How Does Open Business Model Transform Elements of Innovation Culture into Open Innovation Practices of High and Low Internationalisation Firms?

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Abstract

This paper fills in the gap in innovation–internationalisation research based on differences between low and high internationalised firms. It examines how open innovation model serves as a mediator, transforming innovation culture into inbound, coupled and outbound open innovation. A cross-sectional research was used, and data were collected in 2014 on a sample of 82 telecommunication sector, obtaining a response rate of 26% of total telecommunication firms in the Republic of Croatia. The study differentiates between four elements of innovation culture: preparatory teamwork, knowledge sharing, intellectual property rights and established teamwork through formal communication processes. Results confirmed significance of (1) all innovation culture elements on open innovation model, especially in low internationalised firms, and (2) open innovation on inbound and coupled open innovation. Furthermore, open innovation model mediates the relationship between (a) preparatory teamwork and IPR on one side and inbound open innovation on the other side and (b) both preparatory and established teamwork on one side and coupled open innovation on the other side. In terms of different internationalisation levels, the study confirms the importance of (3) intellectual property rights for all open innovation types of highly internationalised firms and only for coupled open innovation of low internationalised firms and (4) established teamwork of both coupled innovation of low and high internationalised firms.

Keywords Innovation culture · Open innovation · Internationalisation · Transitional economy · Business model

JEL Classification O36 · O32 · L24 · L25 · F23

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Introduction

A positive and significant link between innovation and internationalisation had been examined in the literature (Pla-Barber & Alegre, 2007; Lecerf & Omrani, 2020). Firstly, technology-based models of international trade such as Posner’s technology gap theory of trade (Posner, 1961) and Vernon’s product life cycle approach to trade (Vernon, 1966), when applied at the firm level, suggest that innovation confers market power and, as a consequence, facilitates a better export performance (Roper & Love, 2002). Firms internationalise when pressured to find a way to survive at low levels of resource slack, whereby especially for highly innovative firms, this pattern affects changes (Kiss et al., 2018). Nonetheless, the European Union’s innovation systems are fragmented and lay their foundation on public research and development which directs firms to enter global value chains with innovative products or services (Radosevic & Ciampi Stancova, 2018). In this setting, firms from small open economies are pressured to innovate and expand to non-localised geographical areas. Similar setting is provided by small open economy’s firms, such as those firms from the Republic of Croatia, which foster growth of their innovative services and products. Telecommunications industry is characterised by innovativeness and is especially being pressured to innovate under current circumstances and firm endeavours (e.g. such as of COVID-19 era), where an increase demand for telecommunications products and services pressured firms to increase their offerings.

This paper provides an in-depth analysis of firms’ differences in open innovation culture with respect to internationalisation level of telecommunications firms. It attempts to answer practical questions regarding usage of a business model as an instrument of transformation of innovation culture into open innovation practices. This study aims to answer the research question: how does open business model transform elements of innovation culture into open innovation practices of high and low internationalisation firms? Moreover, it adds to the theoretical discussion on limitations of using both business model and innovation culture in two different internationalised business environments. Hence, the significance of the paper is twofold. It provides an in-depth analysis of firms’ differences in open innovation culture, thereby answering practical questions regarding usage of a business model as an instrument of transformation of innovation culture into open innovation practices. Secondly, the study adds to the theoretical discussion on limitations of using both business model and innovation culture in different business environments.

The remaining part of the paper is organised as follows. The literature review depicts evolutionary theory as a key theory determining the innovation–internationalisation process and provides a rationale and theoretical background for tested hypotheses. The Methodology section is followed by the Results and Discussion section and Conclusion of the paper, which provides practical and policy implications of the study.

Literature Review

Evolutionary theory examines innovation and includes various aspects of a firm entry, performance, growth and exit from the market (Ettlie, 2006, p. 74). It emerged because the neoclassical economic theory lacked clarification of the concepts of
uncertainty, information asymmetry, bounded rationality, opportunism and asset specificity (Rumelt et al., 1991). Since these concepts are tightly bound to the challenges of open innovation, the key concepts of evolutionary theory are firstly explained.

Evolutionary theory originates from Schumpeter’s (1934) theory of technological change. As change is Darwinian in nature, incremental innovations, imitation and progressive adoptions gradually lead to institutional changes allowing evolution to occur slowly and endogenously through alteration of tacit knowledge, routines and competitive dynamics (please see the studies of Polanyi (1967); Nelson and Winter (1982), p. 402; Teece (1987); Ettlie (2006), p. 71; Teles (2009); Brousseau et al. (2011); Brousseau and Raynaud (2011). There are two aspects of evolutionary theory: the developmental evolution and the socioeconomic evolution (Rumelt et al., 1991). As the socioeconomic evolutionary theory is holistic (Rumelt et al., 1991), it regards a firm as “a set of capabilities, procedures and decision rules that perform under a set of external conditions” (Ettlie, 2006, p. 70) that are in the locus of production and regarded as “an open system that survives through some form of exchange with the environment” (Nelson & Winter, 1982, p. 113). Organisational routine is one of its key concepts and is defined as a “set of ways of doing things and ways of determining what to do” (Nelson & Winter, 1982, p. 399). Routines range from capabilities (techniques that firms use) and choices (behaviours that can be optimised). Although flexibility of routinised behaviour is limited, routines change with the changing environments. The concept of routines enables our understanding of the readiness of a firm for open innovation, i.e. organisational open innovation model, as well as the main internal determinants for its enhancement or deprivation. Innovation occurs through a change in routines, i.e. its anomalies and their re-combinations (Nelson & Winter, 1982, p. 128–129). Routine re-combinations are unpredictable and uncertain and can result in organisational activity directed at innovation (or problem-solving) and the innovative activities themselves (Nelson & Winter, 1982, p. 132–134).

