INNOVATION ATTRIBUTES AND MANAGER DECISIONS ABOUT THE ADOPTION OF INNOVATIONS IN ORGANIZATIONS: A META-ANALYTICAL REVIEW

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1. Introduction

Innovations are essential for firms to build core competences and create sustainable competitive advantage (Porter, 2005; Reed & DeFillippi, 1990; Rogers, 1983; Schumpeter, 1934). At the organizational level, Damanpour and Gopalakrishnan (1998) observed that a new idea, behavior, practice, or product (i.e., innovation) may come to organizations in two distinct ways, i.e. innovations may be either generated or adopted. When generated, an innovation is initiated and developed in organizations; when adopted, it is generated elsewhere than in the adopting organization (Angle & Van de Ven, 1989; Rogers, 1983; Zaltman, Duncan & Holbek, 1973). And, as observed by March and Simon (1958) most innovations in organizations result from borrowing rather than invention. This proposition is supported by the wide-ranging research on the adoption of innovations—particularly, on the identification of the factors that facilitate organizations to adopt a new technology—across several levels of analysis that have been produced within several disciplines in management sciences over the decades (for a review see Crossan & Apaydin, 2010; Wolfe, 1994).

Since the elaboration of the innovation diffusion theory (Rogers, 1983), a large number of studies has considered how attributes of innovations influence the adoption decisions taken by managers in organizations. However, different studies focusing on a given topic often appear to conflict and often really do conflict. Downs and Mohr (1976) suggested that attributes of innovations are interdependent with characteristics of organizations. Therefore, it is unlikely that a given attribute of an innovation would have the same kind of relationship to adoption decisions across a large array of organizations. Wolf (1994) noted that most consistent result of innovation research is that the results are inconsistent. Other scholars have further noted that extant studies exhibited somehow conflicting results and variations in magnitude, statistical significance, and direction of the observed relationships between the attributes of innovations and adoption decisions (see also Bruque & Moyano, 2007; Premkumar, 2003). In that, consider, for example, Kurnia et al. (2015) found that the perceived benefits are associated negatively to the adoption decision while Premkumar (2003) found instead a significant and positive association between the same considered

variables. In the same vein, some studies have reported that compatibility has a positive relationship with the decision to adopt an innovation (Gupta, Seetharaman & Raj, 2013; Luqman & Abdullah, 2011). Other works, have provided evidence of a significant, negative relationship between compatibility and the innovation adoption decision (Wanyoike, Mukulu & Waititu, 2012). Consequently, it has been pointed out that several decades of empirical studies into the adoption of innovations by organizations have failed to provide clear and consistent findings (Keupp, Palmié & Gassmann, 2012; Tidd, 2001). The critical issues in research on adoptions of innovations by organizations lead to the following question, How then does a researcher (and even more a practitioner) make sense of the attributes of innovations that are most effective for triggering manager decisions to adopt innovations in organizations?

Summarizing and integrating the work to date on innovation research and identifying areas for future enquiries represent an important task for future studies (Anderson, Potočnik & Zhou, 2014). Therefore, we employ a meta-analysis to integrate empirical findings on the effects of attributes of innovations (i.e., relative advantage, compatibility, complexity, observability, and trialability) on manager decisions about the adoption of innovations in organizations. Note that the use of meta-analysis allows us to combine data collected from companies with different characteristics and operating in various industries and countries, which would be infeasible in typical on-field research. We expect that by advancing our understanding of the innovation attributes-innovation adoption relationship we could help organizations to develop new technologies that are likely to be successfully adopted by other organizations and, at the same time, provide researchers with insights into ways to build more precise, more comprehensive, and more rigorous models about the adoption of innovations in organizations.

Referring to Pierce and Delbecq (1977) conceptualization of the innovation adoption behavior in organizations as a decision being made by the appropriate manager providing mandate and resources for the change in the organization; Kimbery (1981) insights that decision makers' preferences are keys to explain innovation adoption decisions in organizations; Fishbein and Ajzen (1975) and Ajzen (1985; 1987; 1991) seminal works on the theory of planned behavior that identified and modeled the effects of decision maker preferences on adoption decisions; Taylor and Todd (1995a) development of a decomposed theory of planned behavior that linked some of the attributes of innovations—as elaborated within the innovation adoption theory—to the behavioral preferences of decision makers, we conceive the effects of attributes of

innovations (i.e., relative advantage, compatibility, and complexity) on adoption decisions as mediated by one or more of the behavioral preferences of managers represented by attitudes, subjective norms, and perceived behavioral control. In doing so, we offer a first attempt to integrate the innovation diffusion theory with the theory of planned behavior. In the field study of adoption of innovations by organizations, efforts to integrate theories would probably constitutes as one of the most important contributions to the progress of research activities (Downs & Mohr, 1976).

Studies on manager decisions about the adoption of innovations in organizations offers a wide range of antecedents for the considered mediators, and researchers disagree about which one best influence these decisions. For example, Rogers (1983) suggests that attitudes of organizational decision makers are likely to mediate the relationships between all the five attributes of innovations and the adoption decision. Other studies based on the technology acceptance model (Davis, 1989) suggested instead that only a subset of attributes of innovations (i.e., relative advantage and complexity) are mediated by attitudes of decision makers. Other studies suggest instead that not only attitudes but also decision maker's subjective norms and perceived behavior control mediate the innovation attributes-innovation adoption linkages (Taylor & Todd, 1995b). Furthermore, while different studies suggests that the effects of attributes of innovations are fully mediated by behavioral preferences of decision makers (e.g., Harrison, Mykytyn Jr & Riemenschneider, 1997; Riemenschneider, Harrison & Mykytyn, 2003), others considered that there is a direct effect of attributes of innovations on manager decisions about the adoption of innovations in organizations (Tornatzky & Klein, 1982). Some other studies consider managers' behavioral preferences as independent variables (as the attributes of innovations) that are likely to produce a direct effect on the adoption decision (Kimberly & Evanisko, 1981; Premkumar & Roberts, 1999; Thong & Yap, 1995). Finally, researchers have also offered evidence that the implications of managers behavioral preferences on the adoption decision may be influenced by contexts in which such decision takes place (e.g., see Damanpour, 1996) as well as by research settings employed by scholars (e.g., see Tornatzky & Klein, 1982). The different mediators and the various antecedents, moderators, and consequences of such mediators lead to the critical question, How do decision makers' behavioral preferences contribute to mediate the attributes of innovations-adoption decision linkage in organizations?

Although narrative and quantitative review of the literature on the attributes of innovations-adoption decision linkage are available (e.g., Anderson et al., 2014; Jeyaraj, Rottman & Lacity, 2006; Kapoor, Dwivedi & Williams, 2014a; Kapoor, Dwivedi & Williams, 2014b; King & He, 2006; Tornatzky & Klein, 1982; Weigel, Hazen, Cegielski & Hall, 2014), an empirical review that fully addresses the attributes of innovation-decision makers behavioral preferences-adoption decisions in organizations relationships has yet to be conducted. The current study fills this void by proposing a meta-analytic framework (see Figure 1), by testing hypotheses based on a sample of 165 unique studies published in two decades on the antecedent-adoption chain in organizations, while building on previous literature to extend it, and by offering insight into the following research questions: (1) How do variations in attributes of innovations account for variations in manager decisions about the adoption of innovations in organizations? (2) What decision makers' behavioral preferences are most affected by variations in attributes of innovations? (3) How do variations in decision makers' behavioral preferences account for variations in innovation adoption decisions in organizations? (4) How do variations in the contextual conditions in which the adoption decision takes place and in research settings employed by scholars influence the mediators-adoption linkages?

2 Conceptual Framework

In this study, we developed a meta-analytic framework that encompasses the potential mediating mechanisms and the moderating variables that may potentially intervene and shape the innovation attributes-innovation adoption relationships in organizations (see Figure 1). In the following paragraphs, we expanded our framework in different parts, which nearly correspond to our research questions, by first reviewing the literature on the innovation attributes-innovation adoption relationship, then investigating the mediators of such relationship, and, finally studying their potential moderators.

Insert Figure 1 above here

2.1 Main Relationships between Attributes of Innovations and Manager Decisions about the Adoption of Innovations in Organizations

The basic theoretical perspectives for considering the main effects of attributes of innovation on adoption decisions in organizations is the innovation diffusion theory (Rogers, 1983). This perspective has inspired most of the empirical studies on innovation adoption (for a recent review see Kapoor et al., 2014a;

Kapoor et al., 2014b) and it represents a building block on which such frameworks as technology, organization, environment framework (Tornatzky & Klein, 1982), the technology acceptance model (Davis, 1989), Kwon and Zmud's (1987) five contextual factors model, and the Robertson and Gatignon (1986) competitive effects model have built on.

In the innovation diffusion theory, the adoption decision is conceived as a choice to make full use of an innovation as the best course of action available in an organization (Rogers, 1983:p. 20). In defining the adoption decision, the innovation diffusion theory considers a decision maker that is able to assess the attributes and thus the expected net benefits of innovations and according to such assessment she makes a choice on whether to adopt innovations or not. As in expectancy-value models (Fishbein & Ajzen, 1975), the idea is that decision makers are more likely to adopt innovations that are slightly uncertain and are expected to produce positively valenced outcomes (see also Abrahamson, 1991; Taylor & Todd, 1995a).

In the innovation diffusion theory, the attributes of innovations that are likely to influence the adoption decisions are relative advantage, compatibility, complexity, observability, and trialability (Rogers, 1983:p. 211). Specifically, relative advantage refers to the degree to which an innovation provides desirable consequences for the adopter compared to other available alternatives, providing the decision makers with insight of its net benefits, which in turn will favor the innovation adoption decision (e.g., Premkumar, 2003). Compatibility refers the degree to which an innovation is considered to consistently fit with existing business processes, values, past experiences, and needs. An innovation that is more compatible is also less uncertain to the decision maker (Rogers, 1983:p. 223). Moreover, greater levels of compatibility increase the expected net benefits of an innovation since the innovation will require the decision maker fewer efforts to integrate the new technology with the already deployed ones. Therefore, greater levels of compatibility of an innovation are expected to influence positively adoption decisions in organizations (e.g., Jeon, Han & Lee, 2006). Concerning complexity, a new technology that is intricate and difficult to master requires decision makers to invest greater amount of resources to understand it and, subsequently, to catch up with its adoption, which in turn has negative impacts on the assessment of the net benefits of the innovation. Moreover, an innovation that is more complex is more uncertain to the decision maker. Therefore, greater levels of complexity are expected to influence negatively adoption decisions in organizations (Thong, 1999). Trialability and observability offer the decision maker the possibility to more effectively assess the net

benefits of the innovation. Observability may help decision maker to assess the positive features of an innovation. In addition, greater levels of observability may offer the decision maker greater opportunities to learn about the new technology, which increase its net benefits and, in turn, favor adoption decisions (e.g., Hashem & Tann, 2007). Finally, the availability of the innovation on a trial basis allows decision makers to experiment with the new technology, exploring in advance its potentialities, and even identify and resolve ex-ante problems associated to the innovation before committing to fully adopting it. These possibilities increase the net benefits offered by innovations to a decision maker. Thus, greater levels of trialability are expected to influence positively the adoption decision (e.g., Ramdani, Kawalek & Lorenzo, 2009). From the discussion it follows that:

Hypothesis 1: Greater levels of relative advantage, observability, observability, and trialability (complexity) are likely to have positive (negative) effects on innovation adoption decisions in organizations.

