

Internationalisation Modes in the Australian Telecommunications Industry: The Influence of Different Innovation Types

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ABSTRACT

This paper identifies the influence of product, service and process innovation, radical innovation, competitive intensity and international customer requirements on a firm's internationalisation mode. The empirical research was conducted by the means of the questionnaire survey on the Australian telecommunications industry between April and September 2014. The multinomial logistic regression analysed 88 responses based on the differences in the firms' internationalisation modes: "no" internationalisation, "non-equity" internationalisation and "equity" internationalisation. The results suggest that: (1) Product innovation and competitive intensity significantly influence firms' preference for "equity" versus "non-equity" internationalisation mode. (2) Neither service nor process innovations are significant predictors of firms' choice of "equity" rather than "non-equity" internationalisation mode. (3) Radical innovations significantly predict firms' preference for "no" internationalisation compared to "non-equity" internationalisation. (4) Radical innovations moderate the relationship between the process innovation and a firm's preference for "equity" compared to "non-equity" internationalisation. Hence, product innovations are the most important predictor of firms' preferences towards "equity" versus "non-equity" internationalisation, and firms with radical innovations prefer domestic operations. These notions pertain to the importance of the transaction cost theory in the analysis of firm innovation and internationalisation.

Keywords: Internationalisation Mode, Innovation, Radical Innovation, Competitive Intensity, International Customer Requirements, Telecommunications Industry, Australia

1. INTRODUCTION

Global strategic positioning became a necessity for firms striving to achieve sustainable, long term success (Olhager, 2003; Ritter & Gemünden, 2004). Continuous innovation is a prerequisite for a sustainable success that enables firms to expand to foreign markets (Pla-Barber & Alegre, 2007; Chetty & Stangl, 2010; Gopalakrishnan & Damanpour, 1997; Subramaniam & Venkatraman, 1999; OECD, 2005; Keupp et al., 2012; Kafouros et al., 2008; Hagen et al., 2014). It also enables firms to achieve and maintain competitive advantage and growth (Barney, 1991; Chetty & Stangl, 2010).

Although a lot of academic literature analyses the effects of innovation on internationalisation (Rodríguez & Nieto, 2012; O' Cass & Weerawardena, 2009; Ripolles Meliá, Blesa Pérez, & Roig Dobón, 2010), the studies mainly analyse the effects of innovation on the internationalisation process, namely the speed of internationalisation and the stages of internationalisation. On the other side, the modes of internationalisation have been studied through the lens of transaction cost theory (Williamson, 1975), which identifies asset specificity as one of the reasons for "equity" internationalisation. Hence, there is a lack of research that combines the effect of different innovation types, radical innovation, competitive intensity and international customer requirements on internationalisation modes, which sketch firms responses to the changing market conditions.

This paper aims to expand our understanding of the effect of three different types of innovation on the Australian telecommunications industry's internationalisation mode. We differ between product, service and process innovation to study their effect on the firms' preference towards "equity", "non-equity" or "no" internationalisation. We also examine how radical innovation, competitive intensity and international customer requirements affect the firms' preference towards specific internationalisation mode; and what is the moderation effect between: (1) radical innovation and each innovation type, and (2) international customer requirements and competitive intensity, on the firms' preferred mode of internationalisation.

A conceptual framework developed in the literature review section follows this introductory section. Hypotheses are presented in the literature review section. Third section explains the research method, data sources, sample and variables used in the model. Fourth section illustrates the findings of the empirical research. Lastly, we explain theoretical and practical implications, depict research limitations and recommend some future research directions.

2. LITERATURE REVIEW

This paper examines internationalisation through the transaction cost theory (Williamson, 1975). Transaction costs occur in opportunistic environments bounded by rationality. Transaction costs are low in the trustworthy relationships. They are the result of asset specificity and search, negotiation and contract enforcement (Williamson, 1985). Asset specificities come from firms' specialised production assets, skills, or combination of specialised skills and assets (David & Han, 2004). Specific assets are innovations, and can be licensed, franchised or otherwise exchanged on the market or within a firm (Root, 1987). As trust enforces the exchange of specific assets between the two units, the lack of trust or incorrect transfer pose a risk for a firm (Anderson & Gatignon, 1986). Firms protect their specific assets through a higher degree of control of its international operations, i.e. "equity" mode of internationalisation, in cases of high transaction costs (Makino & Neupert, 2000; Hennart, 1991; Gatignon & Anderson, 1988).

Innovation is an entrepreneurial tool essential for achieving competitive success (Drucker, 1985; Chetty & Stangl, 2010), economic growth and productivity (Ganotakis & Love 2012; Oke et al., 2007; Chetty & Stangl, 2010; Gopalakrishnan & Damanpour, 1997; OECD, 2005). We use the OECD (2005) definition of innovation and differ between a product, process, and service innovation. Product and service innovations are essential for successful international market entry, especially in highly competitive environments (Becker & Egger, 2013). Process innovations increase the quality of the production process or decrease its costs (Chetty & Stangl, 2010). Product innovations involve more explicit knowledge, while service and process innovations contain more tacit knowledge. The distinction is important because tacit knowledge is more asset specific, requires more trustworthy relationships, and, hence, generates higher transaction costs for a firm (Polanyi, 1958). Therefore, differences in types of innovation can generate different preferences towards a firm's internationalisation mode.

