DOCTORAL THESIS

Title	**THE USE OF MANAGEMENT ACCOUNTING AND CONTROL SYSTEMS FOR THE ENHANCEMENT OF ORGANISATIONAL OUTCOMES**
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Aos meus pais, ao meu irmão e a Cynthia

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Thesis abstract

Abstract in English

The purpose of this thesis is to examine the extent to which the usage and style-of-use of management accounting and control systems (MACS) by senior management contribute to the achievement of desirable organisational outcomes. In this research, organisational outcome is conceptualised in terms of product innovation and financial performance. Based on contingency theory, this research is organised in a compendium of four articles. A theoretical paper and three empirical research studies that rely on two pre-existent surveys and an original survey exclusively developed for this dissertation are bases for hypotheses testing. The aim of each of the four research pieces of this thesis is the one of contributing to advance our knowledge on the effects and means by which the use of MACS is capable of enabling and supporting organisational success. Two research papers examine organisational outcome in terms of 'innovation outputs', whereas other two articles concentrate on the organisational outcome in terms of 'organisational performance'.

The first paper in this dissertation aims to contribute to the recent levers of control (LOC) (Simons, 1995) literature on the relationships between innovation and MACS by emphasising the importance of the choice by which individual MACS are selected for interactive use. Using a pre-existing survey collected from 57 medium-sized Spanish firms, we find evidence supporting (1) the choice of individual MACS selected for interactive use is associated with a firm's innovation management mode (IMM), and (2) the level of product innovation output is influenced by whether or not IMM and interactive MACS feature similar cognitive models and whether the sophistication of the information contents provided by the interactive MACS responds to the priority needs perceived in the IMM. Our findings further indicate that similarity in patterns between IMM and MACS does not lead to a beneficial impact on the level of innovation outcomes, suggesting instead that it may induce the replication of existing dysfunctional trends caused by innovation momentum.

The second paper examines the influence of MACS on the development of some key organisational capabilities related to innovation processes. More specifically, this research examines the associations between different forms of control (cultural controls, interactive

controls, diagnostic controls) and the capabilities required in the creativity and conversion ability stages of the innovation process. We examine these associations separately for entrepreneurial and conservative firms. Using survey data collected from 120 medium and large Spanish companies, we find evidence supporting that each form of control within the control package has diverse influences on the different stages of the innovation process and that the significance and direction of these influences varies between entrepreneurial and conservative firms. By associating specific forms of control within the control package with specific components or stages of the innovation process, our results highlight the simultaneous complementarities and supplementarities between specific forms of control.

The third paper aims to review how the construct 'performance' has been assessed in prior contingency-grounded, survey-based management accounting and control systems research, to analyse the alternative approaches that have been adopted in the literature, and to provide some insights for enhancing the assessment of performance in future survey-based empirical research. First, the paper identifies a total of 82 survey-based, contingency-grounded papers published in top accounting journals in the period 1982-2008 where performance was used as a variable of analysis. Specifically, this study examines the problems of a) conceptualisation that are reflected on threats to construct validity and b) measurement. The article emphasises issues that could assist researchers in selecting between the various available choices of performance measurement by considering their respective weaknesses and strengths.

Finally, a fourth paper examines the extent to which the use of Strategic Performance Measurement Systems (SPMS) influences organisational performance through the shaping of the strategic agendas and the strategic decision arrays that result from strategy (re)formulation processes. In this research we defined SPMS as management tools that are characterised by a combination of high levels of four constitutive dimensions (i.e. the integration of long-term strategy and operational goals, the presence of multi-perspective metrics, the inclusion of cause-effect linkages, and the presence of a sequence goals/targets/action plans). We argue that organisations that use SPMS achieve enhanced performance (in comparison with those firms that use other performance measurement systems not qualified as SPMS) and that this enhancement is associated not only with a better implementation of intended strategies as it has been assumed in previous empirical research, but also with the comprehensiveness of the strategic agendas and strategic decision arrays obtained in the processes of (re)formulation of intended strategies. Results from tests of a

structural model using Partial Least Squares (PLS) regressions on archival and survey data collected from Chief Executive Officers of 279 medium and large Spanish companies provide support in favour of hypotheses suggesting that a) the positive effect of the use of SPMS on organisational performance is mediated by the comprehensiveness of the strategic decision array (i.e. variety and number of decisions) that result from strategy (re)formulation processes; and that (b) the greater the environmental dynamism, the more positive the effect of the comprehensiveness of the strategic decision array on organisational performance.

Resumen en Español

El objetivo de esta tesis es examinar en qué medida la utilización y el estilo de uso de los sistemas de contabilidad y control de gestión (MACS) por la alta dirección contribuyen a la consecución de resultados deseados por la organización. En esta investigación, los resultados de la organización se conceptualizan en términos de innovación de productos y rendimiento financiero. Esta investigación está organizada en un compendio de cuatro artículos sobre la base de la teoría de la contingencia. Un trabajo teórico y tres estudios de investigación empírica, que se apoyan en dos encuestas pre-existentes y una encuesta original desarrollada exclusivamente para esta tesis, son las bases para las pruebas de hipótesis. El objetivo de cada uno de los cuatro trabajos de investigación de la tesis es el de contribuir al avance del conocimiento sobre los efectos y mecanismos mediante los cuales el uso de los MACS es capaz de facilitar y apoyar el éxito de la organización. Dos trabajos de investigación examinan los resultados de la organización en términos de 'resultados de la innovación', mientras que otros dos artículos se concentran en los resultados organizativos en términos de 'rendimientos financieros'.

El primer artículo en esta tesis pretende contribuir a la literatura sobre las palancas de control (levers of control, LOC) (Simons, 1995), investigando las relaciones entre la innovación y MACS, con especial atención a la importancia de la elección por la cual específicos MACS se seleccionan para un uso interactivo. Utilizando una encuesta pre-existente recogida entre 57 empresas españolas de tamaño mediano, encontramos evidencia que (1) la elección de un MACS específico para el uso interactivo está relacionada con el modo de gestión de la innovación (IMM) de una empresa, y (2) el nivel de innovación en productos está influenciada por si el uso interactivo del MACS comparte característica y modelos cognitivos similares y si la sofisticación de los contenidos de información proporcionada por el MACS interactivo responde a la prioridad de las necesidades percibidas por el IMM. Nuestros resultados indican además que la similitud en los patrones entre IMM y MACS no da lugar a un impacto beneficioso en los resultados de la innovación, lo que sugiere en cambio que esta similitud en los patrones puede inducir a la replicación de las actuales tendencias disfuncionales causadas por el '*innovation momentum*'.

El segundo artículo analiza la influencia de los MACS en el desarrollo de algunas capacidades claves de la organización relacionadas con los procesos de innovación. Más específicamente, esta investigación examina la asociación entre diferentes formas de control (controles culturales, controles interactivos, y controles diagnósticos) y las capacidades necesarias en la creatividad y conversión en el proceso de innovación. Examinamos estas asociaciones por separado para las empresas emprendedoras y conservadoras. Utilizando datos de encuesta realizada entre 120 empresas españolas medianas y grandes, encontramos evidencia de que cada forma de control dentro del paquete de control tiene influencias diversas en las diferentes etapas del proceso de innovación y que la importancia y la dirección de estas influencias varía entre empresas emprendedoras y conservadoras. Mediante la asociación de formas específicas de control en el paquete de control con determinados componentes o etapas del proceso de innovación, nuestros resultados ponen de manifiesto la simultánea complementariedad y suplementariedad entre las formas específicas de control.

El tercer artículo pretende revisar cómo el constructo *performance* ha sido utilizado por estudios previos en el área de la contabilidad de gestión basados en la teoría de la contingencia y en encuestas, analizando los distintos criterios que se han adoptado en la literatura, y proponiendo algunas ideas para mejorar la calidad de futuras investigaciones empíricas basadas en encuestas y que utilizan la variable *performance*. En primer lugar, el trabajo identifica un total de 82 artículos basados en encuestas, publicados en las revistas de contabilidad más importantes en el periodo comprendido entre 1982-2008 cuyo constructo *performance* se utiliza como una variable de análisis. En concreto, este estudio examina a) los problemas de conceptualización que se reflejan en las amenazas a la validez del constructo y b) problemas de medición. El artículo pone en relieve las cuestiones que podrían ayudar a los investigadores en la selección entre las opciones disponibles de medición de la variable *performance* considerando sus debilidades y fortalezas.

Por último, un cuarto estudio en esta tesis examina el grado en que el uso de los Sistemas Estratégico de Medición de Desempeño (SPMS) influye en el rendimiento organizacional a través de la ordenación de las agendas y decisiones estratégicas que se derivan de los procesos de (re)formulación de la estrategia organizacional. En esta investigación hemos definido SPMS como herramientas de gestión que se caracterizan por una combinación de altos niveles de cuatro dimensiones constitutivas (es decir, la integración de la estrategia a largo plazo y las metas operacionales, la presencia de indicadores desde una perspectiva

múltiple, la inclusión de los vínculos de causa-efecto, y la presencia de una secuencia de objetivos / metas / planes de acción). En este trabalho se argumenta que las organizaciones que utilizan SPMS logran un mejor rendimiento (en comparación con las empresas que utilizan otros sistemas de medición del desempeño no calificados como SPMS) y que esta mejora se asocia no sólo con una mejor aplicación de las estrategias destinadas como se ha supuesto en investigaciones empíricas anteriores, sino también con la ordenación de las agendas estratégicas y las decisiones estratégicas obtenidas en los procesos de (re) formulación de estrategias. Los resultados de las pruebas de un modelo estructural utilizando regresiones mediante mínimos cuadrados parciales (PLS) en datos de encuesta recogidos entre directores generales de 279 empresas españolas medianas y grandes apoyan la hipótesis que sugiere que a) el efecto positivo del uso de SPMS en el rendimiento de la organización está mediada por la amplitud de la matriz de decisiones estratégicas (es decir, variedad y el número de decisiones) que resultan de los procesos de (re) formulación de la estrategia, y que b) cuanto mayor es el dinamismo del ambiente, más positivo el efecto de la amplitud de la matriz de decisión estratégica sobre el rendimiento organizacional.

Resum en Català

L'objectiu d'aquesta tesi és examinar la mesura en que l'ús i l'estil d'ús dels sistemes de comptabilitat i control de gestió (MACS) per l'alta direcció contribueixen a la consecució dels resultats desitjables de l'organització. En aquesta investigació, el concepte de resultats d'organització s'explica en termes d'innovació de productes i del rendiment financer. Sobre la base de la teoria de contingència, aquesta recerca està organitzada en un compendi de quatre articles. Un treball teòric i tres estudis d'investigació empírica que es desenvolupen a partir de dues enquestes preexistents i una enquesta original creada exclusivament per a aquesta tesi serveixen de base per a les proves d'hipòtesis. L'objectiu de cadascun dels quatre treballs de recerca d'aquesta tesi és el de contribuir a avançar en el coneixement sobre els efectes i mecanismes mitjançant els quals l'ús dels MACS és capaç de facilitar i donar suport a l'èxit de l'organització. Dos treballs de recerca examinaran els resultats d'organització en termes de 'resultats de la innovació', mentre que altres dos articles es focalitzen en els resultats organitzatius en termes de 'rendiment de l'organització'.

El primer article en aquesta tesi pretén contribuir a la literatura sobre les palanques de control (levers of control, LOC) (Simons, 1995), investigant les relacions entre la innovació i MACS, posant l'accent en la importància de l'elecció per la qual les MACS es seleccionen pel seu ús interactiu. Utilitzant dades d'enquestes de 57 empreses espanyoles (catalanes) mitjanes, trobem evidència que recolza (1) l'elecció de MACS per a l'ús interactiu s'associa amb la manera d'una empresa de gestió de la innovació (IMM), i (2) el nivell de la innovació de productes està influenciada per si o MACS seleccionat per ús interactiu i IMM comparteix similars models cognitius i si la sofisticació dels continguts d'informació proporcionada pel MACS interactiu respon a la prioritat de les necessitats percebudes en la IMM. Els nostres resultats indiquen, a més, que la similitud en els patrons d'entre IMM i MACS no dóna lloc a un impacte beneficiós en el nivell dels resultats de la innovació, el que suggereix en canvi que pot induir la replicació de les actuals tendències disfuncionals causades pel 'innovation momentum'.

El segon article analitza la influència dels MACS en el desenvolupament d'algunes capacitats clau d'organització relacionades amb els processos d'innovació. Més específicament, aquesta investigació examina l'associació entre diferents formes de control (controls culturals,

controls interactius, i controls de diagnòstic) i les capacitats necessàries en la creativitat i les etapes de conversió del procés d'innovació. Examinem aquestes associacions per separat per les empreses emprenedores i conservadores. Utilitzant dades d'enquestes de 120 empreses espanyoles (catalanes) mitjanes i grans, trobem evidència que cada forma de control dins del paquet de control té influències diferents en les diverses etapes del procés d'innovació i que la rellevància i la direcció d'aquestes influències varia entre empreses emprenedores i empreses conservadores. Mitjançant l'associació de formes específiques de control en el paquet de control amb determinats components o etapes del procés d'innovació, els nostres resultats posen de manifest la simultània complementarietat i suplementàries entre les formes específiques de control.

El tercer document té com a objectiu revisar com la variable rendiment (‘performance’) ha estat avaluada en l'àrea de la comptabilitat de gestió en recerca basat en la teoria de la contingència i en enquestes, analitzant els diferents criteris que s'han adoptat en la literatura, i proporcionant algunes idees per millorar la mesura de aquesta variable en futures investigacions empíriques basades en enquestes. En primer lloc, el treball identifica un total de 82 articles basats en enquestes, aquestes treballs es van publicar en revistes de comptabilitat més importants del període 1982-2008. En concret, aquest estudi examina a) els problemes de conceptualització que es reflecteixen en les amenaces a la validesa de constructe i b) mesurament. L'article posa de relleu les qüestions que podrien ajudar els investigadors en la selecció entre les opcions disponibles de mesurament de la variable *perfomance* considerant les seves debilitats i fortaleses.

Finalment, un quart treball examina el grau en què l'ús de sistemes estratègics de mesura del rendiment (SPMS) influeix en el desenvolupament organitzatiu a través de la conformació de les agendes estratègiques i les matrius de decisions estratègiques que es deriven dels processos de (re) formulació de l'estratègia. En aquesta recerca hem definit SPMS com a eines de gestió que es caracteritzen per una combinació d'alts nivells de quatre dimensions constitutives (és a dir, la integració de l'estratègia a llarg termini i les metes operacionals, la presència d'indicadors des d'una perspectiva múltiple, la inclusió dels vincles de causa-efecte, i la presència d'una seqüència d'objectius / metes / plans d'acció). S'argumenta que les organitzacions que utilitzen SPMS aconsegueixen un millor rendiment (en comparació amb les empreses que utilitzen altres sistemes de mesurament de l'acompliment, no qualificats com SPMS) i que aquesta millora s'associa no només amb una millor aplicació de les

estratègies destinades com s'ha suposat en anteriors empírica investigació, sinó també amb la integralitat dels programes estratègics i les matrius de decisions estratègiques obtingudes en els processos de (re) formulació d'estratègies. Els resultats de les proves d'un model estructural utilitzant regressions de mínims quadrats parcials (PLS) en dades d'arxiu i enquesta recollits de directors generals de 279 empreses espanyoles (catalanes) mitjanes i grans donen suport a favor de la hipòtesi que suggereix que a) l'efecte positiu de l'ús de SPMS en l'èxit de l'organització està mediada per l'amplitud de la matriu de decisions estratègiques (és a dir, varietat i el nombre de decisions) que resulten dels processos de (re) formulació de l'estratègia, i que (b) més gran és el dinamisme del medi ambient, més positiu l'efecte de l'amplitud de la matriu de decisió estratègica sobre el rendiment organitzatiu.

Contributions to scientific knowledge

The aim of this section is to summarise the peer-review processes undergone by the research comprised in this thesis. All four papers presented in this dissertation have been submitted to peer-review processes and/or have been presented in academic conferences / research seminars. The information depicted in the following table (Table 1.1) relates the specific article with presentations and publications.

Table 1.1. Table of academic contributions

Title	Journal / Conference / Seminar
The Choice of Interactive Control Systems under Different Innovation Management Modes	Bisbe, J. and Malagueño, R. (2009), *European Accounting Review*, 18(2), pp. 371-405. DOI: 10.1080/09638180902863803
The Role of Management Accounting and Control Systems as Antecedents of Organisational Creativity and Conversion Ability in Innovation Processes	Malagueño, R. (Presenter) and Bisbe, J. Accounting seminars series, University of Essex, Colchester, United Kingdom, Wednesday, 3 November 2010. Malagueño, R. (Presenter) and Bisbe, J., 7th Conference on New Directions in Management Accounting, EIASM Brussels, Belgium, 15-17 December, 2010. Malagueño, R. (Presenter) and Bisbe, J., Debating the link between creativity and control, A Workshop Sponsored by Accounting, Organizations and Society, IESE Business School and Sda Bocconi School of Management, Barcelona, Spain, 4–5 April 2011.
Performance as a Variable in Management Accounting Research: a critical review	Malagueño, R. (Presenter), Bisbe, J. and Batista-Foguet, M.J., 9th Manufacturing Accounting Research Conference, Muenster, Germany, 21-24 June, 2009. Malagueño, R., 6th Conference on New Directions in Management Accounting, EIASM Brussels, Belgium, 15-17 December, 2008.
Strategic Performance Measurement Systems Strategy Formulation and Organisational Performance	Malagueño, R. (Presenter), Bisbe, J. and Gimbert, X., Accounting seminars series, University of Manchester, Manchester, United Kingdom, 17 February, 2010. Bisbe, J. (Presenter), Malagueño, R. and Gimbert. X. Global Management Accounting Research Symposium, Michigan State University, 10-11 June, 2010.

Chapter 1: General Introduction

1.1 Overarching framework

This thesis is organised in seven chapters. In chapter 1, I present the theoretical background that underlines this research depicting a general research model that comprises the different pieces of research developed in this document. Further, chapter 1 briefly introduces the main research questions, results and contributions of this study. Chapter 2 contains the first research paper of this thesis - *The Choice of Interactive Control Systems under Different Innovation Management Modes*. The paper presented in Chapter 2 is the result of collaboration with Prof. Josep Bisbe that ended up published in the prestigious journal *European Accounting Review*. Chapter 3 encloses the paper - *The Role of Management Accounting and Control Systems as Antecedents of Organisational Creativity and Innovation Processes*, in which an empirical research is based on an original survey developed among 120 organisations in Catalonia, Spain. On chapter 4, the paper - *Performance as a Variable in Management Accounting Research: a critical review* – presents a theoretical note based on a literature review over 20-years of management accounting publications. Chapter 5 brings the final empirical piece of this thesis - *Strategic Performance Measurement Systems Strategy Formulation and Organisational Performance*. The aim of each of the four research pieces of this thesis is the one of contributing to advance our knowledge on the effects and means by which the use of MACS is capable of enabling and supporting organisational success. Two research papers examine organisational outcome in terms of 'innovation outputs', whereas other two articles concentrate on the organisational outcome in terms of 'organisational performance'. Chapter 6 presents conclusions, open questions for future research and discusses some of the limitations of this thesis. Finally, chapter 7 brings together all references used in this thesis.

1.2 Theoretical Perspective

This thesis aims to contribute to the extant contingency theory by examining specific management accounting and control systems effects' on enhancing organisational outcomes. Contingency Theory is based on the assumption that there is no universally appropriate

organisational practice, procedure or system which applies uniformly to all organisations in every context. Contingency approach suggests that particular features of an appropriate practice, procedure or system will depend upon a specific organisational and environmental context (Donaldson, 2001). In this research, the emphasis is concentrated on management accounting and control systems (MACS), which are defined as the set of procedures and accounting tools managers use in order to ensure the achievement of organisational goals. They encompass informal controls (e.g. cultural controls, clans, values and symbols) as well as formal controls (e.g. formal beliefs systems, rules and regulations, feedback and measurement systems) (Malmi and Brown, 2008; Merchant and Van der Stede, 2007).

