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UNDERSTANDING INNOVATION ADOPTION: EFFECTS OF ORIENTATION, PRESSURE AND CONTROL ON ADOPTION INTENTIONS

We develop and test a theoretically-based integrative framework of key proximal factors (orientation, pressure and control) that helps to explain the effects of more general factors (the organization's strategy, structure and environment) on intentions to adopt an innovation one year later. Senior managers from 134 organizations were surveyed and confirmatory factor analyses showed that these hypothesized core factors provided a good fit to the data, indicating that our framework can provide a theoretical base to the previous, largely atheoretical, literature. Moreover, in a subgroup of 63 organizations, control mediated the effects of organizational strategy and centralization on organizational innovation adoption intentions one year later. We suggest this model of core factors enables researchers to understand why certain variables are important to organizational innovation adoption and promotes identification of fertile research areas around orientation, pressure and control, and it enables managers to focus on the most proximal triggers for increasing innovation adoption.

Keywords: innovation adoption, orientation, external pressure, perceived control

Organizational innovation adoption has received a lot of attention in the management and innovation fields from a number of different perspectives. Some of these perspectives, such as institutional theory, have a strong theoretical framework guiding the selection and evaluation of predictor variables (e.g., Barley and Kunda, 1992; Cole, 1985). However, others such as the organizational innovativeness approach have produced swathes of literature identifying numerous predictor variables with little of this work drawing upon an overarching theoretical framework (Wolfe, 1994). In this study, we identify and test a theoretically-based integrative framework of factors (orientation, pressure and control) that helps to explain the effects of more general factors (the organization's strategy, structure and environment). We also examine the effects of the predictor variables on intentions to adopt an innovation one year later. In doing so, we hope to contribute both theoretically and empirically to the innovation adoption literature.

Innovation is a widely discussed topic, especially in business, information technology, engineering, and public development contexts. Rogers (2003) defines an innovation as a new idea, practice, or object. From an organizational perspective, the most commonly cited definition of innovation is provided by Zaltman, Duncan and Holbeck (1973: 10), who wrote, "An innovation is an idea, practice, or material artefact perceived to be new by the relevant adoption unit." This is similar to Luecke and Katz (2003), who wrote "Innovation . . . is generally understood as the introduction of a new thing or method . . . Innovation is the embodiment, combination, or synthesis of knowledge in original, relevant, valued new products, processes, or services" (p. 2).

We use these definitions with their overarching premise of an introduction of novelty to the organization; however, following the distinction made by Wolfe (1994), we are

interested in organizational innovativeness (in particular the adoption component of that process) and not the diffusion nor the process of diffusion of innovations (cf. Ansari et al., in press). Furthermore, our aim in this study is to develop an integrative model of innovation adoption that can be applied across innovations. Therefore, in our definition we also wanted to explicitly encompass different innovation types. First, we can categorize the innovation types based on the Oslo manual (OECD, 1997) into three categories: (1) product/service innovation; (2) process innovation and (3) organizational innovation including management practices and strategies. Second, we can also categorise innovation on the basis of its newness or radicalness (Garcia and Calantone, 2002). To summarise, we will be examining the organizational adoption of product, process and organizational innovations that may be incrementally different to the current organizational standing or radically different to the current organizational standing.

What are the predictor variables?

A vast number of predictor variables have been identified within the organizational innovation adoption literature (Wolfe, 1994). Much of this literature has examined the factors separately with no integration across factors (e.g., Rogers, 1995; Tabak and Barr, 1996). Those researchers who have attempted to organize these variables into categories have done so either according to level (e.g., individual, organizational, contextual: Meyer and Goes, 1988; Wejnert, 2002) or descriptive categorization (e.g., perceived benefit, external pressure and organizational readiness: Iacovou, Benbasat & Dexter, 1995; or motivational readiness, institutional resources, staff attributes and organizational climate: Lehman, Greener & Simpson, 2002), rather than underlying theory. Indeed, one of the most widely-cited of these pieces of research explicitly state their atheoretical examination of

innovation adoption (Kimberly and Evanisko, 1981). Although these piecemeal studies and atheoretical categorizations have contributed to our knowledge of organizational innovation adoption, they do not allow us to understand why the factors are important. An overarching theoretical framework would provide a deeper understanding of adoption, promote the integration of research findings into a reasoned set of strategies to guide practitioners, and most importantly, lead to the generation of new research questions for future research to address.

We approached this need for an overarching theoretical framework by initially reviewing the extant literature on organizational-level innovation adoption (as outlined in Table 1 and discussed below). While some research had categorized the previous literature in terms of levels (e.g., Frambach and Schillewaert, 2002; Meyer and Goes, 1988), we wanted a more explanatory categorization framework. Thus, we began our literature review by using each of the current descriptive categorizations (Iacovou et al., 1995; Lehman et al., 2002) to see if they could explain all of the previous literature; however, for each of them there were research findings that could not be incorporated. Given this, we then took an inductive approach to identifying a possible underlying categorization. For each piece of research in our literature review we used key words to capture the main concepts in the study (see "Specific Concepts" in Table 1). Once these key concepts were identified we then grouped them with other similar concepts (see "Concepts" in Table 1). In doing so, we found that categories emerged that were analogous to the Theory of Planned Behavior (TPB: Ajzen, 1985; Ajzen, 1991) and the Technology Acceptance Model (TAM: Davis, 1989).

The TPB is a social psychological model aimed at understanding the link between attitudes and behavior and posits that a person's intention to perform a behavior is the

immediate antecedent of that behavior. Intention, in turn, is predicted by three factors: 1) attitudes; 2) subjective norms; and 3) perceived behavioral control. Attitudes refer to an individual's overall positive or negative evaluation of the behavior and are based on beliefs about the perceived outcomes of the behavior and the perceived valence of these outcomes. Subjective norm refers to the individual's perception of whether significant others would want him/her to engage in the behavior based on the individual's beliefs about what each significant other wants and the individual's motivation to comply with that referent. Finally, perceived behavioral control refers to the amount of control that the person feels they have over performing the behavior (i.e., its perceived ease or difficulty). Perceived behavioral control is based on beliefs about the extent to which certain factors may facilitate or hinder the behavior and the frequency with which such factors may be encountered.

Table 1 about here

Although it has never before been related to organizational innovation adoption, aspects of the TPB can be seen in early adoption research (Ostlund, 1974; Rogers, 1983; Rogers, 1995; Rogers, 2003). This work suggested that perceived innovation attributes (e.g., relative advantage, complexity and perceived risk) was related to an individual's willingness to adopt an innovation; these attributes are very similar to the attitudinal component of the TPB. Furthermore, and building on the innovation attributes model, the TPB has been applied at the individual level in the form of the Technology Acceptance Model (TAM: Davis, 1989). The TAM and its more recent extensions (TAM2 and TAM3; Venkatesh and Davis, 2000; Venkatesh and Bala, 2008) examine individual-level adoption, that is an individual's intentions to use an innovation that has been implemented across the organization (e.g., a new computer system). More specifically, these models have examined

the behaviour of individual-level technology adoption and the role that attitudes, subjective norms and perceived behavioural control play in intentions to adopt new technology (e.g., Davis, Bagozzi, & Warshaw, 1989; Schepers & Wetzels, 2007; Schillewaert, Ahearne, Frambach, & Moenaert, 2005). They suggest that intentions to adopt technology are influenced by the perceived usefulness, perceived ease of use, and subjective norms of that technology, and that these in turn are affected by the job relevance, status implications, output quality and demonstrability, self-efficacy, external control, computer anxiety, computer playfulness and enjoyment of the new technology (Venkatesh and Bala, 2008).

