The Effects of Performance Measurement Uses on Organizational Ambidexterity and Company Performance

ABSTRACT

This study looks at how performance measurement can be used to drive simultaneously exploitative and explorative behaviors, and impact company performance. In doing so, this research considers performance measurement as an important, but neglected antecedent of organizational ambidexterity, and adds to existing evidence on the impact of organizational ambidexterity on firm financial and non-financial performance. The study draws on two main bodies of literature: organizational ambidexterity, and performance measurement and management. The results of our survey of 153 Italian companies suggest that: (1) organizational ambidexterity positively impacts company performance; (2) integrating diagnostic and interactive uses of measurement systems positively affects organizational performance; and (3) this relationship is mediated by a company’s ability to innovate its products or services, while exploiting existing assets and resources. Taken together, these findings suggest that organizational ambidexterity positively mediates the relationship between performance measurement uses and company performance.

Keywords: Organizational ambidexterity; Performance measurement; Innovation; Organizational performance.
“Freedom is not the absence of structure ... but rather a clear structure that enables people to work within established boundaries in an autonomous and creative way” (Erich Fromm)

INTRODUCTION

Whether organizations can both align to current business demands while being capable of adapting to changes in their environments is a major theme in management and organizational theory and practice (Raisch and Birkinshaw 2008). Particularly over the past decade, a growing number of studies have utilized the concept of ‘organizational ambidexterity’ (OA) to express organizations’ capacity to exploit existing assets and resources while exploring new opportunities and radically innovate their products or services (see, e.g., Birkinshaw and Gupta, 2013; O’Reilly and Tushman, 2013).

Many empirical studies have focused on the examination of OA and its effects on company performance (He and Wong, 2004; Lubatkin et al., 2006; Raisch et al., 2009). However, results are still not conclusive, also because of substantial differences in conceptualization, operationalization and measurement of OA (Birkinshaw and Gupta, 2013; Junni et al., 2013). Moreover, few studies have considered the antecedents of organizational ambidexterity; indeed, “what is missing is a clear articulation of those specific management actions that facilitate the simultaneous pursuit of exploitation and exploration” (O’Reilly and Tushman, 2011; p. 8).

In this paper we consider a previously neglected antecedent of OA: performance measurement (Micheli and Mari, 2014; Neely, 2005). While several authors have investigated the roles that performance measurement systems (PMS) can play in enhancing organizational alignment (Kaplan and Norton, 2008; Kolehmainen, 2010), few studies have looked at the impact of PMS on innovation (e.g., Bisbe and Otley,
2004), and there is very limited evidence as to the impact of performance measurement on organizations’ capacity to both explore and exploit (Franco et al., 2012).

Furthermore, past research has shown how different types of PMS can have diverse effects on financial and non-financial performance (Speckbacher et al., 2003; Franco et al., 2007; Micheli and Manzoni, 2010): for example, whether performance measures are related to strategy, and whether cause-and-effect links between objectives and measures are articulated (Gimbert et al., 2010; Kaplan and Norton, 2004). However, a growing body of literature shows that the link between PMS and performance depends not simply on how systems are structured, but how they are used (Koufteros et al., 2014). In particular, scholars have adopted Simons’ (1995) levers of control framework to distinguish between two types of uses of performance measurement – ‘diagnostic’ and ‘interactive’ – and found that both impact performance, but in different ways (see, e.g., Henri, 2006).

In this paper we investigate the effects of performance measurement use on organizational ambidexterity and company performance, and find that the combination of diagnostic and interactive uses has a positive impact on both financial and non-financial performance, and that organizational ambidexterity is also positively correlated with financial and non-financial performance. When we consider both performance measurement uses and OA, we find that the impact of PMS uses on financial performance is fully mediated by ambidexterity.

The paper first reviews the ambidexterity and performance measurement literatures, and develops research hypotheses that relate performance measurement, organizational ambidexterity and company performance. It then presents the method and findings from a survey of 153 companies. It concludes by highlighting theoretical and practical implications.
THEORETICAL FRAMEWORK

Organizational ambidexterity

Duncan (1976) was the first author to utilize the term organizational ambidexterity; however, March’s (1991) article on organizations’ capacity to explore new possibilities, while exploiting existing assets and knowledge, is often cited as a seminal paper in the OA literature. Essentially, exploitation tends to build on existing knowledge and emphasize current customer preferences and offerings (Raisch and Birkinshaw, 2008), while exploration refers to the capacity of organizations to investigate and pursue new opportunities, develop new knowledge, and radically innovate their products and services (Tushman and O’Reilly, 1996).