Knowledge inherent in communication channels and various networking strategies minimises the uncertainty through learning, adapting and using external information to develop internal processes (Cohendet & Llerena, 1998; Teles, 2009). Consequently, a new value is created either through R&D or by imitating best practices, investing, entering new markets or adapting to new labour market conditions (Ettlie, 2006, p. 70), assuming the positive managerial effects inciting knowledge sharing visions (Anand & Dalmasso, 2020). Moreover, client cooperation enhances firms’ cost strategies, while personalisation and knowledge sharing decrease firms’ cost strategies (Braga et al., 2018). With respect to the global environment, internationally competitive innovations replace a design currently preferred by users (Beise, 2004, p. 997), making ways for new organisational routines in the preferred selection environments. Therefore, evolutionary theory helps in understanding the role of the readiness of the business model for open innovation given in which the role of an organisational open innovation culture is important to comprehend the way organisations function, i.e. their organisational routines and organisational innovation culture.
Behavioural dimension of organisational culture involves managing the individuals, firms and relationships on one side and activities and resources on the other side (Deligonul et al., 2013). The purpose of the behavioural dimension is a transformation of social capital into a competitive advantage provided firms have resources necessary for successful innovative and international performance. Both behavioural and constitutive aspects of organisation’s innovation culture should be used to facilitate growth of innovative businesses. In line with Deligonul et al. (2013), this paper is inclined towards fostering greater innovation that is fostered by advantages of satisfactory collaborative innovation culture (Schulze-Krogh & Calignano, 2020). Hence, the conceptual model is presented in Fig. 1.

Literature review and the constructed conceptual model formed the ground for the following research question: how does open business model transform elements of innovation culture into open innovation practices of high and low internationalisation firms?

Hypotheses Development

Open Business Models

Due to rapid technological developments, turbulent environment and uncertainty, business model’s role in firm’s value creation is important for a firm’s competitive advantage (Amit & Zott, 2001; Chesbrough, 2007a, 2007b; Huang et al., 2013; Kilintzis et al., 2020). Business model is “a narrative and calculative tool” that allows decoding, understanding and effectively communicating a strategy, thereby enabling the exploration of a market and the construction of the innovation networks within and across organisations to occur (Doganova & Eyquem-Renault, 2009). If firms want to benefit from their existing business models, they require a system-level, holistic approach towards the business model innovation.

Open business model is an important aspect of organisational innovation due to its ability to increase organisational flexibility, decrease inertia and overcome commoditisation challenges (Chesbrough, 2010, Zott et al., 2010; Lakhani & Tushman, 2012, p. 33; Carayannis et al., 2014). Open business models allow collaboration of the partnering organisations in the co-creation of innovation (Chesbrough, 2007b;
Gambardella & McGahan, 2010). Furthermore, the emergence of collaborative communities or the development of complementary goods or services enables business models to become sources of innovation themselves (Chesbrough, 2003, 2010; Terziiovski, 2010; Zott et al., 2010, p. 18; Giesen et al., 2007; Zott et al., 2010).

Competing solely in technology is becoming increasingly difficult, and firms’ business model value comes from commercialisation of innovative ideas and the cooperation with external sources (Zott et al., 2010, p. 18). In order to be successful, a “business model needs to identify: (1) the value proposition, (2) the market segment, (2) the value chain structure, (3) the revenue generating mechanisms, (4) the position of a firm within the value network, and (5) formulate the competitive strategy” (Chesbrough, 2003, 2011). Moreover, a business model can be a source of innovation itself (Chesbrough, 2003, 2007a, 2007b, 2010).

Innovation Culture

Traditional, internal organisation-centred models of innovation and open innovation models imply different organisational boundaries and organisational designs (Lakhani & Tushman, 2012). Differences in designs imply there is a need for coordination of open innovation activities within a firm (Mortara & Minshall, 2011) in which decentralised learning is enabled through teamwork effort, while the centralised learning allows time for innovation but can also inhibit it (Burgess, 2013; Hossain & Zahidul Islam, 2015). Innovation processes should be flexible, allowing a firm to decompose its innovation tasks and access the necessary knowledge in a timely manner that does not affect the way an organisation functions (Della Peruta et al., 2018; Lakhani & Tushman, 2012). Self-organising innovation communities in which firms gain necessary knowledge and innovation foster collaboration, process decomposition and knowledge dispersion (Chesbrough, 2010; Von Hippel, 2005). In this way open innovation complements traditional innovations.

Intellectual property rights facilitate research collaboration (Carayannis, 1999) in product or service developments of various technical complexities (Foray, 2004). Patents are examples of technically specific, industrial intellectual property rights that protect ideas and incorporate a degree of novelty, and copyrights are examples of non-technically specific intellectual property rights which protect the explanation of an idea (Foray, 2004, p. 131 and 140). The main purpose of the intellectual property rights is to attract investors, enhance allocation of resources, reduce risk of duplication and facilitate trade in information (Foray, 2004, p. 103). Thereby, their value for open innovation is displayed in positive knowledge externalities (West et al., 2014). If intellectual property is easily replicated, they are inefficient inhibitors of the firm’s proprietary knowledge (Teece, 1986; Todorova & Durisin, 2007, p. 781). Hence, firms’ R&D networks often have centres in domestic markets in order to protect innovation within the familiar environments (Di Minin & Bianchi, 2011). On the other hand, the deterministic nature and secrecy of intellectual property rights may disable new opportunities arising from collaborations with differing stakeholders (Belderbos et al., 2014; Wolpert, 2002). Von Hippel (2005, p. 10) states that innovators sometimes freely reveal innovations because of the positive reputation and network effects of innovation diffusion that originates with it.
Namely, a trade secret might not be a successful long-term strategy because many other innovators possess similar knowledge that can further improve the existing innovation process. Innovation diffusion causes network externalities to increase the benefits of innovation within different national and organisational contexts (Beise, 2004). Torkelli et al., (2009, p. 187–188) indicate that in the presence of network externalities (and before the emergence of a standard), the effect of complementary assets and absorptive capacity is muted, and the propensity to use external knowledge increases. As explained by the network theory, this happens due to the coexistence of personal and professional relationships which shape the dynamics of innovation diffusion and enable adjustments to the changing market conditions and new strategic opportunities (Ceci & Iubatti, 2012).

Network externalities (Stoneman, 2007, p. 381) (1) propagate the number of innovation users, (2) reduce the uncertainty of the future dominant technology application, (3) provide complementary inputs to innovation processes and (4) reinforce alternative diffusion drivers and might beneficially in the process of standard creation. They aid in innovation diffusion and facilitate open innovation and act as motivating factors for firms wishing to join the innovation landscape. Torkelli et al., (2009, p. 189) state that game theoretic issues pertain to the reciprocity of information sharing. If a potential user of a focal firm’s knowledge expects to profit from applying that knowledge, a focal firm may hesitate to actually provide the knowledge, i.e. unless it will lose out on its future value. The choice of governance mechanisms (e.g. joint venture, merger) aligns the interests of both firms that benefit from the innovation. Hence, business model’s role in the open innovation culture is examined with the following hypothesis:

Hypothesis 1 Innovation culture determinants positively affect open innovation.