Additionally, innovation can be radical or incremental (Kirzner, 1973, Schumpeter, 1934; von Stamm, 2003). Radical innovations imply departing from firms' existing practices, while incremental innovations reinforce the existing capabilities (Gopalakrishnan & Damanpour, 1997). Radical innovations are difficult to predict, uncertain and involve a high degree of flexibility (von Stamm, 2003). We observe that radical innovations are accompanied with higher transaction costs than incremental innovations because they possess a higher level of asset specificity.

Our model tests the effect of product, service and process innovation on the Australian telecommunications internationalisation mode. It also examines the effects of radical innovation, competitive intensity, and international customer requirements on the internationalisation mode. The model studies whether radical innovations moderate the relationship between innovation and firms' preferred mode of internationalisation and whether the international customer requirements moderate the relationship between the competitive intensity and internationalisation modes. The conceptual framework of our model is given in Figure 1.

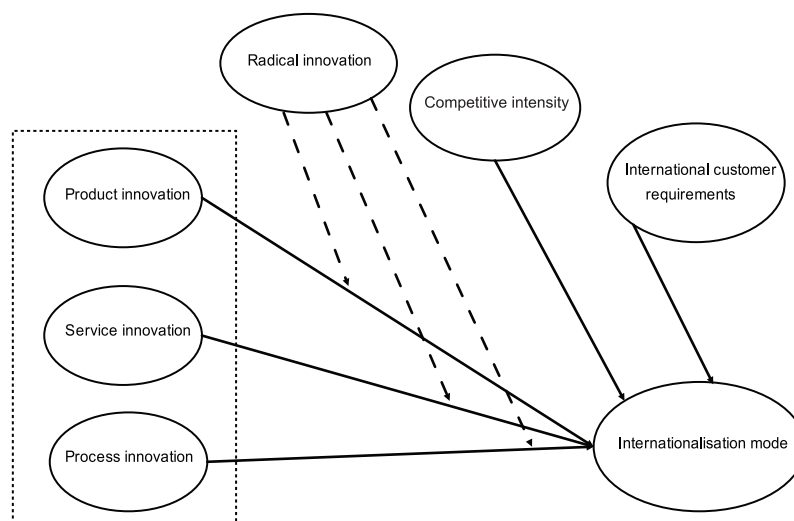


Figure 1: Conceptual framework

2.1. Innovation Types and Internationalisation Modes

Becker and Egger (2009) emphasized the importance of product innovation on “non-equity” mode of entry. Cassiman and Golovko (2011) explained how product innovations affect the drive for “non-equity” internationalisation. According to their research, successful product innovations direct the “non-equity” internationalisation through investments that enhance productivity and decrease the R&D costs. Cassiman and Martinez-Ros (2007) found a positive effect of product innovation on internationalisation; and a lack of support for process innovation’s effect on internationalisation. On the other hand, Becker and Egger (2009) indicate that both product and process innovations are significant determinants of internationalisation. As the research on innovation and internationalisation predominantly explores the effect of innovation on the speed of internationalisation and the stages of internationalisation (Basile, 2001; Rodríguez & Nieto, 2012; O’Cass & Weerawardena, 2009; Ripolles et al., 2010), there is a research gap that needs to address firms’ preferred mode of internationalisation in terms of product, service and process innovation.

In terms of the transaction cost theory, higher level of innovation implies internationalisation through the governance structures possessing a greater degree of firm control. We assume that higher levels of innovation imply “equity” internationalisation because of the higher degree of tacit, asset specific knowledge connected to innovation. Namely, firms are reluctant to give up control over their innovation in the uncertain foreign environments. Hence, our first hypothesis:

Hypothesis 1: Firms with higher levels of innovation prefer equity mode of internationalisation.

2.2. Radical Innovation and Internationalisation Modes

Internationalisation and radical innovation are often examined via their effect on international performance (Chetty & Stangl, 2010; Laanti et al., 2007; Majkgard & Sharma, 1998; Zahra et al., 2000, etc.). Radical innovations tend to speed up and increase firms’ internationalisation process and performance compared to firms which incrementally innovate (Chetty & Stangl, 2010).

On the other hand, Zahra, Ireland, and Hitt (2000) explore how internationalisation influences radical innovation. They state that internationalisation positively affects learning which consequently affects radical innovation (Zahra et al., 2000). Laanti et al.’s (2007) study confirms these findings. Namely, radical innovations incite fundamental changes. Due to its complexity, tacit knowledge and asset specificity, radical innovations generate transaction costs. Hence, radical innovation in either products, services or processes imply that firms will want to maintain a higher degree of control over those assets, and use “equity” mode of internationalisation. Therefore, we predict that firms with more radical innovation will prefer “equity” to other forms of internationalisation. Our second and third hypotheses state:

Hypothesis 2: Firms with more radical innovation will prefer either equity or no internationalisation to non-equity internationalisation.

Hypothesis 3: Radical innovation moderates the relationship between innovation and firm’s preferred internationalisation mode.

2.3. The Effect of Competitive Intensity and International Customer Requirements On Internationalisation Modes

Environmental aspects, such as competitive intensity and international customer requirements, affect firm internationalisation (Cadogan et al., 2003; Kwon & Hu, 2000; Rose & Shoham, 2002; Gubik & Karajz, 2014; Abrahameczik, 2012; Martin & Javalgi, 2015). Competition might activate firms’ potentials in the international markets (Abrahameczik, 2012), often moderating the firms’ internal strategic orientation on international performance (Cadogan et al., 2003; Boso et al., 2012; Martin & Javalgi, 2015). However, we see there exists a lack of research connecting competitive intensity to internationalisation modes. Hence, Hypothesis 4, 5 and 6:

Hypothesis 4: Perceived competitive intensity influences firms’ internationalisation mode.