Extant research shows that the singular pursuit of exploitation yields diminishing returns, and can lead to various dysfunctional consequences, as it may make an organization incapable of adapting to changing conditions. Exploitation also may lead to a “success trap” (Gupta et al., 2006), as it is often triggered by early success, which in turn reinforces further exploitation along the same trajectory. Similarly, a sole focus on exploration would not be appropriate either, because, at best, it may lead to inefficiency and the inability to build on previous successes and, at worst, it can make an organization collapse. “Because of the broad dispersion in the range of possible outcomes, exploration often leads to failure, which in turn promotes the search for even newer ideas and thus more exploration, thereby creating a ‘failure trap’” (Gupta et al., 2006; p. 695).

Scholars agree that achieving exploitation and exploration concurrently is challenging, because the objectives of each activity are often in conflict and they tend to be iteratively self-reinforcing. However, OA has been conceptualized in different ways by different authors, as some have proposed that the two objectives should be balanced,
others that they should be traded off against one another, others that they should be reconciled, or even simply managed (Birkinshaw and Gupta, 2013). While conceptual differences are not problematic per se, they have resulted into a deep fragmentation of the field (Junni et al., 2013). According to some authors, OA refers to the achievement of an optimal balance between exploration and exploitation; therefore, they regard exploration and exploitation as poles on a continuum, and OA as an optimal point on such continuum (see, e.g., Lavie et al., 2010). Others, instead, consider exploration and exploitation as independent activities, and OA as the combination of high levels of both (see, e.g., Birkinshaw and Gupta, 2013).

Different ways of framing OA have also meant that results may be difficult to compare or even inconsistent; this is particularly evident when considering the effects of OA on firm performance. Many authors have examined such relationship: some have found a positive effect, others a negative one, and others have emphasized the importance of contingent factors (see, e.g., Athuahene-Gima, 2005; Gibson and Birkinshaw, 2004; He and Wong, 2004; Lubatkin et al., 2006; Raisch et al., 2009). Interestingly, Cao et al. (2009) explicitly tested the effects of either balancing or combining exploration and exploitation (i.e., similar levels vs. their interaction), and found that both are positively associated with firm performance. However, they also indicated that unpacking the ambidexterity construct into distinct dimensions could explain previously unaccounted-for variance in firm performance. More widely, recent reviews found that on the whole OA was positively associated with performance (O’Reilly and Tushman, 2013), but that such relationship is often moderated by contextual factors, and, indeed, influenced by specific, methodological choices (Junni et al., 2013).
In this study, we consider exploration and exploitation as separate dimensions (see also, e.g., Gibson and Birkinshaw, 2004; Lubatkin et al., 2006), and OA as firms’ ability to consistently deliver on both at the same time (Birkinshaw and Gupta, 2013). Importantly, while we regard exploration and exploitation as independent activities, we do not underestimate the inherent trade-offs between them, nor do we see them as complementary (Lavie et al., 2010); rather, we argue that exploration and exploitation are not necessarily in opposition (Gupta et al., 2006).

While this research investigates the impact of OA on firm performance, it also contributes to addressing calls for further studies on the antecedents of OA (e.g., Raisch and Birkinshaw, 2008; Simsek et al., 2009; Lavie et al., 2010). Extant studies have looked at the roles of top management teams in integrating units in cases of structural ambidexterity; others have also identified leadership, organizational culture and structure as other key factors (see, e.g., Lubatkin et al., 2006; Jansen et al., 2006). However, few authors have investigated how management systems and processes could be used to achieve organizational ambidexterity (Raisch and Birkinshaw, 2008). In this research we are interested in investigating mechanisms that managers can use to reconcile the tension between exploration and exploitation, and agree with O’Reilly and Tushman (2013) that organizational ambidexterity “is reflected in a complex set of decisions and routines that enable the organization to sense and seize new opportunities through the reallocation of organizational assets” (p. 332). Therefore, we decided to look specifically at the role of a mechanism that is commonly utilized to promote alignment and control, but that has also been used to stimulate improvement and innovation: performance measurement.
Performance measurement

Performance measurement is a formal process, which aims to obtain, analyze, and express information about an aspect of a process, an activity or a person (Gray, Micheli and Pavlov, 2014). Since the early 1990’s, organizations have invested increasing resources in designing, implementing and using performance measurement systems (PMS), such as the Balanced Scorecard (Kaplan and Norton, 1992) or the Performance Prism (Neely, Adams and Kennerley, 2002) with the aims of formulating and executing strategy, supporting decision-making, and improving performance (Franco et al., 2007).

Essentially, a PMS is a particular type of management control system, which comprises “purposefully designed, information based and explicit sets of structures, routines, procedures and processes that help managers ensure that their organization’s strategies and plans are carried out or, if conditions warrant, that they are modified” (Bisbe and Otley, 2004; p. 709).