Pursuant to a firm’s market orientation which is an important contributor to the innovation performance (Božić & Radas, 2005; Jaworski & Kohli, 1993; Narver & Salter, 1990; Sisodiya, 2012), the asymmetry of information occurs between users and manufacturers (Von Hippel, 2005) or between competitors. It is a result of sticky information and high costs of innovation development (Von Hippel, 2005) that ultimately result in impeded efficiency (Foray, 2004, p. 42). Hence, various internal factors incite or hinder the asymmetry of information and the coordination of innovation within a business model. They affect open innovation activities. Some of them include an organisation’s complementary assets, innovation absorption capacity, motivation and learning effects and the level of task decomposition within firms (Torkelli et al., 2009).

Complementary assets are “distinctive resources of alliance partners that collectively generate greater rents than the sum of those obtained from the individual endowments of each partner” (Dyer & Singh, 1998, p. 666–667). The existence of complementary assets is an important aspect of open innovation because internal R&D and external openness mutually complement each other by allowing easier assimilation and development of ideas and higher market value of innovations (Teece, 1986; Chesbrough, 2003; Dahlander & Gann, 2010). With respect to collaborations in the international environment, they generate more valuable, rare and difficult to imitate assets
than single firm assets (Dyer & Singh, 1998). Torkelli et al. (2009, p. 182–183) differentiate between: (1) complementary proprietary knowledge combined with external knowledge to form an innovation and (2) complementary assets such as brand names, distribution or service networks or manufacturing capabilities. Firms that generate mutually complementary assets should have compatible decision processes, information and control systems, strategies, capabilities and cultures (Doz, 1996; Wolpert, 2002) to allow advantageous innovation diffusion to occur (Beise, 2004, p. 1002; Wu et al., 2013). However, problems of finding potential partners and the access to the accurate and timely information can delay the process and result in the recombination of complementary assets (Dyer & Singh, 1998). Thus, complementary assets provide a great source of competitive advantage which can be diminished in cases of information asymmetry. Firms need to analyse and be aware of their strengths and weaknesses to readily absorb and develop the complementary assets of their innovation partners. The challenges associated with innovation absorption are therefore provided in the following section. Herein, open business model is viewed as organisational tool to foster open innovation culture’s determinants’ effect on open innovation, and the following hypothesis is proposed.

Networking provides an interactive platform for the knowledge generation, collaboration and transfer, enhances the availability of external knowledge and establishes a firm’s cooperative pattern necessary for obtaining complementary know-how (Huang & Rice, 2009). It lowers firm’s R&D costs (Pyka, 2007) and enhances firms’ trust, reputation, reciprocity and interdependence (Larson, 1992). Informal know-how trading is an important aspect of game theory associated with open innovation (Von Hippel, 1988; Pyka, 2007, p. 365). Actors (firms) in the network could be better off if an appropriate coordination and patterns of industrial R&D (Pyka, 2007) allow firms to obtain valuable unique expertise (Chesbrough, 2010; Huang & Rice, 2009; Keupp & Gassmann, 2009).

If firms’ absorptive capacity rests on a firm’s ability to acquire, assimilate, transform and exploit information and innovation found in the environment, it requires a flexible business model (Zahra & George, 2002; Dahlander & Gann, 2010; Spithoven et al., 2011). When a firm possesses an absorptive capacity, external research and innovation complement the in-house research (Hagedoorn & Wang, 2012). Firms’ investments into internal R&D increase firms’ absorption potential (Cohen & Levinthal, 1990; Huang & Rice, 2009), thereby enabling the technology acquisition to reinforce the relationship between technology exploitation and firm performance (Hung & Chou, 2013). The absorptive capacity and innovation are path-dependent (Cohen & Levinthal, 1990). They evolve through networking (Huang & Rice, 2009, p. 216). Namely, the absorptive capacity develops cumulatively, based on the level of prior skills and knowledge and its relatedness to a firm’s current knowledge. On the other hand, Diez-Vial and Fernandez-Olmos’s (2012) study illustrated that the amount of internal knowledge does not necessarily influence the absorption of external knowledge. Hence, the creation of absorptive capacity might not occur (Cohen & Levinthal, 1998) if it is locked into an embedded knowledge base, rigid capabilities and a path-dependent managerial cognitions (Sedoglavich et al., 2014). Therefore, an organisations’ institutional elements such as trust, internal competition, complementary resources, technological uncertainty,
consumer competition, future uncertainty (Khoja & Maranville, 2010) and human capital (Vinding, 2006) influence absorptive capacity development. However, absorptive capacity also depends on the organisation’s external environment and on the transfers of knowledge across and within subunits (Todorova & Durisin, 2007):

**Hypothesis 2** Firm’s open innovation model mediates the relationship between innovation culture’s determinants and open innovation.

**Internationalisation–Innovation Link**

Theoretical foundation of internationalisation is found in firms’ innovative behaviour which states that firms gradually build capabilities to disrupt and extract profits from international markets. Internationalisation is explained through the knowledge-based theory, the resource-based theory (Buckley & Casson, 1976, 2009; Kogut & Zander, 1992, 1993; Rugman et al., 2011), the internalisation theory’s transaction cost economics (Bartlett & Ghoshal, 1989; Rugman & Verbeke, 1992) and the Upsala and the innovation models (Anderson, 1993; Johanson & Vahlne, 1990; Cassiman & Golovko, 2011). As firms face a variety of challenges that impede their internationalisation processes, costs of R&D and market research, specific and specialised intangible managerial knowledge (Narula, 2002, p. 801), the liability of foreignness and newness and the political and operational risks (Lu & Beamish, 2001) increase the costs of the final product. On the other hand, product over-standardisation raises concerns about the appropriate level of integration into international markets (Reuber & Fischer, 2011; Zahra et al., 2000).

The aspects of freely revealing or sourcing innovation are opposed to the acquisition or sale of innovations, thereby posing challenges with respect to the costs of the product or service development. This is especially meaningful in the international environment in which foreign sourcing can result in superior innovation performance (Kafouros & Forsans, 2013) although it might come with the increase in the cost of international innovation search. Alternatively, free revelation or sourcing of innovation might decrease the size of profits for the developing firm.