Hypothesis 5: Firms that pursue international customer requirements prefer either equity or non-equity to no internationalisation.

Hypothesis 6: Perceived competitive intensity moderates the relationship between firms focus on international customer requirements and preferred internationalisation mode.

3. RESEARCH METHOD

3.1. Data source and sample

The purpose of this paper is to examine the influence of the amount of product, service and process innovation on the Australian telecommunication industry’s mode of internationalisation. We study the effects of radical innovation, competitive intensity

and international requirements on the internationalisation mode on one side, and the interaction between: (1) each type of innovation and radical innovation, and (2) the competitive intensity and international customer requirements on the other side.

The Australian economy is marked with the history of “colonial socialism”, exports of primary products and limited technology imports (Gregory, 1993), which raised a concern about the maintenance of high standards of living of this relatively small OECD economy. The Australian national innovation system portrayed the characteristics of high level of government involvement and low added value created predominantly in the manufacturing sector. Historically however, the majority of the Australian manufacturing firms were foreign owned and did not invest in research and development (Gregory, 1993). Therefore, it was necessary to incite innovation and innovative entrepreneurs.

The Australian economy and innovation system underwent significant changes in the last couple of decades. Geographic clustering of the Australian innovation system occurred simultaneously with the changing pattern of R&D which is, nowadays, directed towards the applied research. The geographic clustering occurred in the proximity of universities and research institutes (e.g., Telstra and University of Adelaide), who provided the infrastructure and skilled labour, thereby enabling the reduction of the firms’ transaction costs (Telstra Media Release, 2004; Australian Mobile Telecommunications Association, 2005). Although Australia was one of the leaders in telecommunications deregulation (Spiller & Cardilli, 1997), its telecommunications industry is still characterised with the below average business sophistication compared to the other OECD countries (WEF, 2015; AISR, 2015). The pace of change and customer demands direct innovation in the telecommunications industry (Australian Mobile Telecommunications Association, 2005), while the access to distribution channels and compatibility of foreign practices influence its internationalisation modes (Julian, 2009) connected to the global and the Asia Pacific region (e.g., Optus and SingTel). Therefore, the Australian economy provides an interesting setting for the research on innovation related internationalisation modes.

Our empirical study is based on the Australian telecommunications firms. The survey was used as a research instrument. It was conducted on senior project team members, CEOs and Heads of product or service development, marketing or sales departments between April and September 2014 on the population of 656 firms identified from the Australian Company 360 database in March 2014. The unit of our empirical analysis is a firm. 88 responses were gathered and used in the empirical analysis (13.41% response rate).

3.2. Variables and Measures

Our model studies the interaction between one dependent variable, three control variables and six independent variables based on the pre-existing measures (Jaworski and Kholi, 1993). We used the perceptual measures to identify the level of innovation, internationalisation modes, competitive intensity and requirements of international customers.

3.2.1. Dependent variables

The respondents were asked to evaluate the share of exports in total sales, share of income from foreign subsidiary, share of income from foreign strategic alliances and share of income from internationally sold licences in the four years preceding the survey (2010, 2011, 2012 and 2013) (Jaworski & Kholi, 1993; Doz et al., 2001; Frishammar & Andersson, 2009; Parida et al., 2013; Lasagni, 2012; Ramsey et al., 2012). The answers were recorded on the Likert scale from 1 to 7 (1 = 0% of total income, 7 = more than 50% of total income). We used the hierarchical cluster analysis to study whether the differences in the internationalisation modes exist. A dendrogram plot indicated the existence of three clusters. Subsequently, the K-means cluster analysis with the fixed set of three clusters was performed. Cases were grouped in one of the three clusters. Each case was saved according to its corresponding clusters. Final cluster centres are displayed in Table 1.

Table 1 shows there exist three internationalisation modes: (1) no internationalisation, (2) non-equity internationalisation, and (3) equity internationalisation. Although we recognise the possible problems with the small sample data analysis, we decided to obtain the three clusters in the analysis to study the core of the internationalisation mode differences.

3.2.2. Independent variables

We followed OECD’s distinction between product, service and process innovation. OECD (2005) defines product innovation as “a good or service that is new or significantly improved including significant improvements in technical specifications, components and materials, software in the product, user friendliness or other functional characteristics”. Herein we divided improvement in goods and services to attain differences in product and service innovation. Process innovation is “new or significantly improved production or delivery methods including significant changes in techniques, equipment and/or

Table 1: Final cluster centres

	No internationalisation	Non-equity internationalisation	Equity internationalisation
Share of exports in total sales	-0.63	0.53	1.44
Share of income from foreign subsidiaries	-0.60	0.37	1.55
Share of income from foreign strategic alliances	-0.51	0.17	1.53
Share of licences sold internationally	-0.47	0.09	1.51
Number of cases (percentage)	52 (59.09%)	21 (23.86%)	15 (17.05%)

N = 88

software” (OECD, 2005). We asked the respondents to evaluate the amount of product, service and process innovation their firm produced in the four years preceding the survey (2010, 2011, 2012 and 2013; Terziovski, 2010; Lasagni 2012). The answers were recorded on the Likert scale between 1 = no innovation and 7 = a lot of innovation.