Contingency approach has been for the last forty years one of the main theoretical perspectives for studying the behavioural and organisational aspects of management and accounting (Drazin and Van de Ven, 1985; Chenhall, 2007). The contingency approach came as a reaction to the universalistic theories of organisation, which argued that there was "one best way" to organise (Donaldson, 2001). According to the universalistic theories maximum effectiveness was accomplished through maximum levels of certain managerial/structural characteristic. For instance, classical management approaches argue that maximum organisational outcomes derive from maximum formalisation and specialisation (Parker and Lewis, 1995). Alternatively, contingency theory does not call for "maximum levels of", but rather, for the adequate level of the structural variable that matches the particular contingency (Drazin and Van de Ven, 1985).

Two main lines of contingency-based research can be distinguished. On one hand, there is the literature that has assessed organisational outcomes such as, organisational performance[1], as an endogenous variable. Hence, the relationship between managerial practices and desirable organisational outcomes underlines management and accounting research (Donaldson, 2001). According to these studies, the contingency perspective assumes high or improved organisational outcome is the ultimate goal of specific configurations of activities and resources that companies deploy in order to develop their competitive advantages (Collis and Montgomery, 2005). As a result, a number of studies investigated the relationship between management and accounting practices and such organisational outcomes (Fisher, 1998; Sousa and Voss, 2008). On the other hand, there is a stream of the contingency-based literature that has placed organisational practices as the outcome variables. This line of research assumes that associations between context and managerial and accounting practices reflect equilibrium

conditions (Donaldson, 2001). Therefore, it takes for granted that every organisation is operating at an optimal level of performance given its situation (Chenhall, 2007), and consequently, investigating the relationship between organisational practices and organisational outcomes (e.g. organisational performance or success) is irrelevant.

Within the specific area of management accounting research, the interest in better understanding the relationship between specific MACS design and use and organisational desired outcomes increased even further after some researchers appended to the earlier contingency notion of "fit" between attributes of MACS and outcomes (Merchant and Simons, 1986; Otley, 1980; Otley and Wilkinson, 1988). According to those scholars the outcome variables related to dimensions of desired organisational or managerial performance should be included in management accounting contingency-based studies. Thus contingency-based studies should identify particular aspects of an MACS which are associated with certain defined circumstances and demonstrate a suitable matching (Gerdin and Greeve, 2004). A good fit between MACS and context should mean enhanced outcome, while a poor fit should imply diminished outcome (Chenhall, 2007).

Besides its popularity, contingency theory has been continuously criticised in research literature. This criticism is better explored in chapter 6 of this thesis. In this study, special care has been taken in order to avoid it from falling into the mistaken footsteps of pioneers. With criticism in mind and using contemporary methodological and theoretical literatures, this thesis attempts to reduce commonly referred problems derived from the theoretical and methodological perspectives chosen. Therefore limitation of this research are acknowledged and treated with the best available resources.

1.3 Research Model, Research Questions and Contributions

Overall, theoretical contributions of the contingency theory are accomplished by the identification of relevant contingency variables that distinguish between contexts, by combining different contexts based on these contingency variables, and by determining the most effective internal organisation designs in each major group (Souza and Voss, 2008). Based mainly on contingency arguments, this thesis is organised in a compendium of four articles each of which furthers our knowledge on the extent to which specific MACS practices within a specific context contributes to organisation success. Four different angles are adopted to examine the topic. Hence, three of these studies identify different management

accounting and control systems practices, specific managerial modes, processes, and capabilities and its influence on organisational outcomes. In this research, organisational outcome is conceptualised in terms of levels of product innovation and organisational performance. For this final and essential outcome of contingency approach namely 'performance', an in-depth study is pursued in order to better understand this concept as a dependent variable in management accounting research.

Figure 1.1 depicts the research model that underlines this thesis. This figure is an attempt to represent the links among the studies existing in this document. Hence, chapter 2 of this thesis examines whether the relationship between individual formal MACS and product innovation is moderated by the fit between MACS selected for interactive use and the innovation management mode of an organisation. This relationship is shown in the line that connects the use of 'formal MACS' to 'product innovation', and this relationship is moderated by the fit between the 'choice of MACS for ICS' and 'Innovation management mode (IMM)'. Chapter 3 focuses on the interchangeable use of 'formal' and 'informal MACS' and its effects on 'innovation capabilities'. Chapter 4 investigates the conceptualisation and measurement of 'performance' as a variable in management accounting research. Finally, chapter 5 examines the extent to which the 'usage of formal MACS' namely Strategic Performance Measurement System contributions to 'organisational performance' is mediated by comprehensiveness of strategic agendas resulting from 'strategy formulation' process and is moderated by 'environmental dynamism'.

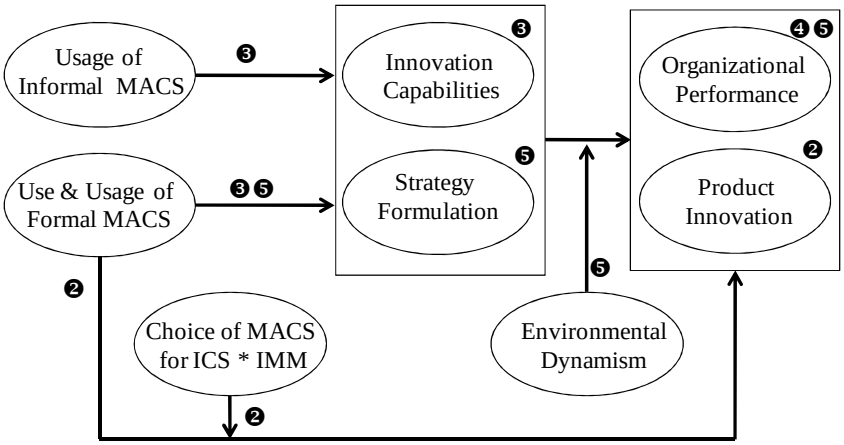

Figure 1.1. Research Model (Chapters:❷,❸, ❹ and ❺)

Note: MACS = management accounting and control systems; ICS = interactive control systems; IMM = innovation management modes

On the remainder of this chapter, it is carried out a brief summary of each of the articles discussed in this thesis, as well as, their research objectives, main results and general contributions.

1.3.1. Paper 1 (Chapter 2)

The first research paper of this thesis, presented in chapter 2, examines the relationship between product innovation and MACS by emphasising the importance of the choice by which individual MACS are selected for interactive use. Building upon the Simons' levers of control framework (Simons, 1995, 2000), and with special attention to the lever of formal style-of-use of control systems known as interactive control system (ICS) (e.g. Bisbe and Otley, 2004; Naranjo-Gil and Hartmann, 2007) (constantly referred as a mechanism for innovation support) this research investigates the organisational factors that influence the choice of which MACS are selected for interactive use. Thus the research explores i) the links between the configurations of the organisational and managerial processes by which innovation arises (i.e. the innovation management modes - IMM) (Park and Kim, 2005; Roussel et al., 1991), ii) the choice of ICS and iii) the potential implications for innovation outcome derived from the expected fit of ICS and IMM. Two research questions are proposed: 1) Is there a link between the choice of interactive MACS and the innovation management modes? and 2) Is there a fit between an IMM and particular MACS with similar or matching characteristics that is effectively translated into positive implications on firm outcome? Empirical evidence based on statistical analysis of 57 questionnaires collected in

previous research developed by Bisbe and Otley (2004) suggests that (1) the choice of individual MACS selected for interactive use is associated with a firm's innovation management mode, and (2) the level of product innovation output is influenced by whether or not innovation management mode and interactive MACS feature similar cognitive models and whether the sophistication of the information contents provided by the interactive MACS responds to the priority needs perceived in the IMM. This study contributes to the contingency theory and more specifically to the emerging literature on the levers of control framework by focusing on factors that explain to a certain extant the basis for and implications of the choice of individual MACS selected for interactive use. In this regard, this research contributes to management accounting literature in at least three respects. Firstly, and in contrast to most previous studies on ICS, the object of analysis of this paper explicitly covers several distinct individual MACS (i.e. budgets, balanced scorecard, and project management), which are candidates for interactive use, thus obtaining insights into their idiosyncrasies and their suitability for interactive use in specific settings. Secondly, this study extend Simons' (1991) postulate affirming that the choice of the interactive MACS is associated with attributes of the competitive setting, to internal attributes such as IMM. Thirdly, this study introduces a new angle in the discussion about the effects of ICS on innovation. Previous literature has investigated these effects disregarding the pertinence of the choice of the individual MACS selected for interactive use (e.g. Bisbe and Otley, 2004; Bonner et al., 2002; Henri, 2006; Widener, 2007).

1.3.2. Paper 2 (Chapter 3)

Chapter 3 brings the second empirical paper of this thesis. Similarly to chapter 2, it examines the relationship between MACS and innovation. However the emphasis on this paper is not on particular formal style-of-use of MACS but on the effects of formal and informal MACS within a control package to enable and support innovation capabilities. In an attempt to contribute to the limited literature that examined the effects of control systems into the innovation process, the first aim of this research is to better understand the mechanisms through which MACS influence innovation. Accordingly, this research concentrates on the effects of MACS to innovation capabilities by examining the innovation in terms of organisational creativity and the ability of an organisation to translate an idea into a final product (conversion ability constituents). Drawing from levers of control (LOC) framework (Simons, 1995, 2000) and considering informal controls (Malmi and Brown, 2008; Merchant

and Van der Stede, 2007), a MACS package that accounts for formal and informal control systems (i.e. interactive, diagnostic and cultural control systems) is used to assess their contributions to the innovation capability (i.e. organisational creativity, coordination capability, knowledge integration and filtering practices). By examining this MACS package the paper attempts to reply to two calls in recent management accounting literature. On one hand, this research includes less formalised controls such as cultural controls into a framework (i.e. LOC) that traditionally only accounted for formal control systems (Berry et al., 2009; Collier, 2005). On the other hand, this study examines the relationship between informal and formal control systems to make sense of MACS choice in the innovation setting (Bisbe and Malagueño, 2009). Thus, we investigate whether informal and formal control systems are substitutes or complements within the control package (Davila et al., 2009; Fisher, 1998; Malmi and Brown, 2008). Further, as contingency perspective has constantly highlight the importance of strategy as a major contingency in organisational studies, and as previous studies in management accounting have suggested the relationship between strategy and the use of measures on the innovation process (Bisbe and Otley, 2004; Davila et al., 2004) this research investigates to what extent strategic patterns moderate the effects of MACS on the innovation process. Results of structural model regressions from 120 questionnaires collected through survey developed for this research provide evidence to the positive association between MACS and elements of the innovation process moderated by strategic pattern. More specifically, results suggest different effects and interchangeable contribution interactive, diagnostic and cultural control systems play in the innovation setting. Findings indicate top managers rely on different forms and uses of control systems to foster the development of constituents of the innovation process. Therefore, organisations that pursue a conservative strategic pattern, in which cultural controls are design to keep efficiency rather than stimulate innovation, the use of interactive control systems (ICS) is associated to the development of organisational creativity, coordination and knowledge integration. On the other hand, organisations that pursue an entrepreneurial strategic pattern rely to a greater extent on cultural forms of control to encourage innovation and opportunity seeking, whereas rely on interactive control systems to develop innovation filtering practices. To a certain extent this findings challenge the dilemma MACS as complements versus MACS as supplements (Fisher, 1998). According to such dilemma within a control package MACS could be used as complements in which various systems are adopted as bundles versus supplements in which MACS are chosen as alternative ways to achieve the same objective. Hence, in the context of which a system is chosen to explore, enable and support

specific element of the innovation process we find MACS as substitutes, however in the context of the whole innovation process we find systems acting as complements.

1.3.3. Paper 3 (Chapter 4)

The third paper in this thesis aims to review how the construct performance has been assessed in prior contingency-grounded, survey-based management accounting research. The importance of performance for management research has long been recognised. High or improved performance is considered the ultimate goal of the specific configurations of activities and resources that companies deploy in order to develop their competitive advantages (Collis and Montgomery, 2005). Consequently, performance as an outcome variable has been extensively used, to the extent that performance is one of the most studied variables in organisational and management literatures (Venkatraman and Ramanujam, 1987; Bommer et al., 1995). Within the specific area of contingency-based management accounting research, a number of studies disclosed interest for investigating the relationship between MACS and performance (Hayes, 1977; Khandwalla, 1977). The interest in the construct performance in MACS literature increased even further after researchers appended to the earlier contingency studies the notion of "fit" between attributes of MACS and outcomes and claimed that outcome variables related to dimensions of desired organisational or managerial performance should be included in contingency-based studies (Merchant and Simons, 1986; Otley, 1980; Otley and Wilkinson, 1988).

Even though in recent years noteworthy progress has been made by management accounting researchers to ensure proper construct conceptualisation, measurement and a greater correspondence between concepts and measures (Bisbe et al., 2007; Chenhall and Moers, 2007; Gerdin and Greve, 2008; Luft and Shields, 2003), some concerns are particularly striking when performance is the construct of interest (Lebas and Euske, 2008). March and Sutton (1997) for instance, show scepticism regarding the use of such variable due to the conflicting basis surrounding the use of performance as a dependent variables, the unstable advantages of higher performance, and the endogeneity problems associated with the choice for the variable performance as a criterion variable.

Notwithstanding the criticisms, performance continues to be constantly assessed in management research and therefore it warrant appraisal and discussion. This paper aims to review how performance has been assessed in prior contingency-based empirical quantitative

management accounting research. In order to organise this analysis we present the discussion on subjects related to conceptualisation, measurement and correspondence between concepts and measures. The contribution of this study is threefold. First, it provides an exhaustive review of the different approaches to measurement of performance that have been used in extant survey-based MACS research grounded on contingency theory. Using an adaptation of Venkatraman and Ramanujam's (1986, 1987) classification scheme, an organised inventory of papers is proposed in order to identify and assess the relative frequency of use of the different measurement approaches used in previous MACS literature. As a result of this organised inventory, the paper provides specific supporting evidence that self-reported perceptual measures are clearly the predominant approach being used for assessing performance in extant management accounting research.

Consequently, and as a second contribution of the paper, it discusses some of the most relevant problems associated with such a predominant method of performance assessment. This article organises these problems into, on the one hand, conceptualisation problems (reflected as potential risks of misspecification) and, on the other hand, problems of operationalisation (caused by different sources of potential bias). This paper evaluates several alternatives concluding that none of them is free of concern. As a third contribution of the paper, it provides insights that are expected to assist researchers in enhancing conceptualisation and measurement of subsequent quantitative research using the variable performance.

1.3.4. Paper 4 (Chapter 5)

Finally, the fourth paper of this thesis examines the extent to which the usage of particular MACS - Strategic Performance Measurement Systems (SPMS) - influences organisational performance through the shaping of the strategic agendas and the strategic decision arrays that result from strategy (re)formulation processes. In this research it is argued that organisations that use SPMS achieve enhanced performance (in comparison with those firms that use other MACS not qualified as SPMS) and that this enhancement is associated not only with a better implementation of intended strategies as it has been assumed in previous empirical research (Kaplan and Norton, 2004), but also with the comprehensiveness of the strategic agendas and strategic decision arrays obtained in the processes of (re)formulation of intended strategies. Second, this research examines how environmental dynamism moderates the relationship between SPMS and the desirable organisational performance. Results from

tests of a structural model using Partial Least Squares (PLS) regressions on archival and data collected in a previous survey by Gimbert et al. (2010) from Chief Executive Officers of 279 medium and large Spanish companies provide support in favour of hypotheses suggesting that a) the positive effect of the use of SPMS on organisational performance is mediated by the comprehensiveness of the strategic decision array (i.e. variety and number of decisions) that result from strategy (re)formulation processes; and that (b) the greater the environmental dynamism, the more positive the effect of the comprehensiveness of the strategic decision array on organisational performance. Notwithstanding the research limitations, this study contributes to previous strategy and management accounting literature in at least two ways. First, this paper demonstrates that, despite being primarily conceived to facilitate strategy implementation, the use of SPMS has a positive effect on organisational performance which is mediated by aspects related to strategy (re)formulation. SPMS contribute to enhance performance not only through better execution of intended strategies, but also through the development of more comprehensive strategic agendas and more comprehensive strategic decision arrays arising from conscious processes of (re)formulation of intended strategy. Second, the paper examines the effects of environmental dynamism on the relationships between the nature of strategic agendas and intentional strategy (re)formulation processes on the one hand and organisational performance on the other hand, concluding that the effectiveness of SPMS is more pronounced under dynamic environments.

1.3.5. Overall view of research questions, results and contributions

Figures 1.2, 1.3, and 1.4 depict an overall view of research questions, results, and contributions respectively.