Since PMS started to become widely diffused, a considerable body of research has developed around their design as well as their effects (Micheli and Manzoni, 2010). For example, there is evidence that PMS can make organizations more efficient, although results are sometimes conflicting and are mostly drawn from case-based research (for a review, see Franco et al., 2012). Also, some studies have looked at the effects of performance measurement on innovation, but have reached diverging conclusions (e.g., Bisbe and Otley, 2004; Melnyk et al., 2010). Considering organizational performance as dependent variable, evidence suggests that PMS can have a positive impact, but that such relationship strongly depends on how performance measurement “systems are designed, developed, and, more importantly, used” (Franco et al., 2012; pp. 96-97). As a consequence, an important stream of literature has focused not only on the structure of PMS, but how they can be utilized. To do so, scholars have tended to use an established
framework in strategy and management accounting - Simons’ levers of control (Simons, 1995; Koufteros et al., 2014). According to Simons, management control systems could be used in four ways - as beliefs systems, boundary systems, diagnostic systems, and interactive systems (Figure 1).

While all four ‘levers’ play important roles, several authors have considered only two of them: diagnostic and interactive (see, e.g., Henri, 2006). A diagnostic use of PMS tends to fulfill a traditional feedback role as measurement systems are utilized to monitor and reward the achievement of pre-established targets. An interactive use is more related to strategy formulation and implementation, and focuses organizational attention more on strategic priorities and on stimulating dialogue (e.g., between managers and employees; between an organization and its external stakeholders) (Simons, 1995).

Traditionally, authors have tended to emphasize the “mechanistic” (diagnostic) use of PMS, while neglecting the more “organic” (interactive) use (Koufteros, 2014), thus highlighting PMS’ monitoring and controlling role, often in relation to dysfunctional consequences (see, e.g., Norreklit, 2000; Smith, 1995; Townley et al., 2003). Instead, authors who have considered the effects of both diagnostic and interactive uses on performance have reached divergent conclusions. For example, Marginson (2002) found that the interactive use of a PMS could enhance innovation, through the development of new ideas and initiatives within the firm. Bisbe and Otley (2004) found that interactive use could favor innovation, but only in low-innovating firms, and that this effect was opposite in high-innovating firms. Henri (2006) suggested that an interactive use fosters
capabilities leading to strategic choices by focusing organizational attention on strategic priorities and stimulating dialogue, but that a diagnostic use exerts negative pressure on these capabilities. This led the author to conclude that diagnostic and interactive “represent two complementary and nested uses [as] they work simultaneously but for different purposes” (Henri, 2006; p. 533), thus creating a “dynamic tension” between predictable goal achievement and innovation (Hall, 2008). Also, such dynamic tension “harvests unique organizational capabilities and competitive advantages through organizational dialogue, mutual understanding and better direction” (Koufteros et al., 2014; p. 317).

A similar example of dynamic tension’s positive impact on organizational performance is the case of organizational ambidexterity, where scholars have recognized the benefits of simultaneously pursuing seemingly contradictory aims, promoting both exploitative and explorative types of behaviors. However, while there are overlaps and interesting connections between the fields of performance measurement and organizational ambidexterity (e.g., the idea of ‘paradoxical thinking’ proposed in both literatures – see also, Andriopoulos and Lewis, 2009), we are not aware of studies that have specifically considered performance measurement in relation to organizational ambidexterity.

Hypotheses

This research empirically examines the relationships between PMS use, organizational ambidexterity, and company performance (both financial and non-financial). In particular, we posit that a diagnostic use encourages exploitative behaviors by creating constraints and ensures compliance with orders (Simons, 1995), whereas an interactive use is more likely to lead to exploring opportunities and learning across the organization
(Henri, 2006). Therefore, we hypothesize that the combined use of PMS (measured as the interaction term between diagnostic and interactive uses) has a direct, positive impact on organizational ambidexterity (conceptualized as the interaction term between exploration and exploitation). Building on the performance measurement literature (Franco et al., 2012), we posit that the combined use of PMS positively impacts performance (both financial and non-financial). Following previous reviews in the field of OA (e.g., Junni et al., 2013; Lavie et al., 2010; O’Reilly and Tushman, 2013), we also hypothesize that organizational ambidexterity positively impacts performance (both financial and non-financial). Finally, we look at the mediation effect of OA on the relationship between PMS use and performance. Therefore, we hypothesize the following:

\[ H1: \text{ PMS use positively affects organizational ambidexterity.} \]

\[ H2: \text{ PMS use positively affects company performance.} \]

This hypothesis can be divided into the following sub-hypotheses:

\[ H2a: \text{ PMS use positively affects company non-financial performance.} \]

\[ H2b: \text{ PMS use positively affects company financial performance.} \]

\[ H3: \text{ Organizational ambidexterity positively affects company performance.} \]

This hypothesis can be divided into the following sub-hypotheses:

\[ H3a: \text{ Organizational ambidexterity positively affects company non-financial performance.} \]

\[ H3b: \text{ Organizational ambidexterity positively affects company financial performance.} \]
H4: Organizational ambidexterity positively mediates the relationship between PMS use and company performance.