Radical innovation was measured with four items that examined the extent to which a product, service or process of an organisation is new to the industry: (1) Our product, service or process uses technology which was not used before; (2) Our product, service or process is the first of its kind in the industry; (3) Our product, service or process is highly innovative and completely new in the industry; and (4) Our product, service or process is different from others on the market; on Likert scale from 1 = not at all to 7 = very much (Sisodiya et al., 2013; Delingonul et al., 2011; Liao et al., 2012). Factor analysis was performed by using principal axis factoring. Extracted items had communalities greater than 0.4, 74.94% of the total variance is explained by the items and Cronbach’s alpha is 0.92.

Similarly, competitive intensity was measured with three items: (1) Competition in our industry is intense; (2) Domestic competition in our industry is intense; and (3) Price competition in the industry is common; on the Likert scale from 1 = not at all to 7 = very much (Jaworski & Kholi, 1993). Principal axis factoring showed communalities greater than 0.4, the data correspond to the 64.00% of total variance explained, and Cronbach’s alpha is 0.84.

Respondent were asked whether their firm takes the preferences of: (1) domestic customers, (2) both domestic and international customers, and (3) international customers into account in designing the product, service or a process. Ordinal scale was composed based on the three answers showing the degree of international customer requirements taken into account.

3.2.3 Control variables

We controlled for the influence of firm size, firm age and R&D intensity as they may affect the internationalisation mode. Firm size was measured with the amount of firm employees (Choi & Contractor, 2016). The answers were measured on the Likert scale in accordance with the defined size of small, medium and large firms: (1) 1 employee, (2) 2- 5 employees, (3) 6-10 employees, (4) 10-50 employees, (5) 51-250 employees, (6) more than 250 employees. Firm age could affect the size and experience with innovation and internationalisation (Rothaermel & Deeds, 2004; Choi & Contractor, 2016). Namely, it is more likely that the mature firm have more experience and resources to engage in equity versus other modes of internationalisation. Moreover, younger firms tend to pioneer in business model innovation, i.e. the sort of innovation that changes the entire system (Australian Innovation System Report, 2015). Finally, we controlled for the effect of the R&D intensity measured as a percentage of R&D in total turnover. The answers were recorded on the seven point Likert scale: (1) 0%, (2) 1-3%, (3) 3-5%, (4) 5-10%, (5) 11-25%, (6) 26-50%, and (7) more than 50% of total turnover.

4. FINDINGS

The empirical analysis was based on the responses from 88 firms (13.4% response rate). Table 2 shows the descriptive statistics and correlations between variables.

ANOVA analysed the three internationalisation modes’ multi group differences. It showed that the three groups differ in firm age ($p < 0.01$), R&D intensity ($p < 0.01$), international customer requirements ($p < 0.001$) and product innovation ($p < 0.001$). The differences between no internationalisation, non-equity and equity internationalisation were not found in firm size, service nor process innovation.

Post-hoc Bonferroni test on firm age confirmed that the significant differences exist between “no” internationalisation and “equity” internationalisation on 1 percent significance level ($p < 0.01$), and “non-equity” and “equity” internationalisation modes on 10 percent significance level ($p < 0.10$). There are significant differences in R&D intensity between “no” and

“non-equity” internationalisation ($p < 0.05$), and “no” and “equity” internationalisation ($p < 0.10$), but the differences were not significant between “non-equity” and “equity” internationalisation. Similar applies for international customer requirements where there are statistically significant differences between “no” and “non-equity” internationalisation ($p < 0.01$), and “no” and “equity” internationalisation ($p < 0.001$), but not between “non-equity” and “equity” internationalisation. Lastly, there are significant differences between “no” and “equity” internationalisation in product innovation ($p < 0.001$) and between “non-equity” and “equity” internationalisation ($p < 0.10$).

The multinomial logistic regression was done to devise the lack of internationalisation, non-equity internationalisation and equity internationalisation for each of the three innovation types. Its goal was to distinguish between firm’s preferred choice of internationalisation. Hence, it differentiated between (1) “equity” and “non-equity” internationalisation, (2) “equity” and “no” internationalisation, and (3) “no” and “non-equity” internationalisation. The following sections show the results multinomial logistic regression used to test the Hypotheses 1-6 (Tables 3, 4 and 5).

4.1.1 Product innovation and internationalisation modes

Table 3 depicts the parameter estimates for the Hypotheses 1-6 that explored the effect of the product innovation on the internationalisation mode.

Table 2: Descriptive statistics and correlation

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1. Internationalisation mode	2.07	0.64	1									
2. Firm size	0.00	0.99	0.17	1								
3. Firm age	0.00	1.00	-0.30***	-0.66***	1							
4. R&D intensity	0.00	1.00	0.30***	0.03	0.12	1						
5. International requirements	1.57	0.58	0.45***	0.08	-0.18*	0.17	1					
6. Product innovation	0.00	0.98	0.44***	0.31***	-0.20*	0.40***	0.20*	1				
7. Service innovation	0.00	0.98	0.20*	0.20*	-0.06	0.39***	0.14	0.49***	1			
8. Process innovation	0.00	0.96	0.20*	0.20*	0.01	0.37***	0.15	0.32***	0.73***	1		
9. Radical innovation	0.00	0.97	0.21*	-0.11	0.19*	0.42***	0.22**	0.35***	0.36***	0.22**	1	
10. Competitive intensity	0.00	0.93	0.23**	0.21*	-0.25**	-0.14	-0.09	0.16	0.05	-0.04	-0.07	1