2.2 Mediators of the Relationship between Attributes of Innovations and Manager Decisions about the adoption of Innovations in Organizations

If innovation attributes have an effect on the decision to adopt a new technology, this effect should be mediated by mechanisms that affect this decision. First, adoption decisions in organizations require an intervention of a decision maker. Second, as noted by March and Simon (1958), a manager brings her own preferences to the decision making context and these preferences are likely to exert a meaningful influence on organizational behaviors (Staw, 1991), in general, and for the adoption of innovations, in particular. As observed by Rogers (1983), not only the assessment of the attributes of innovations but also the preferences of decision makers are key for an adoption decision to occur (see also Baldridge & Burnham, 1975; Hage & Dewar, 1973; Kimberly & Evanisko, 1981; Miller, Manfred & Toulouse, 1982).

In representing the behavioral preferences of managers (i.e., attitude, norm, and perceived behavioral control) we referred to the theory of planned behavior (Ajzen, 1991). This behavioral theory is derived from social psychology and represents an extension of the expectancy theory (Vroom, 1864) that has been generally employed in understanding different behaviors (Armitage & Conner, 2001; Sutton, 1998). In addition, extant studies have employed the considered theory to explain important organizational decisions (e.g., Cordano & Frieze, 2000), and more specifically the adoption of innovations in organizations (e.g.,

Harrison et al., 1997; Marcati, Guido & Peluso, 2008; Riemenschneider et al., 2003). Both the innovation diffusion theory and the theory of planned behavior focus on decision makers, yet on two distinct but complementary aspects: the assessment of the attributes of innovations and the behavioral preferences of decision makers. By jointly considering in our framework the assessments of attributes of innovations and behavioral preferences of decision makers we expect to offer further explanatory power on the decision to adopt innovations in organizations.

In our framework the assessment of attributes of innovations are likely to influence organization decision makers' behavioral preferences and these preferences create, in turn, opportunities and pressures for adopting innovations. Specifically, we integrated the innovation diffusion theory (Rogers, 1983) and the theory of planned behavior in its decomposed form (Oliver & Bearden, 1985; Taylor & Todd, 1995a) and considered the attributes of innovations-behavioral preferences of managers-adoption decision associations. It must be noted that the theory of planned behavior in its decomposed form considers all the attributes of an innovation but observability and trialability (see also Davis, 1989; Davis, Bagozzi & Warshaw, 1989). Moreover, by relating the adoption decision to both attributes of innovations and preferences of managers we introduced a behavioral element according to which an innovation can be adopted or rejected in organizations not only because of its expected net benefits but, for example, because of pressures stemming from the environment or because of perceived lack of resources necessary to adopt the new technology.

The first potential mediating variable is attitude which refers to individual's positive or negative evaluation of an action to be taken (Ajzen, 1987; Fishbein & Ajzen, 1975). Concerning the relationship between the assessments of the attributes of innovations (i.e., relative advantage, compatibility, and complexity) and attitudes, the considered attributes are similar to the attitudinal beliefs—which typically identify the advantages and disadvantages associated with performing a behavior (Shimp & Kavas, 1984)—used in studies based on the theory of planned behavior and they are considered as antecedents of the attitudes (Ajzen, 1991). Specifically, attitudes are formed by associating a behavior to a certain outcome. Consistently with the expectancy-value model, the attributes that come to be linked to the behavior can be then valued positively or negatively and because of these evaluations, decision makers tend to develop a favorable or unfavorable attitude toward the behavior (Ajzen, 1987; Fishbein & Ajzen, 1975). Innovations characterized by such desirable consequences as increases in customer satisfaction, reduction in costs,

enhancement of the relationships with customers and suppliers, and various economies associated to their compatibility with organization's existing technology and to their easy to use are more likely to favor the development of a favorable attitude toward them than innovations characterized by more limited (greater) levels of relative advantage and compatibility (complexity) (Taylor & Todd, 1995a). Concerning the implications of attitudes on the adoption decision, in the theories of reasoned actions and of propositional control, if a decision maker holds the belief that a given behavior will lead to a certain event and such event is positive, the decision maker's adoption of the behavior should increase (Dulany, 1961; Fishbein, 1967). Similarly, in the theory of planned behavior it has been considered that decision makers tend to adopt behaviors toward which they have positive affect (Ajzen, 1987; Ajzen, 1991; Rogers, 1983). It then follows that the more favorable the attitude of a decision maker toward a new technology, and the stronger should be the tendency of the decision maker's to adopt the innovation. The discussion leads to the following hypothesis.

Hypothesis 2: Attitude is positively (negatively) related to relative advantage and compatibility (complexity) and mediates the relationship between relative advantage, compatibility, and complexity, on the one hand, and innovation adoption decisions in organizations, on the other hand.

The second mediator is subjective norms (or simply norms) which reflect one agreement (or disagreement) with statements that refer to the preferences of others (e.g., like owners, employees, suppliers, customers) about performing the decision under examination (Ajzen, 1987; Fishbein & Ajzen, 1975). Concerning the relationship between attributes of innovations (i.e., relative advantage, compatibility, and complexity) and norms, Ryan (1982) offered a premise based on Fishbein and Ajzen (1975) that the perception of the attitudinal beliefs that stem from assessments of attributes of innovations may affect not only attitudes but other types of behavioral preferences (like norms) through secondary mechanisms. Shimp and Kavas (1984) elaborated on these mechanisms by introducing the notion of false consensus (Oliver & Bearden, 1985; Ross, 1977; Taylor & Todd, 1995a). Developed within studies of behaviors of individuals, the mechanism of "false consensus" was observed in all social environments in which some behaviors are important to recognize but often difficult to determine (Cross & Brodt, 2001; Flynn & Wiltermuth, 2010; Gross & Miller, 1997). Specifically, the false consensus mechanism involves that decision makers tend to overestimate the importance of personal and dispositional factors relative to external pressures and by doing

so they tend to infer broad personal disposition and expect consistency in behavior or outcomes across widely disparate situations and contexts. A decision maker's strong held perception about the relative advantage, the compatibility, or the complexity of a given innovation may then consider that these perceptions are common and widely legitimate, and that others would not only agree with these beliefs, but would state them in prescriptive manner. In this vein false consensus resemble to an "anchoring and adjustment" process, whereby decision makers anchor on their own preferences and inadequately adjust for ways in which they tend to vary from others (Davis, Hoch, & Ragsdale, 1986). For the implications of subjective norms on the adoption decision, even if the decision maker has a tendency to produce a distorted interpretation of the social environment by overestimating the support for its own perceptions of an innovation's relative advantages, compatibility, and complexity by others (Taylor & Todd, 1995a), these erroneous norms matter and are likely to influence people's decisions via compliance mechanisms (Ajzen, 1991; Fishbein & Ajzen, 1975). Thus, in cases in which decision makers believe that adopting the new technology is considered by others as common, she may be sufficiently motivated to comply with this idea, which, in turn, is likely to influence her decision to adopt the innovation. From the discussion it follows that:

Hypothesis 3: Norm is positively (negatively) related to relative advantage and compatibility (complexity) and mediates the relationship between relative advantage, compatibility, and complexity, on the one hand, and innovation adoption decisions in organizations, on the other hand.

The third mediator is perceived behavioral control which reflects beliefs regarding access to the resources and opportunities needed to perform a behavior (Ajzen, 1991; Ajzen & Driver, 1992). Concerning the relationship between attributes of innovations and perceived behavioral control, it has been observed that the greater the amount of resources and opportunities a decision maker perceives to possess, and the fewer obstacles and impediments she anticipates, the greater should be her perceived control over the behavior (Ajzen, 1991). The adoption of innovations that are highly complex requires the decision maker to overcome different obstacles and invest greater levels of resources for its understanding (Triandis, 1979) and, more relevantly, to sustain the processes that are required to use and assimilate the new technology within the organization once adopted (Attewell, 1992). Moreover, complex technologies are often composed of many interacting parts that need to be configured and performance with high reliability, and even small variations in performance can induce high risks of failures (Perrow, 1994). These risky characteristics of complex

innovations increase the possibility of a decision maker to perceive the innovation as subjectively threatening (Bandura, 1977). Accordingly, greater levels of complexity of an innovation may induce the perception of the inadequacy of available resources as well as of more extended obstacles and impediments associated to the adoption of the new technology which, in turn, reduce the perceived control upon the innovation (Taylor & Todd, 1995a). Concerning the implications of the perceived behavioral control on the adoption decision, greater levels of control perception on innovations are associated to greater levels of confidence that the decision maker will bring the adoption to a successful conclusion. In the same vein, the greater perceived control on innovations reduces uncertainties and risks associated to their adoption, which represent additional aspects that favor the adoption decision (Ajzen, 1985). From the discussion it follows that:

Hypothesis 4: Perceived behavioral control is negatively related to complexity and mediates the relationship between complexity and innovation adoption decisions in organizations.

2.3 Potential Moderators of the Relationship between Behavioral Preferences of Decision Makers and Innovations Adoption

The model we conceptualized herein can be referred to many different contexts in which an adoption decision may take place (Huber, 1990; Mowday & Sutton, 1993). Therefore, we introduced a set of post hoc analyses that refer to moderating effect on the mediators-adoption linkages. These moderators reflect the contexts in which the adoption decision takes place as well as research settings employed by scholars in measuring constructs under examination.

The organizational contexts of the adoption decision. The behavioral preferences of managers can find expression in an adoption behavior only if the decision maker can actually influence the behavior, i.e., if the person can decide at will to perform or not perform the behavior (Ajzen, 1991). In organizations, it is well acknowledged that organization decision maker can influence the adoption behavior, and researchers recognize that such influence vary from large to small (Bass & Stogdill, 1990). Consequently, when the influence of a decision maker on the organizational behaviors is large it is likely to expect that if a decision maker develops appropriate attitudes, norm, and behavioral control on the innovation, it is very likely that an adoption behavior will occur in the organization. By contrast, if such influence is small, decision maker's behavioral preferences may play a more limited role in shaping the final adoption decision. In the following study we consider two determinants that may affect the influence exerted by the decision maker on the

organization: the hierarchical position of the decision maker and the size of an organization (Ettlie, 1983; Miller & Friesen, 1982).

The hierarchical position of the decision maker represents a key variable in studies of organizational behavior (Staw, 1991). Because of their positions, top managers are less subject to rules and procedure and their decisions often entail a good degree of discretion (Baldridge & Burnham, 1975). As one descends the organizational levels rules, procedure, and supervision processes take instead prominence, and thus the influence of any single individual on organizational behaviors is likely to decrease (Staw, 1991). Consequently, top managers may take actions that reflect their own preferences more easily than other decision makers characterized by less autonomy. In addition, top managers have direct and personal contacts with most levels of management and through such contacts they shape most of the key organizational behaviors (Kets de Vries & Miller, 1984). Consequently, we should expect the hierarchical position of decision makers to moderate the effects of behavioral preferences on innovation adoption decision in organizations.

Hypothesis 5: The effect of attitude, norm, and perceived behavioral control on adoption decisions in organizations will be stronger when the decision maker is a top manager rather than when the decision maker is a lower-level manager.

The organization size represents one of the most important variables in micro-organizational studies (Kimberly, 1976). In organizations of more limited size, individuals can make most of the key decisions themselves (Chen & Hambrick, 1995), directly influence other managers, and tightly control and channel operations (Mowday & Sutton, 1993). For example, Miller and Droge (1986) observed that the individual decision maker preferences are likely to be a critical and perhaps tremendously important element in small organizations, in which the impact of the leader can be very direct and pervasive (Premkumar, 2003; Unsworth, Sawang, Murray & Sorbello, 2009; Welsh & White, 1981). In contrast, large organizations may have procedures, routines, style, and bureaucratic momentum of their own which can more easily absorb or resist leaders' initiatives. In addition, extant studies in strategic management posit that larger firms tend to be associated with many and varying stakeholders with somehow conflicting interests and preferences (Fombrun & Shanley, 1990) and are more likely to be under regulatory and public scrutiny (Bloom & Kotler, 1975). Consequently, in organizations of larger size behaviors are less under the control of a single decision

maker (Thompson, 1967). The discussion then suggests that organization size will moderate the effects of behavioral preferences on innovation adoption decision in organizations.