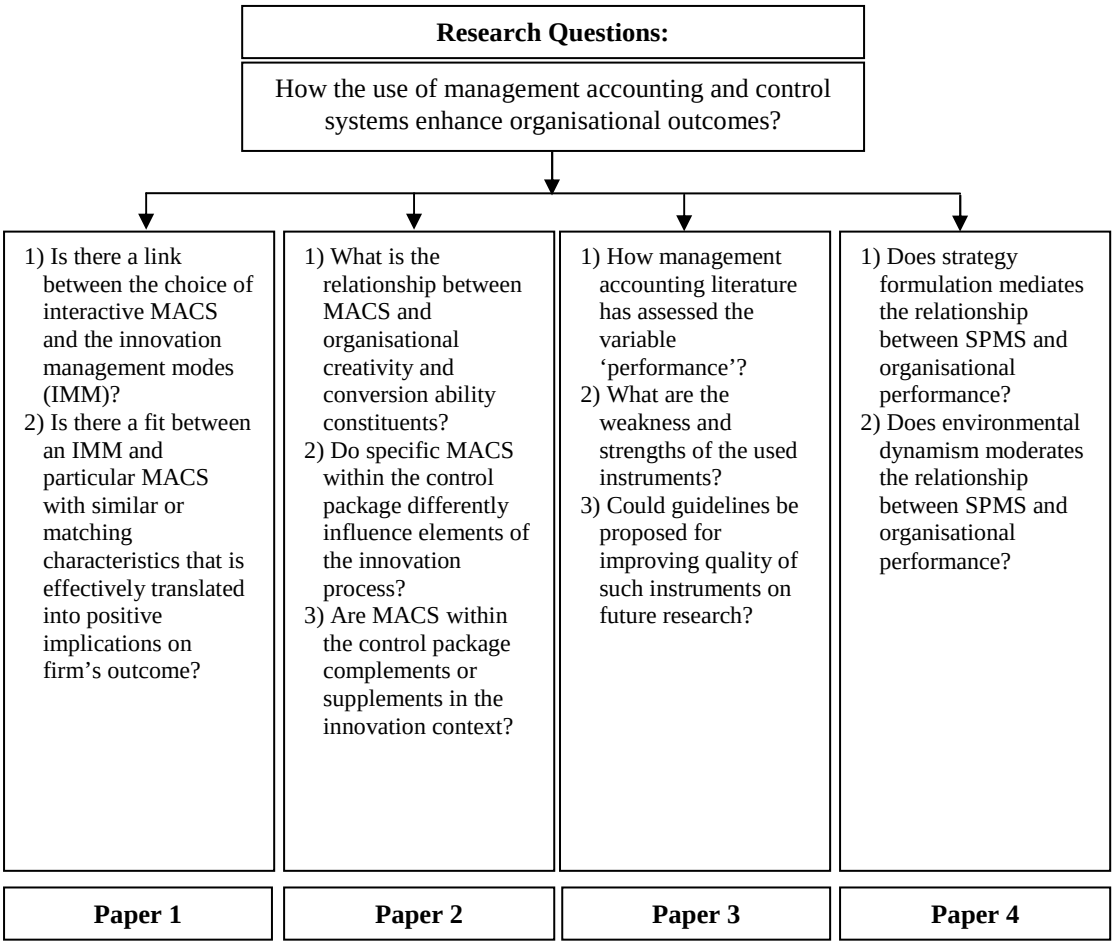

Figure 1.2: Overview research questions

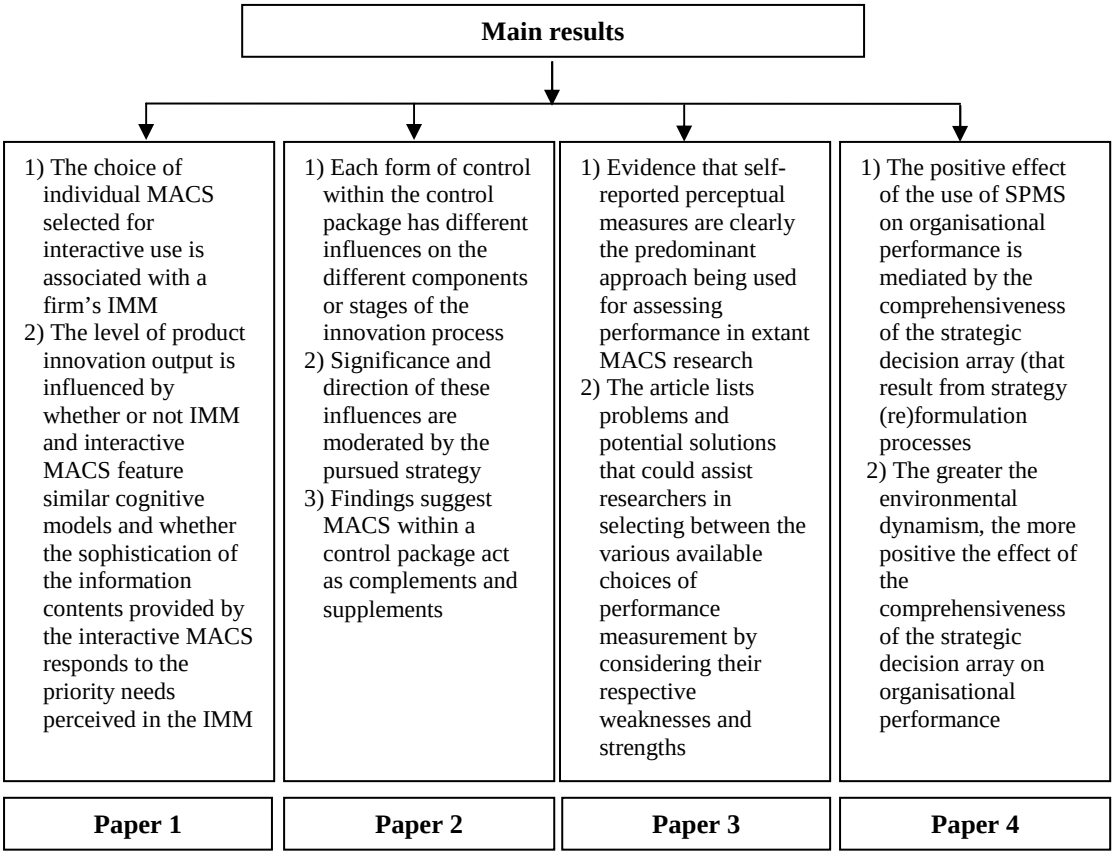

Figure 1.3: Overview of results

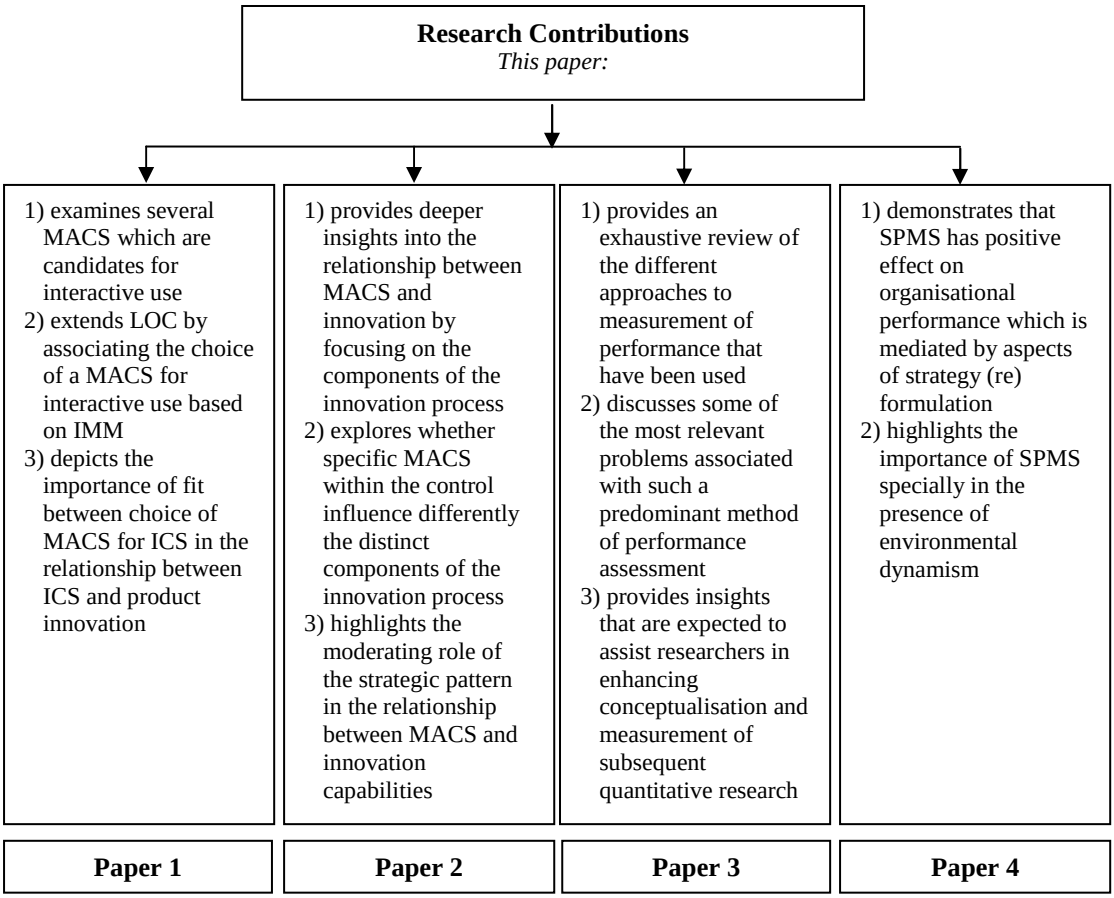

Figure 1.4: Overview of contributions

1.4. Notes

[1] Although contingency perspectives could influence both individual and organisational levels, in this research our main interest is on the organisational consequences of contextual variables.

Chapter 2: The Choice of Interactive Control Systems under Different Innovation Management Modes

2.1 Introduction to chapter 2

The second chapter of this thesis addresses the relationships between innovation and management accounting and control systems (MACS) by emphasising notions of "fit" between MACS and innovation management modes. This study particularly, examines the importance of the choice by which individual MACS are selected for interactive use, and its possible effects to product innovation. This paper was written by Ricardo Malagueño and Dr. Prof. Josep Bisbe from ESADE - Universitat Ramon Llull. This paper has been published in the *European Accounting Review*, DOI: 10.1080/09638180902863803. Publication date: May 2009.

2.2. Abstract

This paper contributes to the recent levers of control (LOC) literature on the relationships between innovation and management accounting and control systems (MACS) by emphasising the importance of the choice by which individual MACS are selected for interactive use. Using survey data collected from 57 medium-sized Spanish firms, we find evidence supporting (1) the choice of individual MACS selected for interactive use is associated with a firm's innovation management mode (IMM), and (2) the level of product innovation output is influenced by whether or not IMM and interactive MACS feature similar cognitive models and whether the sophistication of the information contents provided by the interactive MACS responds to the priority needs perceived in the IMM. Our findings further indicate that similarity in patterns between IMM and MACS does not lead to a beneficial impact on the level of innovation outputs, suggesting instead that it may induce the replication of existing dysfunctional trends caused by innovation momentum.

2.3. Introduction

The relationships between formal management accounting and control systems (MACS)[1] and innovation have been the object of increasing interest in a recent stream of literature. In contrast to traditional views, a growing number of studies have concluded that formal MACS may effectively contribute to the innovation effort provided that certain conditions are met (e.g.; Bonner, 2005; Cardinal, 2001; Chapman, 1998; Davila, 2000, 2005; Davila et al., 2005; Ditillo, 2004; Granlund and Taipaleenmaki, 2005; Langfield-Smith, 2007; Simons, 1995). Several of these studies have highlighted the relevance of the attributes of the use of MACS in supporting creative innovation (Ahrens and Chapman, 2004; Chapman, 1998; Simons, 1995). This line of research argues that, under some styles of use, formal MACS may be dynamic, flexible and adaptive to changing environments, whilst at the same time being stable enough to frame cognitive models and communication patterns (Davila, 2005). One of the frameworks that has incorporated differences in styles of use of MACS is Simons' levers of control framework (LOC) (Simons, 1995, 2000). LOC theory states that the joint use and integration of four levers of control (namely belief systems, boundary systems, diagnostic systems and interactive systems) create a dynamic tension between different styles of use of formal MACS within the overall control package, thereby allowing firms to encourage innovation while concurrently pursuing pre-established goals.

Drawing on the LOC framework, a stream of empirical research has investigated the joint use and integration between levers from different angles such as the implications of some levers on the features of others (Chenhall et al., 2008; Tuomela, 2005), the effects of the interplay between levers on outcomes (Henri, 2006) or the multiple inter-dependencies among the levers of control and their implications for outcomes (Widener, 2007). Complementary to the insights on the integration between levers, another emerging stream of studies has focused on providing an in-depth understanding of the features and separate effects of the various individual levers. Within this latter stream, recent empirical research on innovation and strategic change has paid special attention to the lever of interactive control systems (ICS) (e.g. Abernethy and Brownell, 1999; Bonner et al., 2002; Bisbe and Otley, 2004; Henri, 2006; Naranjo-Gil and Hartmann, 2007; Heidmann, 2008). This interest in ICS is not surprising, given their relative conceptual novelty and their expected role in encouraging innovative behaviour (Simons, 1995, 2000). However, and despite this interest, little emphasis has yet been placed on the organisational factors that influence the choice of which

are the individual MACS selected by firms for interactive use (hereafter used interchangeably with ICS) or on the implications of that choice.

Building on Simons (1991), we argue in this paper that the choice of ICS, largely ignored in prior LOC literature, is relevant and deserves further attention. According to LOC theory, a given firm purposefully chooses a very limited number of individual MACS for interactive use (Simons, 1991, 2000). Connecting arguments derived from cognitive theories (Bergman et al., 2007; Birnberg et al., 2007; Howells, 1995; Smith et al., 2005) with arguments related to the ability of MACS to mitigate the dysfunctional excesses of strategic momentum (Amburgey and Miner, 1992; Jansen, 2004; Miller and Friesen, 1982), we consider it plausible that not all choices of ICS are equally pertinent, which will have consequences for organisational outcomes such as innovation. Consequently, we claim that a better understanding of the systematic factors associated with these choices as well as of the implications of these choices is of relevance to both researchers and managers. Hence, the purpose of this paper is twofold. First, it aims to examine whether systematic organisational factors cause top managers to make different choices as to which individual MACS are selected for interactive use. More specifically, we explore the links between the configurations of the organisational and managerial processes by which innovation arises (i.e. the innovation management modes, IMM) (Park and Kim, 2005; Roussel et al., 1991) and the choice of ICS. We express these links in terms of expected patterns of fit between individual MACS selected for interactive use and specific IMM. Secondly, this paper aims to investigate whether this expected fit is effectively translated into beneficial implications on product innovation outputs.

This study contributes to the emerging literature on the LOC framework by focusing not on the effects (separately or in interplay with other levers) of any individual MACS (whichever this may be) being used interactively, but on issues related to the choice as to which individual MACS is the one to be used interactively. In this regard, more precisely, we aim to contribute in at least three respects. Firstly, and in contrast to most previous studies on ICS, the object of analysis of this paper explicitly covers several distinct individual MACS, which are candidates for interactive use, thus obtaining insights into their idiosyncrasies and their suitability for interactive use in specific settings. Secondly, we extend Simons' (1991) postulate affirming that the choice of the interactive MACS is associated with attributes of the competitive setting, to internal attributes such as IMM. Results obtained from survey

responses from 57 medium-sized firms provide evidence supporting that the choice of ICS is associated with the IMM followed by firms. Thirdly, this study introduces a new angle in the discussion about the effects of ICS on innovation. Previous literature has investigated these effects disregarding the pertinence of the choice of the individual MACS selected for interactive use (e.g. Bonner et al., 2002; Bisbe and Otley, 2004; Henri, 2006; Widener, 2007). In this paper, we address the implications of this choice on product innovation outputs. Our empirical results support the fact that the fit in terms of similar characteristics between the individual MACS selected for interactive use and the firm's IMM influences the level of product innovation outputs. However, our findings suggest that similar patterns between ICS and IMM are not necessarily conducive to beneficial implications (Bisbe and Otley, 2004; Miller and Friesen, 1982) but they may instead induce a replication of and conformity to existing dysfunctional trends. On this basis, we introduce the distinction between supplementary and complementary fit (Cable and Edwards, 2004) which we believe may be useful for future MACS research.

The remainder of the paper is organised as follows. Section 2 outlines the conceptual underpinnings of this study, introducing ICS within the LOC framework, the choice of individual MACS as ICS and the configurations of IMM. Section 3 presents a series of testable propositions derived from this conceptual background. Section 4 describes the research design, including data collection procedures and operationalisation of measurement instruments. The results of the study are presented in Section 5. We conclude in Section 6 with a discussion of the implications of the study, evaluating its limitations and summarising its findings.

2.4 Conceptual Background

2.4.1. The Choice of Interactive Control Systems

Interactive control systems (ICS) are formal information systems used by managers to get regularly and personally involved in the decision activities of subordinates, to discuss strategic uncertainties and to foster dialogue and debate. They expand and orient opportunity-seeking and provide input to the formation of emergent strategies. Thus, and in interplay with the other levers of control, ICS eventually contribute to fostering the development of innovation initiatives that are successfully transformed into enhanced performance (Simons, 1995, 2000). Several empirical studies have investigated the (direct) relationships between

ICS and an array of organisational variables related to innovation, including attributes of new product development projects (NPD), strategic capabilities such as organisational learning and innovativeness (i.e. the attitudinal openness of the organisation to new ideas, products and processes), as well as product innovation outputs. Hence, and in contrast to the LOC framework's theoretical claim, the empirical findings of Bonner et al. (2002) suggest that the use of ICS during NPD may in fact impose constraints on creativity and impede progress towards successful innovation outputs. However, other research has found evidence in favour of a positive direct effect of ICS on organisational learning and innovativeness (e.g. Henri, 2006) and on strategic change (e.g. Abernethy and Brownell, 1999; Naranjo-Gil and Hartmann, 2007). In her study on the interplay between levers of control and learning, Widener (2007) did not find a direct link between ICS and learning, but rather an indirect influence primarily channelled through diagnostic systems. Some studies have claimed that the relationship between control systems and innovation output may not be uniformly linear across the spectrum of innovation but may depend instead on the firm's level of innovation (Bisbe and Otley, 2004). Overall, even though prior LOC literature supports the postulate that ICS play a significant role in shaping innovation, there is still a lack of consensus about the specific nature of this relationship.[2]

One plausible explanation for this lack of consensus is the limited attention in prior research to aspects related to the choice of the individual formal MACS to be selected for interactive use. However, this limited attention is unwarranted since the choice of ICS is a crucial aspect of the LOC framework. LOC theory suggests it is most likely that, in a given firm, some of the individual formal MACS are used diagnostically while others are used interactively. Attempting to use all or many of the individual MACS interactively for extended periods of time would risk creating a situation of information overload, superficial analysis, a lack of perspective and potential paralysis (Simons, 1991, p. 59). Therefore, except in situations where a clear strategic vision is lacking and during short periods of crisis, top managers introduce interactivity into the control package by deliberately choosing a very limited number of individual MACS to be used interactively (most often, only one) (Simons, 2000, p. 223).[3]

Any individual formal MACS is a potential candidate for interactive use (Simons, 2000, p. 219). However, the choice of which individual MACS is selected for interactive use is neither universal nor inconsequential: any individual MACS used as an ICS focuses organisational

attention and sets organisational agendas, but each individual MACS has idiosyncratic informational effects. These informational effects are twofold (Birnberg et al., 2007). On the one hand, individual MACS provide information contents with different levels of sophistication (Tillema, 2005) in terms of attributes such as scope, aggregation and integration (Bouwens and Abernethy, 2000; Chenhall and Morris, 1986).[4] On the other hand, there are differences in the way each individual MACS influences how boundedly rational managers use heuristics to search for and process this information and how managers form and use cognitive models or mental representations of their organisations and environment (Birnberg et al., 2007; Markman and Gentner, 2001).

In this study, we focus on three individual MACS which, according to the literature, are widely used in practice (Chenhall and Langfield-Smith, 1998; Rigby, 2001; Gehrke and Horvath, 2002; Speckbacher et al., 2003; Neely et al., 2007) and are candidates for interactive-use (i) budget systems (Abernethy and Brownell, 1999; Covaleski et al., 2003); (ii) performance measurement systems (Garengo et al., 2005), such as the balanced scorecard (Kaplan and Norton, 1996, 2000; Tuomela, 2005) or the tableaux-de-bord (Bourguignon et al., 2004; Epstein and Manzoni, 1997) (hereafter BSC);[5] and (iii) project management systems (hereafter, PMS) (Davila, 2000; PMI, 2004). These three individual MACS cover different combinations of attributes of information contents sophistication (Chong and Eggleton, 2003; PMI, 2004; Subramaniam and Mia, 2003; Van der Veeken and Wouters, 2002). Moreover, the differences in the way these three individual MACS frame information induce different managers' heuristics and cognitive representations (Birnberg et al., 2007).

Top managers appear to make different choices as to which individual MACS to use interactively and which diagnostically. This choice is not random but subject to some systematic factors (Simons, 2000). Simons (1991), for example, found evidence supporting the fact that the choice is influenced by characteristics of the strategic setting (such as technological dependence, regulation, complexity of value chain and ease of tactical response). Despite this claim, LOC literature addressing the systematic factors that influence the choice of the control system to be used interactively is still very sparse and has been limited to the characteristics of competitive markets, ignoring the potential role of internal organisational configurations in this respect.

2.4.2. Typologies of R&D and Innovation Management

Organisational and managerial processes of R&D and innovation tend to operate in configurations of interconnected operating principles, routines and practices that commonly occur together (Fiss, 2007; Meyer et al., 1993).[6] Roussel et al.'s (1991) offers a well-established typology of configurations for the organisational and managerial processes through which R&D is developed (Lichtenhaler, 2003; Paraponaris, 2003; Park and Kim, 2005). It defines three configurations of R&D management (namely an intuitive, a systematic and a strategic R&D mode) based on a number of salient characteristics related to management context and operating principles, routines and practices (e.g. funding, resource allocation, targeting, priority setting, measurement of results, evaluation of progress). Details of the key characteristics of each of these three R&D modes can be found in Appendix 1.

