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Abstract

While the effect of technological innovations (TI) on firm performance is established, performance contributions of management innovations (MI) is as yet undetermined. Theoretical discourse on the motivation for the adoption of MIs questions their performance outcome, and an integration of empirical research of the MI-performance relationship is lacking. This study thus examines three questions: (1) is the adoption of MI beneficial to organizations; (2) is the impact of MI on performance at par with that of TI; and (3) what are the potential sources of inconsistency in the MI-performance relationship? We quantitatively integrate the empirical findings using 52 independent samples from 44 articles published in peer-reviewed journals via two different procedures—support score and meta-analysis—for complementarity and reliability. The results from both procedures indicate that: (1) MI positively affects performance; (2) the direction and strength of the effect of MI on performance does not differ from that of TI; and (3) industrial sector (manufacturing vs. service) and construct measurement (both innovation and performance) moderate the MI-performance relationship. We discuss the implications of our findings for future research on innovation and performance in organizations.

Keywords: Management innovation, technological innovation, firm performance, quantitative integration

1. Introduction

Management Innovation (MI) is the introduction of a new structure, process, system, program, or practice in an organization or its units (Evangelista and Vezzani; 2010; Lam, 2005; Whittington et al., 1999; Zahra et al., 2000). The potential role of MI for strategic change, organizational renewal, and effectiveness has been noted by scholars in multiple disciplines. For instance, economic research points out MIs are both economically and socially important as they could impact productivity and employment (Edquist et al., 2001; Sanidas, 2005). Strategy and management research also offer that MI could influence organizational conduct and outcome as product and technological process innovations would (Ittner and Larcker, 1997; Luk et al., 2008). Yet, the importance of innovation as a driver of firm competitiveness and performance, while generally accepted for technology-based product and process innovations, has not been equally recognized for non-technological organizational innovations (Bloom and Van Reenen, 2007; Damanpour and Aravind, 2012; Tether and Tajar, 2008; Volberda et al., 2013). Indeed, some scholars portray the diffusion of new managerial techniques and practices as faddish, and argue that the primary motivation for the introduction of nontechnical innovations is to gain external legitimacy and reputation rather than to create internal value (Abrahamson, 1996; Staw & Epstein, 2000; Wang, 2010). Therefore, whether or not the adoption of MI is beneficial to firm performance remains an open research question.

Innovation is ultimately a practical construct and its relevance hinges on whether it would produce desirable results for the adopting organizations. Despite a considerable number of academic studies, however, an integrative analysis of the performance consequences of MI has not yet been conducted. This study addresses this research need and aims to contribute by investigating whether MI affects firm performance. We systematically identify the empirical studies on the association between MI and performance and aggregate their findings via two quantitative methods. We also examine the sources of inconsistencies in the findings by testing the role of four substantive (level of analysis, country, industry, and type of performance) and two methodological (measurement of innovation and performance) moderators. Since the efficacy of MI has usually been compared with technological innovation (TI), we also conduct a comparative analysis of the influence of TI versus MI on firm performance and test whether the direction or the extent of their effects are different.

We use two quantitative integration procedures to integrate research results based on both bivariate and multivariate analyses, and to test the robustness of our findings. First, we use a procedure based on the percentage of significant statistical tests that support the association between MI and performance (Boyne, 2002; Damanpour, 2010; Light and Smith, 1971). This procedure (henceforth "support score") incorporates the results from the studies that conduct multivariate analyses and report regression coefficients. Then, we use a meta-analysis procedure to aggregate the results from the studies that report correlation coefficients (Calantone et al., 2010; Camison-Zornoza et al., 2004; Chen et al., 2010; Rosenbusch et al., 2011). Each method has its weaknesses and strengths;[1] together, they provide more reliable results than each alone. By aggregating evidence on the effect of MI on performance for the first time, the results of this study provide new insight for both research and practice. For research, it informs the contrast between rational and institutional perspectives, identifies several sources of inconsistency of the MI-performance association, and guides future research on the role of innovation types for organizational outcome.

The next section provides a theoretical overview of innovation in organizations and distinguishes MI from TI. This is followed by a section on the relationship between MI and firm performance from rational and institutional perspectives, the two prominent theoretical views by which the relationship is explained. Then we introduce our sample, describe the two analytical techniques that are used to integrate research findings, and present the results. Finally, we discuss the implications of our findings for theory and research on innovation and performance in organizations.

2. Theoretical overview

Innovation has been studied in many academic disciplines, where the terminology, level of analysis, and research methodology differ. At the organizational level, innovation is viewed as a multilevel, multistage

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[1] While the meta-analysis allows for the computation of effect size, it relies on integrating the findings from the studies that have conducted bivariate analyses only. The support score procedure does not allow computing effect size; however, it aggregates the results from the studies that have conducted multivariate analyses where the influences of factors other than innovation on performance have been accounted for. Therefore, the findings based on the two procedures are complementary and more accurate than each alone.

construct (Sears and Baba, 2011), conceptualized as a process as well as an outcome, and grouped into several types. To carve out MI from the expansive innovation literature, we provide a brief overview to lay down the theoretical foundation for the selection of empirical studies and integration of their findings.

2.1 Definition of innovation

According to Damanpour (1991: 566), innovation is defined as "adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization." Newness or novelty is a common term in the definitions of innovation across disciplinary fields. It is a relative term as the unit of adoption differs by the level of analysis, which can be a person, project team, organizational unit, organization, industry, or a larger social system. The relative unit of adoption explains the differences between innovation and its sister concepts such as creativity, invention, organizational and technological change. This study focuses on the level of organizational unit (e.g., division, business, function) and the organization. We define *innovation* as the introduction of a new product, service, or process to the external market or the introduction of a new device, system, program, or practice in one or more internal units (Dougherty and Hardy, 1996; Klein and Sorra, 1996; Walker et al., 2011). The intention to engage in innovation is to respond to the competitive or institutional environment and to help the organization cope with emerging external or internal contingencies.

Organizations both generate and adopt innovation. *Generation* is a process that results in an outcome―a new product, service, technology, or practice (Roberts, 1988; Schilling, 2013; Hollen et al., 2013). The organization that generates the innovation may do so for its own use (e.g., R&D unit develops a new technology for use in the production unit) or for supply to the market. *Adoption* is a process that delineates how an organization acquires and uses a technology, product, policy, or practice for the first time (Damanpour and Wischnevsky, 2006; Walker, 2008; Wolfe, 1994). The outcome of the adoption process is the assimilation of the new program in the organization's operations and activities. Desirable performance outcomes may result from both generation and adoption.

2.2 Technological and management innovation

Most studies of innovation, especially those conducted by economists and technologists have focused on technology-based products and process innovations (Armbruster et al., 2008; Evangelista and Vezzani, 2010; Tether and Tajar, 2008). The importance of product and process innovations can be attributed to Schumpeter's early work on the role of "new products" and "new methods of production" for economic growth and firm prosperity (Fagerberg, 2005; Schumpeter, 1934). *Product innovations* are usually defined as new products or services introduced to meet an external user need, and *process innovations* are defined as new elements introduced into a firm's production or service operation to produce a product or render a service (Damanpour, 2010; Schilling, 2013; Utterback, 1994). Together they constitute *technological innovations* as used in this study.

The distinction between TI and MI corresponds generally with the distinction between technology and social structure (Evan, 1966). At the firm level, TIs are associated with technical core or technical system of an organization and MIs are associated with the social core or the social system (Daft, 1978; Damanpour and Evan, 1984; Tether and Tajar, 2008). In other words, while TIs are primarily introduced to change the organization's operating system, MIs are mainly introduced to affect the management system (Han et al., 1998; Montes et al., 2005; Naveh and Marcus, 2005).

The term MI used here corresponds with the terms administrative innovation, organizational innovation, and managerial innovation as were applied in previous research (Birkinshaw et al., 2008; Kimberly, 1981; Kraus et al., 2011; Walker et al., 2011). Damanpour and Aravind (2012) reviewed these terms and found that they overlap significantly in both definition and use. Researchers' disciplinary fields often determine use of a certain term, and the techniques and practices portrayed by these terms provide new knowledge for structuring the organization, devising strategies, and performing the work of management (Damanpour and Aravind, 2012, pp. 427-432). We thus define *management innovation* as the introduction of a new structure, process, system, program, or practice in an organization or its units (Evangelista and Vezzani; 2010; Lam, 2005; Whittington et al., 1999; Zahra et al., 2000).