International strategy that is backed by intangible assets eases the international integration process (Autio et al., 2011). Having a well-thought out international strategy enables minimisation of challenges by overcoming inertia and establishing the routines of foreign collaboration (Narula, 2002) that could be present in organisations and overcome by open innovation business models. In this paper, an attempt is made to examine differences in open innovation practices resulting from different open business models of low internalised and high internalised firms:

**Hypothesis 3** The effect of innovation culture’s determinants on open innovation varies between firms with low and high internationalised firms.
Methodology and Research Setting

Research Setting

The empirical research is based on the firms from the Croatian telecommunications industry. Croatian telecommunications industry recorded a growth in revenue and exports before the 2008 recession occurred. Although exports show better responsiveness to changing market conditions compared to operating revenue (particularly exports of telecommunication services), total operating revenue, exports and value of intangible assets after 2008 recession depict the lack of recovery in line with domestic market trends (Orbis, 2013). If the yearly change in the value of intangible assets (the value of patents, licences, goodwill and other) is compared with the yearly change in the value of operating revenue and exports, slower change is evident in the value of intangible assets and a strong correlation between percentage change in exports with the value of intangible assets (Fig. 2) (Orbis, 2013). This is interpreted as the sensitivity of the telecommunications industry in terms of the institutional environment.

Methodology

This study used a sample of telecommunication firms, both manufacturing and services, under NACE classification 26.3, 26.4 and 61 available through Orbis (2013) database. Structured questionnaire survey was sent to senior project team leaders including marketing, operational and technical executive officers, who have the knowledge on firm’s innovation and internationalisation. Eighty-two valid responses

Fig. 2 Operating profits, exports and intangible fixed assets of the telecommunication firms (Source: Orbis (2013) Database [online]. Available at: orbis.bvdinfo.com (1 November 2013))
| Variable              | Explanation                                                                 | Literature                                                                 |
|----------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Open innovation      | **Open innovation model**, how firms adapt their business model for development of new products and services | Huang et al. (2013), Johnson et al. (2008), Moore (2004), Parida et al. (2013), Sisodiya et al. (2013), Hung and Chou (2013) |
|                      | **Inbound/coupled/outbound open innovation**, the extent to which external sources were used in a product, service or process development | Chesbrough (2003), Chesbrough and Crowther (2006), Lind et al. (2012), Hung and Chou (2013), Sisodiya et al. (2013), Parida et al. (2013) and Huang et al. (2013) |
| Organisational innovation culture | The extent to which firms use formal methods of cooperation in product, service or process development: strategic alliances, licencing, patents, joint project teams, formal progress reports, trade secrets, seminars, information technology, explicit management control system, top-down or bottom-up communication processes, exchange of employees between project teams, flatter organisational structure | De Luca and Atuahene-Gima (2007), Zahra et al. (2000), Lichtenhaler (2010), Terziovski (2010) |
| Internationalisation level | The share of exports in total sales, the share of income from foreign subsidiaries, the share of income from foreign strategic alliances, the share of foreign added value in total added value, the share of licences sold to foreign firms, the number of new export markets | Jaworski and Kohli (1993), Doz et al. (2001), Frishammar and Andersson (2009), Parida et al. (2013), Lasagni (2012), Christensen (2006), Ramsey et al. (2012), Jetto-Gillies and Sprague (2014) |

Source: Author
per firm were gathered in 2014 in one round of survey. Previously developed measures were adapted to fit the purpose of this study with the multiple item scales for each of the constructs (Churchill, 1979). The constructs were validated and tested for consistency as shown below. Each of the initially proposed constructs followed from the literature as explained in the following sections and depicted in Table 1.

**Dependent Variables**

*Open innovation practices* were composed of three distinctive constructs. The open innovation constructs aimed to capture the perspectives consistent with Carayannis and Provanse’s (2008) indicators of input, throughput and output innovation. Hence, inbound/coupled/outbound open innovation constructs were confirmed as proposed by Chesbrough (2003). Confirmatory factor analysis was done on all constructs. Inbound open innovation, coupled open innovation and outbound open innovation’s each principal component analysis depicted one component with eigenvalue larger than 1. Kaiser–Meyer–Olkin measure and Bartlett’s test of sphericity’s p values, respectively, indicated good sampling adequacy (values are presented in Table 2).

**Independent Variables**

A thorough literature review resulted with a proposed model that assimilated constructs relevant for the research on organisational open innovation culture. *Organisational open innovation culture* construct is based on a fourteen-item scale which examined the extent to which firms use formal cooperation practices with external sources in a product, service, process or project development (Table 1). Four constructs of organisational open innovation culture were extracted from exploratory factor analysis based on eigenvalues greater than 1 and using varimax rotation (Table 2). These constructs were then evaluated by confirmatory factor analysis, results of which are presented in Table 2.