Hypothesis 6: The effect of attitude, norm, and perceived behavioral control on adoption decisions in organizations will be stronger in small organizations than in larger ones.

The research settings of the adoption decision. In organizations the adoption decision involves different, contingent choices (Eveland, 1979). Accordingly, the key issue is just which one of these choices is in fact the crucial one—i.e., the one correctly identifying the moment at which the organization shifted from the category of non-adopter to the category of adopter. In their research settings scholars tended to first identify a decision (or a few) which they believe to be critical in some sense, and use the occurrence of that decision as an indication of adoption. Second, they search for documentary evidence in organizations or specified critical decision makers and ask them about organization's adoption (Becker, 1970). It goes without saying that selecting one measure for the adoption decision instead of another as well as measuring the adoption decision according to self-reported or objective data matter for empirical results. For example, data from decision maker is easy to collect, but may be affected by the choice of people to supply it; how much a top manager, for example, knows about what his organization is really doing with the innovation (Eveland, 1979). We then consider in our study additional moderators (i.e., measures of the adoption decision and presence of common method variance in self-reported data) that have a methodological nature and capture some of the key elements of research settings employed by scholars in their studies.

In assessing the behavioral preferences-adoption decisions linkage, literature has introduced the distinction between intentions and expectations. Whereas intention involves making a behavioral commitment to perform (or not perform) an action, expectation is one's estimated likelihood of performing the action, whether or not a commitment has been made (Warshaw & Davis, 1985). In forming expectations, decision makers are likely to consider not only their current behavioral preferences but also their future beliefs as well as beliefs toward alternative actions or outcomes Therefore, current behavioral preferences may play a less relevant role in predicting expectations rather than intentions. In addition, expectations involve considerations of the potential impediments/barriers that may prevent the behavior from being implemented (Warshaw & Davis, 1985) which may not be under the volitional control of the decision maker (Saltzer, 1981), and therefore render the decision maker's current behavioral preferences less relevant for the

adoption decision (for an early review see Sheppard, Hartwick & Warshaw, 1988). The above arguments suggest the following hypothesis.

Hypothesis 7: The effect of attitude, norm, and perceived behavioral control on adoption decisions in organizations will be stronger when decision makers are asked to indicate their present intentions than when they are asked to estimate their future expectations.

Literature has also introduced the distinction between the behavior (the adoption decision) and intention/expectation toward the behavior (the intention to adopt). In the view of the theory of planned behavior it has been conceived that attitudes and norm are associated to intention but not to adoption while perceived behavioral control has an effect on both intention and adoption (Ajzen, 1985; Ajzen, 1991; Fishbein & Ajzen, 1975). Consequently, the measure of the adoption decision moderates the attitude and norm-adoption linkages.

Hypothesis 8: The effect of attitude and norm on adoption decisions in organizations will be stronger when decision makers are asked to indicate their intentions than when they are asked to estimate the effective adoption of the innovation.

The common method variance refers to cases in which variance is associated to the measurement method rather than to constructs that measures represent (Campbell & Fiske, 1959). There are studies that suggested how the common method variance bias affect estimates of researches based on self-report data (Crampton & Wagner, 1994). For example, extant literature provided evidence that attitudes and norms are strongly associated with self-reported everyday behaviors but did not correlate with objective evidence of the same behavior (Armitage & Conner, 1999; Armitage & Conner, 2001). The effect of the common method variance bias on estimates is likely to vary not only across studies based on self-report/objective data but also within studies based on self-report data. For example, in the context of the adoption of an information system the presence of the considered bias induced by research settings employed by scholars increases the magnitude of the association between variables (Malhotra, Kim & Patil, 2006). The above arguments suggest the following hypothesis.

Hypothesis 9: The effect of attitude, norm, and perceived behavioral control on adoption decisions in organizations will be stronger in studies that are affected by common method bias with greater extent that in studies that are affected by the bias with more limited extent.

2.4 Empirical studies on the innovation attributes-innovation adoption linkages

Empirical studies provided evidences on the relative advantage-, compatibility-, complexity, and observability-innovation adoption associations that are consistent with the theoretical predictions. Despite these consistent patterns, there are, however, a few studies that offered contrary evidences. Concerning the relative advantage-innovation adoption association, there are studies that reported how greater level of perceived benefits about an innovation are likely to reduce the propensity of organizations to adopt such new technology (Kurnia et al., 2015). In the same way, although complexity discourages innovation adoption, there are studies that provided evidences for a positive, significant association between complexity and innovation adoption (Messerschmidt & Hinz, 2013; Seyal & Rahman, 2003). Finally, studies on the trialability-innovation adoption linkage offer mixed results, with some works that offer evidences of positive, significant associations (L99986) and other of negative, significant associations (Premkumar, Ramamurthy & Crum, 1997).

Concerning the mediating variables, empirical studies offered consistent evidences on the attitude-, norm, and behavioral control-innovation adoption associations. There is just one study that reported a slightly negative association between norm and innovation adoption in organizations (Hsu, Ray & Li-Hsieh, 2014). Regarding the innovation attributes-mediating variables associations, empirical studies shown consistent pattern on the relative advantage-, compatibility, and complexity-attitude associations. Such consistent patters are observable for relative advantage- and compatibility-norm associations. However, although studies provided evidences of negative associations between complexity and norm, one work offered empirical evidence of a negative, significant association (Tashkandi & Al-Jabri, 2015).

We must note that although extant empirical studies on the main effect of innovation attributes on innovation adoption decision in organizations abounds, we found only a few studies that tested the mediation effects of the preferences of managers on the innovation attributes-innovation adoption linkages (Harrison et al., 1997).

There are also prior meta-analyses and reviews on the innovation adoption that focused on many important issues, including (a) factors affecting information technology usage (Mahmood, Hall & Swanberg, 2001); (b) drivers of intention and adoption behavior in consumer adoption behavior (Arts, Frambach & Bijmolt, 2011); (c) the determinants of information systems success (DeLone & McLean, 2003; Sabherwal,

Jeyaraj & Chowa, 2006); (d) the performance implications of the adoption of innovations in organizations (Rosenbusch, Brinckmann & Bausch, 2011); (e) the role of organizational characteristics and the adoption of IT technologies in organizations (Hameed, Counsell & Swift, 2012); (f) the technological, organizational and individual factors that influence the adoption and diffusion of IT-based innovations by individuals and organizations (Jeyaraj et al., 2006); (g) the effect of Rogers' innovation-attributes on the adoption of innovation by individuals and organizations (Arts et al., 2011; Kapoor et al., 2014b; Tornatzky & Klein, 1982); (h) the determinant of the acceptance of technologies by individuals (King & He, 2006; Schepers & Wetzels, 2007); (i) the applications of models of diffusion of innovations (Sultan, Farley & Lehmann, 1990); (j) performance implications of the adoption of innovations (Rosenbusch et al., 2011).

It must be observed that we focused on the adoption of innovations in organizations and integrated the potential mediators/moderators of the innovation attributes-innovation adoption relationships. To the best of our knowledge no previous meta-analysis has offered an integration of the potential mediators/moderators on the innovation attributes-innovation adoption relationships in organizations. One exception is the meta-analysis by Weigel et al. (2014) where researchers combined diffusion of innovations and the theory of planned behavior to develop a model of innovation adoption-behavior. Yet, in their analysis researchers combined studies on the adoption of innovation by consumers as well as by managers in organizations. Moreover, they used antecedents of diffusion of innovations and theory of planned behavior and they offered only evidences of their main effects on the innovation adoption decision.

3 Research Method

3.1 Database Development and Inclusion Criteria

In selecting the most important studies that explored the relationship between an adoption decision and its correlates, we followed some general rules set out in the literature (e.g., see Chen, Damanpour & Reilly, 2010). First, we searched relevant bibliographic databases, namely ABI/INFORM Global, Business Source Premier, JStore, ProQuest, IEEExplore, Science Direct, Scopus, and ISI Web of Science. In order to identify relevant journal articles, conference papers and dissertation works published in English, we performed the search based on the following Boolean expression: ("organization") AND ("adoption") AND ("innovation"), where "organization" includes, for example, such keywords as business, enterprise, company, organization. The term "adoption" includes, for example, adoption, intention to adopt, adopters, non-adopters, whereas the

term “innovation” includes such terms as innovation, new technology, information system, cost accounting, payroll, enterprise resource planning, computer-assisted manufacturing, e-commerce, e-business, and customer relationship management.

We integrated the first database search with thorough examination of primary journals in relevant research fields, such as innovation management, strategic management, technology and R&D, organizational behavior, entrepreneurship and marketing. In order to mitigate the publication bias (Begg, 1994), we used a bottom-up search approach and considered existing meta-analyses and seminal papers that have dealt with relationships under study, and carefully examined their reference lists. Additionally, we analyzed cross-references in the acquired reports, sent requests for working papers and forthcoming publications. Specifically, we used two-way ‘snowballing’, backward-tracing all references reported in previously identified articles and forward-tracing all articles that cited these articles using Google Scholar and ISI Web of Knowledge.

Following Damanpour (1991), each collected study was scrutinized and included into the meta-analysis if only it meets the following eligibility criteria. First, we focused on studies that deal with the adoption of innovations. Reports focusing specifically on either awareness or post-adoption aspects (e.g., “infusion,” or “satisfaction with the innovation,” or “impact of the innovation of firms’ performance”) were excluded. Although we acknowledge the importance of post-adoption aspects (Angle & Van de Ven, 1989; Damanpour & Wischnevsky, 2006; Rogers, 1983; Zaltman et al., 1973), it has been observed that mixing innovation stages increases the risk of finding inconsistent and, at times, contradictory research results because the direction of the influence of some determinants on innovation is also contingent on the decision being considered (Wolfe, 1994). In particular, adoption and post-adoption stages imply different conceptualization of the decision to be taken in organizations (for an early review of post-adoption studies see DeLone & McLean, 1992, 2003). Because of the conceptual differences in the dependent variable between adoption and post-adoption studies, the nature of the considered correlates between pairs of variables differs, too. And, even if one can observe a partial overlapping between the attributes of an innovation emphasized in adoption and post-adoption studies (e.g., see Larsen, 2003), these aspects may express dissimilar underlying conceptualizations. Consequently, aggregating under the same label variables that express very different

constructs may induce an excess of heterogeneity into our study and at the same time may render the interpretation of results more difficult.

Second, the analysis was at an organizational, not an individual or organizational population level. As observed by Tornatzky and Klein (1982) research should study innovations that will be adopted by managers of organizations, not by individuals operating alone since it is not logical to attempt to generalize from the individual adoption process to the organizational innovation process as the two process may in fact be quite different. Moreover, it must be noted that such concepts and variables as organization size and decision makers' hierarchical position do apply to organizations but not to individuals.

Third, to be eligible studies had to include at least one of the attributes of innovations that is expected to correlate with the decision to adopt innovations. Fourth, we checked for the presence in the study of information about the adopters and excluded reports that present no source information whatsoever about the sample of studied organizations. Since the concepts of attitude, norm and perceived behavioral control have been referred to individual decision maker and their extension to teams or group decision-making has not been developed, we controlled that studies measured the behavioral preferences of managers with respect to an individual decision maker or in case of multiple respondents for each sample organizations that these preferences were derived individually for each member belonging to an organization (Harrison et al., 1997). Fifth, the study was published in a scholarly book, in a PhD thesis, or journal. Finally, we required a study to include appropriate statistics. In that, we only synthesized studies that provided information to calculate the correlation between considered constructs of Table 1 (Hunter & Schmidt, 2004).

Although unintentional omissions might have occurred, after these comprehensive search steps we ended up identifying a total of 986 correlations from 165 different manuscripts to yield a combine sample sized of 31,626. A list of the articles used in our empirical meta-analysis is available as an electronic companion from the journal webpage.

