road	94	Chia Tai Qingchunbao Pharmaceutical Co., Ltd
30	Shandong Xinhua Pharmaceutical Co., Ltd	95	Shaanxi Dongsheng Group Co., Ltd
31	Shandong Taibang Biological Products Co., Ltd	96	Tasly Pharmaceuticals Inc
32	Shandong Luoxin Pharmaceutical Group Co., Ltd	97	Sino-American Shanghai Squibb Pharmaceutical Co., Ltd
33	Shandong Lukang Dongyue Pharmaceutical Co., Ltd	98	Jiangsu Hengrui Pharmaceutical Co., Ltd
34	Shandong Tianrui Pharmaceutical Co., Ltd	99	Fujian Tongchun Pharmaceutical Co., Ltd
35	Salubris	100	Shandong Phoenix Pharmaceutical Co., Ltd
36	Jining Hengxin Pharmaceutical Technology Co., Ltd	101	Donggang Industry and Trade Group Limited
37	Jiangsu Simcere Pharmaceutical Co., Ltd	102	Hunan Jiuzhitang Co., Ltd
38	Guangzhou Baiyunshan Guanghua Pharmaceutical Co., Ltd	103	Shanghai Roche Pharmaceutical Co., Ltd
39	Fujian Pacific Pharmaceutical Co., Ltd	104	Shijiazhuang Shenwei Pharmaceutical Co., Ltd
40	Yantai Rongchang Pharmaceutical Co., Ltd	105	China Resources Hubei Pharmaceutical Co., Ltd
41	Tai'an Jianlian Pharmaceutical Co., Ltd	106	AstraZeneca Pharmaceuticals Limited
42	Yantai North Pharmaceutical Co., Ltd	107	Zhejiang Xinhecheng Co., Ltd
43	Taian Rencheng Pharmaceutical Co., Ltd	108	Jiangzhong Pharmaceutical Co., Ltd
44	Nanjing Shunxin Pharmaceutical Co., Ltd	109	East Medicine Group Supply and Marketing Company
45	Jiangxi Nanchang Songhai Pharmaceutical Co., Ltd	110	Shandong Kangmei Pharmaceutical Co., Ltd
46	Jiangxi Deshang Pharmaceutical Co., Ltd	111	Guanling Pharmaceutical Limited
47	Hangzhou Tianmushan Pharmaceutical Co., Ltd	112	Kunming Pharmaceutical Group Co., Ltd
48	Jiangsu Deyuan Pharmaceutical Co., Ltd	113	Jining Huaneng Pharmaceutical Factory Co., Ltd
49	Tesson International Medical Technology Co., Ltd	114	Guilin Sanjin Group Co., Ltd

Appendix A (continued)

S/N	Corporate name	S/N	Corporate name
50	Shanghai Pharmaceutical (Group) Co., Ltd	115	Shandong Lianzhong Pharmaceutical Chain Co., Ltd
51	China National Pharmaceutical Group Corporation	116	Huarui Pharmaceutical Co., Ltd
52	Guangzhou Pharmaceutical Group Co., Ltd	117	Guangdong Yili Pharmaceutical Co., Ltd
53	Tianjin Pharmaceutical Group Co., Ltd	118	Jiangsu Chia Tai Tianqing Pharmaceutical Co., Ltd
54	Harbin Pharmaceutical Group Limited	119	Beijing Zizhu Pharmaceutical Co., Ltd
55	Jiangsu Yangtze River Pharmaceutical Group Company	120	Chuangmei Pharmaceutical Co., Ltd
56	Tai Chi Group Limited	121	Jiangsu Lingfeng Pharmaceutical Co., Ltd
57	Chenxin Pharmaceutical Co., Ltd	122	Jiangsu Yunyang Group Pharmaceutical Co., Ltd
58	Shandong Kong Shengtang Pharmaceutical Co., Ltd	123	Jiangxi Dadi Medicine and Health Products Co., Ltd
59	Pfizer Pharmaceutical Co., Ltd. Shandong Branch	124	Jiangxi Jiren Pharmaceutical Co., Ltd
60	Nanjing Pharmaceutical Co., Ltd	125	Jiangxi Huiren Pharmaceutical Co., Ltd
61	Shandong Murdeson Biopharmaceutical Co., Ltd	126	Changzhou Siyao Pharmaceutical Co., Ltd
62	Guizhou Yibai Pharmaceutical Co., Ltd	127	Jianmin Pharmaceutical Group Co., Ltd
63	Chongqing Pharmaceutical Co., Ltd	128	Bailing Enterprise Group Pharmaceutical Co., Ltd
64	Tianjin Pharmaceutical Group Co., Ltd	129	Shi Huida Pharmaceutical Group (Jilin) Co., Ltd
65	Hangzhou Huadong Pharmaceutical Group Co., Ltd	130	Haiwang Changjian Pharmaceutical Co., Ltd