Whereas the identification of product and technological process innovations has precedence, the identification of MIs has not been entirely clear. However, recently, the OECD (2005) Oslo Manual and the Community Innovation Survey have provided a comprehensive list of MIs grouped in three categories: (1) new *business practices* such supply-chain management, business re-engineering, knowledge management, lean production, and quality management; (2) new methods of *organizing work responsibilities and decision making* such as first use of a new system of employee responsibilities, teamwork, decentralization, integration or de-integration of departments, and education/training systems; and (3) new methods of *organizing external relations* with other organizations such as first use of alliances, partnerships, outsourcing, or subcontracting. These MIs correspond closely with non-technological techniques and practices noted by economists and organizational scholars (e.g., Armbruster et al., 2008; Birkinshaw et al., 2008; Bloom and Van Renan, 2007; Edquist et al., 2001, Hamel, 2006), and help identifying MIs in distinction from TIs.

2.3 Innovation and performance

Innovation and performance are complex constructs. Performance is the ultimate measure of organizational outcome and is affected by myriad market contingencies and organizational conditions (Evan, 1976). Innovation is risky, disrupts organizational operations and activities, and its impact on firm performance is neither predictable nor necessarily desirable (Rogers, 2003). Yet, innovation generally enjoys a positive connotation in both academia and society at large. Policy makers, organizational leaders, and scholars alike postulate that innovations' outcome for both the generators and adopters are favorable (Borins, 1998; Gundy et al., 2011; Ittner and Larcker, 1997; Tidd et al., 2001). Empirical research has provided ample evidence for this view as it often reports that firm innovation strategies and activities positively affect performance (Bowen et al., 2010; Calantone et al., 2010; Rosenbusch, 2011). We briefly explain the logic of the positive impact.

2.3.1 Entrepreneurial and corporate models of innovation

The role of innovation as an engine of economic growth and firm prosperity was pioneered by Joseph Schumpeter (1934). He first presented a model of innovation known as "Schumpeter Mark I" or

"Entrepreneurial Model" (Barras, 1990, Damanpour, 2010). The model posits that discontinuous change driven by new firms is the primary source of innovation in economic systems (Schumpeter, 1934). The competition among a variety of small, entrepreneurial firms creates technological breakthroughs that result in "temporary monopoly profits" for the entrepreneur and lead to economic development (Barras, 1990, pp. 231-232). The entrepreneurial model considers innovation the essence of new, independent companies that create new industries or act as major agent of change in established industries. It provides the logic for the "technological imperative" that still is the dominant view of innovation for economic prosperity and firm performance (Armbruster et al., 2008; Damanpour et al., 2009; Evangelista and Vezzani, 2010). The entrepreneurial model also emphasizes the role of disruptive innovations introduced by start-up firms as the primary source of superior performance (Christensen, 1997).

In his later work, Schumpeter (1943) proposed an alternative model of innovation known as "Schumpeter Mark II" or "Corporate Model" (Barras, 1990; Damanpour, 2010). This model "stresses the scale economies to be derived from technological progress" and gives the edge to large, incumbent firms that have "the resources to at least partly internalize the R&D process" as the primary source of innovation for economic development and progress (Barras, 1990, p. 232). In an oligopolistic market structure, large firms have some degree of monopoly power to generate internal resources for innovation (Barras, 1990; Klein, 1977). Their better access to capital, scientific knowledge, production means, and management expertise increase the likelihood of investing in and gaining from innovation (Damanpour and Wischnevsky, 2006).

The entrepreneurial and corporate models debate the role of start-ups (small firms) versus incumbents (large firms) for innovation. However, both models emphasize the significance of the introduction of new product and process technologies for economic growth and organizational performance. Chandy and Tellis (2000) examined the influence of firm size on the introduction of 64 radical product innovations in consumer durables and office products from 1851 to 1998. They found that while 73% of radical product innovations were generated by non-incumbents before World War II, the incumbents significantly outnumbered non-incumbents (74% to 26%) for the innovations generated after the war (p. 8). Chandy and Tellis' (2000) historical analysis shows that over time the process of "creative destruction" associated with entrepreneurial model has been shifted to the process of "creative accumulation" associated with the corporate model (Sanidas, 2005).

As innovations in organizational strategy, structure, and processes, MIs are primarily applicable to large, complex organizations rather than small, entrepreneurial firms. As such, the impact of MI on performance should be viewed in the context of the corporate model of innovation and the process of creative accumulation.

2.4 Rational and institutional explanations of the MI-performance relationship

A variety of explanations has been used to explain motivation for the adoption of MI. For example, Birkinshaw et al. (2008) identified four main theoretical approaches—institutional, fashion, cultural, and rational. Sturdy (2004) contrasted the rational approach with several other approaches (e.g., political, cultural, institutional) and concluded that the rational approach remains the dominant approach and provides a point of departure for the newer approaches. Volberda, Van Den Bosch and Mihalache's (2014) bibliometric analysis of Social Science Citation Index articles that cite Birkenshaw et al. (2008) identify the rational and institutional streams of research on MI as those associated with performance. Given that rational and institutional explanations are the two most widely used approaches in MI research we focus on these perspectives. On one hand, some authors argue that MI like TI is central to organizational effectiveness and survival and its introduction will help maintain or improve organizational conduct and outcome (Camison and Lopez, 2010; Mol and Birkinshaw, 2009; Zahra et al., 2000). Rooted in the economic theory of innovation, this view assumes that the intention for adoption of innovation, whether TI or MI, is to boost performance, and refers to this as the rational perspective (Birkinshaw et al., 2008; Damanpour and Aravind, 2012). On the other hand, another group of authors rely on theoretical explanations from institutional and behavioral contagion theories and offer an alternative view

(Abrahamson, 1991; Birkinshaw et al., 2008; Burns and Wholey, 1993). These scholars argue that at the time of adoption the adopters are less certain about performance contributions of MI than TI, and thus adopt MI based on social and institutional rather than technical reasons (Abrahamson, 1991; Greve, 1995; Staw and Epstein, 2000). Since this view is rooted in the neo-institutional theory, we label this the institutional perspective (Abrahamson, 1996; Birkinshaw et al., 2008; Damanpour and Aravind, 2012). These two perspectives are often presented as contrasting given the different theoretical logics they present for innovation adoption, as well as different performance consequences. The rational adoption of MI is associated with immediate and direct operational economic performance gains. By contrast adoption from the institutional perspective is associated with social and legitimization outcomes at the point of adoption rather than technical performance, which are therefore more uncertain and diffuse: performance benefits may arise, but not in a timely manner.

2.4.1 Rational perspective

The performance gap theory, and theories of organizational learning and change, first mover advantage, and economics of organization have provided the rationale in support of the intended influence of innovation on firm conduct and outcome (Keupp, Palmie, and Gassmann, 2012; Lam, 2005; Wischnevsky and Damanpour, 2006). For instance, the performance gap theory argues that the perceived difference between what an organization is actually accomplishing and what it can potentially accomplish creates a need for change to bridge the gap (Zaltman, Duncan, and Holbek, 1973). Theories of organizational learning and change view organizations as adaptive systems that change in response to external pressures and internal aspirations in order to function effectively and efficiently (Jiménez-Jiménez and Sanz-Valle, 2011; Stata, 1989). Since innovation is a means of organizational change, these theories posit that the introduction of innovation aims to ensure adaptive behavior, enabling the organization to maintain or improve its performance. The adaptation argument aligns with the perspective of organization as an open system, where performance is considered as the ability of the organization to cope with all systematic processes to carry out its organization-adapting and organization-maintaining functions effectively (Evan, 1976; Scott, 1992). The early or first mover advantage theory also emphasizes the importance of innovation for firm competitiveness and growth, and argues that engaging in innovation activity enables organizations to be aware of the latest developments, absorb new and related knowledge, and increase the likelihood of benefiting from the innovation over time (Bierly et al., 2009; Lieberman and Montgomery, 1988; Roberts and Amit, 2003).

In summary, these perspectives on the adoption and consequences of innovation emphasize rational decision-making based on the assessment of costs and benefits of innovation adoption and subsequent gains in efficiency and effectiveness (Volberda et al. 2014). The rational perspective offers that while the positive outcome of MI, like other innovation types, is not guaranteed, MI is central to organizational sustainability and effectiveness (Hollen et al., 2013). Therefore, independent of expected or unexpected and desirable or undesirable outcomes, the intention for the introduction of MI is to enable the organization to perform.

2.4.2 Institutional perspective

Institutional theory emphasizes the role of social factors and pressures from regulators, competitors, customers, shareholders, trade and professional associations, parent organizations, and non-governmental organizations on organizational actions, and argues that these external pressures direct organizations to adopt innovations toward the pursuit of legitimacy and conformity to the norms of the institutional environment (Ashworth et al., 2009; Love and Cebon, 2008; Sturdy, 2004). This perspective has been mostly applied to MIs perhaps because compared with TIs they are intangible, operationally more complex, and easier to modify (Armbruster et al., 2008; Damanpour and Aravind, 2012; Tether and Tajar, 2008; Yeung et al., 2006). According to this view, organizational leaders tend to rely on the currency of the innovation in the population rather than its technical merits in making the adoption-decision (Burns and Wholey, 1993; Greve, 1995; Yeung et al., 2006). As Abrahamson (1991) observes, since organizations are uncertain about the efficiency of MIs, they are influenced by the behavior of other organizations in their population in adopting these innovations. This contagious behavior results in social approval and reputation rather than an immediate economic performance gain (Greve, 1995). More tangible economic gains may arise at later points in time, but are not anticipated at the point of adoption because the focus is upon imitative behavior for the purposes of legitimation.