This hypothesis can be divided into the following sub-hypotheses:

H4a: Organizational ambidexterity positively mediates the relationship between PMS use and company non-financial performance.

H4b: Organizational ambidexterity positively mediates the relationship between PMS use and company financial performance.

The theoretical model underlying this research is reported in figure 2.

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METHOD

Procedures and sample

In order to validate the proposed hypotheses, we collected data through a survey on a sample of Italian firms. We randomly identified a company sample (600 firms) using a database provided by the Italian Association of Chief Financial Officers. In 2013, letters endorsed by the director of the Association were sent to the CFOs of these firms. These letters explained the research project, encouraged participation, promised that each participating firm would receive an executive summary of the findings when the study was completed, and indicated that we would follow up by e-mail. We sent out the questionnaire by e-mail and required it to be filled in by the CFO and the CEO. Six months later we conducted a follow up survey on the companies that had not previously
answered our questionnaire. Overall, 153 firms provided usable questionnaires, thus representing a response rate of 24%, comparable to similar studies in the field.

Firms in the final sample had an average size of 4.977 (s.d.= 19.546) full-time employees, and were operating in a wide range of industries covering manufacturing (28.4%), automotive (12.6%), food (9.6%), ICT (9.0%), chemical (8.0%), and other industries. 67% of the firms had a turnover higher than 50 million Euros, 6% lower than 10 million Euros. To test for nonresponse bias, we examined differences between respondents and non-respondents for our final sample. T-tests showed no significant differences based on the number of full-time employees and turnover. We also compared early and late respondents in terms of demographics and model variables. These comparisons did not reveal any differences (p < 0.05), showing that nonresponse bias was not a problem.

**Measures**

All constructs were measured with multi-item scales. Scores on these measures were means calculated across items. Scales for each construct were derived from extant literature and small modifications were made to adapt measures to the context analyzed. Adapted scales were pretested on a small sample of managers to ensure that meanings were clear. Using our final sample, we conducted numerous analyses (described below) to verify that our measures were sound. This research design enabled us to target respondents that have substantial organizational level knowledge and specific knowledge in relation to PMS, organizational ambidexterity and company performance. We summarize the study’s key measures in appendix A; correlations and descriptive statistics are reported in Table 1. Additionally, in order to externally validate our
measures of company financial performance, we collected accounting data from a secondary source from 2010 to 2013 on a subsample of firms.

**Firm performance.** Because firm performance is a multidimensional construct (Hart 1992), we assessed it along two dimensions: firm *non-financial performance* and firm *financial performance*. *Non-financial performance* was measured with four items adapted from Gibson and Birkinshaw (2004) that required the respondents to reflect on business unit performance over the last four years and indicate the degree to which respondents agreed with statements such as: “This business unit is achieving its full potential” and “This business unit does a good job of satisfying our customers”. The scales range from 1 (completely disagree) to 7 (completely agree).

Firm *financial performance* was measured with a three-item scale, adapted from Reinartz et al. (2004) and Jaworski and Kohli (1993), which required respondents to assess their company performance relative to competitors over the last four years according to market share, sales growth, and current profitability. The scales range from 1 (*much less*) to 7 (*much more*).

An exploratory factor analysis with oblique rotation was conducted on the 7 items and revealed the expected two-factor structure, which accounted for 75.8% of the variance. The two factors appropriately represented the firm non-financial and financial performance items. Primary loadings exceeded .66, and cross-loadings were lower than .31. Adequate reliabilities were achieved for both non-financial performance ($\alpha = .83$) and financial performance ($\alpha = .84$). These results suggest adequate validity and reliability of the two measures.

We used the CEOs’/CFOs’ evaluation of financial performance because 43% of the companies in our sample were SMEs, for which accounting data on financial
performance are not available, largely because the owners are not legally required to publish them. In addition, we did so because it is generally assumed that CEOs/CFOs are knowledgeable informants, particularly with regard to their firms’ performance (Lubatkin et al., 2006).

That said, and despite evidence to suggest that CEO/CFO self-reports of performance significantly correlate with some objective measures of firm performance (Dess and Robinson, 1984; Robinson and Pearce, 1988), we decided to further test the veracity of our subjective measure. To do so, we collected from Amadeus, a Bureau van Dijk database, objective measures of firms’ return on equity (ROE) and return on investment (ROI) on a subsample of firms (N=86) over the same time frame as our subjective performance measure (i.e., from 2010 to 2013). As suggested by several scholars (Rothaermel and Alexandre, 2009; He and Wong, 2004; Henri and Journeault, 2010), ROE and ROI are commonly used variables in strategic management research to proxy firm financial performance because they assess how efficiently a firm uses its resources. Moreover, using ROE and ROI has the added benefit of negating the need to explicitly control for firm size, because ROE and ROI are size-adjusted ratios. As mentioned above, we collected annual data for each firm during the four-year period between 2010 and 2013 in order to recognize time lags and to attenuate annual fluctuations in the ROE and ROI data. Following prior research (Rothaermel 2001; Zahra et al. 2000), we then averaged the ROE and the ROI data obtained over this time period to create two financial performance indices. We applied a logarithmic transformation to enhance the normality of the variable’s underlying distribution.