*Open innovation model* refers to a firm’s ability to adapt its business model to a development of new products and services. Herein, the adaptation implies the lack of negative consequences for the firm’s existing processes and structures, while business model innovation includes repositioning a customers’ value proposition and redesigning the firms’ profit formula (Table 1). The construct of readiness for open innovation used in this thesis includes five items. Three items were derived from the questionnaire of Huang et al. (2013), and the remaining two items measure a responsiveness of a firm’s structures and processes to collaborate with other firms on a new product, service, process and project development (Parida et al., 2013; Sisodiya et al., 2013; Hung & Chou, 2013) (Table 2). In this study, *internationalisation* is based on five items depicted in Table 1 and measured on 7-point Likert scale (results in Table 2). All items loaded onto a single construct. Herein, the sample of 82 responses was divided into two subsamples based on the median response. Fifty percent of responses (41 response) obtained below median level of internationalisation, i.e. low internationalisation subsample, and fifty percent of responses (41 response) obtained above median level of
| Construct                      | Indicator | λ     | Cronbach's alpha | AVE  | CR  |
|-------------------------------|-----------|-------|-------------------|------|-----|
| **Open innovation practices** | Please estimate for the past four years (2010, 2011, 2012 and 2013) |       |                   |      |     |
| Please rate your organisation’s readiness for open innovation. Without negative effects on our core business, our processes and structures enable us to: | |       |                   |      |     |
| Open innovation model         | 1. Redesign our organisation’s profit formula. (How we extract value from our business.) | 0.833 | 0.604             | 0.883|     |
|                               | 2. Redesign customers’ value propositions |       |                   |      |     |
|                               | 3. Develop a new business process |       |                   |      |     |
|                               | 4. Collaborate with other organisations on a new product, service or process development |       |                   |      |     |
|                               | 5. Adopt ideas outside of our organisation |       |                   |      |     |
| Inbound open innovation       | 1. Gather information | 0.692 | 0.616             | 0.637|     |
|                               | 2. Buy or use technology |       |                   |      |     |
|                               | 3. Adopt available external knowledge and technology to internal developments |       |                   |      |     |
| Coupled open innovation       | 4. Exchange experiences | 0.574 | 0.540             | 0.589|     |
|                               | 5. Jointly undertake R&D activities |       |                   |      |     |
|                               | 6. Develop a product or cooperate on a project |       |                   |      |     |
| Outbound open innovation      | 7. Promote ideas that cannot be self-developed | 0.682 | 0.628             | 0.604|     |
|                               | 8. Sell a firm’s non-core technology | 0.757 |                   |      |     |
| Innovation culture            | 1. Establishing joint project teams | 0.786 |                   |      |     |
|                              | 2. Information and communication technology (e.g. Skype meetings) | 0.915 |                   |      |     |
| Construct                                                                 | Indicator                                                                 | λ    | Cronbach’s alpha | AVE  | CR  |
|--------------------------------------------------------------------------|---------------------------------------------------------------------------|------|------------------|------|-----|
| 3. Explicit management control system                                     |                                                                           | 0.895|                  |      |     |
| Knowledge sharing                                                        | 4. Strategic alliances                                                   | 0.803|                  |      |     |
|                                                                           | 5. Joint seminars                                                         | 0.671|                  |      |     |
|                                                                           | 6. Exchanging employees between project teams                             | 0.813|                  |      |     |
| Intellectual property rights                                             | 7. Purchasing licencing technologies                                       | 0.737|                  |      |     |
|                                                                           | 8. Patent disclosures                                                    | 0.676|                  |      |     |
|                                                                           | 9. Patents within non-disclosure agreements                                | 0.784|                  |      |     |
|                                                                           | 10. Trade secrets                                                        | 0.722|                  |      |     |
| Established teamwork through formal communication processes              | 11. Regular and formal progress reports                                   | 0.810|                  |      |     |
|                                                                           | 12. Joint investment                                                     | 0.836|                  |      |     |
|                                                                           | 13. Effective “top-down” & “bottom-up” communication process             | 0.777|                  |      |     |
| Internationalisation                                                     |                                                                           | 0.835|                  | 0.607| 0.885|
| Indicate your organisation’s performance according to the following areas| 1. Share of exports in total sales                                        | 0.723|                  |      |     |
|                                                                           | 2. Share of income from foreign subsidiaries                             | 0.787|                  |      |     |
|                                                                           | 3. Share of income from foreign strategic alliances                       | 0.754|                  |      |     |
|                                                                           | 4. Share of foreign added value in total added value                      | 0.822|                  |      |     |
|                                                                           | 5. Share of licences sold to foreign organisations                       | 0.806|                  |      |     |

Source: Author
internationalisation, i.e. high internationalisation subsample. Hierarchical regression was made for each of the two subsamples.

**Control Variables**

*Control variables* included the following: (1) *firm size* (turnover) as larger firms might provide higher revenues to innovation or market research departments granting them more or less autonomy; (2) *industry* (manufacturing) whereby a dummy variable 1 was attributed to ten firms that identified as manufacturing orientated firms; (3) *internationalisation year* as it might influence firms’ knowledge about international environment and their knowledge sharing practices therein; and (4) *R&D size* (personnel) as greater R&D size might influence firms’ innovation practices.

**Results and Discussion**

Descriptive statistics of the dependent, independent and control variables are depicted in Table 1. All data were standardised to avoid possible multicollinearity issues.

Based on the results of the exploratory and confirmatory factor analysis presented in Table 2 measurement model, our conceptual model is adapted and presented in Fig. 3.

Figure 3 presents the components of open innovation culture: (1) preparatory teamwork, (2) knowledge sharing, (3) intellectual property rights and (4) formally established teamwork, which present independent variables in our model. Three open innovation practices are defined in line with the proposed theories: (1) inbound open innovation, (2) coupled open innovation and (3) outbound open innovation. Table 3 depicts descriptive statistics and cross-correlations of

![Organizational innovation culture](chart1)

![Open innovation](chart2)

Fig. 3 Detailed conceptual model (Source: Author.)
Table 3
Descriptive statistics and cross-correlations

|                          | Minimum  | Maximum  | Mean   | S.D.  | Skewness (S.E. = 0.266) | Kurtosis (S.E. = 0.526) | 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 |
|--------------------------|----------|----------|--------|-------|--------------------------|--------------------------|----|----|----|----|----|----|----|----|----|----|----|----|
| Inbound open innovation  | -2.465   | 1.740    | 0.1    | 0.112 | -0.827                   | 0.254                    | 1  |    |    |    |    |    |    |    |    |    |    |    |
| Coupled open innovation  | -2.370   | 2.483    | 0.1    | 0.018 | 0.044                    | 0.254                    | 1  |    |    |    |    |    |    |    |    |    |    |    |
| Outbound open innovation | -1.441   | 2.400    | 0.1    | 0.109 | -0.829                   | 0.127                    | 0.222 | 1 |
| OI culture: Preparatory teamwork | -1.674 | 1.765    | 0.1    | 0.198 | -0.977                   | 0.257                    | 0.218 | 0.199 | 1 |
| OI culture: Knowledge exchange | -1.856 | 2.413    | 0.1    | 0.200 | -0.538                   | 0.172                    | 0.125 | 0.201 | 0.432 | 1 |
| OI culture: Intellectual property rights | -1.611 | 2.355    | 0.1    | 0.347 | -0.703                   | 0.237                    | 0.371 | 0.334 | 0.593 | 0.469 | 1 |
| OI culture: Established teamwork | -1.182 | 2.184    | 0.1    | 0.861 | 0.536                    | 0.480                    | 0.099 | 0.379 | 0.223 | 0.541 | 0.455 | 0.600 | 1 |
| Open innovation model   | -3.226   | 1.821    | 0.1    | 0.477 | 0.255                    | 0.298                    | 0.266 | 0.182 | 0.265 | 0.271 | 0.397 | 0.254 | 1 |
| Size (turnover)         | -1.170   | 1.578    | 0.1    | 0.185 | -1.369                   | 0.121                    | -0.076 | 0.113 | 0.354 | 0.110 | 0.260 | 0.136 | -0.044 | 1 |
| Industry (manufacturing) | 0       | 1        | 0.120  | 0.329 | 2.354                    | 3.629                    | 0.056 | 0.032 | 0.028 | 0.150 | -0.040 | 0.166 | 0.115 | 0.239 | 0.109 | 1 |
| Internationalisation year  | -1.180  | 2.742    | 0.1    | 0.707 | -0.160                   | 0.001                    | 0.524 | 0.845 | 0.427 | 0.943 | 0.187 | 0.100 | 0.123 | 0.004 | 0.107 | 1 |
| R&D size (employees)    | -1.308   | 2.584    | 0.1    | 1.024 | 0.393                    | 0.086                    | -0.019 | 0.251 | 0.339 | 0.115 | 0.224 | 0.131 | 0.047 | 0.631 | 0.239 | 0.300 | 1 |