N = 88. S.D. = standard deviation. Two-tailed test. Pearson correlation reported. All variables were standardized. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 3: Parameter estimates and results of multinomial logistic model for service innovation

Variable	‘Equity’ versus ‘non-equity’ internationalisation ^a					‘Equity’ versus ‘No’ internationalisation ^b					‘No’ versus ‘Non-equity’ internationalisation ^c				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-0.67 (0.45)	-4.40* (2.39)	-4.49* (2.43)	-5.69* (3.18)	-5.78* (3.21)	-1.62*** (0.40)	-8.60*** (2.39)	-8.87*** (2.47)	-10.09*** (3.30)	-10.33*** (3.30)	0.94*** (0.29)	4.21*** (1.14)	4.39*** (1.17)	4.44*** (1.21)	4.55*** (1.23)
Firm size	-0.36 (0.51)	-1.65* (0.93)	-1.71* (0.93)	-1.59* (0.93)	-1.61* (0.94)	-0.29 (0.47)	-1.56 (0.96)	-1.75* (0.98)	-1.44 (0.94)	-1.60* (0.96)	-0.08 (0.37)	-0.08 (0.43)	0.04 (0.46)	-0.14 (0.44)	-0.01 (0.47)
Firm age	-0.96* (0.50)	-1.69** (0.89)	-1.78** (0.89)	-1.63** (0.83)	-1.70** (0.82)	-1.31*** (0.41)	-1.67** (0.66)	-1.74** (0.67)	-1.99** (0.80)	-1.69** (0.81)	0.35 (0.39)	-0.02 (0.43)	-0.04 (0.45)	-0.04 (0.44)	-0.05 (0.45)
R&D intensity	0.24 (0.43)	-0.41 (0.73)	-0.34 (0.73)	-0.49 (0.73)	-0.42 (0.73)	1.11*** (0.41)	0.66 (0.72)	0.66 (0.72)	0.60 (0.71)	0.60 (0.71)	-0.86*** (0.30)	-1.07*** (0.41)	-1.00** (0.41)	-1.09** (0.41)	-1.02** (0.42)
Product innovation	1.93* (1.01)	1.98* (1.16)	2.06* (1.07)	2.08* (1.24)	2.08* (1.24)	2.40** (1.03)	2.64** (1.17)	2.50** (1.07)	2.70** (1.24)	2.70** (1.24)	-0.47 (0.41)	-0.66 (0.43)	-0.45 (0.42)	-0.63 (0.44)	-0.63 (0.44)
Radical innovation	2.65** (1.10)	2.79** (1.16)	2.79** (1.16)	3.95 (3.06)	4.29 (3.10)	2.77** (0.80)	2.88** (0.83)	2.88** (0.83)	5.13* (3.05)	5.13* (3.07)	0.91** (0.43)	1.07** (0.45)	0.92** (0.43)	1.07** (0.43)	1.07** (0.43)
Competitive intensity	2.65** (1.10)	2.79** (1.16)	2.79** (1.16)	3.95 (3.06)	4.29 (3.10)	2.77** (0.80)	2.88** (0.83)	2.88** (0.83)	5.13* (3.05)	5.13* (3.07)	-0.12 (0.36)	-0.09 (0.36)	-0.18 (0.30)	-0.84 (1.23)	-0.84 (1.23)
International requirements	0.93 (0.93)	0.90 (0.93)	1.50 (1.29)	1.49 (1.29)	1.49 (1.29)	2.93*** (0.98)	3.11*** (1.02)	3.60** (1.41)	3.76*** (1.43)	3.76*** (1.43)	-2.00*** (0.64)	-2.21*** (0.68)	-2.10*** (0.68)	-2.27*** (0.71)	-2.27*** (0.71)
Radical innovation x Product innovation			-0.09 (1.04)		0.03 (1.11)				-0.68 (1.03)				0.39 (0.42)		0.56 (0.44)
Competitive intensity x International requirements			-0.66 (1.45)		-0.80 (1.47)				-1.33 (1.48)					0.67 (0.70)	0.47 (0.71)
Pseudo R ² (McFadden)	0.15	0.43	0.44	0.44	0.45	0.15	0.43	0.44	0.44	0.45	0.15	0.43	0.44	0.44	0.45
-2 log-likelihood	121.22	96.11	93.85	95.66	92.91	121.22	96.11	93.85	94.68	92.91	121.22	96.11	93.85	95.66	92.91
χ^2	24.67***	71.87***	74.12***	73.29***	75.06***	24.67***	71.87***	74.12***	73.29***	75.06***	24.67***	71.87***	74.12***	73.29***	75.06***

Note: N = 88. Standard error reported in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, reference group: “Non-equity” internationalisation, b reference group: “No4 internationalisation”

Table 4: Parameter estimates and results of multinomial logistic model for process innovation