To our knowledge, all workplace applications of the TPB, including TAM, have been at the level of the individual. We propose, instead, that there is an analogous form of the TPB that can be applied at the level of the organization, predicting the organizational-level outcome of innovation adoption. We recognize that by proposing an analogous organizational-level form of the TPB, we bring into question a number of concerns about levels of analysis. Following Chan (1998), we propose a process composition model whereby there is an analogous form of the individual-level processes at the organizational-level. Chan (1998) suggests that a researcher proposing a process composition model needs to ensure "that all critical parameters and parameter interrelationships are adequately operationalized at both the lower and higher levels and that each parameter interrelationship at the lower level has a counterpart at the higher level" (p.241). We believe that our hypothesized model meets these criteria in that there are constructs that have already been proposed at the organizational-level which correspond to those within the TPB and which have been shown to affect innovation adoption. For instance, at the organizational-level, organizational climate (e.g., Litwin & Stringer, 1968) is analogous to attitudes as both

consider enduring perceptions of a particular aspect of the world (Krech and Crutchfield, 1948; Reichers and Schneider, 1990). Similarly, external pressure (Mehrtens et al., 2001) is analogous to individual-level subjective norms as both are concerned with the pressure brought to bear on the referent (either the individual or the organization) by valued outside parties. Finally, we suggest that constructs such as organizational capabilities (e.g., Bates & Flynn, 1995) are analogous to individual-level control as both provide the referent with an easier course of action in implementing the intention. Nevertheless, the novelty of our proposition means that we need both a theoretical link between the extant literature and our suggested higher-order factors, and an exploratory empirical test of the higher-order factor structure.

Should our hypotheses for a theoretical higher-order factor structure be supported then we will be able to more precisely explain organizational innovation adoption. Rather than having a long list of predictor variables that have no underlying reason for being related to organizational innovation adoption, we will be able to bring order to the literature and highlight the key causes of the organizational behavior.

An Integrative Model of Predictor Variables

We therefore propose that factors analogous to those within the TPB at the individual-level may act as proximal higher-order variables affecting organizational-level innovation adoption. In particular we suggest that the variables identified in the current literature are representative of: 1) an organisation's orientation to innovation (i.e., attitude), 2) stakeholder pressure to innovate (i.e., subjective norms), and 3) an organisation's control over innovation adoption (i.e., perceived behavioural control). In other words, we propose that these three proximal factors are common core constructs that are able to represent the

majority of the variables that have been identified in the organizational innovation adoption literature. Nonetheless, we believe that there will be a number of other factors which are determinants of these key proximal factors and that these are more general factors that affect organizational innovation adoption via orientation to innovation, stakeholder pressure to innovate, and organizational control over innovation.

We now provide a review of the literature identifying the conceptual overlaps between the extant variables and our proposed analogous model: first examining the possible higher-order presence of orientation, pressure and control, and second examining support for possible mediating relationships. Table 1 details the full range of papers examined in our review.

We suggest that an organisation's orientation towards innovation adoption has been manifested in a number of forms within the innovation adoption literature. Most explicit is the meta-analytic finding by Damanpour (1991) that senior managers' attitudes towards the innovation were significantly related to organizational innovation adoption. Attitudes towards risk-taking within the organization have also been related to innovation adoption (e.g. Damanpour, 1991; Nystrom et al., 2002), and, because innovation adoption is inherently risky, may be seen as a component of the orientation towards adoption. Finally, the perceived benefits of adoption are also proposed to be manifestations of the orientation towards innovation adoption; such benefits have been found to be related to innovation adoption of information technology (Min and Galle, 2003; Mehrtens et al., 2001).

Second, the pressure exerted by stakeholders to adopt innovations has also been highlighted previously. In previous research, the norms that have been studied have typically come from customers and suppliers (Iacovou et al., 1995), competitors (Min and

Galle, 2003), and government departments (Drazin and Schoonhoven, 1996). As these stakeholders are likely to be considered significant to the organization, we propose that they are representative of pressure.

Perhaps the most widely-studied category of factors, however, is that of control. Control over adoption is defined as the ease (or difficulty) of adopting an innovation; when the process is easy, then the organizational decision-makers feel as though they have control and therefore will be more likely to adopt an innovation. We suggest that factors such as financial resources (Bates and Flynn, 1995) and organizational readiness, including knowledge, technical, and staff readiness (Snyder-Halpern, 2001; Iacovou et al., 1995; Lehman et al., 2002), all act as indicators of ease of adoption. In other words, when an organization has the required resources and readiness to adopt, it will have greater control over adoption.

A meta-analysis testing our propositions is not possible given that much of the previous research has been qualitative case studies. Our hypotheses, therefore, will be tested through confirmatory factor analyses in which an overall orientation latent factor, an overall pressure factor and an overall control latent factor load onto variables that are currently identified in the organizational innovation adoption literature. Figure 1 outlines this hypothesized model. However, to ensure that this model is the most appropriate, three theoretically-plausible alternative models are also specified. The first of these is a nested first-order model where all variables are independent and represents the way in which these variables are usually presented within the literature – that is, that there is no common, higher-order structure. The second and third alternative models are both second-order models (i.e., that there is a higher-order structure): comparisons will be made with a second-

order one-factor model where only one factor loads onto all variables (that is, that the extant variables all represent an underlying "innovativeness" construct), and a second-order two-factor model where orientation and control variables load onto one construct and subjective norms load onto the other. Therefore, we hypothesize that:

Hypothesis 1: The second-order, three-factor CFA model will provide a significantly better fit to the data than a nested traditional first-order model, a second-order, one-factor model, or a second-order two-factor model for all innovation types (product, process & technological innovation).

Hypothesis 1a: An orientation latent factor will load onto attitudes towards innovation adoption, risk-taking culture, and experienced benefits from adopting innovations.

Hypothesis 1b: A pressure latent factor will load onto norms to adopt innovations from suppliers, customers, competitors, government departments, professional organizations and universities.

Hypothesis 1c: A control latent factor will load onto financial resources, knowledge and technical readiness, human resources readiness, and perceived innovation control.

Figure 1 about here

This model represents a model of key predictors of organizational innovation adoption and suggests that orientation, external pressure, and control factors are the primary influences underpinning adoption. However, we do not suggest that these are the *only*

factors affecting innovation adoption (e.g., Venkatesh and Bala, 2008). Indeed, we recognise that there may be many other variables that are influential but we propose that the effects of these more general variables are mediated by orientation, pressure and control.