Note: ** p-value < 0.01, * p – value < 0.05
N = 82. Standardized values reported.
Source: Author’s calculation.
Table 4
Innovation culture and open innovation model

| Control variables: | Low internationalisation | High internationalisation |
|--------------------|--------------------------|--------------------------|
| Size (turnover)     | -0.060 (0.141) -0.132 (0.139) -0.079 (0.136) -0.142 (0.130) -0.081 (0.137) | -0.159 (0.217) -0.135 (0.221) -0.118 (0.221) -0.137 (0.213) -0.083 (0.220) |
| Industry (manufacturing) | 0.700* (0.316) 0.631* (0.307) 0.748* (0.305) 0.562† (0.290) 0.641* (0.308) | 1.420* (0.425) 1.305* (0.465) 1.356* (0.431) 1.134* (0.453) 1.390* (0.440) |
| Internationalisation year | -0.223† (0.115) -0.207† (0.112) -0.214† (0.111) -0.243* (0.105) -0.255* (0.112) | -0.274 -0.278 -0.291 -0.298 -0.277 |
| R&D size (employees) | 0.097 (0.142) 0.047 (0.139) 0.070 (0.137) 0.071 (0.130) 0.086 (0.138) | 0.066 -0.103 0.128 0.013 0.043 |

Independent variables:

| OI culture: Preparatory teamwork | 0.283* (0.113) | 0.434* (0.180) | 0.109 (0.172) |
| OI culture: Knowledge exchange | 0.283** (0.104) | 0.369* (0.156) | 0.143 (0.151) |
| OI culture: Intellectual property rights | 0.423*** (0.102) | 0.561** (0.157) | 0.243 (0.151) |
| OI culture: Established teamwork | 0.253* (0.106) | 0.450** (0.152) | 0.046 (0.145) |

ANOVA (p-value) | 0.079 0.013 0.008 0.000 0.016 | 0.098 0.245 0.265 0.030 0.099 | 0.012 0.023 0.019 0.009 0.026 |
R2 | 0.101 0.168 0.179 0.264 0.163 | 0.028 0.163 0.158 0.282 0.219 | 0.287 0.295 0.304 0.335 0.289 |
Adjusted R2 | 0.055 0.114 0.126 0.216 0.108 | -0.077 0.047 0.041 0.182 0.110 | 0.210 0.197 0.208 0.242 0.190 |
Durbin - Watson | 2.004 1.900 1.979 2.042 1.983 | 2.145 2.271 2.140 2.184 | 2.024 2.107 2.134 2.030 |
Largest VIF | 1.759 1.797 1.768 1.763 1.761 | 2.243 2.447 2.289 2.252 2.245 | 1.788 1.829 1.847 1.793 1.791 |

Note: *** p - value < 0.001 ** p - value < 0.01 * p - value < 0.05 † p - value < 0.1
N = 82. N (low internationalisation) = 41, N (high internationalisation) = 41. Standard errors in parentheses.
Source: Author’s calculation.
variables in the model. Table 4 illustrates the results of cross-sectional regression analysis of the effect of open innovation culture determinants on open innovation model, while Tables 5 and 6 show the results of the hierarchical cross-sectional linear regression analysis for each of the three dependent variables, inbound, coupled and outbound open innovation, and a mediator variable, open innovation model. Sobel test is used to calculate the significance of mediation in case a mediator variable open innovation model is a significant predictor of inbound, coupled and outbound open innovation.

Results of the analysis show that all four elements of innovation culture, (1) preparatory teamwork, (2) knowledge sharing, (3) intellectual property rights and (4) formally established teamwork, are significant predictors of open innovation model, especially in low internationalised firms (Table 4). Hence, hypothesis 1 cannot be rejected. The effect of elements of innovation culture is not significant in high internationalised firms.

Secondly, the results imply that open innovation model statistically significantly predicts inbound and coupled open innovation (Tables 5 and 6) but not outbound open innovation (Table 7). Furthermore, in cases of innovation culture that fosters preparatory teamwork and intellectual property rights, open innovation mediates the relationship open innovation model-inbound open innovation (Table 5). Hence, hypothesis 2 can be practically accepted. Neither in low nor high internationalised firms, this relationship is statistically significant. However, a statistically significant effect of innovation culture that fosters intellectual property rights on inbound open innovation is positive (Table 5).

Table 6 shows that preparatory teamwork, intellectual property rights and formally established teamwork statistically significantly influence coupled open innovation and are mediated by open innovation model. Mediation effect of open innovation model disappears when firms are grouped as low and high internationalisers. However, for both types of firms, innovation culture that fosters intellectual property rights is statistically significant and positive, while for high internationalisers, innovation culture that fosters knowledge sharing is also significant and statistically positive. Table 7 displays the positive effect only of innovation culture that fosters outbound open innovation, without the mediation effect of open innovation, and only in high internationalised firms. Hence, hypothesis 3 cannot be rejected.

Social capital is located in firms’ innovation culture which is interwoven with its formal and informal relationships. This paper questioned how open business model transform elements of innovation culture into open innovation practices of high and low internationalisation firms. Herein, the rationale was found in the transformative role of firms’ business model. An assumption is made that innovation culture is channelled through business mode, which directs firms’ actions into specific open innovation practices. Namely, firms’ internal processes and routines influence firms’ business model to become mode adaptive and flexible. However, only specific elements of open innovation culture are transformed into open innovation practices through business model. These include (a) preparatory teamwork and intellectual property rights for inbound open innovation and (b) preparatory and established teamwork for coupled open innovation. Although allowing for external teamwork
## Table 5