3.2 Variables Coded

In considering the literature on the decision to adopt innovations in organizations, we observed many constructs with similar definitions that operate under diverse aliases and constructs with comparable names but diverse operationalizations. Thus, we use a single construct definition to code existing research. In doing so we included only those aspects that have been analyzed extensively across multiple studies and fit

conceptually (see Table 1). In terms of the followed procedure, four experts coded the variables considered in Table 1. Two experts evaluated all of the studies for all variables excluding the attributes of innovations. A third expert coded the variables for the attributes of innovation and coded correlations. Following this, a fourth expert re-evaluated a random sample of 20% of all of the manuscripts. The initial average inter-rater agreement for the experts was 96%. Occasional disagreements were resolved by repeated discussion between the coders until reaching consensus, according to a procedure originally suggested by (Bullock & Svyantek, 1985) and already employed in previous meta-analytic works (Bauer, Bodner, Erdogan, Truxillo & Tucker, 2007; Chen et al., 2010; Damanpour, 1991). In coding variables, we also collected the following information: affiliation, publication year, country, technology, and industry.

Insert Table 1 above here

Attributes of innovations. Extant studies observed that concept relative advantage is akin to the concept of perceived usefulness (Moore & Benbasat, 1991) and in studies that include consider both, their correlation coefficient is often very high. Therefore, we include perceived usefulness under the relative advantage label. Moreover, some studies referred to the variable of ease of use instead of the variable complexity (Moore & Benbasat, 1991). Because of the differences in the expected sign of correlation coefficients between complexity and ease of use, on the one hand, and the decision to adopt, on the other hand, we reported results for ease of use under the complexity label but recoded the correlation coefficient. It must be further observed that some studies refer to the concept of demonstrability. Since the concept of demonstrability is strongly related to the construct of observability (Moore & Benbasat, 1991), in this meta-analysis we included under the label observability those report that referred to demonstrability as an attribute that is correlated to the decision to adopt a new technology.

Behavioral preferences of decision makers. Attitudes are evaluated by referring to the evaluative property—i.e., how positively or negatively a decision maker feels toward the innovation to be adopted. Measures of the evaluative property consider how pro versus con, favorable versus unfavorable, or supportive versus antagonistic decision makers are toward the innovation (Ostrom, Bond, Knosnick & Sedikides, 1994). Scholars sometimes derived a decision maker's attitude by weighting her belief of the potential outcomes associated to the adoption of the innovation by its subjective evaluation of the effect of

these outcomes (e.g., see Marcati et al., 2008; Nasco, Toledo & Mykytyn, 2008). Finally, there are some studies that measured attitude according to the decision maker's outcome beliefs and omitted to correct such beliefs by the decision maker's outcomes evaluation (Thong, 1999). In order to attenuate the possibility that the variable attitude may enter the mediation analysis as a simply reflection of attributes of innovations (Fiedler, Schott & Meiser, 2011), we excluded those operationalizations from the current meta-analysis. Following Fishbein and Ajzen (1975), norms are affected by a set of salient beliefs about the normative prescriptions of specific actors, weighted by the incentive to fulfill with each of those actors. Norms are typically measured by global, subjective measures as well as according to belief-based measures. In this meta-analysis we combined both (e.g., see Riemenschneider & McKinney, 2001/2002). Finally, the perceived behavioral control construct encompasses two components. The first component includes such aspects as the self-efficacy (Ajzen, 1991), that is an individual's self-confidence in his/her ability to perform a behavior (Bandura, 1977,1982). The second component includes the facilitating conditions and the resources needed to engage in a behavior (Triandis, 1979). This might include access to the time, money and other specialized resources required to engage in a behavior (e.g., skills of employees, experience of the employees, availability of complementary resources).

Adoption decision. The considered construct commonly included assessments on subjective base of whether the decision maker has adopted an innovation (Pontikakis, Lin & Demirbas, 2006) or a set of correlated technologies (e.g., Thong, 1999) or not. Other studies used as a dependent variable a measure of intentions which assessed the intent or willingness to adopt an innovation in the future (e.g., Harrison et al., 1997). Other else studies considered the adoption as a process and ask the decision maker about the stage of adoption at which the organization is currently engaged (e.g., Oliveira, Thomas & Espadanal, 2014). We also found few studies that employed objective measures of adoption. As observed, we excluded studies dealing specifically with post-adoption aspects. We did not consider also studies in which organizations had adopted the innovation and were considered it for further adoption (e.g., Lefebvre, Lefebvre & Harvey, 1996). We also ruled out studies in which the innovation is related to the benefits offered to the firm (e.g., Wu & Chuang, 2010), studies dealing with the decision maker's satisfaction about the innovation (e.g., Thong, 2001), and works that deal with the adoption decision, yet they measured the adoption decision in ways are difficult to distinguish this decision from attributes of innovations (e.g., Gupta et al., 2013).

Moderators. We labeled a study as predominantly small when the number of employees is less than the median number of employees in the sampled organizations; otherwise we labeled the study as predominantly large. We also analyzed the percentage of respondents that are top managers (senior executives/directors or higher positions as defined in Hambrick (1984)) and we labeled a study as predominantly higher positions when the percentage of top managers in the sample was greater than the median percentage of top managers in the sampled organizations, otherwise we labeled the study as predominantly lower positions. We considered the different measures used by scholars for the dependent variable and distinguished between adoption, intention to adopt, and expectation to adopt (see Table 1). As observed by Mitchell (1985), common method variance may influence estimates when dependent and independent variables are measured with the same format. Accordingly, we distinguish studies that measure the dependent and independent variables with the same/different format. Note that there are alternatives ways to control for common method variance (i.e., measures based on self-report vs. objective data, respondents for dependent and independent variables are the same or different), although infeasible for this study because of constraints from available data.

3.3 Univariate Analyses

Following Chen et al. (2010) and Damanpour (1991), we based our meta-analysis procedure on three fundamental steps: (1) the main effect testing; (2) the mediation analysis; (3) the moderator analysis. Concerning the effect size, we relied on correlation coefficients. It must be observed that in most cases correlation coefficients were the primary statistics in our meta-analysis but a few coefficients derive from studies in which logistic regression models or discriminant analysis were applied. Although no universally accepted method for handling such data in a meta-analysis is reported, we retained these studies and used available formulas to calculate effect size estimates from findings presented in a logistic regression and discriminant analysis format (Fern & Monroe, 1996; Lau, Sigelman, Heldman & Babbitt, 1999; Lipsey & Wilson, 2001). We also tested the robustness of our results by excluding findings that originate from studies that used either logistic regression or discriminant analysis and observe consistent results. Finally, when studies drawn from the same sample of observations were published several times, we primarily considered works published on academic journals, when available.

On the collected data we calculated the mean correlation on the relationship between the decision to adopt and its correlates across studies, weighted by sample size. Next, the variance among correlation (observed variance), the variance due to sampling error and residual variance were determined. Following Hunter and Schmidt's (2004) we also calculated corrected means and residual variances. A 95% confidence interval around mean correlation was computed based on the mean correlation, the number of the correlations, and the variance due to sampling error to check if this interval includes the zero. Similarly to previous meta-analyses, we made no adjustments for range restriction, which was hardly assessable in many of the selected studies on organizations' innovation adoption decision (Camisón-Zornoza, Lapiedra-Alcamí, Segarra-Ciprés & Boronat-Navarro, 2004; Chen et al., 2010; Damanpour, 1991; Gooding & Wagner, 1985). We also checked the salience of each association by considering the comparison with the conventional medium effect size of the population according to .30 rule (Cohen & Cohen, 1983). We additionally addressed the publication bias by computing for each considered associations the classical file drawer N (Rosenthal, 1979) and evaluated the publication and eligibility with the normal quantile plot method (Wang & Bushman, 1999).

Concerning the mediation analysis, the magnitude of effects was evaluated according to multiple methods. First, we computed a partial correlation (corrected for unreliability) for each innovation attribute-adoption decision relationships after controlling for the considered mediators. We inferred the presence of a mediating effect when the original correlation coefficient between attributes of innovations and the decision to adopt a new technology was reduced when the influence of the potential mediator is controlled for (Blalock, 1961). In particular, at the one hand, if the correlation coefficient associated to the direct effect is not significantly divergent from zero, then it suggests that the mediator accounts completely for the relationships between attributes of innovations and the decision to adopt. On the other hand, if the partial correlation is identical to the original correlation, then it indicates that there is no mediation effect. If the original correlation is higher than the partial correlation and the significance test of the partial correlation indicates that it is different from zero, then we can conclude that there is a partial intervening effect of the mediator (Gajendran & Harrison, 2007). Second, following Sobel (1982) we calculated the total unstandardized indirect effect (i.e., estimated by the product of correlation coefficients associated to innovation attributes-mediators and mediators-adoption paths). The indirect effect is then divided by its

estimated standard error which approximately follows a standard normal distribution. The estimated corrected standard errors were calculated according to the multivariate delta method introduced by Bobko and Rieck (1980). The suggested method has been employed in different studies (Cheung, 2009) and it has the favorable characteristic that allows one to obtain the standard errors directly from correlation coefficients. Finally, following Viswesvaran and Ones (1995) we used as sample size the harmonic mean of the sample sizes for each of the involved meta-analytic correlations.

We introduced multiple tests to evaluate the need for moderation analysis. The first test refers to the so-called "75% rule" (Gooding & Wagner, 1985) according to which if the variance caused by the sampling error does not account for 75 percent of the observed variance, then we cannot accept the hypothesis of homogeneity among empirical correlations and had to look for other moderating variables that affect the correlations. The second test refers to the Chi-square homogeneity test (Hunter & Schmidt, 2004). Specifically, a non-significant Chi-square statistic suggested there is no true variation across studies. When moderation analysis is appropriate, we followed Hunter and Schmidt's (2004) subgroup analysis. A moderator could produce its effects on estimates in two ways: (1) the expected variance will be lower in the subgroup than in the entire population, and (2) the corrected mean correlations will differ from one group to another. For capturing the two effects we conducted a t-approximation test of difference between the mean correlations of the associations across different subgroups (Wagner & Gooding, 1987: p.249). Note that the focus of moderating analysis is on the differences between different groups of organizations and studies. In the context of our study the relative difference between the characteristics of organizations/studies is more relevant than the absolute characteristics of each organization/study considered. For example, in considering organization size, the categories of small and large relates to a relative concept rather than to an absolute one. In other words, organizations that differ greatly in size will reveal differences in adoption behavior conceivably not of the extent of differences between absolutely large and small organizations, but significant variations however. Finally, some recent studies suggested for robustness to apply two techniques for moderation analysis. In that we employed a meta-regression procedure with random effects (Lipsey & Wilson, 2001).

3.4 Structural Equation Modeling

In addition to the pairwise analyses, we aggregated the studies to test the causal model implicit in Figure 1. This multivariate technique has the benefits of considering all linkages simultaneously and has been recommended by a number of scholars (Colquitt, LePine & Noe, 2000; Shadish, 1996; Viswesvaran & Ones, 1995).

We followed a procedure based on two stages. In the first stage, the application of this technique needs (i) primary study to report either the covariance matrix or the variances of the variables included in their analysis (ii) the effects (i.e., correlation coefficients) must be available between each construct in the model and all other constructs, not just the pairwise effects for constructs with proposed relationships (Brown and Peterson 1993). In analyzing data we followed two procedures: (i) meta-analyzing the covariance matrix and then converting the results to structural relationships and (ii) we converting covariance matrix for each individual study in path coefficients and then meta-analyzing the obtained results (King & He, 2006). Since the two procedures tend to produce only trivial differences, we reported only results obtained from the first procedure. For the analysis, we needed to evaluate an overall sample size and employed the harmonic mean to measure the matrix sample size (Colquitt et al., 2000; Viswesvaran & Ones, 1995). Sample sizes are reported in Table 3.