The most notable factor emerging from our review is organizational strategy. Previous research has identified proactive strategy as one which constantly seeks new opportunities and product development (e.g., Venkatraman, 1989; Miles et al., 1978) and therefore, we suggest that there is a congruence between a proactive strategy and innovation adoption. The organisational innovation adoption literature suggests that organisational strategy influences innovation adoption (Miles et al., 1978; e.g., Han et al., 1998; Srinivasan et al., 2002; Miller and Friesen, 1982), and in particular, firms which have proactive, entrepreneurial strategies are more likely to adopt innovations than firms which have more conservative and defensive strategies (Srinivasan et al., 2002). Thus, a proactive strategy increases the relevance of innovation adoption creating a relationship between the organisation's strategy and its orientation towards an innovation: we suggest, therefore, that orientation mediates the relationship between proactive strategy and intentions to adopt an innovation.

However, the strategy of an organisation will also affect the internal processes, resources, and capabilities of an organisation. Thus, it is likely that an organisation with a proactive strategy will be more likely to make resources available for innovation and will have greater technological and knowledge readiness than one with a less proactive orientation. In other words, we propose that a proactive strategy will be positively related to control over innovation adoption as well as orientation to adopt innovations. We believe that these two proximal variables (orientation and control) will account for all of the variance

within the relationship between proactive strategy and innovation adoption and that they will fully mediate this relationship.

Hypothesis 2: Proactive strategy will be positively related to: a) an organization's orientation; and b) control over adoption. Orientation to adopt and control over adoption will mediate the relationship between proactive strategy and intentions to adopt.

Second, as early as 1965, it was suggested that centralization would decrease creativity and innovation due to high levels of parochialism and a lack of support (both material and psychological) for change (Thompson, 1965). Indeed, centralization has consistently been found to have a negative relationship with innovation adoption (e.g., Kimberly and Evanisko, 1981) and Damanpour's (1991) meta-analysis found that all 31 correlations identified in the literature were significant and negative with the corrected correlation at -.16. We suggest that centralization affects innovation adoption via its effects on control. In other words, at low levels of centralization, power is distributed throughout the organization so there is likely to be an overall greater level of control over innovation adoption across the organisation; at higher levels of centralization, power is held in only a few positions and therefore efficacy across the whole organisation would be lower.

Hypothesis 3: Centralization will be negatively related to control over innovation adoption; control over innovation adoption will mediate the relationship between centralization and intentions to adopt.

Finally, to test whether our analogous form of subjective norms can also mediate the effects of more general factors, we examined the rate at which an industry adopts

innovations. The rate at which an industry adopts innovations will likely increase the pressure to adopt via networking forces, which we believe will increase the perceived pressure to adopt (e.g., Burt, 1987). Therefore, we hypothesize:

Hypothesis 4: Industry rate of adoption will be positively related to pressure to adopt innovations; pressure will mediate the relationship between industry rate of adoption and intentions to adopt.

Thus, this study contributes to the literature by providing and testing an overarching theoretical framework to understand organizational level innovation adoption and by testing whether or not this new framework can account for the effects of more general factors such as organizational strategy and structure. Furthermore, rather than relying on retrospective data collection (e.g., "How many innovations have you adopted over the last few years?"), we measure the predictor variables in one questionnaire, and then one year later ask a sub-sample of these organizations whether they are actually considering adopting an innovation or not. Although we are not able to claim causality, nor address the dynamic processes that may occur on a more regular basis, nor eliminate common method variance amongst the predictor variables, using this method does allow us to minimize common method variance and biases affecting the predictors and the innovation adoption variable and to look at prospective adoption rather than retrospective adoption. We test our hypotheses in two stages. First, using our larger sample of 134 organizational responses, we test the validity of the proposed framework by comparing three alternative confirmatory factor analyses. Second, using a subsample of 63 organizational responses, we then examine whether these

three variables are able to mediate the relationships between strategy, structure and industry rate of adoption on innovation adoption intentions one year later.

METHOD

Sample and Procedure

Multiple sources were used to generate the initial list of sample organizations. First, the enquiries database from a large technology diffusion and training agency provided contact details of predominantly small to medium manufacturing companies. To broaden the sample and to reduce any sampling biases associated with the agency database, the Australian Business Register databases were also used. The names and addresses of the organizations were checked by a research assistant to remove as many as possible those who had moved or gone out of business. The final list comprised contact details for 864 organizations along the east coast of Australia.

At time one, the survey was sent to the Managing Director of all 864 organizations. Thirty-three questionnaires were unable to be delivered. A reminder was sent to those who had not returned their survey a fortnight later. In total, we received responses from senior managers of 134 organizations (16.1% response rate) that are able to be used in the confirmatory factor analyses. Using the Australian and New Zealand Standard Industrial Classification codes, the majority of respondents were in the manufacturing industry (55%); however, 7.5% came from the automotive industry and 6% were design consultants. Most of the companies that responded were small – 33% had fewer than 20 employees, 29% had between 20 and 50 employees, and 16% had between 51 and 100 employees. As might be

expected from these numbers, 45% of companies surveyed had less than $5M gross revenue for 2003-04.

The second survey a year later was conducted with a senior manager via the telephone. A selection of 560 organizations from the original database was telephoned. Of those, 67 were the wrong number or disconnected and 43 did not answer the phone. Forty-one respondents asked to be sent the electronic version but did not complete it and 184 were not interested in participating. Thus, we have responses from 225 organizations (50% response rate), the majority of which were in the manufacturing industry (58%), were small to medium enterprises (less than 20 employees – 33%; 20-50 employees – 27%; 51-100 employees – 19%), and had less than $5M gross revenue in 2003-04 (49%).

Sixty-three companies completed both the first (main) survey and the second survey one year later. A comparison was made between those who completed the first and second surveys with those who only completed the first survey and those who only completed the second survey. There were no differences on demographic variables [organizational size (χ^2 = 1.77 (6), *ns*; revenue (χ^2 = 3.53 (10), *ns*], or industry type [χ^2 = 8.96 (6), *ns*)], predictor variables [attitude towards innovation (F =1.99 (1,110), *ns*), risk-taking (F =1.44 (1,128), *ns*), innovation experiences (F = 7.02 (1,123), *ns*), financial resources (F = 0.29 (1,128), *ns*), technical readiness (F = 0.78 (1,126), *ns*), HR readiness (F = 1.06 (1, 126), *ns*), implementation efficacy (F = 1.41 (1, 109), *ns*), or subjective norms (F = 0.58, (1, 123), *ns*)], or a retrospective innovation adoption variable [F = 2.24, (1, 127) *ns*].

Measures

The measures used in the survey were either previously validated scales or developed for this study. Due to the large number of qualitative studies within the

innovation adoption literature, there were a number of variables identified within the literature that did not have previously developed scales. In these instances, we used theory to create items. Furthermore, as we needed to test the capability of the integrative framework to account for previous findings we used constructs that have previously been identified in the literature. This meant that general measures of orientation, pressure and control were used rather than measures specific to a particular innovation. Pilot testing was conducted with five experts with management and psychology expertise and 15 non-experts to ensure coherence and comprehensibility. To reduce the length of the questionnaire, some previously validated scales had to be shortened. In these instances, items were chosen based on the factor loadings reported in the literature. Unless otherwise mentioned, all items were measured on a five-point response scale ranging from "Not at all" to "A great deal".