Appendix B

Research questionnaire

Part one

Instruction: Please tick [√] and fill in as appropriate.	
1	Name: _____ _____
2	Name of your firm: _____ _____
3	Gender: (a) Male [ ] (b) Female [ ]
4	Job title: _____
5	Age: (a) Below 21 years [ ] (b) 21–29 years [ ] (c) 30–49 year [ ] 50 years and above [ ]
6	Duration of firm existence: (a) 1–2years [ ] (b) 3–4years [ ] (c) 5–6years [ ] (d) 7–8 years [ ] (e) above 8years [ ]
7	Firm ownership structure: (a) Sole-proprietorship [ ] (b) partnership [ ] (c) other [ ]
8	Firm ownership type: (a) family owned [ ] (b) non-family owned [ ]
9	Industry of operation: (a) manufacturing [ ] (b) textile [ ] (c) service [ ] (d) others (please specify) _____
10	Form of business engagement: (a) full-time engagement [ ] (b) part-time engagement (as a side hustle) [ ]
11	Firm size: (a) 1–9 employees/apprentices [ ] (b) 10–49 employees/apprentices [ ] (c) 50–249 employees/apprentices [ ] (d) above 250 employees/apprentices [ ]
12	Contact information: _____

Part two

Instruction: Please tick [√] as it tallies with your answer.

where

SA = Strongly Agree; A = Agree; U = Undecided; D = Disagree; SD = Strongly Disagree

Innovation capability	*SA*	*A*	*U*	*D*	*SD*
Our company frequently tries out new ideas.					
Our company seeks out new ways to do things.					
Our company is creative in its methods of operation.					
Our company is often the first to market with new products and services.					
Innovation in our company is perceived as too risky and is resisted.					
Our new product introduction has increased over the last 5 years.					
MW = much worse; SW = slightly worse; AS = about the same; SB = slightly better; MB = much better					

Corporate social responsibility	*MW*	*SW*	*AS*	*SB*	*MB*
To what extent is your firm involved in the following? Waste Reduction Recycling Energy conservation Reduction in water consumption Reduction of air pollution Reduction in packaging Sustainable transport.					
To what extent does your organisation consider environmental impact when developing new products (such as energy usage, recyclability, pollution)?					
To what extent does your organisation use environmentally friendly (i.e. biodegradable/recyclable) packaging/ containers)?					
To what extent does your firm donate to charity?					
To what extent are staff members involved in charity volunteer work on behalf of the firm?					
To what extent is your company actively involved in a project(s) with the local community?					
To what extent does your company have purchasing policies that favour the local communities in which it operates?					
To what extent does your company have recruitment policies that favour the local communities in which it operates?					
How does the wage rate of your firm relate to the average wage rate of the sector in which your firm operates?					
To what extent does your organisation encourage employees to develop real skills and long-term careers (via Performance Appraisal and Training & Development)?					
To what extent does your organisation ensure adequate steps are taken against all forms of discrimination?					
To what extent does your organisation consult employees on important issues?					
To what extent is your organisation committed to the health and safety of employees?					
To what extent does your firm ensure a work/life balance among employees?					
To what extent does your firm supply clear and accurate information and labelling about products and services, including after sales service?					
To what extent does your company resolve customer complaints in a timely manner?					
To what extent are quality assurance criteria adhered to in production?					
To what extent is your organisation committed to providing value to customers?					
To what extent has the issue of accessibility (disabled customers for example) been considered in the company?					