In the second stage, the intercorrelation matrix was then analyzed in a random effect model using maximum likelihood estimation available in the statistical package STATA 13 (see also Montazemi & Qahri-Saremi, 2015). We estimated the model fit by measuring the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the standard chi-square statistic (Bentler, 1990). Note that given constrains posed by data, we limited the use of the structural equation model to the analysis of main and mediation effects.

4 Results

We provide the results of our analyses structured around our focal research questions. Specifically, we describe the sample of considered studies and provide evidence of the correlations between the considered constructs. Then we introduce mediation and moderation analyses as well as we proposed additional analyses to test the robustness of our results.

4.1 Description of the Sampled Studies and Correlations between Constructs

Concerning the characteristics of sampled studies, retrieved manuscripts were published between 1995 and 2015. Most of them were gathered around 2009. In terms of continents, 46% were collected in Asia, 28% in North America, 10% in Europe, 6% in Africa and 2% in Australia. Of the firms' characteristics, about 44% were operating in non-service industries. In terms of technologies, about 67% of studies considered such technical innovation as CAD, CAM systems, Flexible Manufacturing Systems, ERP, EDI, e-commerce and only 5% considered multiple technologies for adoption. In terms of adoption, almost 31% of the sample organizations already adopted the innovation at the time of the study.

The average number of the sample firms is 197 and the standard deviation is 143. About 86% of respondents were top managers. Of organizations' characteristics their median number of employees was 100. Concerning the research method employed by scholars in their works, the average response rate is 31%. Moreover, of the reports 25% used a random sample, 28% used personal interview for collecting data, and 27% addressed the potential differences between respondents with non-respondents. For what concerns the measurement procedures, the cross-sectional design was the method of choice.

Moreover, in measuring the adoption decision, of studies 41% (24%) measured the adoption decision with a single item (with more than 3 items). We also observed that of studies 85% reported Cronbach's alpha and 73% referred to past studies in building their measures of studies 57% adapted measures of constructs. Content, convergent and discriminant validities were reported in 57%, 77%, and 72% of available reports, respectively. Dependent and independent variables were measured with different scale in 45% of reports. Finally, the adoption of cross-validation or holdout samples as well as tests for endogeneity between dependent and independent variables were nearly non-existent.

Given the available pairwise correlation coefficients, we then determined the average-adjusted intercorrelation among all constructs in our proposed framework. Results are presented in Table 2.

INSERT TABLE 2 ABOUT HERE

From results reported in Table 2 we observed that although the associations between variables concerning both the attributes of innovations and decision makers' behavioral preferences are generally high, no correlation is above the recommended level of .65 (Tabachnick & Fidell, 1996) and, thus, problems induced by a lack of discriminant validity are not likely to bias our data. In addition, we calculated the

variance inflation factor (VIF) for multicollinearity (Montazemi & Qahri-Saremi, 2015), and observed that for all antecedent pairs included in our analysis the VIF ranges from 1.03 to 1.73. Since VIFs are less than the level of 1.87, the assumption of independence of constructs is not violated by the data (Larsson, 1993).

Moreover, the correlation matrix gives some first indications about the relationships between the constructs: the reliability-corrected relationship between the attributes of innovations and the adoption decision ranges between -.39 and -.33 while those between the behavioral preferences of managers and the adoption decision ranges between .54 and .38.

4.2 Which Attributes of Innovations are Most Effective for Triggering Manager Decisions about the Adoption of Innovations in Organizations?

Table 3 shows the results for meta-analysis on the attributes of innovations-innovation adoption decision linkages.

INSERT TABLE 3 ABOUT HERE

Given the results reported in Table 3, we noted that the attributes of innovations tend to influence the adoption with a sufficient consistency and directionality across different studies, organizations, contexts and research settings. Moreover, results appear to be robust with regard to the number of null studies needed to render the observed effects zero (mean file-drawer N is 51,443). Consequently, the attributes of innovation then matter for the adoption decision in organizations.

Our results further suggested that the attributes of innovation influence the adoption decision with different signs and salience. In terms of signs, relative advantage, compatibility, observability, and trialability tend to favor the adoption decision while complexity hamper such decision. According to the .30 rule, attributes of innovations that turn out to be salient determinants of organizations' innovation adoption decision are relative advantage, compatibility, and complexity (see also Tornatzky & Klein, 1982). We further calculated the combined direct effect of the salient attributes of innovations on the adoption decision as estimated by structural equation model. The path coefficient is positive, greater than the .30 rule, and highly significant. This result suggests synergic, combined effects between the three salient attributes of an innovation in triggering an adoption decision. Overall, results provide evidence that confirm hypothesis 1.

4.3 What Decision Makers' Behavioral Preferences are Most Affected by Variations in Attributes of

Innovations?

Table 3 shows also the results for meta-analysis on the attributes of innovations-decision makers' behavioral preferences. The average of the absolute sample-weighted reliability-adjusted correlations among attributes of innovations and mediators is .39. All paths from antecedents to mediators are supported in both the pairwise analyses and the structural equation model. All of the findings appear to be robust with regard to the number of null studies needed to render the observed effects zero (mean file-drawer N is 4,333).

Different attributes of innovations have also differential influences on decision maker-level variables. Relative advantage has the largest positive impact on the mediators of all antecedents, in support of the relevance of this attribute in forming a favorable attitude in the decision makers. The significant impact of attributes of innovations on norm indicates that the mechanism of false consensus in decision makers matter. Yet, the explained variance for the considered associations suggests also that the mechanism of false consensus does not monopolize the process of norms formation. Complexity has instead a negative impact on all the behavioral preferences of decision makers, suggesting that greater levels of complexity have a negative influence on attitude, norm and perceived control perceptions of the innovation to be adopted. We also evaluated the combined effects of the attributes of innovations on the considered mediators. The path coefficient is positive, greater than the .30 rule, and highly significant and indicates joint effects of the attributes of innovations on decision maker's behavioral preferences.

4.4 How do Variations in Decision Makers' Behavioral Preferences Account for Variations in Innovation Adoption Decisions in Organizations?

We now consider the back half part of the model, the mediator-adoption decision relationships. From Table 3 the average sample-weighted reliability-adjusted correlation among mediators and adoption decisions is equal to .44. All paths from mediators to outcome are supported in the pairwise analyses as well as in structural equation model. All of the findings appear to be robust with regard to the number of null studies needed to render the observed effects zero (mean file-drawer N is 35,669).

In general, decision makers' behavioral preferences have a wide range of effectiveness for the adoption of innovation. The combined effect on the adoption decision, as captured by structural equation model, is positive, well greater than the .30 rule and highly significant. This result suggests that decision makers' behavioral preferences may produce synergistic effects. The chances of an innovation to be adopted tend to

increase when the new technology is able to simultaneously stimulate favorable attitude, norm and perceived behavioral control in the decision maker. Concerning the different mediators, they tend to produce varying influences on the adoption decision. Attitude has the greatest influence on the adoption decision. Norm and behavioral control have a more attenuated although highly significant effects. This implies that stimulating a favorable attitude in a decision maker toward the innovation represent a key determinant for its adoption in organizations. We further evaluated the strengths of the effects in the attributes of innovations-adoption decision linkages that are likely to be mediated by decision makers' behavioral preferences. Results for the hypothesized relationships are reported in Table 4.

INSERT TABLE 4 ABOUT HERE

In particular, the analysis provides evidence that if one controls for attitude, norm, and perceived behavioral control in the attributes of innovations-adoption decision relationships, the resulting corrected partial correlation coefficients will be lower than the un-mediated correlations between the considered variables. Moreover, we evaluate the strength and significance of the mediations effects by test developed by Sobel (1982) and observed that the total standardized mediation effects for the considered variables are significant (see Table 4). The pairwise analysis then offers evidence that support hypotheses 2, 3, and 4. Note that the magnitude of corrected partial correlation coefficients is lower than the magnitude of coefficients associated to unmediated effects, yet their significance level were still high for all the considered associations (see Table 4).

As robustness we referred again to the structural equation model. Specifically, we run a first structural equation model that includes decision maker's behavioral preferences as mediators of the attributes of innovations-adoption association (model 1). We also run a second model that includes the direct and the mediation effects between attributes of innovations and adoption decision (model 2). The fit statistics of Model 1 are $\chi^2(8) = 433.49$, RSMEA=.20, $p<.01$, CFI=.77 and those of model 2 are $\chi^2(5) = 381.42$, RSMEA=.24, $p<.01$; CFI=.75. These models allow us to calculate direct, indirect, and total effects (Brown, 1997). The direct effects are the effects of the attributes of innovations on the adoption decision unmediated by other variables. The indirect effects are computed as the product of the paths from the attributes of innovation to the behavioral preferences of manger and from the behavioral preferences of managers to the

adoption decision. These effects for relative advantage (Beta=.13, p <.05), compatibility (Beta=.20, p<.05) and complexity (Beta=-.09, p<.05) are all significant, further supporting hypotheses 2, 3, and 4. We also calculated the direct effects of attributes of innovation on the adoption decision, controlling for decision makers behavioral preferences, for relative advantage (Beta=.13, p<.05), compatibility (Beta=.05, p<.05), and complexity (Beta=-.09, p<.05) and observe that these coefficients are much lower than the corresponded unmediated coefficients for relative advantage (Beta=.21, p<.05), compatibility (Beta=.17, p<.05), and complexity (Beta=-.15, p<.05). On the one hand, these results confirm the mediating role of decision makers' behavioral preferences on the attributes of innovations-adoption linkages. On the other hand, the mediated coefficients for the considered attributes of innovations are still significant. This result is consistent with the analysis of partial correlation coefficients and suggests that other potential mediators are to intervene in the attributes of innovations-adoption linkage.

4.5 How do Variations in Contexts of Adoption and Research Settings Influence the Linkages between Behavioral Preferences of Decision Makers and Adoption Decisions in Organizations?

In introducing the moderation analysis, we observed that the explained variance of associations between mediators and the adoption decision is well below the threshold of 75% and the homogeneity test is always significant for all the considered associations between mediators and adoption decisions in organizations. Outcomes from the considered tests motivate an investigation of the potential sources for the reported differences of effect size. Results are reported in Table 5.

INSERT TABLE 5 ABOUT HERE

The premise that behavioral control perceptions have a greater impact on the adoption decision when one considers top managers is supported. The same effect was not found for attitudes and norms. Therefore, hypothesis 5 is partially confirmed by the data. The moderating effect of the organization size on decision maker's behavioral preferences-adoption associations was found not significant: the t-test and the beta coefficients calculated with a meta-analytical regression model are never significant. Consequently, our data does not provide consistent evidence that support hypothesis 6. Yet, this result suggests that the considered associations hold across organizations of different sizes.

Considering the research settings, the hypothesis that behavioral preferences matter more when the

decision maker can control the adoption of innovation is confirmed for all but perceived behavioral control. Specifically, the magnitude of the attitude and norm-adoption associations is greater when the adoption decision is measured as an intention rather than as an expectation. Therefore, we found partial support for hypothesis 7. We do not find any confirming evidence for hypothesis 8. Attitudes and norm have significant implications not only for the intention to adopt an innovation but also for the adoption decision. Finally, we found evidence that the common method variance may inflate correlation coefficients in the considered studies, particularly for the attitude and norm-adoption linkages. Therefore, hypothesis 9 is partially confirmed by the available data. It must be noted, on the one hand, that when significant the observed differences concern the magnitude of the correlation while the direction and significance level are consistent with our main results. On the other hand, non-significant results must be considered cautiously and avoid to conclude on the limited relevance of the moderator since its non-significance may be related to the power of the test.