Typologies of R&D management configurations can be extended and are useful for identifying IMM configurations of innovation management (Nieto, 2002; Park and Kim, 2005).[7] Drawing an analogy with Roussel et al.'s R&D management modes, innovation management modes (IMM) are archetypes or commonly occurring configurations of organisational and managerial processes by which innovation arises and is managed. Hence, three IMM can be identified. In brief, an intuitive IMM conceives simple and isolated forms of innovation initiatives in a context where a strategic framework for innovation management is lacking. In the systematic IMM, decisions regarding innovation initiatives are mostly taken on a project-by-project basis, while interrelationships among projects and the implications at the firm level are not addressed. In the strategic IMM mode, firms emphasise the interrelationships among innovation initiatives and seek to create a strategically balanced portfolio of innovation initiatives formulated through the integration of technology and business perspectives (Park and Kim, 2005; Roussel et al., 1991).[8]

Given the purpose of this study, we have extended Roussel et al.'s framework to incorporate the implications of top managers' expertise into the definition of IMM. More specifically, external-oriented expertise (i.e. the expert knowledge, skills or experience of individual top managers in subjects related to product/ market issues) (Hoffman and Hegarty, 1993) has been suggested as one of the relevant characteristics of individual top managers in explaining their influence on innovation (Barker and Mueller, 2002; Daellenbach et al., 1999; Hsu et al., 2008). External-oriented expertise influences a manager's stock of knowledge and information processing capacity (Bergman et al., 2007; Smith et al., 2005). This stock and

capacity make a particular difference to routines and patterns of practice in the strategic IMM, where complexity is higher because attention is focused on the creation of a balanced innovation portfolio throughout the firm. Consequently, we have considered it theoretically justified to break the strategic IMM down into a strategic/non-expert IMM and a strategic/expert IMM. Under the latter, external-oriented expertise makes it possible for senior managers to get effectively involved in the allocation of resources to specific projects (in contrast to the former, where senior managers who lack an in-depth understanding of technology and markets are involved only in the overall assignation of resources to units). Furthermore, in strategic/expert IMM, senior managers are able to properly recognise, interpret and discriminate spontaneous bottom-up initiatives, which are welcome and encouraged (Goold and Campbell, 1987; Kanter, 2001; Leonard-Barton, 1995). In contrast, in strategic/non-expert IMM, innovation initiatives have to be channelled through previously established frameworks, with spontaneous personal initiatives outside this framework being considered disruptive and potentially subject to opportunistic behaviour (Hoffman and Hegarty, 1993).

In establishing their own operating principles, routines and practices, IMMs differ from each other in three interrelated aspects. Firstly, each IMM describes a different pattern of how heuristic processes are carried out and is associated to a specific cognitive model of innovation (Howells, 1995) by which reality concerning innovation issues is represented and made sense of, similarities between problems or opportunities are recognised, and alternative solutions or initiatives are brought about and considered (Bergman et al., 2007; Markman and Gentner, 2001; Nightingale, 1998; Teece and Pisano, 1994). Secondly, different IMMs emphasise different perceptions of the priority needs regarding information contents (Park and Kim, 2005). Finally, by proposing distinct linkages and information flows across organisational boundaries, each IMM frames the design and patterns of use of communication networks differently (Roussel et al., 1991).

2.5. Theoretical Development and Formulation of Hypotheses

2.5.1. Hypotheses H1a–H1d

Both IMM and ICS frame how boundedly rational managers use heuristics to search for and process information and how they represent their organisations and environments in cognitive models (Birnberg et al., 2007; Howells, 1995; Markman and Gentner, 2001). Moreover, IMM influence the areas upon which senior managers are interested in focusing organisational attention on, creating perceptions of priority needs as regards information contents (Roussel et al., 1991). ICS, in turn, are instrumental in focusing organisational attention in order to encourage innovative behaviours (Simons, 1995) and in acquiring, interpreting and diffusing information related to issues perceived to be a priority by top managers (Chenhall, 2005). Thus, IMM and the interactive use of MACS appear to be highly interrelated.

An individual MACS should be more likely to be selected as the ICS under a given IMM if the heuristics and cognitive models framed by the MACS are compatible with and similar to the ones framed by the IMM (Bergman et al., 2007; Birnberg et al., 2007). Furthermore, because of its idiosyncratic sophistication (Tillema, 2005), each individual MACS is differently equipped to serve the diverse perceived priority information needs that arise in each IMM. Consequently, an individual MACS should be more likely to be selected as the ICS under a given IMM if it is the best equipped to effectively provide the information perceived as a priority under that IMM. The choice should reinforce that ICS and IMM are mutually supportive and supplement each other. Overall, we expect IMM to be relevant in conditioning the choice of which individual MACS are selected to introduce interactivity into the organisational control package. We next translate this generic line of argument into a set of testable hypotheses H1a–H1d which posit associations between specific IMM and the interactive use of individual MACS.

Under an intuitive IMM, there is no long-term innovation strategy framework and innovation activities are framed as overhead costs that are controlled at aggregate levels. Senior managers decide on the aggregate funding devoted to innovation but participate little in defining programmes or projects. In this IMM, top managers use heuristics and cognitive models that screen out information referring to the project level. They concentrate the

information search and the representation of reality regarding innovation issues in a highly summarised overview of broad innovation features and in an outline of their effects on aggregate levels of expenditure and profitability. As far as the priority information needs are concerned, senior managers are likely to be interested in highly aggregated and highly integrated information rather than in data at lower-level units of analysis (e.g. lower level responsibility centres, specific projects) (Roussel et al., 1991) (see Table 2.1).

Table 2.1. Innovation Management Modes and attributes of sophistication (information contents) of individual MACS

Innovation Management Modes (IMM)	**Attributes of sophistication (information content)**			**Individual MACS selected for interactive use**
	Scope	**Aggregation**	**Integration**	
Intuitive	Broad	Aggregated	High	Balanced Scorecards
Systematic	Medium	Disaggregated	Low	Project Management Systems
Strategic/Non.expert	Narrow	Disaggregated and Aggregated	High	Budget Systems
Strategic/Expert	Narrow or Broad	Disaggregated and Aggregated	High	Budget Systems or Balanced Scorecards

In this context, senior managers are likely to be interested in interactively using MACS that influence heuristics, represent reality and provide a structure for information storage and retrieval (Kadous and Sedor, 2004) in a way that provides elements for understanding, reasoning and predicting the broad scope implications of innovation at consolidated levels, disregarding details at lower levels. Budgets are unlikely to be used interactively under an intuitive IMM since their communication patterns under this mode are characterised by a mere top-down cascade in which each level defines how it will spend its part, with little upward visibility and little attention from senior management (Roussel et al., 1991, p. 29). In contrast, BSC may be expected to be a channel for both top-down and bottom-up communication on selected key variables representing holistic cognitive models. BSC feature broad scope and high levels of aggregation and portray integration by highlighting interdependencies between dimensions of the firm (Chenhall, 2005; Chong and Eggleton,

2003; Kaplan and Norton, 1996). Consequently, it is plausible that firms following an intuitive IMM are associated to an interactive use of BSC (see Note 5). This is formalised as:

H1a: *Firms following an intuitive innovation management mode are more likely to use interactively balanced scorecards than other individual management control systems.*

In the systematic IMM, long- and short-term range plans and management instruments in general recognise projects as discrete and distinct activities of interest to senior managers. Heuristics, cognitive models and decisions are framed on a project-by-project basis and specific targets are set for each individual project, while the interrelationships among projects within and across businesses are omitted. The information about innovation that senior managers perceive as deserving priority attention refers primarily to facets of the individual project level, and communication patterns are designed to ensure flows from each project to the top and back but not across projects (Park and Kim, 2005; Roussel et al., 1991). Since PMS represent the organisational reality through a cognitive model that provides a structure for information storage and retrieval (Kadous and Sedor, 2004) at the project level, the heuristics and cognitive models framed by PMS may be expected to be particularly consistent with the heuristics and cognitive models framed by firms under a systematic IMM. In terms of information contents, PMS are MACS featuring medium scope (i.e. some selected financial and non-financial internal metrics), low levels of aggregation (i.e. information at the individual project level), and low levels of integration (i.e. little information on how the decisions made in one project influence other projects) (Van der Veeken and Wouters, 2002; PMI, 2004), which responds well to the information needs perceived as a priority under the systematic IMM (see Table 2.1). We posit that:

H1b: *Firms following a systematic innovation management mode are more likely to use interactively project management systems than other individual management control systems.*

Firms following a strategic/non-expert IMM seek to create a balanced portfolio of innovation initiatives. Within the constraints derived from the senior managers' lack of external-oriented expertise (Hoffmann and Hegarty, 1993; Smith et al., 2005), the strategic importance of individual projects and priorities are established on a firm-wide basis; and quite specific and precise goals are set and monitored for initiatives that fit into these priorities (Roussel et al., 1991).

Under a strategic/non-expert IMM, firms tend to use corporate-wide heuristics and frame reality in holistic cognitive models that integrate local, lower-level projects (Howells, 1995). In terms of perceptions of priority needs regarding information contents, senior managers operating in a strategic/non-expert IMM are most likely to focus attention on information that does not require highly technical or external-oriented expertise in order to be interpreted. Moreover, communication networks are designed to facilitate flows across organisational boundaries.

In such a context, senior managers are likely to select for interactive use an individual MACS that influences heuristics, represents reality and provides a structure for information storage and retrieval in a way that assists in understanding, reasoning and predicting interrelationships and trade-offs across the organisation.

Furthermore, senior managers are likely to be interested in using interactively MACS that present a narrow scope, focusing primarily on internal financial data, and provide both disaggregated (at the project level) and aggregated (at the SBU or corporate level) information (see Table 2.1). Non-financial metrics provided by broader scope MACS may have little significance or be incomprehensible to senior managers with little understanding of technology and asset deployment, given their lack of external-oriented expertise (Hoffmann and Hegarty, 1993). In contrast, financial data may play an important role in scanning for managers who lack external-oriented expertise, since such information is used to aggregate heterogeneous information about a set of diverse factors into a common dimension, which is expressed in interpretable homogeneous terms (Galbraith, 1973; Van der Veeken and Wouters, 2002). Since budget systems force information sharing and help achieve coordination across the organisation (Merchant and Van der Stede, 2007), are narrow in scope (centred on financial metrics) and provide both disaggregated and aggregated information (from lower-level responsibility centres or projects up to the whole organisation) (Subramaniam and Mia, 2003), we expect that:

H1c: *Firms following a strategic/non-expert innovation management mode are more likely to use interactively budget systems than other individual management control systems.*

While both the strategic/non-expert and the strategic/expert IMM share corporate-wide heuristics and holistic portfolio-based cognitive models, the latter is further defined by senior managers' high external-oriented expertise. Under a strategic/expert IMM, senior managers are conversant with technological, market and general business aspects and therefore do not rule multi-faceted types of information out as relevant (Howells, 1995; Humphreys and Cheng, 2008). Consequently, heuristics and cognitive models under a strategic/expert IMM may incorporate financial and non-financial dimensions, and the perceived priority needs regarding information contents may include both financial and non-financial items. Because of their corporate-wide holistic approach, senior managers of firms under a strategic/expert IMM are likely to be more interested in interactively using MACS that present high levels of integration and aggregation. Since PMS are considered to provide low integration and low aggregation (PMI, 2004; Van der Veeken and Wouters, 2002), we do not expect PMS to be used interactively in firms following a strategic/expert IMM. In contrast, both budget systems and BSC provide a scope that should be interpretable by managers under a strategic/expert IMM, and both present high integration and allow for high aggregation. We therefore hypothesise that:

H1d: *Firms following a strategic/expert innovation management mode are more likely to use interactively balanced scorecards or budget systems than other individual management control systems.*

2.5.2. Hypotheses H2a–H2b

Momentum is a pervasive tendency or force present in organisations by which they adhere to previous directions of evolution and persevere in pursuing courses of actions or in repeating patterns of change (Amburgey and Miner, 1992; Jansen, 2004; Kelly and Amburgey, 1991;

Miller and Friesen, 1980). Strategic momentum applied to innovation (hereafter, innovation momentum) suggests that firms with a propensity to innovate will be inclined to become even more innovative, whereas those not inclined to innovate tend to further limit the circumstances under which they engage in innovation initiatives. In the absence of mitigating influences that attenuate these inclinations, innovation momentum can lead to dysfunctional excesses: in high-innovating firms, there is a risk of reaching too high a level of innovation in the sense that innovation becomes excessive, inadequate or produces dramatically diminished returns; in low innovating firms, there is a risk of innovation sinking to a level that leads to complete strategic stagnation. The use of MACS can be instrumental in attenuating the tendency towards these dysfunctional excesses (Miller and Friesen, 1982).

In line with Miller and Friesen's seminal work, Bisbe and Otley (2004) found the influence of the interactive use of MACS on product innovation output to be dependent on the firm's level of innovation. On the one hand, they provide evidence consistent with the affirmation that, in high-innovating firms, the interactive use of MACS is associated with curbing innovation output levels. Building on the concept of control systems as mitigators of the dysfunctional excesses caused by innovation momentum, they argue that interactive controls help reduce the risk of excessive or inadequate innovation through increased initiative sharing and exposure, and through the provision of filters. On the other hand, and even though they found less conclusive evidence, Bisbe and Otley (2004) suggest that in low-innovating firms, innovation may be positively associated with an interactive use of MACS since interactive controls may contribute to overcoming organisational complacency by legitimating autonomous initiatives, introducing stimuli and providing guidance. We argue here that firms that choose to interactively use an individual MACS whose cognitive model and information contents are consistent with the cognitive model and the perceived priority information needs of the firm's IMM, will be better equipped to mitigate the dysfunctional excesses caused by innovation momentum. We next formalise this generic expectation in the form of two testable hypotheses. For that purpose, we consider that fit between IMM and ICS is present in a given situation if the association between specific IMM and ICS corresponds with one of the associations theoretically derived in H1a–H1d.

In the case of low-innovating companies, we expect that the ability of the ICS to break organisational complacency and to mitigate the tendency towards sinking innovation (Miller and Friesen, 1982) will be reinforced if a company chooses an ICS that provides heuristics

and cognitive models (Birnberg et al., 2007) that are compatible with and supplement those provided by its IMM (Howells, 1995) and if, furthermore, the sophistication of the information contents (Chenhall and Morris, 1986; Tillema, 2005) provided by the ICS corresponds to the priority information needs perceived in the IMM (Roussel et al., 1991). If there is a fit, low-innovating firms should be better equipped to effectively introduce, when needed, legitimisation of bottom-up initiatives, stimulus and guidance (Bisbe and Otley, 2004), and the effects of the interactive MACS in enhancing innovation outputs should be enlarged. Thus:

H2a: *As far as low-innovating firms are concerned, firms in which the individual MACS selected for interactive use fits with its innovation management mode will present higher levels of innovation outputs than firms in which the individual MACS selected for interactive use does not fit with its innovation management mode.*

In high-innovating companies, we expect interactive MACS to help break the propensity towards excessive or inadequate innovation induced by strategic momentum (Bisbe and Otley, 2004; Miller and Friesen, 1982). If a high-innovating company chooses an interactive MACS that provides heuristics and cognitive models (Birnberg et al., 2007) that are compatible with and supplement the ones provided by its IMM (Howell, 1995; Roussel et al., 1991) and, furthermore, the information contents provided by the MACS (Chenhall and Morris, 1986; Tillema, 2005) responds to the priority information needs perceived in the IMM (Roussel et al., 1991), we expect it will be better equipped to effectively introduce, when needed, initiative-sharing, exposure and provision of filters (Bisbe and Otley, 2004). As a result, if there is fit, the ability of the interactive MACS to help curb excessive or inadequate innovation should be accentuated and its effects in constraining innovation outputs should be reinforced. This is formalised as:

H2b: *As far as high-innovating firms are concerned, firms in which the individual MACS selected for interactive use fits with its innovation management mode will present lower levels of innovation than firms in which the individual MACS selected for interactive use does not fit with its innovation management mode.*

2.6. Research Methodology and Design

2.6.1. Sample Selection and Data Collection

Empirical data were gathered via a questionnaire sent by mail to a sample of CEOs of medium-sized, mature Spanish manufacturing firms. For the purposes of this research, medium-sized firms were defined as those with an annual turnover of between 18 and 180 million Euros and between 200 and 2000 employees. In terms of life cycle, firms founded at least ten years before the survey was administered were considered to be mature. Manufacturing firms were defined as those within CNAE's (*Clasificación Nacional de Actividades Ecónomicas*) Section D (Manufacturing Industries). For reasons of accessibility, we focused on firms headquartered in Catalonia (Spain).[9] Exploitation of the Dun & Bradstreet/ CIDEM 2000 database yielded 120 firms meeting these screening criteria.

Instruments documented in academic literature as well as theoretical input from MACS and innovation research were used as the basis for an initial survey draft. The scale items included in the draft were circulated among six scholars with substantive or psychometric expertise and were pre-tested with three CEOs from medium-sized companies. Once revised on the basis of this feedback, questionnaires were distributed and returned by mail in keeping with the suggestions made by Dillman (2000). Out of the 120 distributed questionnaires, 57 were returned and complete.[10] The process yielded a 47.5% response rate, which compares well with the response rate of similar studies (Van der Stede et al., 2007). Two-sample t-tests on means of all measured items for early and late respondents and the visual inspection of parallel box-plots supported the absence of any obvious non-response bias. Support in favour of the absence of common method variance caused by single-source bias was obtained using Harman's one factor test (i.e. four factors with eigenvalues > 1).

2.6.2. Measurement of Constructs

Interactive use of MACS

In this study, we pay special attention to three individual MACS, namely budget systems, BSC and PMS. Panel A in Table 2.2 reports the presence of the individual MACS in the sampled firms. Interactive use of the three individual MACS under study was measured by a multi-scale instrument developed by Bisbe and Otley (2004). This instrument captures

properties of interactive MACS such as the pattern of attention of senior managers, the pattern of attention of middle management and the presence of face-to-face challenges and debate. Properties of interactive MACS such as focus on strategic uncertainties and inspirational involvement were omitted in this study (Bisbe et al., 2007). The questionnaire items are disclosed in Appendix 2. Factor analysis supported unidimensionality for each of the three selected MACS (Appendix 3). Three summated scales were created by adding the scores of the items related to each of the three MACS (in those cases where an individual MACS was not present, its interactive use received a zero score). The internal consistency of each of the three scales was assessed using Cronbach's α. The three α were in the 0.77–0.78 range, suggesting that the reliability of the constructs was acceptable. Panel B in Table 2.2 contains descriptive statistics of these constructs.

Table 2.2. Descriptive Statistics of Interactive Use of MACS

Panel A Are …. Present in the firm?

Number of selected MACS that are present	Budget Systems	Balanced Scorecards (BSC)	Project Management Systems (PMS)	# firms
3	Yes	Yes	Yes	30
2	Yes	Yes	No	14
2	Yes	No	Yes	6
2	No	Yes	Yes	-
1	Yes	No	No	5
1	No	Yes	No	1
1	No	No	Yes	-
0	No	No	No	1
	Total firms = 55	Total firms = 45	Total firms = 36	57

Panel B	Theoretical Range	Min	Max	Mean	Std Dev	Median	Bivariate Spearman Correlations (1)	(2)	(3)
(1) Interactive Use of Budgets (USEBUD)	0.0-21.0	0.00	19.00	12.47	4.40	13.00			
(2) Interactive Use of Balanced Scorecards (USEBSC)	0.0- 21.0	0.00	21.00	10.94	6.42	13.00	0.432**		
(3) Interactive Use of Project Mgmt.Systems (USEPMS)	0.0- 21.0	0.00	18.00	8.05	6.70	10.00	0.351**	0.382**	
(4) Innovation (INNOV)	3.0- 21.0	5.00	21.00	14.12	4.45	14.00	-0.224	0.117	-0.013

Innovation Management Modes

In order to empirically derive a taxonomy of IMM that was theoretically grounded in the typology proposed in Section 2, we selected the following attributes (i) the degree of senior

management involvement in the allocation of resources to specific projects (Park and Kim, 2005; Roussel et al., 1991); (ii) the role of recognition of the bottom-up blossoming of autonomous innovation initiatives that emerge across the organisation (Goold and Campbell, 1987; Kanter, 2001; Leonard-Barton, 1995; Roussel et al., 1991); (iii) the extent to which portfolio techniques are used (Miller and Morris, 1999; Roussel et al., 1991); (iv) the level of precision in project goal-setting and evaluation of progress (Roussel et al., 1991); (v) the extent to which technical and business perspectives are integrated (Miller and Morris, 1999; Roussel et al., 1991); and (vi) the existence of mechanisms for evaluating trade-offs among projects (Roussel et al., 1991).