Several studies have provided empirical evidence in support of the view that performance outcomes are diffuse. For instance, Westphal et al. (1997) studied consequences of the adoption of TQM for organizational efficiency and legitimacy in hospitals and reported that early adopters of quality programs customized them for gaining efficiency but late adopters conformed to prevailing programs for gaining legitimacy. Staw and Epstein (2000) also examined performance consequences of quality programs and found that firms that adopted them did not have higher economic performance than those that did not, but enjoyed more reputation in the population. Although the number of large sample studies of MI and performance based on the institutional perspective is relatively small, the perspective provides an alternative theoretical explanation that differentiates the influence of MI from that of TI on firm performance.

2.5 Moderators of MI-performance

The goal of a quantitative integration of research results is not only to derive a generalized relationship but also to explore the sources of inconsistencies in a relationship and examine whether the relationship is contingent on certain conditions (Calantone et al., 2010; Chen et al., 2010; Hunter and Schmidt, 1990). We thus investigate the likely effects of six moderators on the MI-performance relationship.[2]

2.5.1 Level of analysis

Research on innovation has been conducted at different levels of analysis. For instance, studies of product innovation are conducted at the level of project or program (Calantone et al., 2010; Chen et al., 2010) and studies of innovation in organization are conducted at the level of organizational unit (e.g., R&D, plant, SBU) or organization (Crossan and Apaydin, 2010; Sears and Baba, 2011). The distinction between unit and organization is important for several reasons. First, while each organizational unit interacts with its own external sub-environment (e.g., R&D unit with technological communities), the focal organization

[2] It should be noted that in a quantitative review the selection of the moderators is constrained by the availability of data in the original studies. As such, not all potential moderators could be analyzed. Alternative moderators are outlined in section 5.

constitutes the primary environment of the units and is the main provider of their resources. The external environment of the organization, on the other hand, is broader and constitutes both operating and general environments. Second, the process and outcome of innovation differs across units, and between each unit and the organization. For instance, the process of developing a new process technology in the R&D function differs from the process of implementing that technology in a manufacturing facility. The metrics to assess the success of the development (e.g., speed of development) versus implementation (e.g., difficulty of implementation) of a new practice in a unit versus the organization also differ. At the organization level, for example, the criteria for innovation success include not only those for the developer and implementer units, but also for the administrative unit that coordinates their activities and gauges the contribution of the new practice to the organization's performance goals.

2.5.2 Country

National and cultural context affect organizational activities (Hofstede, 2001), and may have differential effects on innovation (Jones and Davis, 2000). For example, organizations in countries with higher individualism and lower uncertainty avoidance may introduce more innovation due to higher levels of members' drive and risk taking (Calantone et al., 2010; Nakata and Sivakumar, 1996). Moreover, organizational culture, which is central in creating a climate conducive to innovation (Khazanchi et al., 2007), is embedded in national culture (Pothokuchi et al., 2002). Hence, national cultural characteristics could also affect the success of the innovation process through organizational culture (Rosenbusch et al., 2010). For instance, the initiation of innovation, which depends on the extent of generation of new ideas, can be driven by high individualism and low power distance. However, the implementation of innovation, which depends on cooperation, coordination, and organizational experience with critical contingencies, can be inhibited by the same cultural characteristics (Nakata and Sivakumar, 1996). Therefore, innovations that produce favorable outcomes in one cultural context may not necessarily do so in another.

2.5.3 Industry

The extent to which firms engage in innovation activities differ in different industries as the source, demand, and opportunity for innovation vary across industries. In particular, the distinction between service and manufacturing organizations is deemed important for several reasons. First, as noted above, the prominent theories of innovation have been developed from the studies of innovation in manufacturing industries, though the share of services in the economies of most industrial nations has surpassed that of manufacturing (Hipp and Grupp, 2005; Miles, 2005). Second, innovation in services is important beyond the economic importance of the sector as manufacturing firms also provide services related to their goods (Miles, 2005). Third, the nature of service innovation and the structure of service industry differ from manufacturing. For example, innovation in services compared to those in manufacturing tend to be "less formally organized and technological" and "more continuous, consisting of numerous incremental changes" (Tether and Tajar, 2008, p. 723). The structure of the service industry, including size and customization of service firms, role of human capital, forms of personal skills, organization of the innovation process and the delivery of innovation solution, could affect innovation and its outcomes (Hipp and Grupp, 2005; Miles, 2005). Overall, unique attributes of services such as intangibility, customer contact and interaction, and the concurrence of production and consumption (i.e., perishability) prevent transposing the notion of innovation from manufacturing to services and demand for service-specific process and measurement of innovation (Calantone et al., 2010; Hipp and Grupp, 2005; Miles, 2005).

2.5.4 Type of performance

Innovation may influence organizational performance in different ways, such as facilitating adaptation to environmental change, increasing the efficiency or effectiveness of internal processes, gaining prestige and reputation in the institutional environment, and producing financial or economic gains (Crossan and Apaydin, 2010; Walker et al., 2011). A distinction between performance types may help exemplify the contrast between rational and institutional perspectives. As stated earlier, from the rational perspective, potential economic gains motivate the adoption of MI, but from the institutional perspective, social gains for legitimacy and reputation offer the primary justification for adoption (Burns and Wholey, 1993; Kennedy and Fiss, 2009; Lam, 2005). Volberda et al. (2013, p. 6) distinguish between two performance outcomes of MI: (1) hard outcome such as profitability, productivity, growth, and competitive advantage which we term economic; and (2) soft or noneconomic outcomes such as customer satisfaction, employee turnover, stakeholder relation, and environmental impact. It might be anticipated that if the rational perspective holds sway that MI impacts economic performance. If institutional approaches and outcomes dominate, noneconomic outcomes may take precedent initially but be replaced overtime by economic performance benefits. From our dataset, examples of economic gain are labor productivity, sales growth, and profitability; examples of noneconomic gain are client satisfaction, employee retention, and relationship development with alliance partners, distributors, and suppliers.

2.5.5 Measurement of innovation and performance

Innovation has been measured in a variety of ways such as by input (financial and human resources), output (number of new products or practices), process (speed of development, extent of assimilation), or perceptual scale (comparison with the organization's prior innovation or mean industry innovation) (Adams, Bessant, and Phelps, 2006). Previous quantitative reviews of innovation antecedents and outcomes consistently find that differences in the measurement of constructs affect the inconsistencies of the findings of research (Bowen et al., 2010; Boyne, 2002; Camison et al., 2004; Chen et al., 2010). Therefore, we investigated the moderating influences of measurements of innovation and performance. As complex constructs, innovation and performance have been measured in a variety of ways. For example, performance has been operationalized by different indicators including accounting versus market, production versus financial, and past versus future performance (Bowen et al., 2010; Gunday et al., 2011; Luk et al., 2006). Innovation has also been measured by a variety of dimensions and indicators, such as inputs (financial or human resources), intermediary (# of patents), outputs (# of products or services), processes (speed of development, extent of assimilation) (Tidd et al., 2001), and comparative metrics based on the organization's innovation history, industry mean, and so on (Garrido and Camarero, 2010; Hansen, 2010; Mol and Birkinshaw, 2009).

In summary, whereas due to globalization firms have geographically expanded and their structures, processes and systems have become increasingly complex, the state of research on MI is still in an early stage (Crossan and Apaydin, 2010; Damanpour and Aravind, 2012; Enavgelista and Vezzani, 2010;

Keupp et al., 2012). In light of the commonly accepted impact of TI on firm competitiveness and performance, our analyses intend to assess the potential influence of MI on organizational performance and provide insights on the implications of MI in the current business environment.

3 Methods

3.1 Selection of studies and coding

To identify the studies that examined the link between MI and performance, two coders searched electronic databases such as Business Source Complete, Academic Search Complete, EconLit, JSTOR, and Social Sciences Citation Index in July 2011. This search was supplemented by conducting another search in December 2011. The title and abstract of articles in these databases were searched using keywords such as ‘administrative innovat*’ (innovat* = innovation, innovativeness), ‘manage* innovat*’ (manage* = management, managerial), and ‘organizational innovat*, along with performance keywords such as ‘performance’, ‘effectiveness’, and ‘consequence’ (and derivatives thereof).[3] We considered only peer-reviewed articles in English language, and removed duplicate entries across databases. After reading the abstract of the articles, and also text of the articles when necessary, we removed conceptual articles and book reviews. These steps yielded approximately 150 empirical articles.