Knowledge management	*MW*	*SW*	*AS*	*SB*	*MB*
Individuals, after taking part in KM processes, expect better ties and relations with their colleagues and peers.					
Individuals in return of efforts put by them for the success of KM expects to be rewarded by the organisation.					
Individuals believe that after their efforts for the success of KM, the performance of the organisation will improve.					
The pleasing feelings and sentiments individuals' show while managing knowledge in organisations.					
Level of participation in KM by someone.					
Intellectual property	*SA*	*A*	*U*	*D*	*SD*
Firm wants to keep everything for themselves.					
Minimal IP given away under strict conditions.					
Trust-based legal & IP attitude.					
Legal & IP departments of firm encouraged to take long-term view.					
Does your firm demonstrate an open attitude?					
Information technology	*MW*	*SW*	*AS*	*SB*	*MB*
Data management services & architectures (e.g., databases, data warehousing, data availability, storage, accessibility, sharing)					
Network communication services (e.g., connectivity, reliability, availability)					
Application portfolio & services (e.g., ERP, ASP, reusable software modules/components, emerging technologies, et)					
IT facilities' operations/services (e.g., servers, large-scale processors, performance)					
Developing a clear vision regarding how IT contributes to business value.					
Integrating business strategic planning and IT planning.					
Enabling functional area and general management's ability to understand value of IT investments.					
Establishing an effective and flexible IT planning process and developing a robust IT plan.					
We constantly keep current with new information technology innovations.					
We are capable of and continue to experiment with new IT as necessary.					
We have a climate that is supportive of trying out new ways of using IT.					
We constantly seek new ways to enhance the effectiveness of IT use.					

Internal social capital	*SA*	*A*	*U*	*D*	*SD*
Family members offer financial support for the firm when needed					
Friends/colleagues offer soft loans for the firm when needed					
Family members offer strategic business advice					
We get referrals through family members					
We get referrals through friends/colleagues					
Friends/colleagues patronise our business as much as possible					
Family members patronise our business as much as possible					
Family members promote our business activities as much as possible					
Friends/colleagues engage in mental collaborations with us concerning the business					
For partnership business and firms with employees/apprentices					
Business partners share a similar ambition for the firm					
Employees/apprentices trust the product/service offerings of the business					
The firm's vision, mission, and values are understood and driven by all business associates involved					
External social capital	*SA*	*A*	*U*	*D*	*SD*
We have a fantastic relationship with our customers					
We have a fantastic relationship with our suppliers					
We enjoy referrals through our existing customers					
Our customers trust our product/service offerings					
Customers offer us the vital market information and strategic business advice					
We enjoy special discounts from our suppliers					
Our customers suggest to us how we can better satisfy them					
We get easy access to market information from our suppliers					
Open innovation	*SA*	*A*	*U*	*D*	*SD*
Part of our services and sale of products are contributed from licensed technology of external profit organisations (including suppliers, customers, competitors, and consultants)					
Part of our services and sale of products are contributed from licensed technology of external non-profit organisations (including universities or higher education organisations, governmental research organisations or research institutions).					
Our company encourages innovative activities and will utilise external knowledge and information.					
Our company will cooperate externally to create new innovative processes or develop new products.					
Part of our company profits are contributed from external licensed technology.					

Open innovation	*SA*	*A*	*U*	*D*	*SD*
Generally, our company will try to commercialise (license, sell) all of our technology.					
The sale or license of our company technology is limited to relatively mature technology.					
The sale or license of our company technology is limited to our non-core technology.					
Our company will promote innovative ideas or internal technology that cannot be self-developed to market through cooperating with other companies.					
Our company will provide some of our R&D projects to external firms to invest and develop.					