Variable	‘Equity’ versus ‘non-equity’ internationalisation ^a					‘Equity’ versus ‘No’ internationalisation ^b					‘No’ versus ‘Non-equity’ internationalisation ^c				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-0.67 (0.45)	-2.98 (1.96)	-3.39 (2.14)	-4.21 (2.69)	-4.88 (2.98)	-1.62*** (0.40)	-7.19*** (1.95)	-7.65*** (2.14)	-8.62*** (2.83)	-9.30*** (3.15)	0.94*** (0.29)	4.21*** (1.13)	4.26*** (1.13)	4.41*** (1.20)	4.49*** (1.22)
Firm size	-0.36 (0.51)	-1.34 (0.72)	-1.39* (0.81)	-1.15 (0.72)	-1.40* (0.81)	-0.29 (0.47)	-0.85 (0.73)	-1.04 (0.82)	-0.82 (0.72)	-1.03 (0.82)	-0.08 (0.37)	-0.29 (0.43)	-0.35 (0.44)	-0.32 (0.43)	-0.38 (0.44)
Firm age	-0.96* (0.50)	-1.63** (0.73)	-1.89** (0.82)	-1.67** (0.75)	-1.95** (0.86)	-1.31*** (0.41)	-1.51** (0.73)	-1.67** (0.80)	-1.53** (0.74)	-1.70** (0.83)	0.35 (0.39)	-0.12 (0.43)	-0.23 (0.47)	-0.13 (0.41)	-0.25 (0.48)
R&D intensity	0.24 (0.43)	-0.42 (0.65)	-0.37 (0.66)	-0.10 (0.65)	-0.18 (0.67)	1.11*** (0.41)	1.15* (0.62)	1.10* (0.63)	1.09* (0.61)	1.00 (0.63)	-0.86*** (0.30)	-1.07*** (0.41)	-1.17*** (0.41)	-1.18*** (0.41)	-1.18*** (0.41)
Service innovation	0.52 (0.62)	0.35 (0.60)	0.56 (0.63)	0.37 (0.63)	0.37 (0.63)	0.49 (0.60)	0.27 (0.59)	0.56 (0.60)	0.31 (0.60)	0.31 (0.60)	0.78* (0.43)	0.83* (0.44)	0.80* (0.44)	0.86* (0.44)	0.86* (0.44)
Radical innovation	1.45** (0.67)	1.46** (0.68)	1.53** (0.69)	1.55** (0.69)	1.55** (0.69)	0.67 (0.63)	0.63 (0.64)	0.73 (0.64)	0.69 (0.64)	0.69 (0.64)	-0.21 (0.37)	-0.16 (0.38)	-0.24 (0.39)	-0.19 (0.38)	-0.18 (0.39)
Competitive intensity	2.03** (0.82)	2.25** (0.89)	2.25** (0.89)	3.44 (2.85)	4.01 (3.09)	2.34*** (0.82)	2.41*** (0.89)	2.41*** (0.89)	4.68 (2.85)	5.19* (3.09)	-0.21 (0.37)	-0.16 (0.38)	-0.24 (0.39)	-0.19 (0.38)	-0.18 (0.39)
International requirements	0.62 (0.85)	0.74 (0.90)	1.18 (1.14)	1.41 (1.25)	1.41 (1.25)	2.62*** (0.93)	2.80*** (1.06)	3.23** (1.27)	3.58 (1.39)	3.58 (1.39)	-2.00*** (0.64)	-2.07*** (0.64)	-2.08*** (0.68)	-2.17*** (0.70)	-2.17*** (0.70)
Radical innovation x Service Innovation			0.67 (0.62)		0.73 (0.66)			0.46 (0.59)		0.47 (0.61)			0.22 (0.36)		0.27 (0.38)
Competitive intensity x International requirements			-0.68 (1.36)		-0.83 (1.44)				-1.34 (1.38)					0.66 (0.70)	0.66 (0.70)
Pseudo R ² (McFadden)	0.15	0.38	0.39	0.39	0.40	0.15	0.38	0.39	0.39	0.40	0.15	0.38	0.39	0.39	0.40
-2 log-likelihood	121.22	104.02	102.84	102.53	101.25	121.22	104.02	102.84	102.53	101.25	121.22	104.02	102.84	102.53	101.25
χ^2	24.67***	63.85***	65.13***	65.44***	66.72***	24.67***	63.85***	65.13***	65.44***	66.72***	24.67***	63.85***	65.13***	65.44***	66.72***

Note: N = 88. Standard error reported in brackets. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$, reference group: “Non-equity” internationalisation, b reference group: “No” internationalisation

Table 5: Parameter estimates and results of multinomial logistic model for process innovation