We coded the selected articles according to the following procedure: (1) coding instructions to identify dependent, independent, and moderator variables were developed; (2) the coding protocol was pretested and refined by two coders using a sub-sample of five articles; (3) each article was coded independently by at least two coders and reviewed by a third coder; and (4) throughout the coding process, the coders compared their coding and in cases in which their initial coding differed, they discussed disagreements and recoded the studies until consensus was reached (Bullock and Svyantek, 1985).

The coding process resulted in further narrowing the number of original studies. For instance, we removed articles that: (1) did not directly report the influence of MI on performance (Jiménez-Jiménez

[3] Keywords were identified from a review of prior meta-analytic and leading studies such as Damanpour (1991) and Birkinshaw, Hamel and Mol (2008).

and Sanz-Valle, 2011; Kim et al., 2006); (2) used a definition of MI incompatible with the definition we adopted in this study (Garcia-Morales et al., 2008); (3) used the term MI broadly to include other types of innovation (Hult and Ketchen, 2001);[4] (4) and did not have performance as the dependent variable (Bolton, 1993).[5] We also excluded the articles that used a single-item innovation measure (Ittner and Larcker, 1997; Ramsay et al., 2000) as most studies used index (multi-item) measures that are more robust. This process resulted in 44 articles (hereafter *original studies*) that were used in our analysis. They are marked with a * in the reference section.

We coded regression and correlation coefficients between MI (administrative, management, managerial, organizational) and performance, and between TI (technological, product, process) and performance. In addition, we coded six moderators that were found to influence the innovation-performance relationship in previous quantitative reviews (Calantone et al., 2010; Camison et al., 2004; Chen et al., 2010; Rosenbusch et al., 2011), and for which we had data. *Level of analysis* is organization (Antonioli, 2009; Ho, 2011) or organizational unit (Georgantzas and Shapiro, 1993; Hansen et al., 2011). *Country* indicates from where data were collected. Most original studies had collected data from either US or EU, thus we categorized them into two subgroup analyses: (1) United States (US), versus all other countries; and (2) European Union (EU) versus all other countries. *Industry* is categorized as manufacturing, service, or both. *Performance type* is economic/financial (Hansen et al., 2011; Whittington et al., 1999), non-economic (Walker et al., 2011; Wu and Hsieh, 2011), or both (Kraus et al., 2011; Naveh et al., 2004). *Innovation measure* is perceptual/subjective (Camison and Lopez, 2010; Mazzanti et al., 2006), objective (Han et al., 1998; Staw and Epstein, 2000), or both (Westphal et al., 1997). *Performance measure* is perceptual/subjective (Gunday et al., 2011; Hansen et al., 2011), objective

[4] Some authors use the term MI broadly to include all innovations (product, process, market, technological, organizational, etc.) that an organization introduces. As is customary in the studies of innovation types, we use the term MI more specifically to refer to one type of innovation in organizations only.
[5] In a meta-analytic review, Bowen et al. (2010) distinguished between the impact of past performance on innovation and the impact of innovation on future performance and found that while innovation positively affects future performance, the relationship between past performance and innovation is unclear. To account for the uncertainty due to temporal sequence of the relationship between innovation and performance, we included only the studies where innovation was the independent and performance was the dependent variable.

(Lafuente et al., 2009; Lin and Chen, 2007) or both (Walker et al., 2011). Information on the sample and moderators for all original studies is presented in the Appendix.

The original studies were diverse in terms of the moderators. About 40% included data from countries in EU, 20% from US, 25% from countries other than EU and US, and 15% from two or more countries. Approximately 40% of the original studies focused on the manufacturing sector (physical goods), 20% on the service sector (services), and the rest were mixed. More than three-fourths of the studies were at the organization level; the rest were at the organizational unit level. Consistent with other quantitative reviews (Camison et al., 2004; Chen et al., 2010), we used the independent samples within the original studies as the unit of analysis. We identified 52 independent samples (see Appendix).

3.2 Analytical procedures

As stated above, we used two techniques to integrate regression and correlation coefficients. The support score technique computes the percentage of statistical significance of the regression coefficients; the meta-analysis technique computes the weighted mean (by sample size) of the correlation coefficients. Among the 44 original studies, 39 provided results for the MI-performance based on regression analysis and 25 based on correlation analysis, with 47 and 29 independent samples respectively. To compare the influence of MI versus TI on performance, we included only the original studies that reported the regression (or correlation) coefficients for both MI and TI to ensure a better evaluation of the empirical validity of the results. Of the 39 original studies that reported regression coefficients for the MI-performance, 22 with 28 independent samples also included regressions for the TI-performance. Of the 25 original studies that included correlation coefficients for the MI-performance, 16 with 17 independent samples also provided correlations for the TI-performance.

3.2.1 Support score technique

This procedure aggregates the empirical results based on the percentage of statistically significant regression coefficients ($p \leq .05$) (Boyne, 2002; Rosenthal, 1991). The *support score* is defined as the number of regression coefficients that are consistent with the focal hypothesis (e.g., innovation positively affects performance) as a percentage of all the coefficients reported in the study (Boyne, 2002, p. 105).[6] Since multivariate analyses control for variables other than the theoretical variables (here MI and TI), concerns about bias arising from spurious relationships are reduced.

The procedure follows three steps (Damanpour, 2010, pp. 1000-1001). First, in each study the numbers of regression coefficients that show positive, negative, or nonsignificant associations between an independent variable and the dependent variable are identified. Second, a support score for the association between MI and performance in each study is calculated. Third, an "aggregate support score" across all the studies that supports the focal hypothesis is calculated by unweighted or weighted means (Boyne, 2002). The "unweighted" aggregate support score treats the support score from each study equally, regardless of the number of regression coefficients that the study has reported. The "weighted" aggregate support score weights the support score from each study by the number of regression coefficients from that study (Boyne, 2002). The weighted aggregate support score has the advantage that the studies that report one or few tests are not given undue weight; however, it is not fully certain that it provides a more accurate aggregate score in support of the hypothesis than the unweighted support score (Boyne, 2002). The real level of support for the focal hypothesis probably lies somewhere between the unweighted and weighted aggregated scores (Boyne, 2002). Therefore, we report both unweighted and weighted aggregate scores for all possible effects (positive, negative, and nonsignificant). The same procedure is followed for moderator analyses, where the studies are grouped into two sub-samples for each moderator.

3.2.2 Meta-analysis procedure

Meta-analysis quantitatively integrates and analyzes effect sizes across studies (Hunter and Schmidt, 1990). The parameter estimates can be derived by using a fixed-effect or a random-effect model (Erez et al., 1996). Since prior applications have shown that the random-effect approach generates more accurate parameter estimates than the fixed-effect (Erez et al., 1996; Field, 2005; Schmidt et al., 2009), we used a

[6] The support score technique allows the inclusion of significant correlation coefficients in support of a hypothesis. However, to ensure that findings from this technique and meta-analysis are independent, we did not include correlation coefficients in computing the support score.

random-effect model (Bryk and Raudenbush, 1992).[7]

Following the procedure described in LePine et al. (2002) and Seibert et al. (2011), we conducted a two-step meta-analysis using STATA software. In step one, we used an unconditional model (i.e., one without a moderator) to estimate the overall relationship between innovation and performance. First, we transformed each correlation into Hotelling's and Fisher's z-value to normalize their distribution (Erez et al., 1996). We did not correct for measurement error because few original studies reported reliability coefficients. If an original study reported multiple effect sizes within an independent sample due to a measurement that we did not model in this study, we used the mean of the raw correlations. Second, we used the routine *metan* with the random effect model in STATA to estimate the mean correlation and its 95% credibility interval. If a 95% credibility interval does not include zero, it indicates that the meta-analytic correlation is statistically significant at the .05 level. Finally, we back-transformed the meta-analytic correlations to normal correlations (r) and credibility intervals (CI) and reported them. Study characteristics that cause variation in population values are represented by the between-studies variance (τ^2). The null hypothesis that all studies are homogeneous with respect to effect size is assessed by a Cochran chi-square test (Cochran, 1937). A statistically significant chi-square test ($p<.05$) indicates that primary correlations are not homogenous and potential moderators can be modeled and tested. In step two, we conducted moderator analyses by dividing the data into two sub-samples for each moderator and analyzed each sub-sample according to the procedure in step one. In order to compare the results of the moderator analysis with those from the support score analysis, we modeled and reported each covariate independently.