Each of these six attributes was measured on a seven-point Likert scale with two opposed statements as anchors (see Appendix 2 for questionnaire items). Scores on these items were then used to classify firms into groups, using a combination of hierarchical and non-hierarchical clustering algorithms. A hierarchical procedure (using Ward's method for distance measure) was first used to establish the number of clusters and to specify initial cluster seed points. In accordance with the indications of most typologies of R&D and innovation management modes, it was established that the number of interpretable clusters to be obtained from the data should be in the range of two to five. We examined all four alternatives (i.e. the two-, three-, four- and five-cluster solutions) derived from the combination of hierarchical and non-hierarchical procedures. After evaluating the results of all alternatives resulting from hierarchical procedures, we selected the four-cluster solution since it provided results that were interpretable given the theoretical configurations and given that the analysis of the alternative clustering solutions did not raise competing interpretable results. We subsequently used a non-hierarchical procedure (k-means SPSS' QUICKCLUSTER, which uses a parallel threshold method) to produce a cluster solution for a pre-specified number of four clusters.[11] The resulting number of firms per cluster and the descriptive statistics of variables for each cluster are presented in Table 2.3.

Table 2.3. Comparison of items scores between clusters

Cluster♠	n		Allocation	Recognition	Portfolio	Precision	Tech/Buss	Trade-offs
1	7	Mean	4.43	4.14	2.71	5.71	3.29	3.57
		Std.Dev.	1.27	1.57	0.76	0.95	1.38	1.27
		Median	4.00	4.00	3.00	6.00	3.00	4.00
2	8	Mean	6.38	3.50	2.50	1.88	3.75	4.88
		Std.Dev.	0.74	0.53	1.41	0.64	1.67	1.89
		Median	6.50	3.50	2.00	2.00	4.00	5.50
3	13	Mean	2.38	3.46	4.00	3.77	5.15	5.38
		Std.Dev.	1.04	1.13	1.53	1.59	0.99	1.04
		Median	2.00	4.00	4.00	4.00	5.00	5.00
4	29	Mean	6.00	5.52	5.28	3.34	6.10	5.55
		Std.Dev.	0.85	1.24	1.13	1.72	0.72	1.18
		Median	6.00	6.00	6.00	4.00	6.00	6.00
Total	57	Mean	5.04	4.60	4.28	3.53	5.21	5.18
		Std.Dev	1.80	1.51	1.66	1.78	1.48	1.40
		Median	6.00	4.00	4.00	4.00	6.00	5.00
Kruskal-Wallis test (df=3)		Chi-square	35,808	23,704	25,667	17,354	28,980	10,483
		Sig.	.000	.000	.000	.001	.000	.015

♠ 1 = Intuitive; 2 = Systematic; 3 = Strategic/Non-Expert; 4 = Strategic/Expert

We interpreted the results of the cluster analysis on the basis of the values of the clusters' centroids, leading to the profiles summarised in Table 2.4. The resulting profiles could be meaningfully related to the theoretical framework and configurations proposed by the typology of IMM described in Section 2.4.2, and labels were assigned correspondingly.

Table 2.4. Interpretation of the clusters representing Innovation Management Modes

	Intuitive (n =7)	**Systematic (n=8)**	**Strategic / Non-expert (n=13)**	**Strategic / Expert (n=29)**
Senior management involvement in the *allocation* of resources to specific projects	Overall allocation	Allocation to specific projects	Overall Allocation	Allocation to specific projects
Role of *recognition* of bottom-up blossoming of innovation initiatives	Non-recognition of spontaneous initiatives	Previously established framework	Previously established framework	Framework + Recognition of spontaneous initiatives
Extent to which *portfolio* techniques are used	Decisions based on an individual project-basis	Decisions based on an individual project-basis	Decisions based on a project portfolio-basis	Decisions based on a project portfolio-basis
Level of *precision* in project goal-setting and evaluation of progress	Least precise	Most precise	Quite precise	Quite precise
Extent to which *technical and business* perspectives are integrated	Low integration	Low Integration	Moderate/High Integration	High integration
Existence of mechanisms to evaluate *trade-offs* among projects	Priorities within areas	Priorities within areas	Priorities across areas	Priorities across areas

Innovation

While innovative activity takes many different forms (Damanpour, 1991; Garcıa-Valderrama et al., 2003; Johanessen et al., 2001; OECD, 2005), in this paper we focus specifically on product innovation. Product innovation is understood here from an output perspective, and it is defined as the development and launch of products which are in some objective respect unique or distinctive from existing products (Higgins, 1996; OECD, 2005). The firm level is taken as the minimum level of institutional novelty to define the scope of product innovation (Bart, 1991; Kamm, 1987; Li and Atuahene-Gima, 2001; OECD, 2005; Souder, 1987).

In order to measure product innovation, we relied on the scale used by Bisbe and Otley (2004), which drew on instruments proposed by Capon et al. (1992), Scott and Tiessen (1999) and Gemser and Leenders (2001), and adapted them to reflect innovation from an output perspective. The instrument consists of three items measured through seven-point Likert scales, namely the rate of introduction of new products, the tendency of firms to pioneer, and the part of the product portfolio corresponding to recently launched products. Anchors for the three Likert scales refer to innovative/non-innovative behaviours during the last three years in relative terms, in comparison with the industry average (see Appendix 2 for questionnaire items). Factor analysis supported unidimensionality with a 75.44% of variance

explained (Appendix 3). A summated scale was created by adding the scores of the three items, and reversed so that high scores represented high levels of innovation (see Panel B in Table 2.2 for descriptive statistics). A Cronbach-α of 0.83 indicated high internal consistency of the summated scale.

2.7. Results

Table 2.5 reports the medians of the interactive use of the three different individual MACS captured in this study and of innovation within each of the four IMM. In order to test H1a through H1d, we examined whether differences among pairs of MACS within each IMM were significant. We restricted our analysis to the pairs of MACS which corresponded to the expected differences as derived from the formulation of H1a through H1d. Table 2.6 reports the results of the battery of Wilcoxon matched-pairs signed-ranks tests that were used to examine these pair-wise comparisons.[12]

Table 2.5. Medians of construct scores by Innovation Management Mode

		Innovation Management Modes			
	Full sample	**Intuitive**	**Systematic**	**Strategic/ Non-Expert**	**Strategic/ Expert**
	n = 57	n = 7	n = 8	n =13	n=29
Interactive Use of Budgets (USEBUD)	13.00	8.00	12.00	15.00	13.00
Interactive Use of Balanced Scorecards (USEBSC)	13.00	13.00	12.50	14.00	11.00
Interactive Use of Project Mgmt Systems (USEPMS)	10.00	0.00	11.50	11.00	9.00
Innovation (INNOV)	14.00	14.00	15.50	13.00	15.00

As indicated in Table 2.6, significant differences arose in the comparison between pairs of MACS in three out of four IMM. Excluding the systematic IMM (for which no significant differences were detected), significant differences were observed in five out of six compared pairs, all of which were in the direction posited by the hypotheses. At the level of the specific IMM, pair-wise comparisons among MACS within the intuitive IMM suggested that, as predicted by H1a, firms under this mode are more likely to use interactively BSC than both budget and project management systems (PMS) ($p < 0.05$). In contrast, no significant differences between pairs of interactive use of individual MACS were found in the systematic subgroup (even though results indicated that the interactive use of PMS is marginally higher in firms under a systematic mode than in other firms). In the strategic/non-expert subgroup,

as expected, firms appeared to be more likely to use, interactively, budget systems than other individual MACS. However, while the difference with PMS is significant ($p < 0.05$), the difference between budget systems and BSC is not. Regarding the strategic/expert IMM, significant differences arose between the interactive use of PMS and the interactive use of both budgets ($p < 0.01$) and BSC ($p < 0.05$), supporting the postulate that firms under this IMM are more likely to use interactively BSC or budgets than PMS. Overall, our empirical results indicated that H1a and H1d are supported, that H1c is partially supported, and that no supporting evidence was found in favour of H1b.

Table 2.6. Differences between pairs of Interactive Use of individual MACS within Innovation Management Modes

Innovation Management Mode (Hypotheses)	*Comparison between Interactive Use of particular MACS*			*Z*	*Sign.*
Intuitive *(H1a)*	Balanced Scorecards	vs.	Budget Systems	1.75	0.040*
Intuitive *(H1a)*	Balanced Scorecards	vs.	Project Management	2.03	0.021*
Systematic *(H1b)*	Project Management	vs.	Balanced Scorecards	0.17	0.433
Systematic *(H1b)*	Project Management	vs.	Budget Systems	-1.45	0.074
Strategic/non-expert *(H1c)*	Budget Systems	vs.	Balanced Scorecards	0.71	0.238
Strategic/non-expert *(H1c)*	Budget Systems	vs.	Project Management	2.10	0.018*
Strategic/expert *(H1d)*	Balanced Scorecards	vs.	Project Management	1.95	0.026*
Strategic/expert *(H1d)*	Budget Systems	vs.	Project Management	2.92	0.002**

Note: Wilcoxon matched-pairs signed-rank test for the median difference of external variables within innovation management modes.
*, ** Significant levels at 5% and 1%, respectively (one-tailed tests).

In order to test H2 and H2b, we classified firms in two subgroups, based on whether the MACS chosen for interactive use coincided with the individual MACS posited by hypotheses H1a to H1d. Firms were classified as 'fit' if the MACS with the highest interactive use score coincided with the theoretically derived fit proposed in the hypotheses. Thus, intuitive firms where USEBSC > USEBUD and USEPMS; systematic firms where USEPMS > USEBUD and USEBSC; strategic/non-expert firms where USEBUD > USEPMS and USEBSC; and strategic/expert where USEBUD or USEBSC > USEPMS were classified as cases of 'fit' (n = 30). Otherwise, firms were classified as cases of 'non-fit' (n = 27). We subsequently performed two Mann-Whitney U tests; one comparing innovation scores between 'fit' firms and 'non-fit' firms in low-innovating firms (innovation score ≤ median 14.00) (H2a), and a second replicating this analysis for high-innovating firms (innovation scores > median)

(H2b). As shown in Table 2.7 Panel A, results suggest that for both the low- and high-innovation sub-samples, there is a significant difference ($p < 0.05$) in the level of innovation between firms in which the individual MACS selected for interactive use corresponds with the conceptually-derived fit and firms in which there is no such fit. Univariate results suggest that, for low-innovating firms, innovation scores are significantly higher in non-fit firms whereas, for high-innovating firms, they are significantly higher in 'fit' firms. Multivariate results for both low- and high-innovating firms controlling for IMM, ICS and size (see Table 2.7 Panel B) were consistent with the Mann-Whitney U results. For low-innovating firms, the coefficient of the variable FIT was negative and significant at the $p < 0.05$ level. For high-innovating firms, the coefficient of the variable FIT was positive and significant ($p < 0.01$). In summary, while the evidence reported in both panels of Table 2.7 supports the existence of significant differences in the level of innovation between 'fit' and 'non-fit' firms, the detected differences appeared to be in the opposite direction of the predicted signs that were posited in H2a and H2b.

Table 2.7. Tests for differences on innovation between non-fit and fit firms

Panel A: Mann-Whitney U test for the differences on innovation between non-fit vs. fit in low- and high-innovating firms.

	Low-innovating firms		***High-innovating firms***	
	Non-fit	Fit	Non-fit	Fit
	n=16	n=15	n=11	n=15
Innovation median	11.50	9.00	18.00	19.00
Z	-1.716 *		-1.941*	

*, ** Significant levels at 5% and 1%, respectively *(one-tailed tests)*

Panel B: Multiple regression of innovation on fit including control variables.

$$Y = \alpha + \beta_1 FIT + \beta_2 ICS + \beta_k IMMdummies_k + \beta_6 SIZE + \varepsilon$$

	Low-innovating firms				***High-innovating firms***			
	Predicted Sign	Coefficient	t-Stat		Predicted sign	Coefficient	t-Stat	
Constant			3.47	**			8.31	**
FIT	+	-0.445	-1.82	*	–	0.502	3.34	**
ICS		-0.189	-0.93			-0.444	-2.83	*
IMM_1		-0.107	-0.48			0.200	1.38	
IMM_2		-0.308	-1.23			0.134	0.74	
IMM_3		-0.229	-0.96			-0.244	-1.61	
SIZE		-0.262	-1.31			0.056	0.34	
R^2(Adj)		0.015				0.505		
F-stat		1.076				5.244		**
Max_VIF		1.844				1.659		

Dependent variable = $INNOV^2$ for low-innovating firms (to correct for mild negative skewness in this sub-sample); INNOV for high-innovating firms; FIT = Dummy variable that equals 1 if the firm was classified as fit; 0 otherwise; ICS = Interactive use of the individual MACS (USEBUD, USEBSC or USEPMS) that theoretically corresponds to the firm's IMM; IMM = Three dummy variables for the four Innovation Management Modes; SIZE = Ln(Sales in millions of Euros).

*, ** Significant levels at 5% and 1%, respectively (one-tailed for the variable with predicted sign, two-tailed otherwise). Standardised coefficients are presented for all independent variables.

2.8. Conclusion

The aim of this study is to contribute to the emerging Levers of Control (LOC) literature on the relationships between innovation and management accounting and control systems (MACS) by providing insights on the choice made by senior managers in selecting which individual MACS are selected for interactive use (interactive control systems, ICS) (Simons, 1995, 2000), as well as on the impact of this choice on innovation outcomes.

Regarding our first research question, we have argued that the choice of ICS is deliberate and systematic, and that it pursues (1) the compatibility and similarity between the heuristics and cognitive models provided by the firm's Innovation Management Mode (IMM) (Roussel et al., 1991) on the one hand, and those provided by the MACS used interactively on the other hand (Birnberg et al., 2007; Howells, 1995); and (2) the ability of the idiosyncratic information contents of individual MACS used as ICS to effectively respond to the diverse perceived information needs that arise in each IMM (Chenhall and Morris, 1986; Roussel et al., 1991; Tillema, 2005). We have consequently argued that a firm would be more likely to interactively use an individual MACS that is compatible with and presents similar characteristics to its IMM, with both IMM and individual MACS supplementing each other and being mutually supportive. We have established a series of expected specific associations as situations of conceptually-derived fit. The empirical evidence gathered from medium-sized firms has supported the hypotheses regarding firms under an intuitive IMM (which tend to select BSC for interactive use) and under strategic/expert IMM (which tend to select BSC or budgets as ICS). Less conclusive evidence was found regarding the systematic and the strategic/non-expert IMM, but overall evidence has provided at least partial support for the theoretical development establishing that the choice of the specific MACS to be used interactively in a firm is associated with the type of IMM followed by the firm.

Our second research question concerns the extent to which fit between IMM and ICS is translated into beneficial implications on innovation outputs. We considered that the beneficial outcome that should be expected from the conceptually- derived fit between IMM and ICS is an enhanced ability to mitigate the potential dysfunctional excesses caused by innovation momentum (Bisbe and Otley, 2004; Miller and Friesen, 1982). The results of our study indicate that there is in fact a significant difference in the level of innovation between those firms in which the individual MACS selected for interactive use corresponds with the conceptually-derived fit and those firms in which there is no such correspondence. However, we have found this effect to occur in the opposite direction to what we had originally predicted. Contrary to our expectation, we have found that the low-innovating firms in which the MACS selected for interactive use under a given IMM corresponds to the conceptually-derived fit have even lower levels of innovation than those obtained in the absence of fit. Analogously, in the case of high-innovating firms, we have found evidence suggesting that when the MACS selected for interactive use under a given IMM corresponds to the conceptually-derived fit, firms are likely to have higher levels of innovation than firms

without such fit. Altogether, our results indicate that firms in which IMM and MACS present similar heuristics and cognitive models, and in which ICS obediently provide the information needs that are perceived as priorities by senior management given the emphasis of its IMM, are less effective in mitigating the dysfunctional excesses of innovation momentum than firms in which there is no such fit.

A plausible avenue for interpreting this finding is that the ability to effectively mitigate the dysfunctional excesses of innovation momentum is more likely to stem from the introduction of elements which, rather than replicating and fully complying with existing patterns, introduce diversity, offer new perspectives and even produce some disruption. This argument can be related to the distinction proposed in the psychology literature on supplementary fit and complementary fit (Cable and Edwards, 2004). Supplementary fit refers to situations in which entities possess similar or matching characteristics, and the characteristics of one entity replicate to a large extent the characteristics of other entities. In contrast, complementary fit refers to situations in which the weaknesses or actual needs of one entity are offset by the strengths of other entities. In our theoretical development, we implicitly framed our hypotheses in terms of supplementary fit. The evidence we have found at least partially supports the set of hypotheses that postulate that IMM are associated with the interactive use of those individual MACS that provide supplementary fit. However, our findings indicate that this supplementary fit does not in fact lead to an enhanced ability to mitigate the dysfunctional excesses of innovation momentum, but rather may lead to its reinforcement. Our results allow us to speculate that this ability is more likely to arise from the richness obtained by introducing elements that do not fully conform to existing patterns and offer instead new, complementary perspectives (i.e. complementary fit).

Several limitations of the current study must be pointed out. By concentrating on ICS, this study does not analyse the interplay between diagnostic MACS, interactive MACS and the other MACS within the control package (Otley, 1980; Malmi and Brown, 2008; Merchant and Otley, 2007; Widener, 2007). Moreover, its cross-sectional nature does not allow for a process-based understanding of the dynamics of the choice of the ICS. Our findings provide useful insights that could form the basis for future qualitative research examining the dynamics of the process by which an individual MACS is chosen for interactive use under different IMM, as well as the dynamics of the implications of this choice regarding innovation momentum. Finally, given the limitations in sample size, and the specificities

regarding firm size, industries and location, caution must be applied in generalising the results.

Despite these limitations, this paper contributes to the development of LOC theory by emphasising the relevance of the choice of individual MACS to be used interactively. This issue, crucial in LOC theory, had been under-researched in prior empirical literature. The results presented in this study contribute in this regard on several grounds. First, we have covered several individual MACS that are candidates for interactive use, which has allowed us to highlight the idiosyncrasies of each individual MACS should it be selected for interactive use. Second, we have developed LOC theory's claim that the choice of ICS is not random but systematic by providing evidence that supports the fact that the choice of ICS is associated with the configurations of organisational and managerial processes through which innovation arises (IMM). Moreover, we have introduced a new angle into the discussion about the effects of ICS on innovation by concluding that innovation output levels are affected by the presence or absence of fit between the IMM followed by a firm and the individual MACS selected for interactive use. Finally, the results of our study suggest that supplementary fit between IMM and ICS may not be instrumental in mitigating the dysfunctional excesses of innovation momentum, but instead may reinforce the tendency towards them. Future LOC studies should strive to integrate issues surrounding the choice of the individual MACS selected for interactive use with research into the interplay between levers. We believe that this integration will enhance the ability of researchers to capture how firms successfully manage the tension between the need for the predictable achievement of pre-established objectives and the need for creative innovation and how the management of this tension is ultimately reflected in long-term performance.

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2.10. Notes

[1] Management Accounting and Control Systems (MACS) refer to the set of procedures and processes that managers use in order to provide valuable information in decision-making, planning, monitoring and evaluation and, ultimately, to ensure the achievement of their goals and the goals of their organisations. MACS comprise multiple formal and informal individual control systems that operate collectively and interdependently to constitute control packages (Otley, 1980, 1999; Chiapello, 1996; Merchant and Otley, 2007; Malmi and Brown, 2008).

[2] Ambiguous findings may potentially be explained by differences in the conceptualisation of what constitutes an ICS. If the definitions of what constitutes an ICS include only a narrow subset of its theoretical properties, subsets may vary across studies, and ICS may be mistaken for other constructs such as mere intensive use or mere participative use (Bisbe et al., 2007).