Orientation Towards Innovation Adoption

Risk-taking culture was measured by a four-item factor taken from Litwin and Stringer (1968). An example item is "The philosophy of our management is that in the long run we get ahead playing it slow, safe and sure."

Experiences of innovation benefits indicate an organization's realization of the intended benefits of previously-adopted innovations. Based on Totterdell, Leach, Birdi, Clegg and Wall (2002), respondents were asked, "In general, what effect have the innovations that you adopted in the last five years had" on 19 dimensions covering financial benefits (e.g., cost effectiveness and financial performance), customer benefits (e.g., customer satisfaction and customer responsiveness), and employee benefits (e.g., management-employee relation and employee morale).

Attitudes towards innovation adoption was defined as an organizations' overall evaluation of innovation. Items for this scale were constructed in line with current guidelines for the measurement of TPB variables (Ajzen, 1998; Conner and Sparks, 2005). Respondents were asked how their organization viewed innovation adoption using five semantic differential scales: dislike-like, a bad idea-a good idea, negative-positive, worthless-valuable, bad-good. The scale ranged from -3 to +3.

Pressure

This measure examined the perceived pressure from customers, suppliers, competitors, government departments, technology diffusion agencies, and universities to engage or not to engage in innovation adoption. Previous research concerned with external pressure has been primarily theoretical or qualitative. As such, we had to develop quantitative measures for this study. Subjective norms for innovation were comprised of two elements – the degree to which the external stakeholder supports innovation adoption, and the degree to which the organization values the opinion of that stakeholder. Therefore, there were two sets of questions and these items were constructed on the basis of current guidelines for the measurement of TPB variables (Conner and Sparks, 2005; Ajzen, 1998). The first set asked, "To what extent do you believe that [the external stakeholder] <u>think you should introduce</u> innovations into your organization?" (underline included in the survey), while the second asked "To what extent do you <u>value the opinions</u> of [the external stakeholder] in relation to introducing innovation in your organization," (underline included in the survey). The two sets of items were then multiplied for each stakeholder to obtain measures of perceived pressure from each type of stakeholder.

Control over Innovation Adoption

Financial resource availability refers to the financial allocation within the company. The four items used were selected from the original 7-item scale (Klein et al., 2001) based on the factor analysis scores. Sample items were "Money is readily available to pay for special projects in the organization" and "This organization can't afford to spend money on anything but essentials" (reverse-scored).

The *human resources readiness* scale was adopted from the original 4-item scale (Nystrom et al., 2002). The two items included in this study were the availability of skilled labour resources and managerial talent. An example item is "There is usually abundant availability of required labour skills within our organizations for introducing innovation." The other two original items were related to financial resource availability and were similar to the Klein et.al. (2001) measure already included in the study.

Technical and knowledge readiness measured the degree to which organizations possessed existing knowledge and technologies to support any new innovation. Nine questions were adapted from Iacavou et al. (1995) organizational readiness framework, which included perceptions about adequacy of innovative knowledge, technical knowledge, and availability of hardware and software (e.g., "We have existing hardware and software to support innovation.").

Perceived innovation control refers to perceptions of confidence that the organization is capable of adopting innovations. Based on the TPB (Ajzen, 1991), we developed three items to measure the likelihood that the organization was capable of adopting innovations. These items were: "I expect that any innovations we introduce would be successful"; "I am confident that innovation would be successful in this organization" and "We have successfully introduced innovations in the past".

General Factors

Proactive strategy was measured by four items from the strategy of business enterprises measure (Venkatraman, 1989). The preface to the items was 'Relative to other organisations in your industry, to what extent does your organisation emphasise' and an example item is "Being the first ones to introduce new products or services to the market". The internal consistency of this scale was 0.83.

Two items from Hage and Aitken's (1967) organizational structure scale were used to measure *centralization*: "The organisation is highly de-centralized and participatory, encouraging many organisational members to be involved in decision making" and "The organisation is highly centralized and decision making is primarily the responsibility of senior management" (reverse-scored). The internal reliability of the scale was satisfactory ($\alpha = .71$).

Industry rate of adoption was measured by an item asking the respondents "What is the rate of innovation adoption in your industry?" again with a 5-point response scale ranging from "None" to "Very fast".

Intentions to Adopt

One year after the first survey was conducted we asked participants "Are you considering adopting an innovation in the coming year?" In order to increase our response rate, we wanted a very simple question with a very simple initial answer (foot in the door technique; Freedman and Fraser, 1966): as such the response was recorded as yes/no. Once we gained this initial compliance, to increase the validity of the response we asked the

respondent a series of questions about the innovation such as the name of the innovation, the category to which it belonged, and the confidence they had that they would be adopting it.

Control Variables

Industry type: Because close to half of the participating organizations belonged to the manufacturing industry, a dummy variable for manufacturing was created.

Radicalness of adopted innovations: The respondents were asked "To what extent were these innovations radically different from what the organization had or did before?" The scale ranged from 1 (not at all) to 5 (a great deal).

RESULTS

A quick examination of the descriptive components of the survey shows that the innovation intentions covered a variety of innovation types including new processes and work design systems (35.9%), new products (26.1%), new administrative systems (14.1%) and new manufacturing technology (7.0%). Furthermore, we are able to ascertain that most organizational respondents were in an environment in which new technology arose moderately quickly (M = 3.49) and in which there was a high level of competition (M = 3.91).

The first aim of our study was to evaluate the potential of the overarching integrative framework for innovation adoption; that latent factors of orientation, pressure and control would load onto variables traditionally found in the literature. The second set of analyses used the smaller, lagged sample and tested the hypotheses that the proximal factors of orientation, pressure and control would mediate the effects of strategy, centralization, and industry rate of adoption on intentions to adopt innovation.

Modeling Latent Factors of Orientation, Pressure and Control

Using the larger sample of 134 organizational responses, initial congeneric models showed that four items did not load onto their hypothesized scale or cross-loaded to other factors: "Introducing innovation is bad/good" (general attitude scale); "Our organization is performing well relative to our competitors" (financial resources scale), "Decision-making here is too cautious for maximum effectiveness" (reverse-scored for risk-taking culture scale) and "We have previous experiences with soft, managerial innovations" (technical and knowledge readiness scale). Thus we removed these items from the remaining analyses.

The hypothesized second-order model had a good fit to the data (χ^2 = 560.40, df = 450, p<.05; RMSEA=.04 (CI=.03-.06); CFI = .93) and as outlined in detail below, the standardized regression weights were all significant as hypothesized. The composite reliabilities for the second-order factors were all high (.91, .86 and .95 for orientation, external pressure and control, respectively), indicating high convergent validity (Fornell and Larcker, 1981). The average variances extracted were .45 for orientation towards innovation, .48 for external pressure and .53 for control. The average variance extracted for orientation was, therefore, slightly below that recommended by Fornell and Larcker (1981) to provide strong evidence for discriminant validity. Therefore, we compared this model with a second-order, one-factor model in which all variables loaded onto a general "innovativeness" factor and a second-order two-factor model in which attitude and efficacy variables loading onto one factor. These models also had reasonable fits to the data (χ^2 = 576.46, df = 456, p<.05; RMSEA=.05 (CI=.03-.06); CFI=.92; χ^2 = 573.00, df = 454, p<.05; RMSEA=.05 (CI=.03-.06); CFI=.92; respectively), but the difference in the chi-squares obtained was significant for both, thus indicating that the inclusion of additional latent

factors significantly increased the goodness of fit ($\chi^2_{difference}$ = 16.06, df = 6, p<.05; $\chi^2_{difference}$ = 12.60, df = 4, p<.05) providing support for the discriminant validity of the three factors.