Finally, we correlated these objective measures of firm financial performance with our self-report of relative financial performance and found positive and significant correlations with both ROI ($r = .35, p < .01$) and ROE ($r = .19, p < .05$). This measure
of association is coherent with previous studies in the ambidexterity literature that employed similar techniques in order to cross validate perceptual measures of firm’s financial performance (e.g., Lubatkin et al., 2006; He and Wong, 2004). Hence, this finding provides evidence of the external validity of the self-report measure that we used.

**Ambidexterity.** As mentioned in the literature section, following previous studies (e.g., Gibson and Birkinshaw, 2004; Lubatkin et al., 2006; He and Wong, 2004), we consider ambidexterity to be a multidimensional construct. We thus utilized separate scales for exploration and exploitation, adapting them from Lubatkin et al. (2006). Respondents were asked to assess their firm’s orientation during the past 4 years relative to their competitors using a 7-point scale ranging from 1 (*much less*) to 7 (*much more*). Example items consistent with exploration described the firm as one that ‘introduces new generation of products’, and ‘enters new technology fields’. Example items consistent with exploitation described the firm as one that ‘works to reduce total costs’, and ‘improves current processes’ (see Appendix A for the complete list of items).

An exploratory factor analysis with oblique rotation was conducted on the 10 items and revealed the expected two-factor structure, which accounted for 65.9% of the variance. The two factors appropriately represented the exploration and exploitation items. Primary loadings exceeded .62, and cross-loadings were lower than .21. Adequate reliabilities were achieved for both exploration ($\alpha = .82$) and exploitation ($\alpha = .86$). These results suggest adequate validity and reliability of the two measures.

Finally, we modeled organizational ambidexterity as the multiplicative interaction between exploration and exploitation, reflecting the argument that these two organizational capabilities are non-substitutable and interdependent. Following Cao et
al. (2009), and Lubatkin et al. (2006) the interaction model was chosen after comparing, by means of confirmatory factor analyses, three different models presenting the relation between exploration and exploitation as an: (a) interaction; (b) sum; (c) subtraction.

**PMS use.** Focusing on PMS use, we considered PMS use as a multidimensional construct based on a diagnostic use and an interactive use. We thus constructed separate scales for diagnostic use and interactive use, adapting them from Henri (2006). Respondents were asked to rate, using a 7-point scale ranging from 1 (completely disagree) to 7 (completely agree), the extent to which performance measures are used in their firms. Also, respondents were required to focus on those performance measures that are common across organizational units. Example items consistent with diagnostic use describe performance measures as being used to ‘track progress towards goals’, and ‘monitor results’. Example items consistent with interactive use describe performance measures as being used to ‘enable discussion in meetings of superiors, subordinates and peers’, and ‘enable continual challenge and debate underlying data, assumptions and action plans’ (see Appendix A for the complete list of items).

An exploratory factor analysis with oblique rotation was conducted on the 11 items and showed, as expected, the two-factor structure, which accounted for 66.1% of the variance. The two factors appropriately represented the diagnostic use and the interactive use items. Primary loadings exceeded .66, and cross-loadings were lower than .22. Adequate reliabilities were achieved for both diagnostic use ($\alpha = .74$) and interactive use ($\alpha = .91$). These results suggest adequate validity and reliability of the two measures. Coherently with Henri (2006) we modeled the dynamic tension between
interactive and diagnostic use of PMS as the multiplicative interaction term between these two measurement scales.

**Control variables.** We included a number of control variables that might have an impact on the focal constructs of our study: technological diversification, product differentiation, internationalization, slack resources, environmental dynamism, environmental competitiveness, technological turbulence – all measured as seven-point Likert-type scales ranging from 1 (completely disagree) to 7 (completely agree) – and firm size, measured as the natural logarithm of full time employees. These scales were adapted from existing literature (Birkinshaw et al., 1998; Jansen et al., 2006; Jaworski and Kohli, 1993; Nohria and Gulati, 1996; Sethi and Iqbal, 2008).

**Same source bias**

Since most data are self-reported and the same individual reported on both the dependent variables and the independent variables, common-method bias was a concern. Following Podsakoff et al. (2003), we took procedural measures to minimize the impact of CMV by randomizing the sequence of items in the survey, guaranteeing confidentiality to respondents, emphasizing that there were no correct or incorrect answers, asking respondents to provide independent and honest answers.