[3] According to the LOC framework, while any individual MACS can potentially be used diagnostically as well as interactively, individual MACS present in the control package of a given firm are used, except in rather exceptional circumstances, either diagnostically or interactively (Simons, 1995, pp. 103, 120; 2000, pp. 124, 208, italics in the original). Nevertheless, some authors (i.e. Tuomela, 2005; Widener, 2007) have pointed out that individual MACS can simultaneously be used both in an interactive and in a diagnostic manner. Based on LOC theory, potential explanations for this discrepancy include the following: (1) the object of analysis covers only one individual MACS, which makes it virtually impossible to comparatively detect diagnostic uses in some individual MACS and interactive uses in other individual MACS; (2) the nature of the MACS under analysis (e.g. performance measurement systems) is too broad (with many subsystems within, some used interactively, some diagnostically); and (3) the conceptualisation of the constitutive properties of ICS is not stringent enough (see Note 2).

[4] The scope of a particular MACS refers to focus and quantification (we have ignored the time horizon sub-dimension in this study). Narrow (broad) scope MACS provide information that is internally focused and financial (related to both the internal and the external environment and including both financial and non-financial measurements). Aggregation refers to the degree to which data are processed and summarised to provide summated information. Hence, low (high) aggregation refers to systems that only provide basic raw, unprocessed data at lower-level units of analysis (systems that provide processed data that are aggregated in higher-level units of analysis). Finally, integration refers to the provision of information as to how the decisions made in one department or area may influence the performance of other departments, areas or activities (Chenhall and Morris, 1986; Bouwens and Abernethy, 2000).

[5] Hereafter, we use 'balanced scorecard' (BSC) to refer to multi-perspective performance measurement systems in generic terms. Therefore, BSCs as defined here do not need to follow the exact procedure as suggested by Kaplan and Norton (1996, 2000). For the purposes of this study, summarised, multi-perspective sets of both financial and non-financial indicators that aim to capture the extent to which strategic objectives are being achieved are labelled as BSC.

[6] Organisational and managerial processes refer to the routines, operating principles and patterns of practice within a firm. Rather than modular or loosely-coupled entities that operate in isolation, organisational and managerial processes are better understood as operating in organisational configurations, each configuration representing a coherent multidimensional constellation of conceptually distinct routines, operating principles and patterns of practice (Meyer et al., 1993; Fiss, 2007).

[7] While we extend R&D and R&D departments in Roussel et al.'s framework to innovation and innovative units, we acknowledge that innovation is not necessarily originated or developed within an R&D department or from R&D activities (Escorsa and Valls, 2003; Von Hippel, 1988). In fact, studies on technological innovation are experiencing a paradigm shift from R&D management to knowledge management. Even so, frameworks that link knowledge management, R&D

management and innovation management (e.g. Nieto, 2002; Park and Kim, 2005) have often drawn upon the Roussel et al. (1991) typology. Some authors have proposed refinements or extensions of Roussel et al.'s typology (Liyanage et al., 1999; Miller and Morris, 1999; Park and Kim, 2005; Rogers, 1996), but consensus regarding these adaptations, and consequently their influence, is still limited.

[8] Even though typologies of R&D modes and IMM can be interpreted as chronologies of generations associated to specific periods of time in an evolutionary process, they can be alternatively interpreted as maps of configurations that can coexist at a given moment in time across firms that follow different organisational patterns. For example, consistent with this latter approach, Roussel et al. (1991, p. 25) point out that 'as we look on today's industrial scene, we see [the] three generations of R&D management in practice'. In this study, we adopt this latter approach, and therefore expect the different IMM to coexist contemporarily in the industrial setting.

[9] In order to control for undesired effects related to relationships with headquarters, subsidiaries of multinational companies (MNC) with headquarters outside Spain were excluded, since most often these companies do not locate research centres and innovation activities in Spain. Even though there are some significant exceptions, most Spanish subsidiaries of MNC headquartered outside Spain engage in advanced manufacturing or commercial activities related to innovative advanced products developed abroad rather than developing their own innovations (Buesa and Molero, 1998; Hermosilla, 2001).

[10] The firms in the resulting useable sample represent a variety of industries, including chemical and pharmaceutical (11 firms), textile (seven firms), food and beverages (six firms), manufacturing of mechanical equipment (six firms), metal manufacturing (six firms), manufacturing of electrical equipment (five firms), automobile supplies and parts (four firms) and miscellaneous (12 firms). Average sales are E62.8 million (minimum E18.63 million, maximum E165.28 million) and the average number of employees is 374 (minimum 204, maximum 800).

[11] Hierarchical agglomerative techniques using Ward's method indicated similar percentage changes in the agglomeration coefficient across the relevant range of number of clusters. Visual inspection of the dendrograms did not provide either a clear-cut basis for selecting a number of clusters to be formed. Therefore, cluster centroids from the hierarchical results for 2, 3, 4 and 5 clusters were respectively used as initial seed points for the respective non-hierarchical clustering procedures. The four-cluster solution was selected since it was consistent with the results of the analysis and was theoretically interpretable. In order to test robustness, we engaged in a two-step sensitivity analysis. First, we ran six alternative hierarchical clustering procedures, excluding one of the six variables used to form the clusters, at a time. Based on the agglomeration coefficients and the dendrograms, in five out of six computations the four-cluster solution surfaced as appropriate and was theoretically interpretable. Second, we replicated the non-hierarchical procedures (pre-specifying four clusters) with subsamples resulting from a random split. We evaluated the congruence between the assignment of observations to clusters using the randomly split subsamples and the assignment to clusters in the full-sample solution, obtaining 74% coincidence in the assignment of observations to clusters ($Z = 3.56$; $p < 0.001$).

[12] IMMs and ICS have different natures. While IMM represent a limited number of equilibrium states that are largely path-dependant (Park and Kim, 2005; Roussel et al., 1991), the interactive use of a particular MACS can be adjusted or fine-tuned incrementally in a continuous progression (Simons, 1995). Consequently, we ruled out a configuration approach to fit and the predicted association between IMM and ICS is specified as a Cartesian fit (Gerdin and Greve, 2004, 2008).

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Appendix 1. Roussel et al's framework of R&D Management Modes

	Intuitive mode	*Systematic mode*	*Strategic mode*
Context	• No long-term strategic framework • R&D is an overhead cost	• Transition state • Partial strategic framework	• Holistic strategic framework
Philosophy	• R&D decides future technologies • Business decides current technology objectives	• Judge-advocate management/R&D relationship • Customer-supplier business/R&D relationship	• Partnership
Organisation	• Emphasis on cost centres and disciplines • Avoid the matrix	• Centralised and decentralised • Matrix management of projects	• Breaks the isolation of R&D
Technology/ R&D strategy	• No explicit link to business strategy • Technology first, business implications later	• Strategic framework by project • No integration business- or corporate wide	• Technology/R&D and business strategies integrated corporate wide
Operating principles, routines and practices	• Lacking combined business/R&D insight • Fatalistic	• Distinguish between types of R&D • Combined business/R&D insights at project level	• Combined R&D/business insights across the spectrum
Funding	• Line item in annual budget • Fund what you can afford	• Funds based on needs and risk sharing • Different parameters by R&D type	• Varies with technology maturity and competitive impact
Resource allocation	• At the discretion of R&D • No upward visibility	• To fundamental R&D by central R&D management • To other R&D jointly by customers and suppliers separately in each area	• Based on balancing of priorities and risk/reward trade-offs across areas
Targeting	• Is anathema for fundamental and radical R&D • Business and technological objectives sequential	• Consistent business and R&D objectives by project for incremental and radical R&D • Targets precisely defined	• All R&D has defined consistent business and technological objectives located within a firm-wide portfolio • Targets precisely defined
Priority setting	• No strategic priorities • Priorities vary with operational circumstances	• For fundamental R&D by central R&D management • For other R&D jointly by customers and suppliers separately in each area	• Across areas, according to cost/benefits and contribution to strategic objectives
Measuring results	• Expected results not precisely defined • Measurements often misleading	• Expected results precisely defined at the project level • Quantitative for incremental R&D • "Market intelligence gap" for radical R&D	• Expected results precisely defined • Portfolio perspective • Against business objectives and technological expectations •
Evaluating progress	• Ritualistic and perfunctory • Periodic	• Formalised peer reviews • Good communications with businesses for incremental and radical R&D projects	Regularly *and* when external events and internal developments warrant

Source: adapted from Roussel *et al.*, (1991)

Appendix 2. Questionnaire Items

Innovation

(In comparison with the industry average).

. (1) During the last three years we have launched many new products (new to the firm) vs. (7) few new products.

. (1) In new products, we are very often first-to-market vs. (7) very rarely first-to-market.

. (1) The percentage of new products in our product portfolio is much higher than industry average vs. (7) is much lower than industry average.

Innovation Management Modes

. (1) I am involved in the overall allocation of resources to innovation, but not in the decisions about the specific project lines to which these resources will be allocated vs. (7) I am involved in the choice of innovation lines as well as in the decisions about specific projects to which these resources will be allocated (*Allocation*).

. (1) Innovation always takes place within a previously established framework. Spontaneous personal initiatives disrupt this framework. vs. (7) Innovation often arises from spontaneous personal initiatives. For me, it is essential to identify and support such initiatives (*Recognition*).

. (1) When approving, measuring results of or evaluating an innovation project, decisions are based above all on the specific features of that individual project vs. (7) decisions are based above all on that project's place in our project portfolio (*Portfolio*).

. (1)For every project, we always quantify precise objectives (e.g. time, cost, quality) and measure our progress in relation to those objectives vs. (7) It is common that for some projects we do not quantify precise objectives and consequently we do not follow-up progress towards these objectives (*Precision*).

. (1) Managers of innovative units should competently manage their area. It is not their role to have an overall vision of the business, nor contribute to deciding the general innovation policy vs. (7) Apart from competently managing their area, managers of innovative units should have an overall vision of the business and contribute to shaping the general innovation policy (*Tech/Buss*).

. (1) When we are planning, the decision about which particular project should go ahead is taken within each area. vs. (7) is taken globally. We compare innovation projects from different areas and prioritise among them (*Trade-offs*).

Interactive Use of MACS

Is some kind of budgetary system (definition included in original questionnaire) used in your company? (Yes/no). If yes, then (*ib. id. for balanced scorecard tableaux de bord or other multidimensional performance measurement systems and for project management systems*)

(1) Only when there are deviations from planned performance are budget follow-up reports the main subject for face-to-face discussion with my executive team vs. (7) Whether there are deviations from planned performance or not, budget follow-up reports are the main subject for face-to-face discussion with my executive team.

. (1) I pay periodic or occasional attention to budgets (e.g. setting objectives, analysing periodic follow-up reports, . . .) vs. (7) I pay regular and frequent attention to budgets. I use them permanently.

. (1) For many managers in my company, budgets require periodic or occasional, but not permanent, attention vs. (7) In my company, budgets require permanent attention from all managers.

Appendix 3. Factor Analysis* and Reliability Analysis

Variable	Items in questionnaire		Factor 1
Interactive Use of Budgets (USEBUD)	face-to-face challenge on a continuous basis		0.854
	permanent personal attention by the CEO		0.871
	permanent personal attention by manage		0.755
		Eigenvalue	2.06
		% of variance	68.60%
		Cronbach's α	0.77
Interactive Use of Balanced Scorecard (USEBSC)	face-to-face challenge on a continuous basis		0.832
	permanent personal attention by the CEO		0.854
	permanent personal attention by manage		0.819
		Eigenvalue	2.09
		% of variance	69.75%
		Cronbach's α	0.78
Interactive Use of Project Mgmt.Syst. (USEPMS)	face-to-face challenge on a continuous basis		0.770
	permanent personal attention by the CEO		0.879
	permanent personal attention by manage		0.879
		Eigenvalue	2.13
		% of variance	71.24%
		Cronbach's α	0.78
Innovation (INNOV)	rate of introduction of new products		0.856
	tendency of firms to pioneer/being first-to-market		0.859
	% sales from recently launched products		0.891
		Eigenvalue	2.26
		% of variance	75.44%
		Cronbach's α	0.83

***** Factor loadings based on principal component analysis. Rotated solutions using VARIMAX.
For individual MACS, unidimensionality and reliability of the constructs related to interactive use were assessed taking into account the observations from the full sample that reported to use that individual MACS (n = 55 for budgets; n = 45 for BSC; n= 36 for project management systems). The rationale for ignoring non-users was to avoid a potential bias towards unidimensionality and high reliability just because all items for non-users were systematically scored as zero. Inclusion of all cases also supported the dimensionality structure and reliability analysis presented here.

Chapter 3: The Role of Management Accounting and Control Systems as Antecedents of Organisational Creativity and Conversion Ability in Innovation Processes

3.1 Introduction to chapter 3

The third chapter of this thesis addresses the relationship between management accounting and control systems (MACS) and innovation process. The emphasis in this section is not on whether MACS contribute to generate a desirable organisational outcome but rather to identify the relationship among specific MACS within a control package and the channels that could explain how MACS influence final product innovation. This paper has been presented in some research seminars and conferences. This thesis brings the version presented at *Accounting, Organization and Society Workshop in Creativity and Control*.

3.2. Abstract

This paper examines the influence of Management Accounting and Control Systems on the development of some key organisational capabilities related to innovation processes. More specifically, this research examines the associations between different forms of control (cultural controls, interactive controls, diagnostic controls) and the capabilities required in the creativity and conversion ability stages of the innovation process. We examine these associations separately for entrepreneurial and conservative firms. Using survey data collected from 120 medium and large Spanish companies, we find evidence supporting that each form of control within the control package has different influences on the different stages of the innovation process and that the significance and direction of these influences varies between entrepreneurial and conservative firms. By associating specific forms of control within the control package with specific components or stages of the innovation process, our results highlight the simultaneous complementarities and supplementarities between specific forms of control.

3.2 Introduction

Innovation has been recognised as the essence of firms' survival and growth in contemporary environments (Cefis and Marsili, 2006; Matolcsy and Wyatt, 2008). Accordingly, in recent years there has been an increasing interest in accounting research in investigating the relationships between management accounting and control systems (MACS) and innovation. Although studies are not always consistent (Becheikh et al., 2006), a growing consensus in the emergent research in management accounting suggests that both informal and formal MACS may positively contribute to the strength and success of the innovation effort provided they possess certain characteristics such as an enabling, non-invasive style of use or the provision of adaptive frames of reference (Ahrens and Chapman, 2004; Bonner, 2005; Davila, 2000, 2005; Davila and Wouters, 2004; Ditillo, 2004; Revellino and Mouritsen, 2009; Simons, 1995).

Even though previous research offers solid grounds to conclude that MACS may positively influence innovation, little is known yet about the channels through which they shape the innovation processes. The literature on innovation has long established invention, exploration or creativity on the one hand, and exploitation or conversion ability on the other hand, as two key components of the innovation processes that are very distinct in nature (Chandy et al., 2006; March, 1991; Tidd and Bessant, 2009; West and Farr, 1990). Yet, the literature that has investigated whether and how MACS play differentiated roles across these two components of innovation processes is rather scarce and inconclusive. Some studies suggest that MACS may contribute to the innovation effort by encouraging creativity, for example through the establishment of an informal culture that willingly promotes risk-taking (Merchant and Van der Stede, 2007) or through the opportunity-seeking orientation and the empowerment that are derived from formal measurement systems (Simons, 1995). In contrast, other studies claim that MACS do not promote and even do hinder creativity, which relies on intrinsic motivation, freedom and experimentation rather than on control (Amabile, 1998; Bonner et al., 2002). Another stream of studies has highlighted that MACS can contribute to increase the levels of innovation by intervening into the development of the conversion ability of the firm (Ditillo, 2004; Mouritsen et al., 2009). While the distinction between styles of use of MACS (Ahrens and Chapman, 2004; Simons, 1995) has provided some light on these apparently conflicting findings, it is not clear yet how

MACS affect organisational creativity (Marginson, 2002), it is not clear to what extent MACS contribute to conversion ability, and there is a paucity of empirical studies that integrate the implications of MACS on both components of innovation processes. Consequently, recent calls have been made to better understand the effects of control systems within the 'black box' of innovation processes (Davila et al., 2006; 2009).

Most of the limited previous quantitative empirical research that has investigated the relationships between MACS and innovation has included references to the different styles of use of MACS, as these have long been identified as relevant in influencing the way firms approach innovation (Simons, 1995). In these studies, the research questions have tended to focus on the MACS package as a whole (Naranjo-Gil and Hartmann, 2007), on one individual control system within the control package (Henri, 2006; Tuomela, 2005) or on a tandem of formal control systems within the control package (Bisbe and Otley, 2004; Widener, 2007). Following any of these approaches, research risks losing the ability to capture the richness of the interplay between formal and informal control systems within the control package (Malmi and Brown, 2008). Overall, previous research has provided limited insights into the richness of the complementarities and supplementarities between formal and informal systems which are likely to be key to better understand the distinct roles of MACS across the different stages of the innovation process (Davila et al., 2009). The sparse stream of quantitative research that has investigated the relationships between innovation and packages of both formal and informal controls either has not referred to the different styles of use of MACS (e.g. Chenhall and Morris, 1995) or has not paid attention to the distinct phases of the innovation process (creativity vs. conversion ability) (e.g. Chenhall et al, 2011). In summary, large scale evidence on the influence of packages of control (including formal and informal control systems) on the different stages or components of the innovation processes is still missing. Framing the research questions in terms of the relationships between packages of informal and formal MACS (including different styles of use of formal MACS) and the components or stages of the innovation process should help better understand the channels through which MACS as a whole influence innovation and may help reconcile some of the conflicting findings mentioned in the previous paragraph.

Finally, and despite the well-established contingency claims that the associations between attributes of MACS and other organisational variables are largely dependent on strategic patterns or strategic typologies (Chenhall and Morris, 1986; Chenhall, 2007; Langfield-Smith, 2007), none of the studies that have analysed the relationships between MACS and innovation has yet delved into the extent to which the patterns of complementarities or supplementarities between specific control systems and their impact on innovation processes vary across the different strategic patterns or typologies.

In this paper, we examine the influence of different control systems (both formal and informal) within the control package (Malmi and Brown, 2008) on the different stages or components of product innovation processes. We have categorised the constituents of control packages in three forms of control systems: cultural controls (either formal or informal), diagnostic controls (formal), and interactive controls (formal). In turn, building on previous literature, we have classified the components of the product innovation process in four blocks: one related to the creativity stage, and three related to conversion ability (namely knowledge integration, coordination and filtering). Consequently, we have examined the distinct influence of cultural controls, interactive controls and diagnostic controls and the interplay among them on the four mentioned stages or components of the innovation process. As long as it well established in previous literature that creativity is positively associated with innovation (Amabile et al., 1996; Baron and Tang, 2011; Shalley et al., 2003; Woodman et al., 1993) and that coordination and knowledge integration capabilities as well as filtering practices moderate this association (Gomes et al., 2003; Hirunyawipada et al, 2010; Parthasarthy and Hammond, 2002), this paper helps assess the strengths of the channels through which MACS eventually influence the innovation output. We also examine in the paper whether the direction and strength of these influences vary across different strategic typologies, focusing in particular in the comparison between entrepreneurial and conservative firms (Langfield-Smith, 2007; Miller and Friesen, 1982).

Results from tests of a structural model using Partial Least Squares (PLS) regressions on survey data collected from Chief Executive Officers of 126 medium and large Spanish companies provide evidence suggesting that each form of control within the control package has different influences on the different components or stages of the innovation process. Moreover, the significance and direction of these influences varies

between entrepreneurial and conservative firms. Hence, entrepreneurial firms rely on cultural forms of control to encourage creativity, knowledge integration and coordination to eventually foster innovation, whereas filtering practices are associated with interactive control systems. In contrast, in conservative firms, the use of interactive control systems (ICS) is associated to the development of both organisational creativity and the different components of conversion ability whereas cultural controls are primarily associated with knowledge integration and filtering. Diagnostic controls are not associated to conversion ability practices in any of the two innovation models. From these results, it can be inferred that entrepreneurial firms balance on the one hand cultural controls as means for encouraging creativity and strengthening the effects of creativity on innovation through higher knowledge integration and coordination with, on the other hand, interactive controls that develop filtering capabilities that mitigate the association between creativity and innovation. In contrast, conservative firms use interactive control systems as means to encourage creativity in the first place but also to strengthen the effects of creativity on innovation through higher knowledge integration and coordination. This is balanced by cultural controls, which develop filtering capabilities that mitigate the association between creativity and innovation.