4. Results

4.1 MI-performance relationship

[7] Previous meta-analyses have usually used the fixed-effect (FE) procedure (Hunter and Schmidt, 1990). Erez et al. (1996) demonstrated that the FE procedure is less accurate than the random effect (RE) procedure in terms of population mean and variance. Recently, Schmidt et al. (2009) have empirically confirmed Erez et al.'s view and have also recommended use of the RE procedure.

4.1.1 Main effects

The results of the support score analysis on the MI-performance relationship are presented in the first rows of Table 1. The weighted and unweighted aggregate support scores for a positive association are 54 and 57 percent, respectively (Table 1). An aggregate support score of equal or greater than 50% represents moderate to strong support for a hypothesis as it is far higher than would be likely to occur by chance alone (Boyne, 2002).[8] Therefore, both weighted and unweighted scores indicate that MI positively affects performance. The results from the meta-analysis procedure reported in the first row of Table 2 confirm this finding as the MI-performance mean correlation is positive ($r=.213$, $p<.001$). The meta-analysis, however, suggests the existence of moderators on the MI-performance relationship as between studies variance is significant ($\tau^2 = .085$, $p<.001$) (Table 2).

------------- Insert Tables 1 and 2 about here -------------

4.1.2 Moderating effects

Subgroup or moderating analyses by both support score and meta-analysis procedures show that the MI-performance relationship is not moderated by the *level of analysis* since the support scores for both "organization" and "unit" subgroups are 50% or more (Table 1), and the mean correlation for both are positive ($p<.001$, Table 2).

For *country*, the moderating effects of the two subgroups, (1) US versus all other countries; and (2) EU versus all other countries, differed. While the US versus non-US subgroup exhibits a moderating effect as both weighted and unweighted support scores are below 50% for US and are above 50% for non-US, the EU versus non-EU did not show a moderating effect as both weighted and unweighted support scores are above 50% (Table 1). The meta-analysis confirmed this finding. The mean correlations for the US and non-US subgroups are different ($r=.095$, $p>.05$ and $r=.294$, $p<.001$); for the EU and non-EU they are not ($r=.270$, $p<.001$ and $r=.201$, $p<.001$, Table 2). In addition, the negative support scores of 16 and 18 percent for the US, while small in absolute terms, are the highest reported in Table 1. While it is

[8] More precisely, the results for an association are interpreted as: (1) the association is supported if both weighted and unweighted aggregate support scores are equal or greater than 50%; (2) it is partially supported if only one of the two support scores is 50% or more; and (3) it is not supported if both support scores are less than 50% (Damanpour, 2010).

possible that cultural effects in the US influence the adoption of MI, it should be noted that the US subgroup includes the large sample studies conducted from the institutional perspective, which generally report negative performance effects arising from the adoption of MIs (Staw and Epstein 2000; Wang 2010; Westphal et al., 1997). The EU sub-group does not include such studies.

The analysis shows that the MI-performance relation is moderated by *industry*. While both weighted and unweighted aggregate support scores are above the 50% threshold for manufacturing (69 and 68), they fall for service and the weighted support score becomes less than 50% (Table 1). The meta-analysis more clearly shows the moderating effect of industry as the mean correlation for manufacturing is positive (r=.282, p<.001) and for service is nonsignificant (r=.052, p>.05, Table 2). These results may reflect findings that point towards more complex relationship between MI and performance in the service sector. For example, Walker et al. (2011) found that MI's positive impact on performance is moderated by the organization's performance management practices. Comparing four innovation modes, Evangelista and Vezzani (2010, p. 1262) concluded that "the adoption of a more systemic approach to innovation" is required in service vis-à-vis manufacturing organizations.

We also found that *performance type* does not have a moderating effect on the MI-performance relation. Both mean correlations for economic and non-economic groups are positive (r=.150 and .184, p<.001, Table 2), and with one exception the weighted and unweighted aggregate support scores are more than the 50% threshold (47, 53, 59, and 53, Table 1).

For the methodological moderators, the analysis indicates that measurements of both innovation and performance moderate the MI-performance association. Regarding *innovation measure*, the relationship is positive for subjective measure as both aggregate scores are above 50% (58 and 61, Table 1) and mean correlation is positive (r=.288, p<.001, Table 2). However, for objective innovation measure the aggregate scores are less than 50% (39 and 47, Table 1) and mean correlation is nonsignificant (r=-.107, p>.05, Table 2). The same pattern is found for *performance measure*, where for subjective measure the aggregate support scores are high (69% and 68%, Table 1) and mean correlation is positive (r=.314, p<.001, Table 2) but for the objective measure the support scores fall below 50% (44 and 47, Table 1) and the mean correlation is nonsignificant (r=-.051, p>.05, Table 2). These findings confirm those of previous quantitative reviews that point out the crucial role of construct measurement on the findings of empirical studies of the antecedents and consequences of innovation (Calantone et al., 2010; Camison-Zornoza et al., 2004; Chen et al., 2010; Rosenbusch et al., 2011).

In summary, the results from the two integrative techniques consistently suggest that MI positively affect firm performance regardless of the level of analysis and performance type. They also indicate that country partially moderates the MI-performance relationship but show more vivid moderating influences of industry and construct measurement. We found that the positive impact of MI on performance is stronger in manufacturing than service organizations, as well as for subjective than objective measurements of both innovation and performance.

4.2 Comparison of the impact of MI and TI on performance

4.2.1 Main effects

The first rows in Tables 3 and 4 show the results for the main effects of the analysis of the studies that include MI- and TI-performance relationship by the two integrating techniques. The support score analysis shows that weighted and unweighted aggregate scores are positive and above the 50% threshold value for both MI and TI (Table 3). This finding suggests that MI and TI do not affect performance differently. The meta-analysis confirms this finding as mean correlations for both MI and TI are positive (r=.307 and .283, p<.001, Table 4). However, the meta-analysis indicates potential effects of moderating variables for the MI- and TI-performance relationship as between-studies variance statistics are significant ($\tau^2 = .086$ for MI and .060 for TI, p<.001, Table 4).

------------ Insert Tables 2 and 3 about here ------------

4.2.2 Moderating effects

With a few exceptions, the subgroup analyses based on both integrating techniques indicate that MI and TI affect performance positively and the strength of the influence of MI and TI on performance is at par (Tables 3 and 4). For full transparency, the results of all subgroups are reported in the tables; however, below we explain the results that are based on five or more independent samples and correlations on the assumption that they are more meaningful than those with smaller samples (Chen et al., 2010; Henard and Szymanski, 2001).

Regarding the first substantive moderator *level of analysis*, due to sample size limitation a meaningful comparison could only be made for organization. The results in Table 3 do not suggest a difference in the strength of MI and TI influence as the weighted and unweighted aggregate scores are positive and are above the 50% threshold value. The meta-analysis support these findings as mean correlations for level of analysis are also positive (p<.001, Table 4). Similar patterns of results were identified for *industry,* and the methodological moderators *innovation measurement,* and *performance measurement*. Results for *country* were typically above the 50% threshold value and supported by the meta-analysis with the of the weighted score for TI in EU, which is 42%. For *performance type* both integrating techniques showed positive effects for *economic* performance without a significant difference between the strength of effects of MI and TI (Tables 3 and 4). For *non-economic* performance, however, the results were inconsistent. Whereas the meta-analysis showed MI affects non-economic performance positively (r=.209, p<.001), TI's effect is nonsignificant (r=.177, p>.05, Table 4). The results from the support score procedure were in reverse order (Table 3). However, the results for non-economic performance should be interpreted cautiously as they are based on a small number of samples (near threshold value of five) in both techniques.

In summary, the results of moderating analyses for four substantive and two methodological moderators via both support score and meta-analysis procedures strongly suggest that the strength of the impact of MI on performance is not different from that of TI on performance. [9]

[9] To examine whether the effect sizes are statistically different in the sub-samples, we modeled the transformed correlations as a function of observed covariates (e.g., the level of analysis) in a conditional model and conducted two sets of analysis (results available on request). First, consistent with the subgroup analysis, we modeled the effect of covariates independently. The results were consistent with those reported above; that is, the moderating effect of region (US vs. non-US), industry, innovation measurement, and performance measurement were supported, but for the level of analysis, regions (EU versus non-EU), and performance type were not. Second, we combined the matched samples into one dataset and ran a full conditional model in which the transformed correlations were submitted to multiple covariates as in one ordinary regression analysis to test whether the innovation-performance

5 Discussion and Conclusions

The major findings of this study are threefold. First, the balance of evidence reviewed suggests that MI is positively associated with organizational performance. Second, industry and construct measurements (innovation and performance) moderate the relationship between MI and performance. Third, the impact of MI and TI on performance does not differ, and both affect performance positively. These findings have important implications and are indicative of future research for (1) the study of MI and its association with performance, (2) rational and institutional perspectives on the consequences of innovation adoption, and (3) ways in which future studies may be theoretically informed and designed to collect empirical evidence on the consequences of the adoption of MI and TI. We now discuss the implications of these findings and the potential for future research.