Variable	"Equity" versus "non-equity" internationalisation ^a					"Equity" versus "No" internationalisation ^a					"No" versus "Non-equity" internationalisation ^a				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	-0.67 (0.45)	3.12 (2.03)	-5.70* (2.94)	-4.04 (2.60)	-7.07** (3.59)	-1.62** (0.40)	-7.38*** (2.04)	-9.99*** (2.98)	-8.52*** (2.77)	-11.63*** (3.77)	0.94*** (0.29)	4.26*** (1.13)	4.29*** (1.15)	4.45*** (1.21)	4.55*** (1.23)
Firm size	-0.36 (0.51)	-1.31* (0.77)	-2.10** (1.03)	-1.29* (0.76)	-1.99* (1.04)	-0.29 (0.47)	-1.01 (0.78)	-1.82* (1.06)	-0.96 (0.76)	-1.69 (1.04)	-0.08 (0.37)	-0.30 (0.44)	-0.28 (0.43)	-0.33 (0.44)	-0.30 (0.43)
Firm age	-0.96* (0.50)	-1.80** (0.77)	-2.60** (1.04)	-1.83** (0.79)	-2.57** (1.03)	-1.31*** (0.48)	-1.67** (0.76)	-2.49** (1.02)	-1.70** (0.78)	-2.45** (1.02)	0.35 (0.39)	-0.13 (0.44)	-0.11 (0.44)	-0.13 (0.45)	-0.12 (0.45)
R&D intensity	0.24 (0.43)	-0.18 (0.67)	-0.12 (0.74)	-0.24 (0.68)	-0.27 (0.76)	1.11*** (0.41)	0.99 (0.63)	1.12 (0.71)	0.93 (0.63)	0.97 (0.71)	-0.86*** (0.30)	-1.17*** (0.39)	-1.24*** (0.41)	-1.17*** (0.39)	-1.24*** (0.41)
Process innovation		1.04 (0.74)	1.01 (0.81)	1.02 (0.74)	0.88 (0.81)	1.10 (0.73)	1.06 (0.80)	1.10 (0.72)	0.98 (0.78)		-0.02 (0.35)	-0.05 (0.36)	-0.07 (0.36)	-0.10 (0.37)	
Radical innovation		1.83** (0.77)	2.13** (0.92)	1.89** (0.79)	2.14** (0.91)	1.03 (0.74)	1.29 (0.86)	1.08 (0.75)	1.29 (0.85)		0.80* (0.41)	0.84* (0.42)	0.81* (0.42)	0.85* (0.43)	
Competitive intensity		2.05** (0.81)	3.40*** (1.26)	1.99** (1.27)	2.14** (1.30)	2.26*** (0.81)	3.63*** (1.25)	4.41 (2.79)	6.48* (3.40)		-0.21 (0.36)	-0.23 (0.37)	-1.28 (1.19)	-1.32 (1.20)	
International requirements		0.56 (0.86)	1.48 (1.13)	0.99 (1.09)	2.14 (1.44)	2.39*** (0.92)	3.32*** (1.18)	3.69** (1.23)	4.29*** (1.58)		-2.02*** (0.64)	-2.03*** (0.64)	-2.10*** (0.68)	-2.15*** (0.69)	
Radical innovation x Process innovation			1.86** (0.86)	1.90** (0.89)			1.90** (0.87)	1.93** (0.89)				-0.04 (0.33)			
Competitive intensity x International requirements				-0.51 (1.32)	-0.87 (1.57)			-1.19 (1.36)	-1.57 (1.61)				0.68 (0.70)	0.69 (0.70)	
Pseudo R ² (McFadden)	0.15	0.39	0.44	0.40	0.45	0.15	0.39	0.44	0.40	0.45	0.15	0.39	0.44	0.40	0.45
-2 log-likelihood	121.22	102.18	94.63	100.79	93.02	121.22	102.18	94.63	100.79	93.02	121.22	102.18	94.63	100.79	93.02
χ ²	24.67***	65.79***	73.34***	67.18***	74.96***	24.67***	65.79***	73.34***	67.18***	74.96***	24.67***	65.79***	73.34***	67.18***	74.96***

Note: N = 88. Standard error reported in brackets. *** p < 0.01, ** p < 0.05, * p < 0.10

Model 1 in Table 3 shows the results of the multinomial logistic regression for the control variables. Model 2 comprises the entire model that tests the effect of product innovation, radical innovation, competitive intensity and international requirements on firms' internationalisation mode. Model 3 tests the moderation effect of radical innovation and product innovation. Model 4 tests the moderation effect of competitive intensity and international requirements. Finally, Model 5 tests the entire model.

The results show that product innovation significantly influence a firm's preference for equity compared to non-equity internationalisation mode (p < 0.10) and equity compared to no internationalisation (p < 0.05); and no significant influence of firm's preference for no compared to non-equity internationalisation. Radical innovation significantly influence a firm's preference for no compared to non-equity internationalisation mode (p < 0.05). Competitive intensity influences a firm's preference for equity compared to non-equity internationalisation mode (p < 0.05) and equity compared to no internationalisation (p < 0.05). International requirements significantly influence a firm's preference for equity compared to no internationalisation (p < 0.01); and for no compared to non-equity internationalisation (p < 0.01). Neither product and radical innovation nor competitive intensity and international requirements' moderation effects are statistically significant.

4.1.2 Service innovation and internationalisation modes

Parameter estimates for the effect of service innovation on the internationalisation mode (Hypotheses 1-6) is given in Table 4.

The results point to the lack of significance of the service innovation on the preferred internationalisation mode. Radical innovations significantly influence firms' preference for equity compared to non-equity internationalisation mode (p < 0.05) and no compared to non-equity internationalisation mode (p < 0.10). Competitive intensity influences a firm's preference for equity compared to non-equity internationalisation mode (p < 0.05) and equity compared to no internationalisation (p < 0.01). International requirements significantly influence a firm's preference for equity compared to no internationalisation (p < 0.01); and for no internationalisation compared to non-equity internationalisation (p < 0.01). Again, neither service and radical innovation moderation effect nor competitive intensity and international requirement moderation effects are statistically significant.

4.1.3 Process innovation and internationalisation modes

Table 5 illustrates the results of testing of the Hypotheses 1-6 on the effect of the process innovation on the internationalisation mode.

Process innovations do not affect a firm's preferred internationalisation mode. Radical innovations significantly influence a firm's preference for equity versus non-equity internationalisation (p < 0.05) and no compared to non-equity internationalisation mode (p < 0.05). Competitive intensity influences a firm's preference for equity compared to non-equity internationalisation mode (p < 0.05) and equity compared to no internationalisation (p < 0.01). International requirements influence a firm's preference for equity compared to no internationalisation (p < 0.01); and for no compared to non-equity internationalisation (p < 0.01). Herein, the moderation effect of process and radical innovation is statistically significant. Summary of the tested hypotheses is present in Table 6.