| Variables | Inbound open innovation | Low internationalisation | High internationalisation |
|-----------|-------------------------|--------------------------|--------------------------|
|           | coefficient             | standard error           | coefficient              | standard error              |
| Size (turnover) | 0.124 (0.143) | 0.062 (0.098) | 0.113 (0.136) | 0.081 (0.119) | 0.117 (0.143) | 0.318 (0.337) | 0.298 (0.316) | 0.351 (0.351) | 0.321 (0.321) | -0.222 (0.219) | -0.184 (0.221) | -0.179 (0.222) | -0.198 (0.219) | -0.234 (0.218) |
| Industry (manufacturing) | 0.129 (0.147) | -0.002 (0.070) | -0.101 (0.157) | -0.061 (0.057) | -0.095 (0.110) | -0.092 (0.140) | -0.529 (0.509) | -0.513 (0.521) | -0.521 (0.500) | -0.060 (0.057) | -0.177 (0.180) | -0.179 (0.178) | -0.176 (0.178) | 0.101 (0.098) |
| Internationalisation year | 0.120 (0.118) | 0.118 (0.117) | 0.119 (0.119) | 0.110 (0.120) | 0.121 (0.119) | 0.119 (0.119) | 0.100 (0.150) | 0.106 (0.163) | 0.103 (0.163) | 0.109 (0.163) | 0.106 (0.163) | 0.107 (0.163) | 0.106 (0.163) | 0.108 (0.163) |
| R&D size (employees) | 0.052 (-0.018) | -0.031 (-0.044) | -0.001 (-0.012) | -0.000 (0.020) | -0.009 (0.016) | -0.013 (0.016) | -0.002 (0.150) | -0.003 (0.150) | -0.002 (0.150) | -0.000 (0.150) | -0.001 (0.150) | 0.021 (0.077) | 0.005 (0.066) | -0.000 (0.010) | 0.018 (0.010) |
| OI culture: Preparatory teamwork | 0.245 (0.128) | 0.169 (0.121) | 0.055 (0.010) | 0.167 (0.172) | -0.176 (0.176) | -0.177 (0.176) | 0.136 (0.136) | 0.103 (0.103) | 0.096 (0.103) | -0.004 (0.103) | 0.004 (0.103) | 0.046 (0.144) | 0.029 (0.144) | 0.027 (0.144) | 0.026 (0.144) |
| OI culture: Knowledge exchange | 0.162 (0.112) | 0.079 (0.114) | 0.119 (0.114) | 0.110 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) | 0.119 (0.114) |
| OI culture: Intellectual property rights | 0.221 (0.116) | 0.197 (0.125) | 0.03 (0.004) | -0.117 (0.116) | 0.134 (0.136) | 0.175 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) | 0.134 (0.136) |
| OI culture: Established teamwork | 0.083 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) | 0.004 (0.114) |

| Mediators | Open innovation model | 0.316** (0.133) | 0.272* (0.117) | 0.292* (0.119) | 0.271* (0.126) | 0.315** (0.115) | 0.266 (0.109) | 0.345 (0.154) |
|-----------|-----------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|           | coefficient           | standard error   | coefficient       | standard error   | coefficient       | standard error   | coefficient       | standard error   |
| ASDFA (p-value) | 0.035 (0.109) | 0.44 (0.091) | 0.618 (0.130) | 0.402 (0.136) | 0.830 (0.177) | 0.256 (0.149) | 0.329 (0.176) | 0.288 (0.202) | 0.262 (0.202) | 0.288 (0.202) | 0.291 (0.202) |
| R2 | 0.018 (0.108) | 0.069 (0.131) | 0.044 (0.114) | 0.003 (0.117) | 0.25 (0.108) | 0.141 (0.107) | 0.143 (0.104) | 0.152 (0.152) | 0.215 (0.152) | 0.152 (0.152) | 0.218 (0.152) |
| Adjusted R2 | -0.032 (0.051) | 0.009 (0.062) | -0.018 (0.044) | 0.002 (0.047) | -0.038 (0.058) | 0.048 (0.035) | 0.032 (0.005) | 0.055 (0.055) | 0.110 (0.055) | 0.164 (0.055) |
| Durbin-Watson | 1.798 (1.734) | 1.837 (1.793) | 1.750 (1.750) | 1.849 (1.771) | 1.730 (1.734) | 1.776 (1.774) | 1.805 (1.805) | 1.887 (1.887) | 1.987 (1.987) | 2.155 (2.155) | 2.993 (2.993) | 2.298 (2.298) |
| Largest VIF | 1.759 (1.769) | 1.796 (1.818) | 1.706 (1.760) | 1.756 (1.750) | 1.791 (1.737) | 2.248 (2.247) | 2.487 (2.289) | 2.286 (2.245) | 2.245 (2.245) |
| Subset test (un-tailed) | 1.508* (1.822*) | 1.508* (1.822*) | 1.508* (1.822*) | 1.508* (1.822*) | 1.508* (1.822*) | 1.750* (1.750*) | 1.750* (1.750*) | 1.750* (1.750*) | 1.750* (1.750*) |

Note: *** p - value < 0.001 ** p - value < 0.01 * p - value < 0.05 † p - value < 0.1
N = 82. N (low internationalisation) = 41, N (high internationalisation) = 41. Standard errors in parentheses.
Source: Author’s calculation.
### Table 6: Innovation culture and coupled open innovation

|                           | Low Internationalisation | High Internationalisation |
|---------------------------|--------------------------|---------------------------|
| **Independent variables** |                          |                           |
| Industry (manufacturing)   |                          |                           |
| OI culture: Preparatory teamwork | 0.027*                 |                           |
| OI culture: Knowledge exchange | 0.010                  |                           |
| R&D size (employees)      |                          |                           |
| **Control variables**     |                          |                           |
| Size (turnover)           | (0.145)                  | (0.146)                   |
| Industry (manufacturing)  | (0.138)                  | (0.132)                   |
| Internationalisation year | (0.120)                  | (0.111)                   |
| R&D size (employees)      | (0.146)                  | (0.145)                   |
| **Mediator**              |                          |                           |
| Open innovation model     |                          |                           |
| N = 82. N (low internationalisation) = 41, N (high internationalisation) = 41. Standard errors in parentheses. Source: Author’s calculation.
### Table 7: Innovation culture and outbound open innovation

| Control variables | Low Internationalisation | High Internationalisation |
|-------------------|--------------------------|---------------------------|
| Size (turnover)    | -0.067 (0.143)          | -0.056 (0.142)            |
| Industry (manufacturing) | -0.085 (0.322) | -0.073 (0.331) |
| Internationalisation year | -0.048 (0.117) | -0.073 (0.117) |
| R&D size (employees) | 0.031* (0.145) | 0.098 (0.160) |
| OI culture: Preparatory teamwork | 0.148 (0.118) | 0.065 (0.185) |
| OI culture: Knowledge exchange | 0.176 (0.099) | 0.090 (0.069) |
| OI culture: Intellectual property rights | 0.209 (0.109) | 0.194 (0.172) |
| OI culture: Established knowledge | 0.171 (0.113) | 0.153 (0.113) |
| Mediator: Open innovation model | 0.182 (0.114) | 0.154 (0.119) |

| ANOVA (p-value) | Low Internationalisation | High Internationalisation |
|-----------------|--------------------------|---------------------------|
| 0.226 (0.147)   | 0.206 (0.131)            | 0.181 (0.148)             |
| 0.009 (0.099)   | 0.088 (0.107)            | 0.015 (0.145)             |
| 0.021 (0.040)   | 0.028 (0.037)            | 0.006 (0.041)             |
| 1.709 (1.803)   | 1.778 (1.817)            | 1.859 (1.977)             |
| 1.759 (1.760)   | 1.735 (1.747)            | 1.791 (1.877)             |
| 1.701 (1.702)   | 1.758 (1.852)            | 1.850 (1.945)             |

| Note: **p - value < 0.001 *p - value < 0.01 †p - value < 0.05 ‡p - value < 0.1 |
| N = 82. N (low internationalisation) = 41, N (high internationalisation) = 41. Standard errors in parentheses. |