5.1 Research on MI and its consequences

The antecedents, processes, and consequences of innovation in organizations have been studied by management scholars since the 1960s. Following the tradition of innovation research in economics, management research has focused on studying technology-based product and process innovations; non-technological innovations related to organization management have been researched less. Research on MI has recently been resurrected; yet, whether MI (like TI) is a potent force for competitive advantage and firm performance is questioned. Since the adoption of innovation, whether technology-based or not, is a means to organizational effectiveness as the end, we examined performance consequences of MI by integrating the results of empirical research in order to bring more clarity on the usefulness of MI to organizational outcomes.

Data analyses by two quantitative integrating techniques using 52 independent samples from 44

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relationship is moderated by innovation type (MI versus TI). To avoid multicollinearity, we included only four additional moderators in the model: level of analysis, country (EU vs. non-EU), innovation measure, and performance type. The results confirm that the moderating effect of innovation type on the innovation-performance relationship is not significant. Hence, our data suggest that the MI-performance association is not different from the TI-performance association; in other words, no differences between the two associations can be demonstrated.

articles published in peer-reviewed journals suggest that MI positively affect firm performance. Our findings point out that at the firm level the prevailing view of innovation research concerning the sole or superior impact of new technologies and products grounded in the process of creative destruction should be expanded to include the logic of the process of creative accumulation where innovations in the management of the enterprise is also necessary for achieving desirable organizational outcomes (Damanpour and Aravind, 2012; Evangelista and Vezzani, 2010; Sanidas, 2005; Sapprasert and Clausen, 2012). As Volberda et al. (2013) observe, while the importance of TI for organizational and societal progress is undeniable, the old paradigm of industrial innovation based on product and process innovations needs to be augmented by a new paradigm of innovation where the importance of various modes of non-technological innovations is also recognized. In the new paradigm, the introduction of new management processes and practices is needed to modify organizational operations and activities, including those in the R&D functions, to increase efficiency and quality of operational and administrative systems, and to facilitate organizational transformation and renewal (Kim et al., 2012).

Research on MI is still in an early stage and faces many conceptual and methodological challenges (Damanpour 2014). For instance, in the context of the MI-performance relationship, we examined the influence of six moderators and found that industry (manufacturing vs. service) and construct measurement (of both innovation and performance) moderate that relationship. Further research should advance these findings by investigating the role of additional moderators such as private versus public organizations, time trends, innovation momentum, generation versus adoption of innovation, and key antecedents such as slack resources, organizational structure, and so on. A fruitful area for further investigation would to examine the nature of service innovation, and the ways in which the structure of the service industry differs from manufacturing. For example, innovation in services compared to those in manufacturing tend to be "less formally organized and technological" and "more continuous, consisting of numerous incremental changes" (Tether and Tajar, 2008, p. 723). The structure of the service industry, including size and customization of service firms, role of human capital, forms of personal skills, organization of the innovation process and the delivery of innovation solution, could affect innovation and its outcomes (Hipp and Grupp, 2005; Miles, 2005). Overall, unique attributes of services such as intangibility, customer contact and interaction, and the concurrence of production and consumption (i.e., perishability) prevent transposing the notion of innovation from manufacturing to services and demand for service-specific process and measurement of innovation (Calantone et al., 2010; Hipp and Grupp, 2005; Miles, 2005).

Both MI and performance are complex constructs and difficult to measure. The attributes of MI such as complexity, intangibility, and measurability exacerbate the collection of comparable data across organizations. Organizational performance is perhaps the most complex construct in organization studies as it is affected by many environmental and organizational factors and future work could examine short and long-term performance effects. Findings in this study were not conclusive on the impact of MI on economic and noneconomic performance, partly as a product of small sample sizes, and future studies should seek to tease out these and other performance relationships more carefully. Controlling for an adequate number of these factors in different contexts is challenging. Our last recommendation for further research on MI and performance challenges researchers to move away from the common practice found in studies of innovation in organizations to model a direct and independent effect of MI on performance. The majority of the research reviewed in this study adopted this practice. However, whether the relationship between MI and performance is linear or curvilinear, or whether the relationship is direct, moderated, or mediated, is yet to be determined. This study found evidence of moderators, notable in relation to industry and the measurement of innovation and performance, suggesting that the theoretical and empirical examination of mediators and moderates has merit. While the number of studies examining these relationships in our sample was too small to undertake rigorous analysis, it points out this as a fruitful avenue for further investigation. For example, Walker et al. (2012) examined the mediating role that performance management placed on the relationship between MI and performance, and found a statically significant and positive relationship. Despite these challenges, the scarcity of research on MI provides opportunities for contribution to both scholarship and practice. To be fruitful, however, research on MI should be empirically rigorous and theoretically multifaceted.

5.2 Rational and institutional perspectives

We framed the effect of MI on performance based on insights from rational and institutional perspectives. Our findings for the adoption of MI show that the economic and non-economic performance relationships are significant and positive for both integration techniques. These lead to the conclusion that there is support for the rational and institutional perspectives for the adoption of MI and its contribution to organizational conduct and outcome. This conclusion has to be prefaced by the fact that the preponderance of studies reviewed examined the adoption of MI in response to rational assessments of the costs and benefits of their adoption. Interestingly, the studies that were framed based on the institutional logic mainly reported negative or non-significant relationship between MI and performance, though positive associations were uncovered in some studies. We offer a few observations and explanations for future research.

The rational view and the institutional view can co-exist (Kenned and Fiss 2009). From the institutional perspective better performance can be achieved because of the legitimacy and reputational benefits that arise from adopting MI. Rather than viewing the institutional and rational views as competing explains perhaps they should be viewed as complementary. Hargrave and Van de Ven (2006 p.881, p. 882) argue that their four models of institutional change (institutional design, institutional adoption, institutional diffusion, and collective action) "may represent different view of the same process rather than descriptions of different processes" and "can be thought not only as alterative perspectives on a single phenomenon but also as representing different temporal phases of one complete institutional process". If we view MI as an institutional change the rational and institutional views may be valid ways to explain this process and the outcomes from the adoption of MI. For example, in managerial decision making, including decisions in adopting innovations, tensions in balancing the external (both market and institutional) and internal (both structural and strategic) forces exist. Decisions to adopt innovations, whether MIs or TIs, is motivated by both economical and institutional forces and thus require weighting and balancing the pursuit of institutional legitimacy while adhering to economic rationality (Ansari et al., 2010). In this vein, solely relying on a rational or institutional view when studying motivation for adoption and performance consequences of MI, as well as any other type of innovation, is incomplete. Although it could be a tall order, future research on MI in organizations should take a balanced multidisciplinary view and include the logic of both institutional and rational perspectives, explain the role of external and internal forces on motivation for adoption of MI from both theoretical perspectives, be cognizant that in any time period organizations adopt different types of innovation, and account for the role of all types rather than a single type in evaluating performance consequences of innovation. Examining both views would mean that it would be possible to identify if different MIs are adopted for rational or institutional reasons and are associated with economic or noneconomic performance. In examining the varying influences of rational and institutional logics, research should also build time into quantitative studies to ascertain if and when economic benefits of the adoption of MI arise.

This logic can also be applied to questions of the adoption of MI and TI. Institutional perspective focuses solely on motivation for the adoption of MI and does not articulate why managers' motivation for the adoption of MI is different from their motivation for the adoption of TI. In this vein, answers to several key questions from the logic of institutional perspective are called for. For example, what is the adopter's primary motivation for adopting TI; why is it different from its motivation for adopting MI; why the likelihood of adopting a "technically inefficient" MI is more than that of a "technically efficient" MI; why it is not the same for TI; why motivation for adopting of an inefficient (or efficient) MI might differ from that of an inefficient (or efficient) TI; and so on. Without entertaining these questions through cogent arguments and empirical evidence, it is possible to assume that the institutional view of the adoption of MI is influenced either by the dominance of technological imperative or by the complexity and uncertainty associated with the attributes of MI. Finally, this suggests that future research should examine the importance of institutional perspectives, alongside rational ones, in the adoption of TI, as downstream or late adopters of TI may seek legitimation.[10]

[10] We thank one of the anonymous reviewers for this suggestion.

5.3 MI, TI, and performance

Since the efficacy of MI is usually compared with that of TI, we conducted an integrative review of the TI-performance relationship when the original studies also included data on TI. Relying on the same performance measurements, the results showed that there are no differences in the direction and the strength of the association of MI and TI on organizational performance. This important finding suggests that in addition to developing capabilities for introducing product and process innovation, organizations could benefit from developing capabilities for introducing MIs. In other words, organizational competencies gained from improvements in knowledge management system, strategy development and deployment, new ways of structuring and coordinating organizational activities, and managing cooperative agreements and alliances with other enterprises are also needed, especially in competitive markets (Hecker and Ganter, 2013).