Finally, the traditional approach to predicting innovation adoption (a first-order model of independent variables) was tested. Because HR readiness consisted of only two items, it was unable to be identified. Therefore, we used the factor regression weights obtained from the hypothesized model (the best-fitting model) to fix the item regression weights. The fit to the data of this nested first-order model was poor (χ^2 = 696.29, df = 451, p<.05; RMSEA=.07 (CI=.06-.08); CFI=.84), particularly in comparison to the hypothesized second-order, three-factor model ($\chi^2_{difference}$ = 135.89, df = 4, p<.05). Therefore, the hypothesized model was the best-fitting model of those tested. The standardized regression weights for this hypothesized model are presented in Table 2.

When examining the standardized regression weights in the hypothesized model, we found that, as hypothesized, risk-taking (β = .47, p<.05), general attitude towards innovation (β = .54, p<.05), and previous experiences with innovation (β = .88, p<.05) were all significantly related to the second-order latent orientation towards adoption factor. Also as hypothesized, perceived pressure from competitors (β = .47, p<.05), technology diffusion agencies (β = .85, p<.05), professional industry bodies (β = .86, p<.05), government departments (β = .86, p<.05), suppliers (β = .44, p<.05), customers (β = .38, p<.05), and universities (β = .83, p<.05) were all significantly related to the latent pressure factor. Finally, financial resources (β = .47, p<.05), organizational efficacy (β = .59, p<.05), knowledge and technical readiness (β = .83, p<.05), and HR readiness (β = .72, p<.05) were all significantly related to the second-order latent control factor. In line with social psychological research (see Armitage & Conner, 2001), there were significant correlations

between the latent orientation and control factors (r = .64, $p<.05$), the latent pressure and control factors (r = .38, $p<.05$), and the latent orientation and pressure factors (r = .30, $p<.05$). These findings therefore provide support for Hypothesis 1a, b, and c.

Although we proposed that the integrative model would apply to all forms of innovation adoption, we checked the robustness of the hypothesized model fit across different types of innovation. As expected, the fit of the hypothesized model was similar for organizations that had adopted product innovations ($\chi^2 = 557.40$, df = 450, p<.05, RMSEA=.04 (CI=.03-.05), CFI=.94), process innovations ($\chi^2 = 571.40$, df = 450, p<.05, RMSEA=.05 (CI=.04-.06), CFI=.90), and technological innovations ($\chi^2 = 579.82$, df = 450, p<.05, RMSEA=.05 (CI=.04-.06), CFI=.89). The pattern of standardized regression weights for the different innovation adoption types was also similar (due to space limitations, these regression weights are available from the first author). Therefore, we suggest that the mapping of the variables onto the proposed framework holds across organizations adopting different types of innovation and that hypothesis 1 is supported.

Tables 2 and 3 about here

On the basis of the CFA, we calculated composite variables for an organization's orientation towards innovation, pressure to adopt innovations, and control over adoption. The means, standard deviations, composite reliabilities and correlations of these composite variables together with the other key variables of interest are presented in Table 3.

The second stage of the analysis used the smaller sample of 63 organizational responses across the time two points and tested the ability of orientation, pressure and control variables to mediate the relationships between organizational strategy, structure and

industry rate of adoption on innovation adoption intentions. To examine these mediating effects, we first regressed the general factors (and the manufacturing industry control) onto their hypothesised mediating factors (Baron and Kenny, 1986). As hypothesised, proactive strategy was positively related to orientation towards innovation adoption ($\beta = .24$, $p<.05$; $R^2 = .07$; $F(2, 108) = 4.24$, $p<.05$), proactive strategy and centralization were both significantly related to control over innovation adoption ($\beta = .43$ and $\beta = -.17$, $p<.05$, respectively; $R^2 = .22$; $F(3, 108) = 10.20$, $p<.05$), and the rate of industry adoption was positively related to pressure ($\beta = .31$, $p<.05$; $R^2 = .11$; $F(2,109) = 6.72$, $p<.05$).

Next, a logistic regression with proactive strategy, centralization, industry rate of adoption and the manufacturing dummy variable regressed onto intentions to adopt was conducted and found to be significant overall ($\chi^2 = 8.1$; log-likelihood = 49.61; Cox & Snell Pseudo-$R^2 = .14$). However, only centralization had a significant contribution to the overall model (B = -.77; SE = .41; $p<.05$). When orientation, pressure and control were also included in the regression equation, the overall model remained significant ($\chi^2 = 16.38$; log-likelihood = 49.61; Cox & Snell Pseudo-$R^2 = .14$), however centralization was no longer significant (B = -.71; SE = .53; ns), indicating full mediation and full support for hypothesis 3.

Nevertheless, of the three proposed mediating variables, control was the only one to attain true significance (B = .87; SE = .40; $p<.05$); pressure was not significantly associated with innovation intentions a year later after controlling for the other variables (B = .07; SE = .12; ns); and the relationship between orientation and innovation intentions a year later was only marginally significant (B = .15; SE = .08; $p = .07$). Therefore, hypothesis 4 regarding

the mediating effect of pressure on intentions to adopt was not supported nor was hypothesis 2a regarding the mediating effect of orientation.

Given the lack of support for orientation as a mediating variable, we examined the alternative hypothesis that proactive strategy may in fact by the more proximal indicator – in other words, that orientation is driving the organizational strategy. However, examining the loadings from the previous analyses showed that proactive strategy was not significantly related to innovation intentions one year later (B = -.26; SE = .56; n.s.) thus eliminating it as a possible mediator.

To more fully examine hypothesis 2b, we investigated the significance of the indirect effect of strategy on intentions to adopt innovation via control. Both the Sobel test and the Goodman test produced statistics that just reached significance (1.92 and 1.97, respectively, p = .05) thereby indicating partial support for hypothesis 2a and an indirect effect of strategy on intentions to adopt via control over adoption.

DISCUSSION

In this paper, we examined the effects of predictor variables on intentions to adopt an innovation assessed one year later. In doing so, we integrated the organizational innovation adoption research and found support for our theorised model. In contrast to previous approaches, we used robust theory to provide an overarching theoretical framework for categorising variables within the extant innovation adoption literature. Not only did we find that the proposed overall constructs accounted for many of the variables previously identified in the literature, we also found that one of these proximal latent factors mediated the effects of more general factors on adoption intentions one year later. Our research allows us to understand why certain specific factors are important in predicting innovation

adoption. Furthermore, by identifying these three higher-order variables of orientation, pressure and control we are able to pinpoint future research that might prove fruitful in our understanding of successful innovation adoption.