In addition, to evaluate the extent to which CMV might influence our empirical findings, we carried out various post hoc tests on the data. First, a Harman’s single-factor test was conducted on the conceptually crucial variables of our theoretical model (i.e., firm non-financial performance and financial performance, exploration and exploitation, and diagnostic and interactive use of PMS). The outcome of this test

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1 Overall the exploratory factor analyses conducted led to the exclusion of 3 hypothesized items: item ‘4’ of the non-financial performance scale; item ‘5’ of the exploration scale; item ‘4’ of the diagnostic use scale.
showed that there are six factors, and that the highest variance accounted for by one factor is 31%, indicating minimal evidence of method bias (Harman, 1967).

Also, an analysis using a single-method-factor approach advocated by Podsakoff et al. (2003) and by Liang et al. (2007) likewise showed that CMV was not problematic. This approach consists in ascertaining that, after controlling for the effects of an unmeasured latent method factor in a structural model developed on the basis of the hypothesized relationships, all path loadings of the hypothesized indicators with their respective constructs remain statistically significant\(^2\). Due to the limited amount of observations available, however, such test was conducted using a Partial Least Squares approach, whereby a model that did not include a method factor was compared with a model that included a method factor. Taken together these analyses show that CMV is unlikely to have any substantial impact on our results.

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Add Table 1 about here

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RESULTS

Test of Hypotheses

We tested the proposed hypotheses using two-stage least squares (2SLS) regressions and followed the procedure proposed by Baron and Kenny (1986) and Frazier et al. (2004) to test mediation. 2SLS was chosen because (1) it provides consistent estimates when endogeneity might be a concern, as in the case of survey data, (2) it does not require assumption of multivariate normality, (3) it isolates specification errors and generates estimated asymptotic standard errors for significant tests (see Bollen, 1996; Bollen and Paxton, 1998 for details). Table 2 and 3 show regressions results using

\(^2\) Details of this analysis can be requested to the corresponding author.
company non-financial performance and company financial performance as dependent variables respectively.\(^3\)

Hypothesis 1 suggests that PMS use positively affects organizational ambidexterity; our results show that an appropriate balance between diagnostic and interactive use of PMS positively affects ambidexterity (β = .326; p < .001), thus supporting this hypothesis (see model A in both Tables 2 and 3).

Hypothesis 2 postulates that PMS use positively affects company performance. The results show that PMS use positively impacts company non-financial performance (β = .448; p < .001), thus supporting Hypothesis 2a (see model B, Table 2). Considering Hypothesis 2b, model B (Table 3) highlights that PMS use positively affects company’s financial performance (β = .269; p < .01), thus supporting this hypothesis.

Hypothesis 3 posits that OA positively affects company performance. As model C (Table 2) shows, OA positively affects company non-financial performance (β = .428; p < .001), thus supporting Hypothesis 3a. Considering Hypothesis 3b, model C (Table 3) shows that OA positively affects company’s financial performance (β = .374; p < .01), thus supporting this hypothesis.

Hypothesis 4 relates to the mediating effect of OA between PMS use and company performance. Considering Hypothesis 4a, results show that OA partially mediates the relationship between PMS use and company non-financial performance. Model C (Table 2) shows that, when ambidexterity is included into model B, the effect of PMS use on company’s non-financial performance decreases, but remains statistically significant (see Baron and Kenny, 1986 for details on full and partial mediation). Considering Hypothesis 4b, Model C (Table 3) shows that, when ambidexterity is

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\(^3\) All independent variables were included as instrumental variables in the first equation of the 2SLS. Additionally, three other instrumental variables were included: a sector variable (manufacturing vs. service); two variables measuring the years the respondent has been working in the company and the years the respondent has been appointed for his current position as CFO or CEO.
included into model B, the effect of PMS use on company’s financial performance decreases and becomes not statistically significant. Both the size of the coefficient for PMS use and the corresponding test statistic for significant difference decreased from model B (β = .269, p < .01) to model C (β = .147, p > .10). Therefore, taken together, our findings suggest that organizational ambidexterity fully mediates the relationship between PMS use and company’s financial performance (Baron and Kenny, 1986).

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Add Tables 2 and 3 about here

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**Post-hoc analyses**

In order to further verify our findings, we conducted a series of post hoc analyses. Figure 3 shows the relationship between exploration and exploitation for the surveyed companies, and further supports our choice of conceptualizing OA as the two separate dimensions of exploration and exploitation, rather than two opposite extremes (Birkinshaw and Gupta, 2013).