By associating specific forms of control within the control package with specific components or stages of the innovation process (i.e. creativity, conversion ability), these findings highlight the complementarities between specific MACS. Firms use different specific forms of control in different stages of the innovation process and hence sets of specific MACS are collectively bundled in order to achieve successful innovation. At the same time, however, our findings indicate that both creativity and conversion ability can be achieved through alternative ways, and that firms pursuing different strategic patterns use different specific MACS as alternative ways (or use MACS with different emphasis) to develop a given capability. Hence, our findings challenge the traditional dilemma [specific MACS as complements] versus [specific MACS as supplements] (Davila et al., 2009; Fisher, 1998) and suggest instead that specific MACS are both supplements (i.e. different specific MACS can enable and support a given stage of the innovation process, and firms choose different specific MACS in order to enable and support the same component of the innovation process depending on their strategic pattern) and complements (i.e. in the context of the whole innovation process, firms

combine and bundle the different specific MACS that have been chosen to influence each of the stages of the innovation process).

This paper contributes to the literature that examines the effects of management accounting and control systems on innovation in three ways. First, it provides deeper insights into the relationship between MACS and innovation by focusing on the components of the innovation process and modelling them as intervening variables rather than taking innovation as a 'black box' and modelling the effect of MACS on innovation as a direct effect as it was usually the case in prior quantitative literature. The study provides large scale evidence about the channels through which MACS influence the different components of the innovation process, and the inclusion of variables related to the components of the innovation process allows to better understand the generative mechanisms through which MACS are able to influence innovation.

Second, we explore whether specific MACS within the control package (Malmi and Brown, 2008) influence differently the distinct components of the innovation process. Building on literature that has pointed out to differential contributions of MACS to innovation, on the one hand we have captured the difference between interactive and diagnostic feedback and measurement systems as defined in the LOC framework (Simons, 1995) but at the same time, we have gone beyond the LOC framework, which only accounts for formal MACS, to also include informal controls (Berry et al., 2009; Collier, 2005). Hence, we contribute to previous literature on MACS and innovation by integrating in one single model the distinction between styles of use of formal control systems described in the LOC framework and the presence of cultural controls (including formal and informal controls). We have further assessed the interplay between the distinct implications of these different constituents of the control package across the creativity and conversion stages of the innovation process. In doing so, we have also addressed recent calls to investigate whether the various constituents of the control package are adopted as bundles (complements) or as alternative ways (supplements) to reach innovation goals (Davila et al., 2009; Fisher, 1998; Malmi and Brown, 2008).

Third, this paper highlights that firms under different strategic patterns engage differently in this interplay between specific MACS within the control package.

Building on prior literature that had suggested relationships between strategy and the type of influence of MACS on innovation (Bisbe and Otley, 2004; Chenhall and Morris, 1986; Davila et al., 2004; Miller and Friesen, 1980, 1982), we argue that the influence of the specific MACS within the control package across the different components of the innovation process as well as the type of interplay among the specific MACS within the control package will vary depending on the strategic pattern followed by the organisation. These findings contribute to previous literature by pointing out that associations between MACS and innovation that are often taken for granted as universal (for example, that a more interactive use control systems is associated with higher levels of innovation through increased creativity or through increased coordination) are in fact contingent on strategic patterns and are valid only in some specific contexts.

The remainder of the paper is divided into five sections. First, we provide a theoretical background. Second, we introduce the testable hypotheses. This is followed by two sections that discuss the research method and present results. In the fifth section, we conclude.

3.3 Theoretical Background

3.3.1. The innovation process: creativity and conversion ability

Innovation processes refer to the development and implementation of "something new", that is, the bringing of promising creative ideas into completion and introducing them as useable and marketable new practices, services or products (Damanpour, 1991; Van de Ven, 1986). Innovation processes describe how innovation activities are organised, i.e. the sequence involved in undertaking such activities (Parthasarthy and Hammond, 2002). While a vast variety of both linear and non-linear approaches have been proposed in the literature to describe such sequence (Tidd and Bessant, 2009), most studies coincide in identifying two stages or components of the innovation process which are very distinct in nature: one stage related to the development of creative ideas (creativity) and another stage related to the translation of these ideas into useable or commercialised products, processes or practices (conversion ability) (Chandy et el., 2006; Roberts, 2007). Creativity refers to the initial imaginative idea (Amabile, 1998; West and Farr, 1990), whereas innovation to be complete requires conversion ability and successful implementation (Tidd and Bessant, 2009).

Creativity, also referred to in management literature as invention or exploration (March, 1991), corresponds to the development of novel and potentially useful ideas. Individuals and groups are at the centre of organisational creativity (Amabile et al., 1996). At the organisational level, creativity is the capability of generating valuable and functional ideas, procedures, products, or/ and services by individuals working together in a complex social setting (Woodman et al., 1993). The creative output for the entire organisational system flows from the complex mosaic of individual, group, and organisational characteristics and behaviours within each level of social organisation (Woodman et al., 1993). Organisational characteristics generate the contextual influences that operate on both individuals and groups to shape their creativity. Literature on creativity, which is mainly derived from psychology (Amabile and Mueller, 2008) lists several factors that influence organisational creativity, including organisational culture, resources availability, rewards policies and recognition, strategy and organisational mission, structure and technology (Amabile et al., 1996; Burkhardt and Brass, 1990; Damanpour, 1991; King, 1990; Tushman and Nelson, 1990).

The process that describes the conversion of an invention into a useful application has been defined as conversion ability (Chandy et al., 2006) or exploitation (Roberts, 2007). Whereas creativity process entails efforts aimed at generating new ideas, conversion ability refers to the firm's ability to translate a given idea into a launched product, service or practice (Chandy et al., 2006). According to Roberts (2007), this process includes all stages of technological application and transfer and commercial development, such as focusing ideas towards specific objectives, evaluating objectives, allocating and coordinating resources, downstream transfer of research and development, prototyping and pilot running, market targeting and testing and reassessment of decisions. Other studies have observed the conversion ability as a capability which captures refinement, choice, production, efficiency, implementation, and execution (March 1991) or as alternatively proposed in other frameworks, resourcing, implementation and review (Tidd and Bessant, 2009).

The innovation literature has placed distinctive attention to three relevant competencies of successful innovative firms which are related to conversion ability, namely, coordination, knowledge integration and filtering practices (Mitchell, 2006; Pavlou and El Sawy, 2006; Teece et al., 1997; Verona, 1999). Coordination is the ability to manage

and synchronise businesses resources and tasks on a continuing basis (Malone and Crowston, 1994; Pavlou and El Sawy, 2006). A second crucial factor on the process of transforming ideas into final products is related to the ability of a firm to transmit knowledge across organisational participants. The transference of knowledge into value-creating processes depends on the organisation's knowledge integration mechanisms (Zahra and Nielson, 2002). Knowledge integration is characterised by: a) the ability to integrate thought of multiple organisational participants to a pattern of mindful interrelations of actions in a social system (i.e. collective mind; Weick and Roberts, 1993), and b) the quality of interaction among diverse functional areas (i.e. cross-functional integration; Atuahene-Gima, 2005; Eisenhardt and Martin, 2000). Filtering has been defined as the ability to control progress and revise resource commitment of innovation projects or initiatives (Tidd and Bessant, 2009). Filtering practices often take the form of funnelling processes, where mediocre projects are culled out at each gate and resources are focused on the truly meritorious projects (Cooper, 1998: 8).

3.3.2. Management Accounting and Control System Packages

In this research, management accounting and control systems (MACS) are defined as the set of procedures, processes and tools that managers and other organisational participants use in order to help ensure the achievement of their goals and the goals of their organisations (Otley and Berry, 1994). Most often, modern organisations do not utilise individual procedures and tools as single and isolated systems (CIMA, 2009) but rather they tend to have numerous controls present and utilise them in combination in the context of a complex collection or set of control systems that collectively constitute a MACS package (Chenhall, 2007; Fisher, 1998; Malmi and Brown, 2008; Otley, 1980).

In order to make sense of the complexity of MACS packages, management accounting researchers have developed various theoretical frameworks or typologies (e.g. Ferreira and Otley, 2009; Malmi and Brown, 2008; Merchant and Van der Stede, 2007; Simons, 1995). Amongst the frameworks and typologies of MACS packages that have been proposed, some have proved to be particularly useful to conceptualise and empirically study issues related to innovation. Hence, recent literature on MACS and innovation has paid special attention to Simons' levers of control (LOC) framework (Simons, 1995, 2000).

LOC framework states that, in order to effectively deal with the organisational tension between the need for achieving pre-established objectives and the need for expanding opportunity-seeking and innovation, managers use four levers of control (i.e. belief systems, boundary systems, diagnostic control systems and interactive control systems), which in turn create dynamic tensions within the overall control package. Beliefs systems are explicit sets of organisational definitions that senior managers communicate formally in order to provide basic values, purpose and direction for the organisation. Boundary systems are sets of rules and indications that delineate the acceptable domain of activity and the risks to be avoided when seeking opportunities. Finally, feedback and measurement systems are data-based systems that capture measurable information on either inputs, processes or outputs. Depending on the style of use, feedback and measurement systems can be described as diagnostic control systems or as interactive control systems. Diagnostic MACS are feedback and measurement systems based on programmed cybernetic processes (i.e. setting standards, measuring, comparing, and taking corrective actions) and on management by exception (Simons, 1995, 2000). Interactive control systems (ICS) are formal feedback and measurement systems that are used regularly and frequently by managers to get involved in a non-invasive way in the decision activities of subordinates, to debate on strategic uncertainties and to encourage dialogue and discussion among organisational members (Simons, 1995, 2000). The interplay between these four levers of control allows a proper management of the tension between predictable goal achievement and emergence of innovative initiatives and, eventually, favours long-term successful performance.

While the LOC framework has been used as the organising typology in a significant stream of recent research that has investigated the relationships between MACS and innovation (Bisbe and Malagueño, 2009; Bisbe and Otley, 2004; Henri, 2006; Widener, 2007), it is important to keep in mind that Simons' LOC framework relies solely on formal control systems (Collier, 2005). Therefore, while LOC may be useful to gain insights into the relationships between formal MACS and innovation, it is insufficient to investigate the interplay between formal and informal MACS in regard to innovation.

Nevertheless, the informal components of the control systems packages have long been recognised as having a potential significant influence on innovation processes and outputs. A consistent stream of theoretical studies and empirical evidence indicates that

facets of informal controls such as socialisation, clan controls or implicit values and traditions (Abernethy and Brownell, 1997; Abernethy and Stoelwinder, 1991; Ouchi, 1979) do have an influence on the way innovation is carried out in organisations. A number of typologies of control packages have included such informal controls under the label of cultural controls, hence conceptualising cultural control as restricted to informal systems (Baliga and Jaeger, 1984; Pucik and Katz, 1986). However, other authors have conceptualised cultural controls to include both formal and informal components. Hence, Malmi and Brown (2008) define cultural control as the values, beliefs and social norms which are established to influence employees' behaviour. As described by Malmi and Brown (2008), both informal controls such as clan and peer controls (Ouchi, 1979) and formal mission statements, credos, and other forms of beliefs systems and boundary systems (Simons, 1995) are categorised as cultural controls. Accordingly, Merchant and Van der Stede (2007, p. 67) consider that cultural controls exist where managers take actions to shape organisational behaviour norms and to encourage employees to monitor and influence each others' behaviours. For Merchant and Van der Stede, cultural controls may be embodied in both formal (e.g. explicit codes of conduct, codes of ethics, mission, other beliefs and boundary systems) and informal (e.g. implicit management philosophy, ideology, unwritten values, tone at the top) systems that direct organisational participants' behaviours.

In summary, previous literature suggests that both the distinction between interactive uses and diagnostic uses of formal feedback and measurement systems and the inclusion of informal controls provide meaningful insights regarding the relationship MACS / innovation. Therefore, in order to address the research goals of this paper, we have opted for a typology of the components of control packages that, on the one hand, captures the distinction between interactive uses and diagnostic uses of feedback and measurement systems (Simons, 1995) and, on the other hand, includes the informal components related to cultural controls which are absent in the LOC framework. The pursuit of these goals, together with the search of parsimony and tractability, has led us to classify the components of control systems packages in three forms of control which are relevant for the purposes of this study: 1) cultural control systems (both formal and informal, in line with Merchant and Van der Stede, 2007 and Malmi and Brown, 2008); 2) interactive control systems (formal feedback and measurement systems used interactively as defined by Simons 1995, 2000) and 3) diagnostic control systems

(formal feedback and measurement systems used diagnostically as defined by Simons 1995, 2000).

Whatever the typology used to classify the individual systems within a control package, the very same idea of a collection or set of control systems coexisting opens the door to questions about the type of relationships between the individual systems within the package. Some authors have emphasised the complementary relationships between individual control systems which mutually reinforce (e.g. Merchant and Van der Stede, 2007; Simons; 1995). Other authors have focused instead on the substitutability among control systems (Dent, 1990), suggesting that not all systems need be to activated simultaneously because there are numerous control configurations that may result in equivalent firm outcomes (Fisher, 1998). As far as the relationships between MACS and innovation are concerned, little is known yet about the extent to which the various individual control systems within the control package are adopted as complements or as alternative ways (i.e. supplements) to accomplish the same innovation objectives (Davila et al, 2009).

3.3.3. Management Control Systems and Strategy

Contingency theory applied to MACS suggests that there is no universally appropriate control system or control system package that can be applied to all circumstances since the applicability and usefulness of specific attributes or configurations of MACS are influenced by –or contingent upon- certain factors that are both external (e.g. environment, national culture) and internal (e.g. structure, life cycle, size). Among the internal factors, strategy has been considered in the literature as one of the main contextual variables that influences the design and use of MACS (Chenhall, 2007). A stream of management accounting studies that have investigated the relationships between strategy and MACS has emphasised the identification of specific types of control that suit strategic patterns such as generic strategic positions (e.g. cost leadership vs. differentiation), strategic missions (build vs. harvest) or strategic typologies (prospectors vs. defenders; entrepreneurial vs. conservative) (Langfield-Smith, 2007). Recently, and in response to the development of frameworks that describe control packages (Malmi and Brown, 2008; Otley, 1980; Simons, 1995), there has been an increasing concern in understanding the distribution of management attention among individual control systems within a control package across different strategic patterns

(Langfield-Smith, 2007). Hence, one relevant issue to be understood is what is the balance and relative emphasis between individual control systems in order to facilitate strategy formation, strategy implementation and strategic change under different strategic patterns (Auzair and Kim Langfield-Smith, 2005; Cadez and Guilding, 2008; Kober et al., 2007).

Since this study aims to examine whether the relationships between MACS and innovation processes vary across different strategies, we are particularly interested in using a strategic typology based on models of innovation, such as the one proposed by Miller and Friesen (1982). Miller and Friesen categorised firms as conservative or entrepreneurial, using the extent of product innovation and the propensity to risk-taking. Conservative firms perform relatively little information and engage in little risk taking. In these firms, innovation is not a natural state of affairs. They engage in innovation with reluctance, usually as a response to serious challenges and threats that make managers aware of the need for change. In contrast, entrepreneurial firms innovate boldly and regularly while taking considerable risks in their product-market strategies (Miller and Friesen, 1982, p. 3-5)

3.4 Theoretical Development and Hypotheses Formulation

3.4.1. MACS and creativity

Traditional views of the relationships between MACS and innovation had pointed out to the irrelevance (Dougherty and Hardy, 1996; Verona, 1999) or even the incompatibility (Amabile, 1998) of MACS regarding the development of innovation initiatives within organisations. The arguments underlying these views established that the inability of MACS to encourage innovation is primarily located in the creativity stage, since the normative nature of MACS plays against variation and volatility and therefore hinders the intrinsic motivation, freedom, experimentation and flexibility which is needed for novel and creative ideas to flourish (Amabile, 1998).

However, in the last decade, a stream of research has highlighted the relevance of MACS to innovation. Innovation is not a random or spontaneous occurrence, but a process to be managed, especially so in midsize and large firms, and control systems

may assist to do so. MACS can help organisations facing uncertain environments such as the ones associated with innovation by providing a frame of reference that is stable enough to frame cognitive models and communication patterns, whilst at the same time being dynamic, flexible and adaptive to changing environments (Davila, 2005; Davila et al., 2009).

If innovation as a process that needs to be managed and MACS may help do so, it is reasonable to expect that each of the stages in that process needs to be actively managed and that control systems may help do so in each or at least in most of such stages. However, the extent to which MACS distinctly shape each of these stages has hardly been addressed in the literature. This paucity applies particularly to the studies regarding the impact of MACS on creativity.

Among the few studies that have done so, Davila et al. (2009) have pointed out that processes such as identifying a creative idea that becomes the seed of a new product require a particular motivational environment. Creative people and creative groups work within organisations, and therefore their environments are heavily influenced by the control mechanisms of the organisation. Since MACS are important in shaping this environment, they can be expected to have an impact on creativity (Davila et al., 2009).

In fact, prior literature provides some limited evidence consistent with the expectation that different control systems may support organisational creativity. A first block of studies provides arguments for linking cultural controls to the promotion of creativity. Inasmuch as cultural controls are an important element in influencing attitudes and behaviours inside organisations (Jaworski et al., 1993), they can be expected to influence in particular the development of a more or less creative environment. Hence, Tushman and O´Reilly (1997) suggest that in complex and uncertain environments such as the ones associated with the development of novel and creative ideas, control must come in the form of social or cultural control systems that allow directed autonomy and rely on the judgement of employees informed by clarity about vision and objectives of the business. Either through their formal components (e.g. codes of conduct, codes of ethics, organisational credos, formal mission and vision statements that explicitly put in value risk-taking and experimentation) or their informal components (e.g. shared traditions, implicit norms, values and attitudes, clan pressure, tone at the top), cultural controls may provide such clarity (Merchant and Van der Stede, 2007). Consequently,

cultural controls may be an instrument to welcome and encourage generation of ideas and creativity at the organisational level.

A second block of studies has suggested that formal feedback and measurement systems are also important in shaping an environment that nurtures creativity. More precisely, a number of studies has positively associated the interactive use of feedback and measurement systems to innovation (Bisbe and Otley, 2004; Henri, 2006; Widener, 2007). In the context of their interplay with other levers of control (Simons, 1995), interactive control systems contribute to foster the development of innovation initiatives. It is reasonable to expect that this positive association is at least partially channelled through enhanced creativity. Senior managers can use interactive control systems to build internal pressure to break out of narrow search routines and stimulate opportunity-seeking (Simons, 1995, p. 93). Interactive control systems stimulate the discussion and exchange of knowledge around critical assumptions of an organisation's current business model. They help engage the organisation in the exploration of strategic uncertainties. Interactive control systems help create (rather than eliminate) the variation required for innovation (Davila et al., 2009). As a result, interactive control systems have the ability to expand and orient opportunity-seeking providing input to the generation of creative ideas. The use of interactive control systems should then be able to help increase creativity.

While prior evidence is consistent with the expectations that both cultural controls and interactive control systems may be positively associated with creativity, the extant literature consistently suggests instead that diagnostic control systems are not positively associated to creativity since their focus is on cybernetic models whose aim is to eliminate variation regarding pre-established plans and whose mechanistic approach to decision making results in organisational inattention to shifting circumstances and the need for introducing novel patterns (Henri, 2006; Simons, 1995, 2000; Widener, 2007).

Our line of reasoning indicates that both cultural and interactive controls may be used as means for achieving the fostering of creativity. At first sight, this may be interpreted as a sign of substitutability among the two control systems since both systems need not be activated simultaneously because they both result in an equivalent firm outcome, the fostering of creativity (Dent, 1990; Fisher, 1998). However, we argue here that the extent to which either cultural controls or interactive controls are the ones that are

associated with creativity is not random, but depends instead on the strategic pattern of the firm.