More specifically, we found that an orientation towards innovation adoption loaded significantly on to risk-taking culture, previous innovation experiences, and general attitudes towards innovation, overall pressure loaded onto pressure from suppliers, customers, competitors, technology diffusion agencies, government departments, professional associations and universities, while control over innovation adoption loaded significantly on to financial resources, organizational readiness (staff, technology, knowledge) and perceived innovation control. Moreover, the comparative analyses suggested that this second-order model was the best-fitting model of those examined. Our understanding of innovation adoption, therefore, is improved by the identification of these latent factors that integrate the diverse variables.

Our research indicated that an organization's control over innovation adoption mediated the effects of centralization and proactive strategy on adoption intentions one year later. In other words, an organization that distributes decision-making responsibility reduces the difficulties associated with innovation adoption thereby increasing the chances of adopting an innovation. Furthermore, an organization with a proactive strategy may be more likely to have positive attitudes towards innovation adoption and is likely to perceive adoption as more controllable than one without a proactive strategy; again, these conditions are then associated with innovation adoption intentions. These findings are important because they allow us to understand the mechanisms through which these more general factors affect adoption intentions.

Surprisingly, the overall orientation and pressure factors were not significantly related to innovation adoption in the logistic regression analyses. This may be due to the use of existing theory and measures, in that they measured indicators of an organization's general orientation towards innovation adoption and indicators of its general pressure, rather than specific orientation and pressure related to the particular innovation under consideration (Ajzen, 2001). On the other hand, this may represent a true null finding such that control is simply a much stronger predictor of innovation adoption than either orientation or pressure. Given that adopting an innovation is a complex process that involves overcoming many obstacles, it seems appropriate that perceived control has the strongest relationships. Now that our initial research has provided support for the model, future research can develop alternative measures to further understand these anomalies.

Overall, however, our findings lend weight to the proposed integrative model and, thus, its theoretical and practical implications. This, therefore, suggests that the foundations of organizational-level innovation adoption are based on orientation towards innovation adoption, pressure to adopt and perceived control over adoption, and that control factors are the most important for predicting innovation adoption. Given the relatively atheoretical nature of the innovation adoption literature to date, this is a key finding.

Furthermore, there are many potential theoretical threads leading from the proposed model for future research. For instance, Ajzen (1988) states that actual control moderates the relationship between intentions and behaviour; it may be that while many organizations have an intention to adopt an innovation they do not do so due to resourcing or other control issues. In previous innovation adoption research, control has simply been used as a main

effect; however, given the initial support for our model we suggest that it will be worthwhile examining this potential moderating effect of actual control.

Digging deeper into the role of control within the TPB also allows us to identify a number of other possible propositions for organizational innovation adoption research. For example, in the original TPB, Ajzen (1991) proposed that perceived control provides the individual with a feeling of self-efficacy that then influences behaviour via perseverance. In applying this reasoning to organizational innovation adoption, we suggest that those organizations with greater control over adoption will be more likely to persevere in the face of obstacles than those who do not believe they have resources or readiness. Furthermore, perceived control is also likely to be related to actual control; however, this relationship will depend upon the amount and accuracy of the information about the behaviour, and the stability of requirements and resources (Ajzen, 1991). Therefore, we can hypothesise that studies examining perceptions of the organization's current level of resources/readiness will show a stronger link to actual adoption behaviour when those organizations have accurate information about these factors. Conversely, when the respondents in the studies have less accurate information or the resources are much less stable, the link between resources and adoption behaviour will be weak.

Moreover, the importance of control to adoption behaviour will change according to the degree of actual control held by the organization (Ajzen, 1991). That is, when the organization has little volitional control over the adoption of the innovation (such as a relatively untested technology) then resources and readiness will be more important to adoption behaviour. When the organization has a lot of control over the adoption of the innovation (such as an in-house development) then resources and readiness will be less

important. Armitage and Conner (2001) suggest that the importance of control will also change depending upon the degree to which attitudes or subjective norm are strong; in situations where there are very strong attitudes or normative influences for adopting innovation then perceived control is less likely to have an effect on adoption behaviour.

We can also identify a number of practical implications from our research. First, our research helps to distil the key factors involved in increasing innovation adoption. This integration not only helps the academic community in our understanding of innovation adoption, it also helps organizations and practitioners decide upon the key strategies for improvement. In the past, the litany of variables affecting organizational innovation adoption meant that it was difficult to decide upon the best methods for increasing innovation. Our research, showing general support for the proposed model, indicates that orientation, pressure and control can account for the large number of variables previously identified. Examining each of these constructs in more detail then gives us some ideas regarding practical implications. We propose that orientation is akin to an organizational-level attitude variable. In other words, increasing the perception that the innovation is "a good idea" across the organization is likely to be related to greater levels of innovation adoption. Building on the work by Howell and Higgins (1990b; 1990a) we suggest that champions could be used to increase the organization's orientation towards innovation adoption. Our findings regarding external pressure suggest that it is not enough for external agents, such as technology diffusion agencies, universities or government departments, to promote innovation adoption – these agencies must also be valued by the organization. As such, we suggest that these agencies need to actively build relationships with organizations and continually show their relevance and value.

Our results suggest that perhaps the most important way of increasing organizational innovation adoption is to improve the perceived control over innovation adoption. We also suggest though that it is not simply the objective resources that a company holds that are conducive to organizational-level innovation adoption, but the perception that those resources provide greater capability in dealing with innovation adoption. For instance, it may be that a company has a great deal of technical know-how, but if this doesn't translate to a perception of efficacy, then they are less likely to adopt an innovation. Practically, this means that those who are aiming to increase innovation adoption, such as technology diffusion agencies and government departments, may help change an organization's perception of their resources to one that carries greater efficacy. Based on Bandura (1986) we suggest that in the case of innovation adoption, efficacy could be enhanced through mastery experiences of senior managers (e.g., prior successful adoption), or vicarious experiences (e.g., witnessing similar companies adopt an innovation). Furthermore, these strategies could be as simple as highlighting to senior managers the resources that a company has in adopting innovation, or as complex as helping to improve their technological and knowledge readiness through training and skill-building. Regardless of the specific means of increasing control, these implications can be applied to national policies to promote organizational innovation adoption, as well as to technology diffusion agencies, technology consultants and universities who provide assistance schemes for companies that intend to adopt innovations

The study has a number of limitations that should be noted. First, because some of the variables tested had emerged from qualitative research, we needed to create our own measures, and additional validity studies would be useful for these measures. Second, the

response rates were low; however, they were similar to those obtained in similar organizational-level research (Newby et al., 2003). Third, while our study was designed in such a way as to eliminate common method variance between the independent variables and the dependent variable of innovation intentions (Podsakoff et al., 2003), we cannot be sure that there was not common method variance between the independent variables in the CFA. Recent research has shown that current methods for detecting common method variance are flawed and Richardson and colleagues (Richardson et al., 2009) suggest that these methods not be used. Given the inadequacy of the one-factor and the two-factor CFA models to fit the data, we believe that this provides some support, even without the flawed methods, for our premise that the three-factor model is more theoretically robust than simply being based upon common method variance.