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Add Figure 3 about here

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Since this graph suggested the possibility of identifying some meaningful clusters, we performed a cluster analysis to facilitate the specification of groups. We conducted a K-means cluster algorithm (Hartigan, 1975; Hartigan and Wong, 1979) from which a four-group model seemed to provide the best fit. Table 4 shows the exploration and exploitation scores for the four cluster centers (Figure 3 highlights the companies belonging to the four different clusters).
Group 1 consists of 36 firms that were “not ambidextrous”, as they scored low in both exploration and exploitation dimensions. Group 2 consisted of 40 “exploitative” firms with higher ratings on exploitation than exploration. Group 3 consisted of 29 “exploratory” firms with higher ratings on exploration than exploitation. Finally, group 4 consisted of 45 “highly ambidextrous” firms with high ratings on both dimensions.

We performed an ANOVA analysis on the four groups having the financial performance as the dependent variable. Results show that we can reject the null hypothesis that all four groups had the same performance level (F = 8.91, p < .001). Group 4 (ambidextrous) was the best performing followed by group 3 (explorative), group 2 (exploitative) and group 1 (low performing). We conducted the post hoc Student-Newman-Keuls (S-N-K) procedure and established that there were significant differences in financial performance between the four groups. Table 5 shows the results of the S-N-K procedure.

DISCUSSION AND IMPLICATIONS

The question over whether organizations can promote both explorative and exploitative behaviors is a fundamental one for academics and practitioners alike (O’Reilly and Tushman, 2013). The organizational ambidexterity literature posits that firms, which are aligned towards their current goals but are at the same time flexible to adapt rapidly to
changing future demands, have higher firm performance. However, extant empirical findings are not conclusive, and relatively little is known about how ambidexterity is achieved (Lavie et al., 2010).

In this research we considered performance measurement as a mechanism to promote organizational ambidexterity and enhance firm performance. In line with previous studies (e.g., Bisbe and Otley, 2004; Henri, 2006), we focused on two different types of uses of performance measurement systems – diagnostic and interactive. Being interested in the ‘dynamic tensions’ between diagnostic and interactive uses, and between exploration and exploitation, we conceptualized both PMS use and organizational ambidexterity as multidimensional constructs.

This study makes three main contributions to theory. Firstly, we demonstrate the significant impact of the interaction of exploration and exploitation on organizational performance. While others had reached a similar conclusion (Junni et al., 2013; O’Reilly and Tushman, 2013), our conceptualization of OA enables us to show that four types of organizations exist, and that mainly exploitative and mainly explorative firms perform worse than ambidextrous ones. To paraphrase Birkinshaw and Gupta (2013; p. 295), ambidextrous firms are those that define the ‘efficiency frontier’. Such finding would not be possible, had we conceptualized ambidexterity as a continuum, and exploration and exploitation as extremes.

Secondly, we show that different uses of PMS can lead to the achievement of organizational ambidexterity. In other words, the interplay of diagnostic and interactive uses can create and reinforce a context which enables employees to conduct activities directed at aligning the organization while simultaneously keeping the organization adaptable (Gibson and Birkinshaw, 2004). Our emphasis on the use of PMS, rather than their mere existence, enables us to demonstrate that PMS are not ‘mechanistic
structures’ (Burns and Stalker, 1961), but dynamic systems that can be used in different ways to trigger both exploration and exploitation. Therefore, our findings challenge the traditional view of measurement systems being used solely to monitor and exploit current resources, and to enable top management top-down execution of strategy and plans (Kaplan and Norton, 2008). Instead, we agree with Gibson and Birkinshaw (2004) that nurturing well-designed systems and processes enables ambidexterity. Similarly, we support the claim that “ambidexterity is a capability that requires sophisticated, enabling-oriented use of bureaucratic structures” (Adler et al., 2009; p. 110).

Furthermore, we question extant perspectives on antecedents’ roles in promoting either exploration or exploitation, for example: “given our conceptualization of exploration and exploitation as resting at the opposite ends of a continuum, we assume that antecedents of exploration undermine exploitation, and vice versa” (Lavie et al., 2010; p. 118). Indeed, our research shows that PMS could be used to promote both exploration and exploitation.

Thirdly, our results inform the literature on performance measurement and management, showing that PMS can have positive effects on performance, but such effects will depend on the uses of PMS and on the interplay between explorative and exploitative activities. This finding supports previous research, which found initial evidence of the influence of the dynamic tension between diagnostic and interactive uses of PMS on performance (Henri, 2006). Importantly, it is the dynamic tension between the two uses that matters, since an excessive diagnostic use could reduce experimentation and risk taking, whereas too high an interactive use could undermine goal clarity and organizational alignment (Adler and Chen, 2011). Also, our focus on PMS use confirms that ambidexterity is achieved through managerial capability, rather
than through simple introduction of systems and structures (Birkinshaw and Gupta, 2013).