As we noted above, we analyzed and reported only independent effects of MI and TI on performance as a quantitative review analysis is bound by the data prior research provides. The original studies rarely reported statistics on interactive or combinative effects of MI and TI on performance. However, while empirical evidence is rare, innovation scholars have argued that the introduction of one innovation type enhances the value of another type (Battisti and Stoneman, 2010; Evangelista and Vezanni, 2010; Georgantzas and Shapiro, 1993; Hollen et al., 2013; Mol and Birkinshaw, 2009; Sapprasert and Clausen, 2012). Regarding TI and MI, for example, Ettlie (1988) argued that successful manufacturing firms introduce TI and MI concurrently. These studies of the synchronous introduction of TIs and MIs propose that firm competitive advantage and superior performance arises from the interactive pattern of adoption. This emerges from our study as a possible direction for further research. Theoretically, this view is in line with the arguments offered by dynamic and combinative capabilities in strategic management, which offer that innovation is a means of the renewal of the capabilities across organizational parts and systems, including both technological and non-technological capabilities (Damanpour, 2010). Hence, the synchronous adoption of related innovations whether MI and TI, product and process, or radical and incremental is necessary to renew the interdependent capabilities in organizations' social and technical systems for producing optimal outcomes. Practically, this view reflects the reality of innovation adoption in organizations over time. Organizations adopt innovations of different types continually over time; thus, examining the influence of one type without accounting for the influence of other types cannot accurately reflect the true impact of innovation on organizational outcomes. As Robert and Amit (2003) argue, organizational performance is more a function of the organization's history of innovation activity over time rather than the introduction of stand-alone innovations at one time. Accordingly, conceptual development of synchronous innovation and research on the impact of composition of innovation types on organizational performance could help understanding how a balance between MIs and TIs could affect organizational conduct and outcome, and how the balance can be attained based on the firm's context and external and internal contingencies. Our suggestion to integrate rational and institutional perspectives into studies examining the performance consequences of the adoption of different innovation types could provide an avenue to investigate these ideas.

5.4 Conclusion

The integration of the results of research undertaken in this study provides evidence on the influence of MI on firm performance and its efficacy compared with TI. However, we acknowledge that MI is an under-studied innovation type and its antecedents, processes, and outcomes are not well understood. Whereas recent publications have promoted studies of MI (e.g., Armbruster et al., 2008; Birkinshaw et al., 2008; Damanpour and Aravind, 2012; Sapprasert and Clausen, 2012; Volberda et al., 2013), methodological challenges in operationalizing MI and isolating its influence on performance exist. Yet, we believe that research to overcome these challenges will be rewarding. We are encouraged by the inclusion of MIs in the Community Innovation Survey in EU countries and by the regular administration of this survey. Four studies in our sample (Camison and Lopez, 2010; Evangelista and Vezzani, 2010: Mol and Birkinshaw, 2011; Mothe and Thi, 2010) were based on this survey, and more studies are being published. We hope this study's results on the positive effect of MI on performance and the parity of the strength of its effect with that of TI encourage further research for a better understanding of why, how, and under what conditions MIs affect organizational conduct and outcome.

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Table 1 Aggregated support scores (%) for the MI-performance association

		No. of independent samples	No. of tests	+	ns	-
All studies	Weighted	47	202	54	41	5
	Unweighted			57	38	5
Level of analysis						
Unit	Weighted	6	34	73	27	0
	Unweighted			60	40	0
Organization	Weighted	41	168	50	44	6
	Unweighted			57	38	5
Country						
US	Weighted	12	63	44	40	16
	Unweighted			44	37	18
Non-US	Weighted	35	139	57	43	0
	Unweighted			59	41	0
EU	Weighted	19	62	56	44	0
	Unweighted			59	41	0
Non-EU	Weighted	12	52	73	27	0
	Unweighted			71	29	0
Industry						
Manufacturing	Weighted	16	68	69	31	0
	Unweighted			68	32	0
Service	Weighted	10	49	47	49	4
	Unweighted			51	40	10
Performance type						
Economic	Weighted	36	144	47	46	7
	Unweighted			53	41	6
Non-economic	Weighted	10	38	59	41	0
	Unweighted			53	47	0
Innovation measurement[1]						
Subjective	Weighted	40	171	58	42	0
	Unweighted			61	39	0
Objective	Weighted	5	23	39	52	9
	Unweighted			47	49	4
Performance measurement[2]						
Subjective	Weighted	25	88	69	31	0
	Unweighted			68	32	0
Objective	Weighted	19	98	44	46	10
	Unweighted			47	41	12

Notes:
1. Westphal et al. (1997) include a combined measure of innovation (8 tests) and 2 independent samples
2. Abernethy and Bouwens (2005) and Walker et al. (2011) include a combined measure of performance (7 tests)

Table 2 Meta-analysis results for the MI-performance association

	r [95% CI][1]	Ks; Kc; N	τ^2
All studies	.213***[.114, .318]	29; 34; 9468	.0847***
Level of analysis			
Unit	.276***[.214, .337]	7; 9; 1086	.0032
Organization	.191*** [.059, .323]	22; 25; 7782	.1062***
Country			
US	.095 [-.039, .230]	13; 14; 6186	.0585***
Non-US	.294*** [.158, .431]	15; 19; 3110	.0846***
EU	.270*** [.133, .407]	6; 7; 1490	.0294***
Non-EU	.201*** [.079, .318]	23; 27; 7978	.0960***
Industry			
Manufacturing	.282*** [.193, .370]	13;17; 1889	.0256***
Service	.052 [-.121, .225]	5; 5; 3297	.0332***
Performance type			
Economic	.150*** [.045, .255]	22; 22; 7386	.0552***
Non-economic	.184*** [.102, .266]	8; 8; 1313	.0068*
Innovation measurement			
Subjective	.288*** [.202, .374]	23; 28; 6398	.0470**
Objective	-.107 [-.247, .036]	4; 4; 1208	.0127*
Performance measure			
Subjective	.314***[.215, .412]	19; 23; 5763	.0509***
Objective	-.051 [-.161, .060]	8; 8; 4636	.0193***

Notes:
1. r=population correlation; CI=95% credibility interval around the population correlation; Ks=number of independent samples; Kc=number of correlations; N=total sample size; τ2=between-studies variance
*P<.05, ** P<.01, ***p<.001

Table 3 Aggregated support scores (%) for the associations of MI and TI with performance

		Management Innovation					Technological innovation				
		No. of independent samples	No. of tests	+	ns	-	No. of independent samples	No. of tests	+	ns	-
All studies	Weighted	25	86	58	42	0	25	96	61	37	1
	Unweighted			64	36	0			67	32	1
Level of analysis											
Unit	Weighted	1	1	0	100	0	1	2	50	50	0
	Unweighted			0	100	0			50	50	0
Organization	Weighted	24	85	59	41	0	24	94	68	31	1
	Unweighted			67	33	0			62	37	1
Country											
US	Weighted	3	15	47	53	0	3	19	68	26	6
	Unweighted			47	53	0			69	25	6
Non-US	Weighted	22	71	61	39	0	22	77	60	40	0
	Unweighted			67	33	0			67	33	0
EU	Weighted	11	24	58	42	0	11	36	42	58	0
	Unweighted			67	33	0			59	41	0
Non-EU	Weighted	8	30	83	17	0	8	31	71	29	0
	Unweighted			85	15	0			73	27	0
Industry											
Manufacturing	Weighted	9	22	64	36	0	9	43	58	42	0
	Unweighted			70	30	0			74	26	0
Service	Weighted	6	22	50	50	0	6	30	47	50	3
	Unweighted			56	44	0			59	37	3
Performance type[1]											
Economic	Weighted	21	66	55	45	0	21	80	59	40	1
	Unweighted			69	31	0			66	34	1
Non-economic	Weighted	5	7	30	70	0	4	6	50	50	0
	Unweighted			29	71	0			50	50	0
Innovation measurement[2]											
Subjective	Weighted	23	75	59	41	0	22	84	61	39	0
	Unweighted			70	30	0			66	34	0
Objective	Weighted	2	11	55	45	0	3	12	67	25	9
	Unweighted			59	41	0			78	17	6
Performance measure											
Subjective	Weighted	15	39	64	36	0	15	48	69	31	0
	Unweighted			65	35	0			74	26	0
Objective	Weighted	10	47	53	47	0	10	48	54	44	2
	Unweighted			64	36	0			58	40	2