Fourth, the direction of causality is unclear: we implicitly hypothesized that general factors such as strategy would lead to more positive orientation and control; however, it could be that having high levels of orientation and control lead a company to change its strategy to be more proactive. We find this latter direction less plausible given our results; however, more experimentally-based research is needed to pull out these causality effects. Fifth, in trying to map our model onto previous research we made a conscious decision to use existing measures and constructs, which unfortunately do not relate to a specific innovation – as noted earlier, now that our findings provide support for the model, more specific variables can be identified and used. Similarly, the use of a dichotomous intention measure reduced the potential variation in our data. Finally, in order to obtain a large enough sample size to test the complex model, we were only able to obtain data from one senior manager per organization. Although Damanpour (1996) found that the data source

did not affect adoption findings, future research should examine data from multiple respondents. Nevertheless, as a starting point for examining a theoretically-based, integrative model over an extended time-period we believe that this study makes for a good foundation.

Our work extends the field of organizational innovation adoption by separating the measurement of predictor and adoption variables and examining the effects of both general and proximal variables on intentions to adopt one year later. In doing so, we developed and tested an integrative, theoretically-derived model. Our research found that existing variables from the innovation adoption literature do indeed map onto the factors outlined in our model and that control over innovation adoption, in particular, mediates the effect of strategy and centralization on intentions to adopt. We believe that such an approach provides a clearer framework for academics and practitioners to understand and improve innovation adoption.

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TABLE 1.

Organizational-Level Innovation Adoption Literature Mapped on to Integrative Framework

Concepts	Citation	Method	Specific Concept Studied
ORIENTATION			
Attitude toward change	Damanpour (1991)	Empirical (meta-analysis)	Managerial attitude toward change
	Wan, Ong & Lee (2005)	Empirical (large-scale survey)	Belief that innovation is important
Perceived costs & benefits	Baldwin & Lin (2002)	Empirical (secondary data)	Benefits & general cost-related probs
	Chai, Gregory & Shi (2004)	Empirical (7 cases)	Potential benefits of innovation & effort needed to adopt/implement
	Fichman (2004)	Theoretical	Option values
	Griffith, Vere & Bootle (1995)	Theoretical	Cost benefit analysis of adoption and maintenance
	Iacovou, Benbasat & Dexter	Empirical (7 cases)	Perceived costs & benefits (direct and indirect benefits and opportunities)
	Mehrtens, Cragg & Mills	Empirical (7 cases)	Perceived benefits: Efficiency benefits
	Nystrom, Ramamurthy & Wilson (2002)	Empirical (large-scale survey)	Relative advantage of adopted innovations
	Roggenkamp, White & Bazzoli (2005)	Empirical (large-scale survey)	Economic benefits
Attitudes towards risk	Bolton (1993)	Empirical (14 interviews)	Adoption inherently risky
	Fidler & Johnson (1984)	Theoretical	More perceived risk (negative)
	Litwin & Stringer (1968)	Theoretical	Organizational climate: risk orientation
	Miller & Friesen (1982)	Empirical (medium-scale survey)	Risk orientation and competition and customer preferences
	Nystrom, Ramamurthy & Wilson (2002)	Empirical (large-scale survey)	Risk-taking climate, risk orientation
	Rogers (1995)	Theoretical	Early adopters
	Tabak & Barr (1996)	Empirical (large-scale survey)	CEO's risk-taking propensity
	Wan, Ong & Lee (2005)	Empirical (large-scale survey)	Willingness to take risks
	Wang & Cheung (2004)	Empirical (large-scale survey)	Attitudes to risk-taking

Need for innovation	Chai, Gregory & Shi (2004)	Empirical (7 cases)	Urgency of needs
	Chau & Tam (2000)	Empirical (interviews 89 executives)	Perceived need to innovate
	Iacovou, Benbasat & Dexter (1995)	Empirical (7 cases)	Awareness of need for innovation
	Lehman, Greener & Simpson (2002)	Empirical (3 cases)	Need for improvements
	Min & Galle (2003)	Empirical (large-scale survey)	Perceived need to innovate
	Simpson (2002)	Theoretical	Perceived needs for change
	Tzokas & Saren (1997)	Theoretical	Perceived need for innovation
	Xu, Soonhee & Hackney (2005)	Theoretical	Need for innovation & means to address that need
PRESSURE			
External pressure	Attewell (1992)	Theoretical, descriptive	Needs and know-how of suppliers and customers
	Burt (1987)	Theoretical and empirical (two classes of network models analysed)	Orgs motivated by competition
	Drazin & Schoonhoeven (1996)	Theoretical	Government policies
	Iacovou, Benbasat & Dexter (1995)	Empirical (7 cases)	External pressure: trading partners and adoption and org readiness
	Mehrtens, Cragg & Mills (2001)	Empirical (7 cases)	External pressure: users, customers, suppliers, potential employees
	Pouder & St John (1996)	Theoretical	Geographical “hot-spots”
	Redmond (2004)	Theoretical	Cohesion and equivalence
	Roggenkamp, White & Bazzoli (2005)	Empirical (secondary data, descriptive)	Competitor pressure
	Simpson (2002)	Theoretical	Perceived pressure for change
	von Hippel (1988)	Theoretical.	Lead users input in innov development
PERCEIVED CONTROL			
Financial & human resources	Attewell (1992)	Theoretical, descriptive	Knowledge and technical know-how
	Bates & Flynn (1995)	Empirical (large case)	Knowledge and human and org capital resources
	Birdi & Wall (2003)	Narrative review	Investment in R&D and innovation
	Damanpour (1991)	Empirical (meta-analysis)	Technical knowledge resources, slack resources
	Iacovou, Benbasat & Dexter (1995)	Empirical (7 cases)	Resources, technical expertise
	John, Weiss & Dutta (1999)	Theoretical	Resources and large firms
	Kotabe, Sahay & Aulakh (1996)	Theoretical	Resources and large firms

	Lehman, Greener & Simpson (2002)	Empirical (3 cases)	Institutional resources (training), staff attributes (efficacy) and organizational climate (staff openness to change)
	Litwin & Stringer (1968)	Theoretical	Organizational slack
	Nohria & Gulati (1996)	Empirical (large-scale survey)	Resources, org slack
	Nystrom, Ramamurthy & Wilson (2002)	Empirical (large-scale survey)	Slack resources
	Simpson (2002)	Theoretical	Training opportunities (time and place)
	Snyder-Halpern (2001)	Empirical (survey of 33 members)	Resource readiness, end-user readiness, technical readiness, knowledge readiness, and process readiness
	Swan (1995)	Empirical (large case)	Technical and org knowledge
	Tabak & Barr (1996)	Empirical (large)	Resources
	Van Beveren & Thomson (2002)	Empirical (large-scale survey)	HR resources
	Wan, Ong & Lee (2005)	Empirical (large-scale survey)	Resources
Organizational readiness	Iacovou, Benbasat & Dexter (1995)	Empirical (7 cases)	Availability of resources, compatibility and triability impact on org readiness (financial and technological readiness)
	Lehman, Greener & Simpson (2002)	Empirical (3 cases)	Organizational readiness for change
	Mehrtens, Cragg & Mills (2001)	Empirical (7 cases)	Org readiness
	Snyder-Halpern (2001)	Empirical (33 interviews)	Financial support and org readiness, knowledge, staff skills, technical, operational, process, resources and values and goals readiness
	Wejnert (2002)	Theoretical	Firm's familiarity and readiness
Self Efficacy	Fischer, Arnold & Gibbs (1996)	Empirical (121 interviews)	Self-doubt, effective information
	Lehman, Greener & Simpson (2002)	Empirical (3 cases)	Staff efficacy
	Tabak & Barr (1996)	Empirical (large)	Self-Efficacy
GENERAL FACTORS			
Organizational strategy	Ettlie (1983)	Empirical (medium-scale survey)	Org's technology policy affects innovativeness
	Francis & Bessant (2005)	Empirical (small, qualitative)	Innovation targeting strategy (e.g., Do