Source: Author’s calculation.
thorough establishing joint project teams or management tracking systems allow flexibility of a business model, firms secure their proprietary rights to invention.

In terms of differences between high and low internationalised firms, open innovation culture’s elements are significant predictors of adaptive and flexible innovation model for low internationalised firms and not for high internationalised firms. None of the elements of open innovation culture influence open innovation practices of low internationalised firms, apart from established teamwork that influences coupled open innovation in low internationalised firms. However, high internationalised firms’ intellectual property rights are the most significant predictor of inbound, coupled and outbound open innovation but only directly, not through adaptive business model. Additionally, knowledge sharing also directly influences coupled open innovation in high internationalised firms.

Conclusion

This study focused on answering the research question: how do open business model transform elements of innovation culture into open innovation practices of high and low internationalised firm? It attempted to answer this research question through three hypotheses. The first and third hypotheses (H1: Innovation culture determinants positively affect open innovation, and H3: The effect of innovation culture’s determinants on open innovation varies between firms with low and high internationalised firms.) cannot be rejected; the second hypothesis is partially accepted (H2: Firm’s open innovation model mediates the relationship between innovation culture’s determinants and open innovation.). Results confirmed significance of (1) all innovation culture elements on open innovation model, especially in low internationalised firms and (2) open innovation on inbound and coupled open innovation. Furthermore, open innovation model mediates the relationship between (a) preparatory teamwork and IPR on one side and inbound open innovation on the other side and (b) both preparatory and established teamwork on one side and coupled open innovation on the other side. In terms of different internationalisation levels, the study confirms the importance of (3) intellectual property rights for all open innovation types of highly internationalised firms, and only for coupled open innovation of low internationalised firms, and (4) established teamwork of both coupled innovation of low and high internationalised firms.

This research contributes to theoretical findings in the following elements. It confirms the evolutionary nature of firms through differing aspects of organisational innovation culture that have differing influence on inbound, coupled and outbound innovation depending on their respective internationalisation level. Secondly, it adds to the theoretical literature by inspecting the managerial dimension of open innovation model that works as a channel of innovation culture into open innovation practices. It depicts that transformative nature of the channel is not in its absorptive capacity but in ability to identify external elements and adapt to them. Moreover, a novel approach is adopted in the study which has not been explicitly studied in the literature and which inspects differences in firms’ open innovation models and practices depending on the level of their geographical scope. Several implications
arise from this approach. Open innovation failure occurs in terms of outbound open innovation practices, which is especially evident in intellectual property protection of examined firms. Namely, for both examined subsamples (low and high internationalised firms), intellectual property protection statistically significantly affects open innovation practices. Firms do share but are careful what they share and with/to whom. This is a business decision, which in turn could negatively influence their propensity to openly innovate. Moreover, there is a positive link between intellectual property rights and open innovation practices, implying firms’ joint work on patents adds to their resulting innovation, especially for high internationalisers, which tend to be more competitive with respect to their counterparts focusing on local markets. Herein, a question of how effective open innovation actually is, firms’ intellectual property rights are the most significant determinant of open innovation. Namely, the items that formed intellectual property rights factor include purchasing licencing technology, patent disclosures, patents with non-disclosure agreements and trade secrets. If high internationalisers use intellectual property rights in the mentioned form, it is evident that they use innovation from the environment, and it must be questioned to what extent do they innovate as oppose to only commercialise existing technology available on the domestic and international market. High internationalisers might be more efficient in commercialisation due to their scope and area from which they could source already existing innovation. Also, an interesting result emerges from non-significant effect of open innovation model when firms are divided between low and high internationalisers. Namely, the elements of open innovation culture do not influence inbound and outbound open innovation of low internationalisers, nor is knowledge sharing a significant predictor of any open innovation practices. Herein, again the question arises of the nature of open innovation: is open innovation really open or is it just used by firms to quickly commercialise the existing innovation available on the market? The results of this study point to the latter.

Policy implications arising from this study include the nature of local and international enablers for innovation cooperation but also ensuring legal frameworks that all parties that share their knowledge, either formal or informal, tacit or explicitly written, have confidence and trust in the system, and thereby, mutually, that the results of their work will be used for mutual benefits. This is no case for financial incentives but for institutional change.

This study is limited in several aspects. Firstly, it is one industry, one country study that limits generalisation of results. Secondly, the cross-sectional nature of the study demands to be repeated and tracked within already identified firms to inspect how innovation culture changes over time and in line with differing internationalisation levels. Thirdly, it would be beneficial to repeat this study in the study of different country to inspect the validity of results across the industry sector.

Acknowledgements I would like to thank Professor Mile Terziovski, Ph.D., and Sarah Pearson, Ph.D., during my time on the Australian Endeavour Research Fellowship. I am especially grateful to Ian Elsum, Ph.D., the Australian National University, for his comments and our valuable discussions. Their insights helped to shape the topic of the thesis. I have enjoyed the opportunity to learn from their knowledge and experience. I am also thankful to Professor Michael Dowling, Ph.D., University of Regensburg; Omar Bizri, Ph.D., SCITEH, World Bank; Professor Angeles Montoro-Sanchez, Ph.D., University Complutense
de Madrid; Professor Miguel Gonzalez-Loureiro, Ph.D., University of Vigo; Professor Ljubo Jurčić, Ph.D., University of Zagreb; Professor Gerald Steiner, Danube University and Harvard University; Professor Elias Carayannis, Ph.D., The George Washington University, and Professor Michael Harvey, Ph.D., University of Arizona, for their time and comments on the performed research. This study originates from my doctoral thesis. The empirical research differs but parts of the text are used.

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