4.6 Additional Analyses

As robustness we evaluated the possibility that a mediating variable, as it was measured in the study, may only be a spurious one. Thus, we run a regression with random effects (Lipsey & Wilson, 2001) for each mediator on the variables capturing other measured characteristics of our studies (i.e., country, technology, industry, and year). From the analysis we observed that none of the considered variables is associated significantly to the attitude (min p-value =.21; max p-value=.96; R-squared=.23), norm (min p-value =.10; max p-value=.90; R-squared=.18), and perceived behavioral control (min p-value =.06; max p-value=.72; R-squared=.26).

We also provided a further assessment of publication and eligibility biases by running a quantile-plot analysis, here omitted but available on request from the corresponding author, in which the empirical values of considered associations are contrasted with the expected values under the assumption of normality. From the analysis we observed that the sample of effect sizes for the considered associations gather around the diagonal and generally fell within the 95% CIs of the normality line. Therefore, we can conclude that publication and eligibility biases is limited in our study (Wang & Bushman, 1999). We also excluded extreme outliers from the sample of observation and observed that our findings remained unaltered, which confirm the robustness of our results. We finally analyzed associations for the specific sample measures as

reported in Table 1 and find again that our main results hold. Finally, we conducted a one-sample removed analysis to report the influence of each individual sample on our results (Borenstein, Hedges, Higgins & Rothstein, 2009). From the analysis we observed that our main findings hold constant.

5 Discussion

No single study has analyzed the linkages within Figure 1 at once. Meta-analysis combined with path modeling permitted us to conduct such a study. We found consistent evidence that attributes of innovations play a key role in the adoption of the innovation, and relative advantage, compatibility, and complexity are those attributes that are likely to promote greater stimulus on the decision to adopt innovations in organizations. Yet, we found in our sampled studies a work in which greater levels of relative advantage are significantly associated ($p=.02$) to more limited levels of adoption (Kurnia et al., 2015). Authors suggested that the finding is likely to be attributed to the lack of understanding within the surveyed organizations of the benefits of the new technologies as well as to presence of barriers that favor the formation of negative perceptions which outweigh the positive impressions about the impact of the new technologies. For an alternative explanation we refer to studies developed within the protection motivation theory for individuals and propose that in cases in which the level of efficacy of a behavior is low or there is uncertainty that the behavior will result in the desired outcome, the perceptions of lower (even negative) benefits may be more effective than perceptions of greater positive benefits in stimulating the decision maker to adopt the behavior. In addition, decision makers are more likely to involve in extended search for a behavior that is less certain to lead to the expected outcome than for a behavior that is more likely to lead to the expected outcome (Block & Keller, 1995). This result calls for future studies considering the mechanisms and the conditions that may explain a reverse relationship between relative advantage and adoption of innovations in organizations.

Incidentally, we must observe that out of Rogers' five attributes of innovations, observability and trialability were the least used in empirical studies. Some of the reasons behind their more limited utilization are related in our sampled studies to the specificity of the adopted technologies (e.g., Hashem & Tann, 2007), to the findings proposed by the study of, Tornatzky and Klein (1982) as well as on prior research based on the technology, organization, environment framework (Agarwal & Prasad, 1998; Hashem & Tann, 2007; Hsing Wu, Kao & Lin, 2013; Thong, 1999). Other studies referred to the technological acceptance

model in which only usefulness and ease of use (which relates to the concepts of relative advantage and complexity, respectively) are considered (Davis, 1989) and to the decomposed theory of planned behavior where only relative advantage, compatibility, and complexity are discussed as potential variables affecting the behavioral preferences of decision makers (Taylor & Todd, 1995a). However, we provided evidence that both observability and trialability matter for the adoption of innovations in organizations. We then suggest future studies to consider all the attributes of innovation in understanding adoption decisions.

Our results offer evidence that the correlation coefficient of the trialability-adoption association has the lowest magnitude among the attributes of innovations. This result may be influenced by available empirical estimates as well as by the conceptualization/operationalization of trialability. Concerning the empirical estimates, in our sample we found three studies in which greater levels of trialability are associated in a significant way ($p<.05$) to more limited levels of adoption (Aubert, Schroeder & Grimaudo, 2012; Hussin, Nor & Suhaimi, 2008; Ramdani et al., 2009). Authors explain the result by considering that the negative trialability-adoption association may be related to the wrong impression of non-adopters about the possibility to carry out tests of the new technology, that being complex and composed of different parts it is inherently difficult to try. In the considered studies, non-adopters were considered to perceive the innovation to be easier to try than it really was (Aubert et al., 2012). We may attempt to propose an alternative explanation for this result. Instead framing the considered association within the expectancy-value model, we can consider the cognitive reassurance theory and observe that when expectations of efficacy are high (e.g., the perceived trialability of technology is high) the subjects use this opinion as a basis for their behavior, without further evaluations. However, when the expectations of efficacy are low (e.g., the perceived trialability of the technology is low) people carefully search for the characteristics of the behavior and to seek reassurance, which in turn may influence their attitudes toward the behavior and, in turn, the decision to adopt it (Gleicher & Petty, 1992). Therefore, we could consider the possibility that decision makers that perceived the innovation as difficult to try were involved in understanding and experimenting with the innovation to greater extents, which in turn favored their decision to adoption the innovation. Understanding mechanisms in which the observed negative association between trialability and adoption prevail need to be addressed by future research. In the same vein, research should compare the predicting validity of the expectancy-value model with the cognitive reassurance theory or with alternative theories across different contexts and

technologies.

Concerning the conceptualization/operationalization of the construct of trialability, Banerjee, Wei, and Ma (2012) observed that if one considers contexts that are highly uncertain and conceive trialability not just as a belief-based factor but as an active post-intent recursive process of experimentation focused on accumulating information and experience on the innovation, then trialability may become an important determinant of the adoption decision. For an adoption decision to occur, it is important not only the initial perception of the trialability of an innovation but also the effective intention of the decision maker to try it. Considering the discussion about the negative association between trialability and adoption, we may also envisage the possibility that perceived greater levels of trialability may reduce the probability of a decision maker to try the innovation, which in turn may negatively influence the adoption decision. Therefore, further elaborating the concepts of observability and trialability as well as investigating their implication across different contexts and technologies will represent an important task for future research.

We found strong support for the effects of attributes of innovations-behavioral preferences of decision makers and behavioral preferences of decision makers-adoption decision in organizations linkages. A key finding is that the behavioral preferences of decision makers mediate (although partially) the attributes of innovation-adoption decision linkages. Therefore, to the extent that future studies are interested in understanding the mechanisms involved in the adoption decision, the considered constructs of attitudes, norm, and perceived behavioral control should be included.

We also observed that contexts in which adoption take place (i.e., the hierarchical position of the decision maker) as well as research settings employed by scholars matter for empirical predictions. We found evidence that measuring adoption as intention or as expectation as well as measuring dependent and independent variables with the same/different format influence the magnitude of empirical estimates, yet direction and significant levels hold constant. Future studies, particularly those interested in making precise estimates of the innovation attributes-innovation, adoption should make sure to address the problem of measuring the adoption construct, considering alternatives that are both consistent with the conceptual definitions and address the common method variance bias (e.g., by combining data from multiple, different sources or by using multiple respondents).

5.1 Our Findings in the Context of the Past Meta-analytical Works

There are meta-analyses to which our study relates to. Concerning the main effect of attributes of innovations on the adoption of innovations, our study relates to the work of Arts, Frambach, and Bijmolt (2011) that deals with the adoption of innovations by consumers. It is interesting to note that the influence of the attributes of innovations on the decision to adopt innovation was greater when the adopting unit is an organization rather than when the adopter was a consumer. In addition, considering consumers' adoption of innovations correlation coefficients associated to the attributes of complexity, observability, and trialability were close to zero and generally not significant. The comparison suggested that while organizations generally tend to care about all the attributes of an innovation, consumers generally tend to care less about such attributes and in a selective manner.

It must be further noted that those meta-analysis that combined adoptions by organizations and by consumer (Kapoor et al., 2014b), reported coefficients associated to the attributes of an innovation that were generally lower than ours and greater than those reported by Arts, Frambach, and Bijmolt (2011) for consumers. In that, our and the meta-analysis of Arts, Frambach, and Bijmolt (2011) offered a picture of the upper and lower boundaries within which the mean correlation coefficients associated to the attributes of relative advantage (.39;.19), compatibility (.36;.21), complexity (-.33;-.01), observability (.30;.05), trialability (.11;.03) and tend to be distributed.

Our study focused on the adoption decision and, thus, our results relate with studies on post-adoption, particularly with those reviews that examined the performance outcomes of innovation adoption in organizations (Rosenbusch et al., 2011). Although results from the two studies cannot be combined as samples are different, both reviews address an important research need – understanding antecedent innovation performance chain—and suggest a call for primary and review future studies aimed at developing an integrated model that account for the relationships among attributes of innovations, adoption decisions, and performance implications of innovations in organizations.

5.2 Limitations of this Meta-Analysis

Prior to concluding, there are several limitations of this study to discuss. These limitations concern the correlational nature of the results, the validity of self-reports of innovation adoption, the difficulty of analyzing more complex interactions in the proposed framework, the generalizability of the current conclusions to the sample of studies and to the population of potential studies on the topic. Our study has a

correlational nature. The specific composition of the sample of organizations, the preferences of particular researchers, and other un-controlling variables can co-vary with other characteristics of the studies or the methods being used. Fortunately, however, this limitation is mitigated by the use of mediational analysis, multiple measures and methods. Another limitation refers to the potential inaccuracy of the managers' self-reported behavior. However, various factors influence the accuracy of self-reports, such as the length of the time interval and the social context of the adoption as well as the order in which participants answer questions (March & Sutton, 1997). The accuracy of self-reports may also differ across groups. For example, if the innovation conveys a particular status to the adopter, respondents may be tended to report that her firm has adopted the innovation even if an adoption decision has not been taken. Given these possibilities, future studies may combine self-report measure of the adoption decision with objective obtained, for example, from archival data or from third parties (e.g., suppliers of the new technology). Another limitation concerns the associations between attributes of innovations and behavioral preferences of managers. Because of the available conceptualization, we excluded observability and trialability. Yet, we expect future studies to consider how the attributes of observability and trialability may influence the behavioral preferences of managers and, consequently, stimulate the adoption decision. Mediating processes and moderating variables may interact among each other and such interactions may generate further effects on the innovation attributes-innovation adoption relationships. In addition, second order relationships could be also envisaged. Finally, by synthesizing the largest number of studies on the adoption decision that provide source information, the findings from our meta-analysis are probably the most generalizable to date. To complement these findings, future research may offer a sufficiently large number of effect sizes to estimate the population variance and establish the tenability of our conclusions in the broader universe of all possible studies.

5.3 Implications for Practices

This study has also implications for practices. Without knowing the characteristics of the potential adopters, business executives interested in the diffusion of an innovation should design the new technology in a way that at least offers greater benefits compared with already available alternatives and, at the same time, such innovation should be compatible, easy to use, and their benefits highly observable.

Managers must also recognize that the influences of attributes of innovation (particularly relative advantage, compatibility, complexity) on the decision to adopt a new innovation are mediated by a greater

extent by influences on attitude, norms, and behavioral control perceptions of the decision maker. This means that the attributes of innovation need to stimulate positive attitudes, norm and perceived behavioral in the decision maker, particularly those of top managers. Our results suggest that targeted approaches may improve the diffusion of innovations. Because attributes of innovations tend to operate through different mediators that influence the adoption decision differently, a manager who recognizes that the decision maker of adopting organizations may lack the necessary resources to spot the innovation should design technologies whose complexity is very limited. Managers that targets firms that are highly connected with other organizations (i.e., like in business ecosystems) could improve the diffusion of innovation by investing resources for increasing the perception of the relative advantage of the innovation not only by the target adopting organizations but also by partners with which these target organizations are associated.