			better, Do differently)
	Han, Kim & Srivastava (1998)	Empirical (large)	Market & customer orientation
	Miles, Snow, Meyer & Coleman (1978)	Theoretical, case studies	Organization's strategy
	Miller & Friesen (1982)	Empirical (medium-scale survey)	Organization's strategy and product innovativeness
	Salavou, Baltas & Lioukas (2004)	Empirical (large, Greek SMEs)	Market & learning orientations
	Srinivasan, Lilien & Rangaswamy (2002)	Empirical (large)	Technological opportunism and radical technology adoption
	Yamin, Mavondo, Gunasekaran & Sarros (1997)	Empirical (cases)	NON-SIG: Low cost strategy not related to innovation
External environment	Baldridge & Burnham (1975)	Empirical (large)	Environmental uncertainty, size and complexity and environmental change
	Baldwin & Lin (2002)	Empirical (secondary data, descriptive)	Institution-related problems (R&D investment tax credit, capital cost allowance and gov regulations impede adoption), competition
	Damanpour (1996)	Empirical (meta-analysis)	Environmental complexity, instability
	Ettlie (1983)	Empirical	Perceived environmental uncertainty
	Meyer & Goes (1988)	Empirical (large)	Urban environments, aggressive market strategies, market environment
	Min & Galle (2003)	Empirical (large-scale survey)	Industry factors
	Nohria & Gulati (1996)	Empirical (large-scale survey)	Environmental context (competition, dynamism)
	Salavou, Baltas & Lioukas (2004)	Empirical (large, Greek SMEs)	Competition related characteristics
	Wejnert (2002)	Theoretical	Political context on org readiness
Organizational structure	Brandyberry (2003)	Empirical (survey)	Bureaucratic control
	Damanpour (1991)	Empirical (meta-analysis)	Centralization, formal differentiation, specialisation
	Downs & Mohr (1976)	Theoretical	Centralization types of org
	Kimberley & Evanisko (1981)	Empirical (large-scale survey)	Centralization
	Meyer & Goes (1988)	Empirical (large-scale survey)	Organizational structure
	Salaman & Storey (2002)	Empirical (20 interviews with senior managers)	Organizational structure
	Wan, Ong & Lee (2005)	Empirical (large-scale survey)	Centralization

Organization size	Brandyberry (2003)	Empirical (survey)	NON-SIG: Org size not related
	Camisón-Zornoza, Lapiedra-Alcamí Segarra-Ciprés & Boronat-Navarro (2004)	Empirical (meta-analysis)	Organizational size
	Coombs, Narandren & Richards (1996)	Empirical (secondary data)	Organizational size
	Damanpour (1991)	Empirical (meta-analysis)	Organizational size
	Ettlie (1983)	Empirical (medium-scale survey)	Organizational size
	Johns (1993)	Theoretical	Organizational size
	Nystrom, Ramamurthy & Wilson (2002)	Empirical (large)	Organizational size
	Roman & Johnson (2002)	Empirical (case)	Organizational size

TABLE 2

Standardized Regression Loadings for Hypothesized Measurement Model

	Loading		Loading
FIRST-ORDER COMPONENTS		**SECOND-ORDER COMPONENTS**	
Attitudes towards Innovation		Orientation towards Adoption	
Attitudes item 1	.69***	Attitudes towards innovation	.54***
Attitudes item 2	.66***	Risk-taking culture	.47**
Attitudes item 3	.90***	Experiences with innovation	.88**
Attitudes item 4	.78***	Radicalness control	.18
Risk-taking Culture		Industry control	.36[t]
Risk item 1	.68***	Control over Adoption	
Risk item 2	.65***	Financial resources availability	.47***
Risk item 4	.32**	Innovation efficacy	.58***
Financial Resources Availability		Technological readiness	.83***
Money item 1	.65***	HR readiness	.72***
Money item 2	.57***	Radicalness control	.25
Money item 4	.64***	Industry control	-.22
Innovation Efficacy			
Efficacy item 1	.83***		
Efficacy item 2	.66***		
Efficacy item 3	.68***		
Readiness			
Readiness item 1	.91***		

	Loading	Loading
Readiness item 2	.93***	
Readiness item 3	.87***	
Readiness item 4	.62***	
Readiness item 5	.57***	
Experiences of Innovation		
Employee benefits	.58***	
Operational benefits	.56***	
Customer benefits	.68***	
HR Readiness		
HR item 1	.84***	
HR item 2	.62***	
Overall Pressure		
Government pressure	.86***	
Professional assoc. pressure	.83***	
Suppliers pressure	.44***	
University pressure	.83***	
Customers pressure	.38***	
Competitors pressure	.46***	
Tech. diff. agency pressure	.85***	
Radicalness control	.03	
Industry control	-.19	

TABLE 3

Cross-Sectional Means, Standard Deviations, Correlations, and Composite Reliabilities (diagonal).

	Mean (S.D.)	Manuf	2.	3.	4.	5.	6.	7.	8.
2. Attitudes	2.59 (.58)	.13	.85						
3. Risk-taking	3.57 (.74)	-.07	.21*	.60					
4. Innovation experiences	3.80 (.53)	.09	.37***	.20*	.65				
5. Financial resources	3.42 (.83)	.10	.09	.24**	.33***	.66			
6. Technical readiness	3.44 (.91)	-.12	.24**	.28**	.34***	.23**	.89		
7. HR readiness	2.79 (.97)	.02	.22*	.07	.14	.23**	.46***	.70	
8. Innovation efficacy	3.90 (.66)	-.01	.26**	.10	.26**	.09	.39***	.33***	.77
9. Subjective norms	70.9 (31.53)	-.13	.26**	-.07	.13	.34	.34***	.17*	.19*

TABLE 4

Longitudinal Correlations.

	1.	2.	3.	4.	5.	6.
1. Orientation						
2. Pressure	.04					
3. Control	.37**	.26[t]				
4. Proactive strategy	.19	.15	.49***			
5. Centralization	-.44**	-.33*	-.46**	-.11		
6. Industry rate of innovation	.002	.38**	.42**	.41**	-.16	
7. Intentions to adopt	-.07	.24[t]	.32*	.11	-.33*	.14

[t]p<.10; *p<.05; **p<.01; ***p<.001