Notes:
1. Luk et al. (2008) report two samples for MI and one for TI for non-economic performance types.
2. Naranjo-Gil (2009b) uses different measures of innovation

Table 4 Meta-analysis results for the associations of MI and TI with performance

	Management Innovation			Technological innovation		
	r [95%CI][1]	Ks; Kc[2]; N	τ^2	r [95%CI]	Ks; Kc; N	τ^2
All studies	.307*** [.180, .424]	17; 20; 3017	.086***	.283*** [.175, .384]	17; 20; 3017	.060***
Level of analysis						
Unit	.348*[.082, .568]	3; 3; 309	.048***	.375*** [.267, .473]	3; 3; 309	.000
Organization	.299*** [.157, .428]	14; 17; 2708	.093***	.267*** [.145, .382]	14; 17; 2708	.066***
Country						
US	.201* [.020, .369]	4; 4; 509	.024*	.223*** [.120, .321]	4; 4; 509	.003
Non-US	.323*** [.168, .462]	12; 15: 2336	.099***	.280*** [.144, .406]	12; 15; 2336	.072***
EU	.326*** [.153, .478]	4; 5; 799	.0387***	.282*** [.101, .445]	4; 5; 799	.0415***
Non-EU	.300*** [.133, .452]	13; 15; 2218	.1121***	.284*** [.146, 410]	13; 15; 2218	.0725***
Industry						
Manufacturing	.291*** [.187, .389]	11; 13; 1662	.033***	.294*** [.195, 388]	11; 13; 1662	.029***
Service	.132** [.033, .230]	3; 3; 449	.001	.065 [-.217, .338]	3; 3; 449	.057***
Performance type						
Economic	.246*** [.153, .334]	13; 13; 2221	.024*	.259*** [.170, .344]	13; 13; 2221	.022***
Non-economic	.209*** [.103, .323]	5; 5; 950	.009*	.177 [-.026, .367]	5; 5; 950	.047***
Innovation measurement[3]						
Subjective	.319*** [.189, .437]	16; 19; 2876	.087***	.292*** [.175, .401]	15; 18; 2764	.064***
Objective	.068 [-.099, .231]	1; 1; 141	0	.195* [.038, .344]	2; 2; 253	.005
Performance measurement						
Subjective	.323*** [.188, .446]	15; 18; 2764	.091***	.292*** [.175, .401]	15; 18; 2764	.064***
Objective	.155*[.026, .326]	2; 2; 253	.009	.195* [.038, .344]	2; 2; 253	.005

Notes

1. r=population correlation; CI=credibility interval around the population correlation; Ks=number of independent samples, Kc=number of correlations; N=total sample size; τ^2=between-studies variance.
2. The number of correlation coefficients can be larger than the number of independent samples because some original studies (Abernethy and Bouwens, 2005; Luk et al., 2008; Tuominen and Antilla, 2006) report multiple correlation coefficients when within study characteristics such as innovation measurement, performance type, and performance measurement take different variables.
3. The numbers of MI and TI are different because Naranjo-Gil (2009a) measured MI subjectively and measured TI objectively.

*P<.05, ** P<.01, ***p<.001

Appendix: Information on the studies included in the analyses

Study	Sample size	Moderators 1	2	3	4	5	6	7	Analysis
Abernethy and Bouwens (2005)	83	MI	U	OC	M	P	E, N	O-P	β, r
Antonioli (2009)	192	MI	O	EU	M	P	E	P	β
Armbruster et al. (2008)	1,450	MI	O	EU	M	P	E	O	β
Arvanitis (2005)	1382	MI, TI	O	OC	MS	P	E	O	β
Arvanitis and Loukis (2009)									
Swiss	1710	MI, TI	O	MUL	MS	P	E	O	β
Greece	271	MI, TI	O	MUL	MS	P	E	O	β
Camison and Lopez (2010)	159	MI, TI	O	EU	M	P	E-N	P	β, r
Evangelista and Vezzani (2010)									
Manufacturing	7,054	MI, TI	O	EU	M	P	E	O	β
Service	6,816	MI, TI	O	EU	S	P	E	O	β
Garrido and Camarero (2010)									
Large firms	191	MI, TI	O	EU	S	P	E, N	P	β
Small firms	195	MI, TI	O	EU	S	P	E, N	P	β
Georgantzas and Shapiro (1993)	35	MI, TI	U	US	M	P	N	P	r
Gunday et al. (2011)	184	MI, TI	O	OC	M	P	E	P	β, r
Han et al. (1998)	134	MI, TI	O	US	S	O	E	O	β
Hansen (2010)	271	MI	O	EU	S	P	E	O	β
Hansen et al. (2011)	172	MI, TI	U	MUL	M	P	E	P	β, r
Ho (2011)	412	MI, TI	O	OC	M	P	E	P	β
Jiménez-Jiménez and Sanz-Valle (2008)	173	MI, TI	O	EU	MS	P	E	P	r
Kraus et al. (2011)									
Family firms	226	MI, TI	O	EU	MS	P	E-N	P	β
Non-family firms	307	MI, TI	O	EU	MS	P	E-N	P	β
Lafuente et al. (2009)	163	MI	U	EU	M	P	E	O	β
Lin and Chen (2007)	877	MI, TI	O	OC	MS	P	E	O	β
Luk et al. (2008)									
Hong Kong	203	MI, TI	O	OC	M	P	E, N	P	β, r
China	189	MI,TI	O	OC	M	P	E-N	P	β, r
Montes et al. (2005)	202	MI, TI	O	EU	MS	P	E	P	β
Mazzanti et al. (2006)	71	MI	O	EU	M	P	E	P	β
Mazzanti and Zoboli (2008)	140	MI,TI	O	EU	M	P	E	P	r
Mol and Birkinshaw (2009)	1,048	MI,TI	O	EU	MS	P	E	O	β
Mothe and Thi (2010)	555	MI	O	EU	MS	P	E	P	β, r
Naranjo-Gil (2009b)	114	MI	O	EU	S	P	N	P	β
Naranjo-Gil (2009a)	112	MI,TI	O	EU	S	O, P	E	O	β, r
Naveh et al. (2004)	1150	MI	U	US	MS	P	E-N	P	β, r
Naveh et al. (2006)									
Organizational unit	1150	MI	U	US	MS	P	E-N	P	β, r
Organization	304	MI	O	US	MS	P	E	O	β, r
Staw and Epstein (2000)									
Primary sample	100	MI	O	US	MS	O	E	O	β, r
Easton and Jarrell sample	36	MI	O	US	MS	O	E	O	β, r

Appendix (continued)

Study	Sample size	Moderators 1	2	3	4	5	6	7	Analysis
Subramanian and Nilakanta (1996)	141	MI, TI	O	US	S	O	E	O	β, r
Tuominen and Anttila (2006)	327	MI, TI	O	EU	MS	P	E, N	P	β, r
Walker et al. (2011)	136	MI	O	EU	S	P	N	O-P	β, r
Wang (2010)	931	MI	O	US	MS	O	E	O	β, r
Westphal et al. (1997)									
For-profit and nonprofit	2,712	MI	O	US	S	O-P	E	O	β, r
For-profit	300	MI	O	US	MS	O-P	E	O	β, r
Whittington et al. (1999)	458	MI	O	MUL	MS	P	E	O	β
Wu and Hsieh (2011)	196	MI	O	OC	S	P	N	P	β, r
Wu and Lin (2011)	406	MI, TI	O	OC	MS	P	E-N	P	β, r
Wu et al. (2003)	144	MI	U	US	M	P	E, N	P	β, r
Xie et al. (2007)	143	MI, TI	O	OC	MS	P	E-N	P	β
Yamin et al. (1997)	22	MI, TI	O	OC	M	P	E	P	r
Yeung et al. (2006)	225	MI	O	OC	M	P	E, N	P	β
Yiu and Lau (2008)	458	MI, TI	O	OC	M	P	E	P	β, r
Zahra and Covin (1994)	102	MI, TI	U	US	M	P	E	P	r
Zahra et al. (2000)	231	MI, TI	O	US	M	P	E	P	β, r

Notes:
1. *Type of Innovation*: MI=management innovation, TI=technological innovation
2. *Level of Analysis*: U=Organizational Unit, O=Organizational
3. *Country*: US, EU, OC (countries other than US and EU), MUL (multi-country)
4. *Industry*: M=manufacturing, S=service, MS=mixed (manufacturing and service)
5. *Innovation measure*: P=perceptual (subjective), O=objective, O-P=both (perceptual and objective)
6. *Performance type*: E=economic/financial, N=non-economic, E-N=both (economic and non-economic)
7. *Performance measure*: P=perceptual (subjective), O=objective, O-P=both (perceptual and objective)
8. *Analysis*: β=multivariate (regression coefficient), r=bivariate (correlation coefficient)