Business executives should also consider the differential effects of the attributes of innovations on the behavioral preferences of decision makers and, in turn, on the adoption decision. Consider for example that while relative advantage has a significant positive effect on decision makers' attitude and norm, complexity has a negative effect on attitude, norm, and perceived behavioral control of the innovation. Therefore, one can increase the diffusion of an innovation by increasing its relative advantage or by reducing its complexity. From our structural equation model, we also observed that the positive effect of relative advantage on decision maker's behavioral preferences (Beta=.58, $p<.05$) is larger in magnitude than the negative effect of complexity on these behavioral preferences (Beta=-.27, $p<.05$). Thus, when there are trade-offs between relative advantage and complexity in the design of a new technologies, investing resources for providing innovations with greater relative advantages may turn to be beneficial in terms of its diffusion, even if such increases in the advantages of the innovation will be achieved at the expenses of moderate increases in the levels of complexity. In a different perspective, however, if an organization wants to deter the adoption of an innovation by other organizations, business executives could increase the complexity of the innovation and reduce its relative advantage (and also its compatibility) for other organizations and favor that this perception will be shared by most of the players of an industry.

5.4 Future Directions for Research

Our findings provide also evidence that something can be gained by integrating the innovation diffusion theory and the theory of planned behavior. Such integration offers a richer but more articulated explanation

of the adoption decision in organization as well as of its determinants. Specifically, we conceived and provided evidence that decision makers will contribute to the adoption decision not just by simply forming their own interpretation of the attributes of innovation but by developing a more complex set of behavioral preferences which, in turn, will influence the adoption decision. The important role of decision maker in the adoption decision was also envisaged by Rogers who suggested that in the adoption process an individual is expected to pass from the knowledge of an innovation to the formation of an attitude toward the new technology and once formed such attitudes are keys for explaining a decision to adopt an innovation (Rogers, 1983: p. 36). We add to Roger's initial insight that not only attitude but other behavioral preferences (i.e., norms and perceived behavioral control) matter for the adoption decision.

Our results further suggest the importance of scholars to continue to analyze decomposition and crossover effects in the theory of planned behavior (Taylor & Todd, 1995a). Future research should also incorporate as antecedents of decision makers' behavioral preferences the attributes of observability and trialability. To the best of our knowledge, a theoretical discussion of nature (e.g., direct correlates or moderating variables of the attributes of innovation-behavioral preferences linkage), expected association (i.e., which behavioral preferences is influenced), and direction of the effects of these two attributes of innovations on decision makers' behavioral preferences is required. Moreover, direct effects of attributes of innovations on the adoption decision are still significant even if we controlled for the behavioral preferences of the decision maker. The presence of these direct effects may originate from considering the adoption decision in an organization. For example, an organization decision maker may have a very limited attitude toward the innovation but she will pursue its adoption in order to achieve various benefits and reward for herself or for the organization that are extrinsic to the use of the technology by the decision maker herself (Davis et al., 1989). Therefore, studies on the adoption of innovations in organizations should elaborate on the distinction between behavioral preferences that are considered by decision makers as intrinsic or extrinsic to the use of the innovation and evaluating how these distinct preferences are likely mediate the attributes of innovation-adoption relationship.

In understanding the adoption of innovation in organizations, research should also elaborate and even extend the concept of behavioral preferences of decision makers. In that, areas of study that appear to hold promise include such aspects as decision maker's awareness of the attributes of the innovation and trust in

the providers/vendors of the innovation. Note that awareness has been extensively considered within the awareness-motivation-skills and capabilities framework for understanding adoption decision of various behaviors (Dutton & Jackson, 1987; Kiesler & Sproull, 1982; Lant, Milliken & Batra, 1992) and trust has been considered in studies of innovation adoption as antecedent of the decision maker's attitude (Pavlou & Fygenson, 2006). Research should also consider the possibility to take a multidimensional perspective on the behavioral preferences of managers and investigate potential interdependencies both among the behavioral preferences of an organization decision maker and across the preferences of different organization decision makers, identify relations that are potentially complementary or substitutable, and evaluating how these interactive preferences mediate the attributes of innovations-adoption linkages.

Our study provides also evidence of the presence of heterogeneity across nearly all linkages, even after we accounted for the moderators. Therefore, theoretically address and empirically analyze the implications of moderating variables on the antecedents-adoption linkages represent an important task for future research. Concerning moderating variables associated to the contexts of the innovation adoption, past experience of decision maker (Cordano & Frieze, 2000) and espoused national cultural values (Mueller, Rosenbusch & Bausch, 2013; Srite & Karahanna, 2006) represent important aspects to be considered in future studies.

Concerning the overall research settings employed by scholars, this review suggests that still different studies do not meet some of the "ideal" conditions suggested by Tornasky and Klein (1982). We then suggest future studies to continue to embrace a predictive instead of a retrospective stance, use research approaches and measures that are reliable, replicable and permit some degree of statistical power, consider longitudinal design and introduce cross sample validation. Scholars should also carefully spot the issues of endogeneity and chronology. In some way, scholars should design their work and consider their findings in a way that considers that (a) the decision to adopt innovations may induce the decision maker to associate certain attributes to the new technology, (i.e., the adoption decision determines attributes of the innovations); (b) there may be different time lags between the time at which a decision maker is exposed to an innovation and the time at which a decision is taken (i.e., the adoption decision becomes continent upon the period the interview is conducted) ; (c) in some organizations, the decision makers always changes (i.e., the decision maker that decided to adopt the innovation may be different from the individual who evaluate the attributes of the innovation).

Finally, extant studies suggest that the innovation diffusion theory is affected by pro-innovation biases (Jeyaraj et al., 2006). The presence of these biases makes difficult for scholars to address such challenging questions as when and how do organizations adopt "inefficient" innovations? When and how do organizations reject "efficient" innovations? In addressing these challenging questions, in an early study Abrahamson (1991) considered, among other conditions, how influences exerted by other organizations on the decision maker may represent a potential mechanisms for understanding the adoption of inefficient innovations (or the rejection of efficient ones). The integration of the innovation diffusion theory with the theory of planned behavior may offer a complementary perspective on the adoption of inefficient innovations. Specifically, our model not only incorporates the possibility that an organization may adopt inefficient innovations (e.g., an innovation with very limited relative advantages and/or highly complex), via decision makers' norms formation, but also offers some directions on the conditions for these adoption decisions to occur. Specifically, our model suggests that organizations are likely to adopt inefficient innovations when the magnitude of effects produced by external pressures on decision makers' norm will be greater than the magnitude of both the direct effects of attributes of innovations on attitudes as well as of the crossover effects of these attributes on the decision maker's norms. An empirical estimate of conditions according to which effects of external pressures tend to dominate the effects of the attributes of innovations in the adoption of inefficient innovations represent an important issue to be discussed in future studies.

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Details of all works included in our meta-analysis are reported in an electronic companion available from the journal's website.

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Figure 1
Mediator-Moderator Meta-Analytic Framework

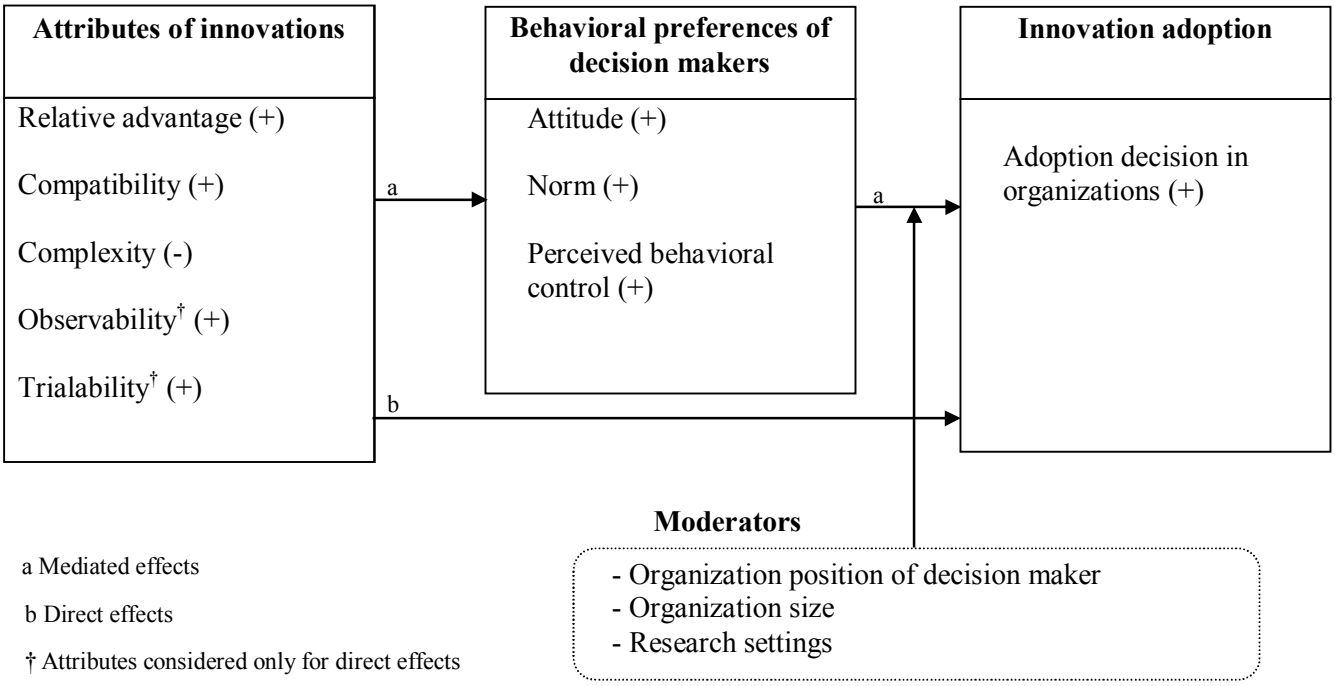

Table 1
Description of Key Constructs

Key Construct	Definitions	Sample measures
Attributes of innovations		
1. Relative advantage	The degree to which an innovation is perceived as being better than the idea it supersedes (Rogers, 1983: p.213)	Relative advantage (Gu, Cao & Duan, 2012; Jarrett, 2003; Seyal & Rahman, 2003) Perceived usefulness (Daryanto, Khan, Matlay & Chakrabarti, 2013; Gamal Aboelmaged, 2010; Heyder, Theuvsen & Hollmann-Hespos, 2012) Perceived benefits (Ghobakhloo & Tang, 2013; Kurnia et al., 2015; Quaddus & Hofmeyer, 2007)
2. Compatibility	The degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters (Rogers, 1983: p.226).	Compatibility (He, Duan, Fu & Li, 2006; Henderson, Sheetz & Trinkle, 2012; Lin & Ho, 2011) Technological compatibility (Uzoka & Ndzinge, 2009; Weng & Lin, 2011)
3. Complexity	The degree to which an innovation is perceived as relatively difficult to understand and use (Rogers, 1983: p.231).	Complexity (Gu et al., 2012; Hsing Wu et al., 2013; Hung, Hung, Tsai & Jiang, 2010) Ease of use (reverse coded) (Arpaci, 2013; Jarrett, 2003; Li, Troutt, Brandyberry & Wang, 2011)
4. Observability	The degree to which the results of an innovation are visible to others (Rogers, 1983: p.232).	Observability (Hussin et al., 2008; Leung, 2005; Sophonthummapharn, 2009) Demonstrability (Askarany, Brierley & Yazdifar, 2012; Plouffe, Vandenbosch & Hulland, 2001)
5.Trialability	The degree to which an innovation may be experimented with on a limited basis (Rogers, 1983: p.231).	Trialability(Hsu & Lin, 2015; Limthongchai & Speece, 2003; Ramdani, Chevers & Williams, 2013)
Preferences of managers		
6. Attitude	Refers to the degree to which an individual has a favorable or unfavorable evaluation or appraisal of the behavior under examination (Ajzen, 1991: p. 188).	Attitude (Gamal Aboelmaged, 2010; Harrison et al., 1997; Riemenschneider et al., 2003) Top management attitude (Lin, Lin, Roan & Yeh, 2012; Thompson, Sijie & Kee-hung, 2009)
7. Norm	Reflects perceived social pressure to perform or not to perform the behavior under examination (Ajzen, 1991: p. 188).	Subjective norm (Harrison et al., 1997; Riemenschneider et al., 2003 ; Xu & Quaddus, 2012) External pressures (Alam & Noor, 2009; Hossain & Quaddus, 2015; Tung & Rieck, 2005)
8. Behavioral control	Refers to the availability of availability of requisite opportunities and resources (e.g., time, money, skills, cooperation of others) to staff the behavior under examination (Ajzen, 1991: p. 182).	Perceived behavioral control (Harrison et al., 1997; Hsu et al., 2014; Riemenschneider et al., 2003) Self-efficacy (Jackson, 2008; Lee & Larsen, 2009; Segaar, Bolman, Willemsen & de Vries, 2006) Facilitating conditions (Leung, 2005; Messerschmidt & Hinz, 2013)
Innovation adoption		
9. Adoption	It is a decision to make full use of an innovation as the best course of action available (Rogers, 1983:p. 20)	Adoption (Jeon et al., 2006; Leung, 2005; Thong, 1999) Intention to adopt (Daryanto et al., 2013; Martinez-Garcıa, Dorward & Rehman, 2013; Quaddus & Hofmeyer, 2007) Expectation to adopt (Hussin et al., 2008; Lee & Larsen, 2009; Marcati et al., 2008)