Table 6: Summary of hypotheses' tests

	Product innovation	Service innovation	Process innovation
H1	Supported	-	-
H2	Partially supported	Partially supported	Partially supported
H3	-	-	Supported
H4	Supported	Supported	Supported
H5	Supported	Supported	Supported
H6	-	-	-

The results of the hypotheses testing show that only firms with higher levels of product innovation prefer equity internationalisation compared to, either “non-equity” or “no” internationalisation. Neither service nor process innovations significantly influence a firm's preference towards a specific internationalisation mode. If a firm obtains a higher level of product innovation, it will engage in “equity” internationalisation. The lack of support towards service and process innovation preference towards “equity” internationalisation might come from the risk associated with the “equity” internationalisation that is accompanied with higher levels of tacit knowledge. Service or process innovations are bound by the tacit knowledge, while product innovations contain more explicit knowledge. The lack of trust and the lack of knowledge might influence a firm's willingness to share tacit knowledge on the international market.

Hypothesis 2 is partially supported. Namely, firms with more radical product innovations prefer “no” internationalisation over “non-equity” internationalisation. Again, the lack of trust and the ability to tailor products for the specificities of the domestic market might be a reason for this occurrence. The Australian customers might be more sophisticated than the customers of the surrounding Asia-Pacific countries, thereby influencing firms' decisions to place products with radical innovation on the domestic market. Alternatively, the products with radical innovations might be specifically tailored for the Australian market as opposed to the Asia-Pacific markets. Radical innovation in services influences the firms' preferences towards “equity” compared to “non-equity” internationalisation. Radical innovations in processes influence the firms' preferences towards: (a) “no” compared to “non-equity” internationalisation, and (b) “equity” compared to “non-equity” internationalisation. The results enforce the transaction costs approach. Firms want to control the asset specific knowledge in service and process innovation thereby choosing “equity” internationalisation, but if equity internationalisation is not possible, the firms with radical innovation will prefer to do business on the domestic market.

Radical innovation moderates only the relationship between process innovation and firms' preference towards (a) “equity” over “non-equity” internationalisation, and (b) “equity” over “no” internationalisation. The effect is not significant in terms of product and service innovation. Namely, the tacit knowledge inherent in process innovation results in the asset specificity calling for a transaction costs approach.

Perceived competitive intensity influences firms' preference towards (a) “equity” compared to “non-equity” internationalisation, (b) “equity” compared to “no” internationalisation, and (c) “non-equity” compared to “no” internationalisation. Firms perceiving higher competitive intensity are more likely to prioritise “equity” internationalisation over “non-equity” internationalisation, and, lastly, remain in their domestic market. The rationale comes from the need to survive and grow. Firms want to take the lead on the international markets as soon as they perceive they are losing competitive edge on the domestic market and can use higher level of control on the foreign markets to obtain better international position.

Firms that follow the international customer requirements prefer either “equity” or “non-equity” to “no” internationalisation. This relation is significant for all three types of innovation: product, service and process. The rationale is similar as the rationale of competitive intensity and affirms the results of Julian's study (2009).

Lastly, perceived competitive intensity does not moderate the relationship between firms focus on international customer requirements and the preferred internationalisation mode. It was hypothesised that in cases of high competitive intensity, firms will want to focus more on the international customers opposed to the customers on the domestic market, thereby preferring the “equity” internationalisation as the internationalisation mode with a higher level of control of foreign operations with higher levels of asset specificity. This relationship, however, is of the opposite direction and non-significant. We would encourage future research on the topic.

5. THEORETICAL AND PRACTITIONER IMPLICATIONS

The paper followed from the inability of stage models of internationalisation to adequately explain the pattern of internationalisation (Spowart & Wickramasekera, 2009). It studied the effect of product, service and process innovation, radical innovation, competitive intensity and international customer requirements on a firm's internationalisation mode. It employed the transaction costs approach towards firm internationalisation (Williamson, 1975) to examine the differences between different innovation types and internationalisation modes in the Australian telecommunications industry. By exploring the difference between various innovation types, this study revealed that product innovations are the most important predictor when choosing "equity" versus "non-equity" internationalisation. Although this study confirmed R&D intensity as a significant predictor of different internationalisation modes, its additional practical importance comes from examining the effect of competitive intensity and international customer requirements on the internationalisation modes. It adds to the previous literature on the subject of internationalisation modes. Namely, Julian (2009) stated that market attractiveness, access to distribution and adaptation to foreign market needs are the predictors of the "equity" internationalisation. Therefore, the theoretical importance of this study stems from opening new subject of an in-depth research on types of innovation. This paper adds to the innovation and internationalisation literature in exploration of the effect of product, service and process innovation on the internationalisation mode. The practical importance of this study follows from the ability of a firm to respond to the changing market conditions on the other side.

6. LIMITATIONS

This is a cross-sectional study examining one sector. In order to make generalisable recommendations, the research should include multi-sector and longitudinal approaches. Moreover, this is a single country study, and it would be beneficial to study the topic on in multi-country setting. Finally, this study is limited by the survey data and it would be beneficial that future studies incorporate some of the objective variables, such as the secondary data on competitive intensity (e.g. industry concentration coefficients).

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