This research has two main implications for practice. First, organizations should actively consider the diagnostic and interactive uses of performance measurement systems, and their interplay. For example, while some measures could be used to monitor and control specific processes or resources, others should be utilized to promote wider discussions about whether and how such processes ought to be modified or redesigned. These different uses also relate to the notions of feedback and feed-forward controls (Ishikawa and Smith, 1972): some measures should help understand past performance and trigger incremental improvements (feedback), whereas others should help promote actions which help avoid deviations from planned performance or target outputs, and may trigger more radical improvements (feed-forward). Also, the interplay between uses should be considered over time; for example, as environmental conditions or strategic priorities change, performance measures could be used more interactively.

Second, organizations could benefit from different uses of PMS through the introduction and use of two types of targets, which reflect both diagnostic and interactive logics - ‘performance targets’ and ‘learning targets’ (Seijts and Latham, 2005). The former are framed so that the focus is on performance (e.g., increase sales volume by 10 percent this year). The latter are framed to focus attention on knowledge or skill acquisition, perhaps in relation to the introduction of a new service or product (e.g., identify three ways of developing a relationship with end-users of our new products). Also in this case different types of targets may be more appropriate depending on context and over different periods of time, encouraging individuals to explore and exploit, and helping managers “override the organization’s tendency to go down the path of least resistance” (Birkinshaw and Gupta, 2013; p. 293).
LIMITATIONS AND FURTHER RESEARCH

Although our sample of companies was appropriate to validate the proposed research hypotheses, the demographic characteristics of companies were not appropriate to explore contingencies by means of split-sample analyses. Future studies could look at the effects of PMS on organizational ambidexterity and on performance in specific types of organizations (e.g., large companies or SMEs) or industries. Previous research found that organizational ambidexterity has a greater impact on performance especially in non-manufacturing industries (Junni et al., 2013); therefore, scholars could contrast the role of PMS use and of OA in manufacturing and in non-manufacturing organizations. Additionally, the cross sectional nature of our data did not allow us to explore time-dependent dynamics in PMS use. Further research could also examine changes in uses of PMS over time, and the effects of such changes on both ambidexterity and performance. Such studies could be either survey-based or qualitative, to better understand how organizations achieve higher levels of ambidexterity through the uses of PMS.
Appendix: Survey Questionnaire

Diagnostic use

Please rate the extent to which your top management team currently uses performance measures to:

1. ...track progress towards goals
2. ...monitor results
3. ...compare outcomes to expectations
4. ...review key measures

Interactive use

Please rate the extent to which your top management team currently uses performance measures to:

1. ...enable discussion in meetings of superiors, subordinates and peers
2. ...enable continual challenge and debate underlying data, assumptions and action plans
3. ...provide a common view of the organization
4. ...tie the organization together
5. ...enable the organization to focus on common issues
6. ...enable the organization to focus on critical success factors
7. ...develop a common vocabulary in the organization

Exploration

“Relative to your competitors, how does your firm perform concerning the following statements:”

1. Introduce new generation of products
2.  *Extend product range*

3.  *Open up new markets*

4.  *Enter new technology fields*

5.  *Learn about customers and markets for our products*

**Exploitation**

“Relative to your competitors, how does your firm perform concerning the following statements:”

1.  *Reduce total costs*

2.  *Improve existing product quality*

3.  *Improve flexibility of processes*

4.  *Reduce lead time*

5.  *Improve current processes*

**Non-financial Performance**

1.  *This business unit is achieving its full potential*

2.  *People at my level are satisfied with the level of business unit performance*

3.  *This business unit does a good job of satisfying our customers*

4.  *This business unit gives me the opportunity and encouragement to do the best work I am capable of*

**Financial Performance**

1.  *Attaining market share*

2.  *Attaining sales growth*

3.  *Current profitability.*
REFERENCES


FIGURES

Figure 1 – Simons’ levers of control

Define, communicate, and reinforce the basic values, purpose, and direction for the organization.

Used by top managers to regularly and personally involve themselves in the decision activities of subordinates.

Establish explicit limits and rules which must be respected.

Monitor organizational outcomes and correct deviations from preset standards of performance.

Figure 2 – Theoretical model

PMS use

INTERACTIVE

X

DIAGNOSTIC

Ambidexterity

EXPLORATION

X

EXPLOITATION

Company performance

• Non-financial
• Financial
Figure 3 – Plot of exploration and exploitation
## TABLES

### Table 1 – Descriptive statistics and correlations

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N=153; * p< .05; ** p< .01; *** p< .001.

On the diagonal Cronbach’s alpha reliability coefficient. PMS use is the interaction of diagnostic use and interactive use. Ambidexterity is the interaction of exploration and exploitation.
Table 2. Results of 2SLS regression analyses on organizational ambidexterity and firm’s non-financial performance

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† p<.10; * p<.05; ** p<.01; *** p<.001.
Table 3. Results of 2SLS regression analyses on organizational ambidexterity and firm’s financial performance

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† p<.10; * p<.05; ** p<.01; *** p<.001.
### Table 4. Results of post-hoc cluster analysis

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### Table 5. Results of S-N-K procedure

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