Table 2
Average Reliability-Adjusted Intercorrelations Among Constructs in meta-analytic model

	1	2	3	4	5	6	7	8	9
1. Relative advantage	[.87]								
SD of correlations	--								
Number of correlations	--								
Sample size	--								
2. Compatibility	.47*	[.86]							
SD of correlations	.04	--							
Number of correlations	32	--							
Sample size	6,034	--							
3. Complexity	-.37*	-.35*	[.85]						
SD of correlations	.05	.08	--						
Number of correlations	51	26	--						
Sample size	10,187	4,914	--						
4. Observability	.39*	.41*	-.31*	[.80]					
SD of correlations	.02	.03	.04	--					
Number of correlations	12	10	10	--					
Sample size	2,297	1,958	1,958	--					
5. Trialability	.29*	.30*	-.21*	.42*	[.85]				
SD of correlations	.01	.03	.04	.02	--				
Number of correlations	11	10	11	9	--				
Sample size	2,290	2,157	2,290	1,719	--				
6. Attitude	.50*	.45*	-.38*	.39*[a]	.27*	[.89]			
SD of correlations	.04	.07	.04	.01	.01	--			
Number of correlations	20	6	12	1	3	--			
Sample size	3,955	1,433	2,503	95	666	--			
7. Norms	.41*	.30*	-.26*	.42*	.22*[a]	.56*	[.83]		
SD of correlations	.04	.02	.04	.01	.01	.02	--		
Number of correlations	47	12	19	4	3	13	--		
Sample size	7,991	1,920	3,467	793	453	2,605	--		
8. Behavioral control	.35*	.36*	-.39*	.36*	.18*[a]	.42*	.37*	[.83]	
SD of correlations	.03	.03	.03	.03	.01	.04	.03	--	
Number of correlations	40	15	20	2	3	9	29	--	
Sample size	7,300	3,051	3,898	313	751	1,550	4,670	--	
9. Adoption	.39*	.36*	-.33*	.30*	.11*	.54*	.38*	.40*	[.89]
SD of correlations	.04	.03	.04	.02	.02	.03	.04	.03	--
Number of correlations	153	68	90	22	20	33	86	74	--
Sample size	30,414	14,301	19,685	4,605	4,328	6,559	15,819	14,273	--

Notes: Entries on the diagonal in brackets are weighted mean Cronbach's alpha coefficients.
[a] Means that the coefficient is cross-situationally consistent according to the Chi-squared homogeneity test.
* $p < .05$.

Table 3

Descriptive Statistics and Influences of Attributes of Innovation and of Decision Maker-Level Mediators on Adoption Decisions

	Number of raw effects	Total sample size	Mean correlation coefficients	Weighted mean correlation coefficients [Beta]	Corrected mean correlation coefficients	Observed variance correlation coefficients [S.E.]	T-value(d.f.) [z-values]	Explained variance (in %)	95% credibi-lity interval	File Drawer N (Using Two-Tailed Test)	X2 homogeneity test (d.f.)
Attributes of innovations → Adoption											
Relative advantage → Adoption	153	30,414	.34*	.34*	.39*	.04	22.59 (152)	.16	.42	184,144	1205.23 (152)
Compatibility→ Adoption	68	14,301	.31*	.31*	.36*	.03	14.07 (67)	.16	.42	29,941	524.23 (67)
Complexity→ Adoption	90	19,685	-.26*	-.28*	-.33*	.04	14.24 (89)	.15	-.43	40,600	757.31 (89)
Observability→ Adoption	22	4,605	.25*	.25*	.30*	.02	7.87 (21)	.22	.33	2,009	110.33 (21)
Trialability → Adoption	20	4,328	.14*	.10*	.11*	.02	3.25 (19)	.27	.23	518	74.90 (19)
Attributes*[b] → *Adoption	--	1,365	--	[.92*]	--	[.03]	[28.75]	--	--	--	--
Attributes of innovations → Mediators											
Relative advantage → Attitude	20	3,955	.47*	.44*	.50*	.04	9.41 (19)	.15	.49	6,292	215.84 (19)
Compatibility → Attitude	6	1,433	.42*	.38*	.45*	.07	3.48 (5)	.07	.71	531	124.48 (5)
Complexity → Attitude	12	2,503	-.35*	-.34*	-.38*	.04	5.7 (11)	.12	.46	1,269	120.61 (11)
Relative advantage → Norm	47	7,991	.36*	.35*	.41*	.04	12.11 (46)	.16	.47	17,638	363.58 (46)
Compatibility → Norm	12	1,920	.24*	.25*	.30*	.02	5.54 (11)	.25	.33	439	51.17 (11)
Complexity → Norm	19	3,467	-.18*	-.22*	-.26*	.04	4.66 (18)	.13	.48	1,099	156.26 (18)
Complexity → Behavioral control	20	3,898	-.32*	-.34*	-.39*	.03	7.86 (19)	.16	-.46	3,065	158.7 (19)
Attributes*[b] → *Mediators	--	1,365	--	[.88*]	--	[.02]	[29.84]	--	--	--	--
Mediators → Adoption											
Attitude → Adoption	33	6,559	.49*	.48*	.54*	.03	15.12 (32)	.19	.40	19,183	286.28 (32)
Norm → Adoption	86	15,819	.34*	.32*	.38*	.04	14.07 (85)	.14	.51	46,896	775.23 (85)
Behavioral control → Adoption	74	14,273	.34*	.35*	.40*	.03	17.05 (73)	.19	.39	40,930	488.10 (73)
Mediators → Adoption	--	1,365	--	[*.94**]	--	[*.02*]	[*34.44*]	--	--	--	--

Note: harmonic mean of total sample size, and standardized beta coefficients are reported for structural equation model. All Ns greatly exceed the critical N calculated as Ncrit=5xN+10 (Rosenthal, 1991). The model associated to the Attributes-Adoption linkages has the following indexes $\chi^2(4) = 16.49$, RMSEA = .04, p<.01, CFI=.99. The model associated to the Attributes-Mediator linkages has the following indexes $\chi2(8) = 186.86$ RMSEA = .12, p<.01, CFI=.89. The model associated to the Mediators-Adoption linkages has the following indexes: $\chi2(4) = 38.96$, RMSEA =.08, p<.01, CFI=.98.

[a] Means that the correlation coefficient is cross-situationally consistent according to the Chi-squared homogeneity test.

[b] Only salient variables (i.e., relative advantage, compatibility, and complexity) are included under the label Attributes.

* $p < .05$.

Table 4

Relationships between Attributes of Innovation and Adoption Decision after Controlling for Behavioral Preferences of Decision Makers

	Attitude		Norm		Behavioral control	
	Corrected mean partial correlation coefficients	Total unstandardized mediation effect (SE)	Corrected mean partial correlation coefficients	Total unstandardized mediation effect (SE)	Corrected mean partial correlation coefficients	Total unstandardized mediation effect (SE)
Relative advantage → Adoption	.16*(6,846)	.23*(.01)	.29*(13,560)	.11*(.01)	--	--
Compatibility→ Adoption	.15*(3,260)	.22*(.01)	.27*(4,587)	.09*(.01)	--	--
Complexity→ Adoption	-.14*(4,977)	-.19*(.01)	-.25*(7,454)	-.08*(.01)	-.19*(8,706)	-.13*(.01)

Note. Note that the significance of partial correlations was evaluated against the harmonic mean of sample sizes (in parentheses).

* $p < .05$.

Table 5a

Influence of Organization Contexts on Decision Maker's Behavioral Preferences-Adoption Decision Linkage

	Hierarchical position				Organizational size			
	Higher	Lower	*t-test*	*Beta (t-value)*	Larger	Smaller	*t-test*	*Beta (t-value)*
Mediators → Adoption decision								
Attitude → Adoption	.57 (15)	.50[a] (9)	.87	.32	.62 (10)	.58 (14)	.36	.09
	3,205	1,863		(1.53)	1,695	2,737		(.74)
Norm → Adoption	.46 (28)	.40 (32)	.52	.01	.43 (36)	.38 (28)	.74	.02
	4,372	5,444		(.04)	5,721	5,608		(.50)
Behavioral control → Adoption	.43 (34)	.30 (18)	2.66*	.28*	.41 (25)	.40 (26)	.42	.01
	6,053	4,038		(2.69)	5,460	4,891		(.01)

Note: Number of correlations is reported in parentheses. Sample size is reported under correlation coefficients. Differences in sample sizes depend on availability of data for moderators.

[a] Means that the correlation coefficient is cross-situationally consistent according to the Chi-squared homogeneity test.

* $p < .05$;

Table 5b

Influence of Research Settings on Decision Maker's Behavioral Preferences-Adoption Decision Linkage

	Adoption measures				Adopion measures				Measures of dependent/Indipendent			
	Intention	Expectation	*t-test*	*Beta (t-value)*	Intention/ expectation	Adoption	*t-test*	*Beta (t-value)*	Same format	Different format	*t-test*	*Beta (t-value)*
Mediators → Adoption decision												
Attitude → Adoption	.71 (8)	.45 [a] (8)	2.55*	.57*	.53 (12)	.55 (20)	.29	-.09	.61 (21)	.46[a] (12)	2.34*	.31*
	1,213	1,506		(2.65)	2,850	3,576		(.58)	3,671	2,888		(1.98)
Norm → Adoption	.55[a] (13)	.34 (24)	2.79*	.33*	.35 (33)	.38 (39)	.65	-.16	.43 (45)	.32 (40)	2.36*	.31*
	1876	3,485		(2.36)	7,379	6,781		(1.42)	8,238	7,432		(2.69)
Behavioral control → Adoption	.42 [a] (4)	.38 (26)	0.29	.17	.41 (34)	.4 (29)	.04	-.09	.44 (32)	.39 (42)	1.20	.14
	544	4,839		(0.79)	7,240	5,140		(.74)	5,795	8,478		(1.21)

Note: Number of correlations is reported in parentheses. Sample size is reported under correlation coefficients. Differences in sample sizes depend on availability of data for moderators.

[a] Means that the correlation coefficient is cross-situationally consistent according to the Chi-squared homogeneity test.

* $p < .05$;