Several researches have indicated the importance of understanding strategy to disentangle the relationship between the use of MACS and innovation (Bisbe and Otley, 2004; Davila et al., 2004; Miller and Friesen, 1982; O' Reilly, 1989). For example, Miller and Friesen (1982) highlighted that formal feedback and measurement systems are used differently in entrepreneurial and in conservative firms. While such control systems indicate the need for innovations in conservative firms, they are used to point to the need to curb innovative excesses in entrepreneurial firms. Jørgensen and Messner (2010) have found that organisational participants account for the appropriateness of new product development practices not only on the basis of accounting information, but also by mobilising different strategic objectives to which these practices are expected to contribute. Consequently, we think it plausible that firms under different strategic typologies combine differently substitutable components of the control package in order to achieve the same objective.

More specifically, we expect entrepreneurial firms to rely primarily on cultural controls to encourage creativity. In entrepreneurial firms, innovation is seen as good in itself and this belief is likely to permeate and to be maintained and constantly reinforced through codes of conduct, organisational credos, formal mission, shared traditions, implicit norms, values and attitudes and clan pressure. Cultural controls express the core values and beliefs of the organisation, and therefore these systems can be expected to provide inspiration and drive towards searching for new opportunities (Conant et al., 1990; McKee et al, 1989; Shortell and Zajac, 1990). While interactive control systems have the potential to encourage creativity, they are not likely to do so in this specific context. First, we expect it to be so because cultural controls are pervasive and the fostering of creativity as an existing capability is already activated through them (Abernethy and Brownell, 1997; Grafton et al., 2010; Tushman and O´Reilly, 1997). Second, because interactive control systems reveal in this context as useful in mitigating the excessive and dysfunctional generation and launching of new initiatives that may arise from the pressures of cultural controls (Bisbe and Otley, 2004; Miller and Friesen, 1982). From these arguments, we derive the following hypothesis:

H1a: *In entrepreneurial firms, cultural control systems are positively associated with organisation creativity, and this association is more positive than the association between interactive control systems and organisational creativity.*

In contrast, we expect conservative firms to rely primarily on interactive controls to encourage creativity. In conservative firms, positive attitudes towards proactive risk taking are not embedded in the organisational culture and innovation is not a natural state of affairs (Miller and Friesen, 1982). Cultural controls, from formal codes of conduct to clan pressure, emphasise efficiency and the preservation of current patterns unless major challenges or threats impose a need for change. In this context, and to the extent that an interactive use of control systems involves regular face-to-face discussions on strategic uncertainties, interactive control systems may be used by top managers to break organisational complacency, to indicate the need for and trigger the generation of new ideas, to legitimise the sparse autonomous creative initiatives that may appear spontaneously and to provide guidance on where to search for opportunities (Bisbe and Otley, 2004). Consequently, we would expect conservative firms to rely on interactive control systems to develop a new capability (Grafton et al., 2010) and hence foster the organisational creativity that tends to be naturally inhibited by cultural controls in that context. Therefore,

H1b: *In conservative firms, interactive control systems are positively associated with organisation creativity, and this association is more positive than the association between cultural control systems and organisational creativity.*

3.4.2. MACS and conversion ability

Previous literature in management accounting suggests MACS influence the ability of organisations to both exploit their existing capabilities and identify new capabilities (Chenhall, 2005; Grafton et al., 2010), including existing and new capabilities associated with innovation (Davila et al., 2004; Henri, 2006). More precisely, some

studies have shown that MACS are enablers and supporters of capabilities related to conversion ability, such as coordination capabilities (Davila, 2000; Nixon, 1998; Pavlou and El Sawy, 2006), knowledge integration capabilities (Bruhl et al, 2010; Ditillo, 2004; Vaivio, 2004; Weick and Roberts 1993; Wouters and Roijmans, 2010), and filtering practices (Bisbe and Otley, 2004; Chenhall and Morris, 1995; Cooper, 1998).

For example, Davila (2000) has observed the role of MACS in new product development projects, emphasising their contribution to coordination and uncertainty reduction by providing sources of information that close the gap between information on hand and information required to perform tasks across constituencies. In investigating knowledge-intensive setting, Ditillo (2004) has demonstrated that MACS can effectively satisfy the two complementary needs of activity coordination and knowledge integration. Finally, drawing on the communication properties of the interactive control systems, Chenhall and Morris have concluded that through MACS managers can maintain a focused view of organisational direction, capabilities and constraints. MACS allow organisations to filter and trim off creative efforts that are not in line with the managerial agenda (Chenhall and Morris, 1995). Overall, these studies indicate that MACS can contribute to the firm's ability to translate an idea into a new or improved launched product. Previous literature provides further indications suggesting that different specific MACS within the control package may support different facets of conversion ability.

Cultural controls are designed to encourage mutual monitoring and group pressure. In doing so, they may be instrumental in fostering coordination. For example, the direct interaction that results from physical and social arrangements such as open office arrangements may enhance the ability of new product development units to quickly and accurately allocate resources to project tasks. Socialisation policies make new product development managers more capable in appointing organisational members workers to relevant tasks. Both physical and social arrangements and socialisation can help managers become more capable in identifying synergies among their resources and tasks and in better synchronising their activities. By enhancing the ability of units involved in new product development to allocate resources, assign tasks, and synchronise activities, cultural controls can enhance the coordination capability (Pavlou and El Sawy, 2006). Cultural controls can also be expected to enhance knowledge

integration. Peer interaction and clan pressure enable organisational members involved in innovation projects to transfer tacit knowledge (Polanyi, 1967), to make visible what the other individuals think and do, to visualise how they fit in, to learn how their work affects others and collectively create patterns of sense-making (Ditillo, 2004). Codes of conduct, mission and vision statements and tone at the top also enhance the ability of organisational members to build shared interpretations. In sum, cultural controls can contribute to foster the collective mind and knowledge integration.

Interactive control systems can also be expected to enhance coordination and knowledge integration. By ensuring that data generated by the system becomes an important and recurring agenda in discussions with all subordinates and by ensuring that the system is the focus of regular attention by managers of different or identical hierarchical levels throughout the whole organisation, interactive control systems act as coordination devices that break down the functional and hierarchical barriers that restrict the flows of information (Henri, 2006; Simons, 1995). Hence, interactive control systems have the potential to concentrate organisational attention in one direction, coordinate flows of information and mitigate the risks of cross-functional conflict. Allocation of resources, assignment of tasks and synchronisation of activities are all done at the light of the strategic uncertainties highlighted by the interactive control system. Moreover, the continuous challenging of and debate around data, assumptions and action plans that are associated with interactive control systems facilitate knowledge dissemination and the integration of the thought worlds of multiple individuals. By providing a common forum and agenda for communication, interactive control systems can make knowledge more visible and accessible. In summary, interactive control systems have the potential to facilitate knowledge transfer between units, achieve shared sensemaking across units and eventually foster knowledge integration (Henri, 2006; Simons, 1995).

In contrast to the two previous forms of control, diagnostic control systems are not likely to be adequate means to foster the coordination and knowledge integration capabilities related to innovation. Since diagnostic control systems rely on cybernetic logic, they represent single-loop learning but not the higher level, double-loop learning (Henri, 2006) that is necessary for the coordination of activities related to the transformation of novel ideas into useable products or practices which, by nature, are

plagued by complexity and uncertainty (Abernethy and Brownell, 1997; Abernethy and Stoelwinder, 1991). Moreover, since diagnostic control systems focus organisational attention only on an exception basis, it is unlikely that they are able to help integrate the complex and developing knowledge of the multiple organisational participants into an integrated pattern (Simons, 1995). Finally, diagnostic control systems are associated with highly structured channels of communication and restricted flows of information. However, coordination and knowledge integration rely on cross-functional processes, and thus require free flows of information and open channels of communication. Diagnostic control systems would undercut the commitment of organisational actors to these cross-functional processes by reinforcing the existing lines of authority and responsibility (Abernethy and Brownell, 1999; Henri, 2006).

The foregoing arguments suggest that both cultural and interactive controls may be used as means for enhancing coordination and knowledge integration capabilities. Analogously to what we developed in the preceding section, we expect that the extent to which either cultural controls or interactive controls are the ones that are associated with coordination and knowledge integration is not random, but depends instead on the strategic pattern of the firm.[1] We think it plausible that firms under different strategic typologies combine differently substitutable components of the control package in order to achieve coordination and knowledge integration.

We expect entrepreneurial firms to rely primarily on cultural controls to foster coordination and knowledge integration of innovation activities. In the entrepreneurial model of innovation, firms innovate boldly and regularly (Miller and Friesen, 1982). Because of their high levels of innovation, entrepreneurial firms present low levels of programmability, high levels of uncertainty and difficulty of outcome measurement in the short-term. Past research has concluded that high reliance on formal feedback and measurement systems is inadequate in situations where tasks are not programmable, there is high task or goal uncertainty and outcomes are not measurable in the short term (Abernethy and Brownell, 1997; Abernethy and Stoelwinder, 1991; Ouchi, 1977). Recent studies have emphasised that this inadequacy applies primarily to diagnostic uses of formal feedback and measurement systems, whereas interactive uses of such systems may be effective in these contexts in providing a stable yet adaptive frame or reference (Davila et al., 2009). While we acknowledge this potential, we also belief that

in a context of low programmability and difficulty to measure, formal feedback and measurement systems (even if used interactively) will have limitations in its ability to provide frames of reference that foster coordination and knowledge interaction precisely because of their metrics-based nature.

Given the plausible limitations of interactive control systems regarding the enhancement of coordination and knowledge integration related to innovation activities, entrepreneurial firms can resort to cultural control. In the entrepreneurial model, bringing ideas into completion is seen as good in itself, as a vital part of strategy. Consequently, the shared traditions, norms, beliefs, attitudes and ways of behaving on which cultural controls are built cause employees to work together in a well-coordinated fashion and to integrate knowledge (Merchant and Van der Stede, 2007, p. 77). In this context, mission and vision statements and tone at the top are likely to reinforce attitudes and ways of behaving that make explicit that the organisation considers important not only the generation of ideas but also the ability to translate these ideas into useable and marketable products. Moreover, physical and social arrangements (i.e. open office arrangements, vocabulary valuing completion) are likely to deliver messages about the importance of coordination and knowledge sharing. Socialisation policies and peer interaction make sure that in an organisation that innovates so boldly and regularly, each organisational member knows as much as possible who knows what and provide channels for mutual adjustment and synchronisation. In sum, we expect entrepreneurial firms to rely primarily on cultural controls to develop coordination and knowledge integration abilities. Hence,

H2a: *In entrepreneurial firms, cultural control systems are positively associated with [coordination and knowledge integration capabilities], and this association is more positive than the association between interactive control systems and [coordination and knowledge integration capabilities]*.

In contrast, in conservative firms, innovation is not a natural, self-driven state of affairs (Miller and Friesen, 1982) and the need to innovate boldly and regularly is not embedded in the organisational culture. Shared traditions, norms, beliefs, attitudes and ways of behaving emphasise efficiency and the preservation of current patterns rather

than the effective implementation of novel patterns (Walker and Ruekert, 1987). Hence, cultural controls should not be expected in conservative firms to be highly instrumental in promoting activities and capabilities associated to innovation, including coordination and knowledge integration capabilities. Rather, when coordination and knowledge integration are needed, conservative firms are more likely to resort on interactive control systems. In absence of cultural controls being able to play that role, interactive control systems may at least help partially address the reciprocal among diverse functional specialists, the complexity and the uncertainty associated with conversion ability (Chandy et al., 2006; Chenhall and Morris, 1986). Interactive control systems provide a forum for organisational members from diverse areas to communicate and deliberate on the non-routine, under-identified multi-disciplinary problems entailed by the conversion of creative ideas into marketable products. These problems are unlikely to be amenable to quick intuitive or programmed decision-making, but may be addressed through the regular, face-to-face dialogue and debate among managers that is facilitated by the interactive use of control systems (Bisbe and Otley, 2004; Chapman, 1998; Miller et al., 1988). In absence of cultural controls doing so, interactive control systems provide and agenda and a forum for this required dialogue and debate. In nurturing consultation and collaboration, interactive control systems may help develop new organisational capabilities (Grafton et al., 2010) related to conversion ability, such as coordination and knowledge integration. We formalise this as,

H2b: *In conservative firms, interactive control systems are positively associated with [coordination and knowledge integration capabilities], and this association is more positive than the association between cultural control systems and [coordination and knowledge integration capabilities]*.

3.4.3. MACS and filtering

Filtering refers to the ability to control progress and revise resource commitment of innovation projects or initiatives (Tidd and Bessant, 2009) so that mediocre projects are abandoned, delayed or modified in scope and resources are focused on the truly meritorious projects (Cooper, 1998). Based on prior theory, diagnostic control systems

seem to be reasonable candidates for activating filtering capabilities. Diagnostic controls have been described as cybernetic tools that aim to ensure compliance and predictable goal achievement by creating constraints and eliminating deviation from pre-established plans (Henri, 2006; Simons, 1995). Applied to innovation processes, this means that diagnostic control systems limit the deployment of innovation initiatives by providing boundaries and restrict risk-taking. Diagnostic controls may contribute to control innovation progress, detect projects or initiatives that do not fit within plans and consequently provide input for decisions that involve stopping or delaying resource commitment to the progress of creative ideas into their completion as marketable products (Amabile et al., 1996; Becheikh et al., 2006).

However, diagnostic control systems are not the only means for fostering filtering practices. In the case of conservative firms, cultural controls can be expected to naturally act as filters of innovation initiatives. This is a context where norms, beliefs, attitudes and ways of behaving send consistent messages throughout the organisation reinforcing that product innovation is something that is done reluctantly and only in response to challenges. Thus, mutual monitoring and group pressure will convey that the behaviours that are expected from organisational members (Merchant and Van der Stede, 2007; Miller and Friesen, 1982) should lead to careful scrutinisation of all attempts to advance creative ideas into the conversion stage.

In contrast, in entrepreneurial firms, cultural controls are unlikely to foster filtering practices, since the cultural norms that are embodied in the written and unwritten rules that govern employees' behaviours are keen to promote experimentation and risk taking for its own sake. In fact, entrepreneurial firms face the risk of suffering an organisational momentum leading to overzealous experimentation, superfluous creativity, and eventually excessive or ill-orientated innovation with diminished returns. In this context, interactive control systems may be useful in fostering filtering practices. Through their strong level of involvement in a given management control system, top managers signal to all members of the organisation what are the firm's priorities in terms of strategic uncertainties. Hence, the use of control systems as interactive dialogue tools may be helpful for learning how to discriminate which opportunities are worthwhile and which are not given the strategic uncertainties faced by the firm, and for revealing proactively under which circumstances innovation is superfluous or ill-

directed. This is likely to lead on occasions to the non-implementation or abandonment of some shared non-focused initiatives. Overall, we expect entrepreneurial firms using interactive control systems will find it easier to avoid and filter out innovative excesses (Bisbe and Otley, 2004). This reasoning suggests the following two hypotheses:

H3a: *In entrepreneurial firms, both diagnostic and interactive control systems are positively associated with filtering practices and this association is more positive than the association between cultural control systems and filtering practices.*

H3b: *In conservative firms, both cultural control systems and diagnostic control systems are positively associated with filtering practices and this association is more positive than the association between interactive control systems and filtering practices.*

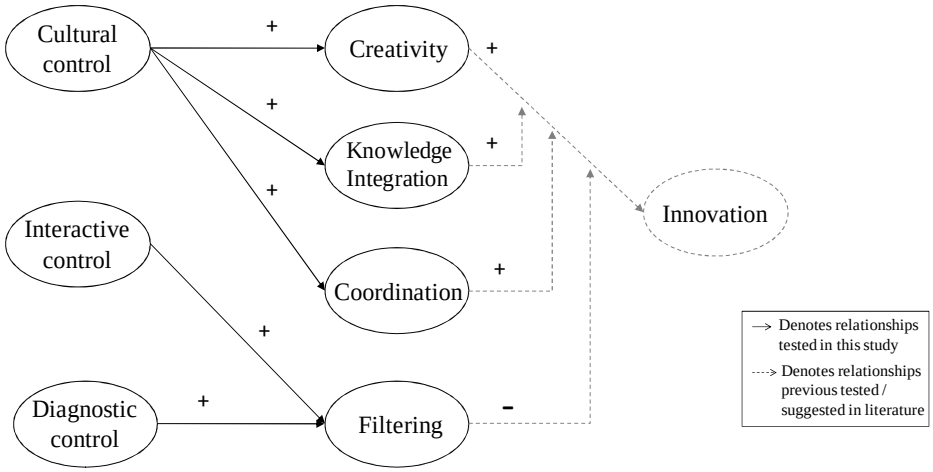

Figure 3.1.Theoretical model (entrepreneurial firms).

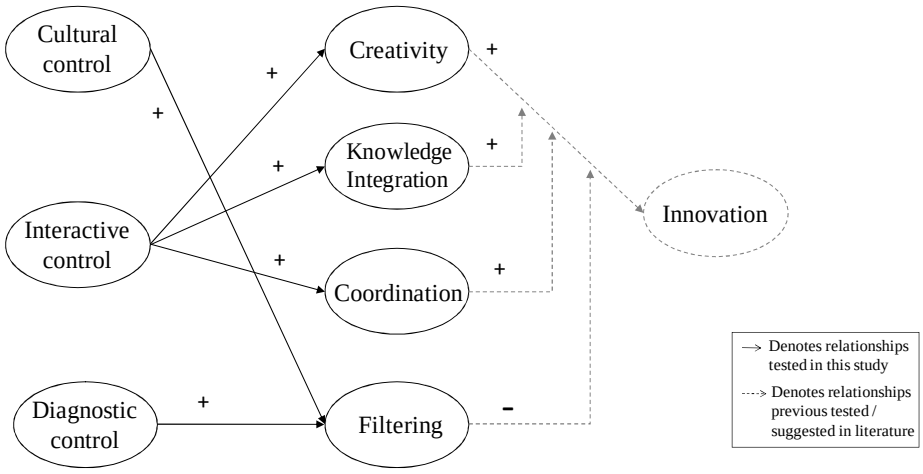

Figure 3.2.Theoretical model (conservative firms).

In this research, we focus on the effects of MACS on the development of organisational creativity and the constituents of conversion ability. The hypotheses H1 – H3 are related to such effects, as reflected and summarised in the solid lines in Figures 3.1 and 3.2. These two figures also present in dotted lines the influence of creativity and conversion ability on product innovation outputs. While we acknowledge the existence of these links in order to highlight the importance of creativity and conversion ability, we do not test them in this paper as they have already been extensively set forth and tested in previous literature. For instance, it has been argued that creativity is the raw material for later organisational innovations (Shalley et al., 2003). Prior evidence consistently suggests that in fact employee and organisational creativity are positively associated with organisational innovation and, in particular, with product innovation (Amabile et al., 1996; Woodman et al., 1993; Baron and Tang, 2011). Furthermore, innovation and marketing literature have comprehensively demonstrated the beneficial contributions of knowledge integration and coordination practices to the success of new product development. More specifically, they have suggested a positive moderating effect of both coordination and knowledge integration on the relationship between creativity and innovation (see Figures 3.1 and 3.2) (Gomes et al., 2003; Hirunyawipada et al, 2010). Similarly, Parthasarthy and Hammond (2002) have suggested that functional integration is a significant moderator in the innovation input-outcome relationship. Finally, filtering practices have been portrayed as gates in the innovation processes (Tidd and Bessant, 2009), so that the higher the filtering practices, the weaker the association between the

level of creativity and the amount of innovation outputs (even though some studies suggest a positive moderation regarding innovation performance) (Cooper, 1998).

3.5. Research Method

3.5.1. Sample selection and data collection

Empirical data were collected by a written survey questionnaire administered to a sample of CEOs (Chief Executive Officers) in medium and large-sized Spanish firms. For the purpose of sample selection, we considered medium and large-sized firms as those with a minimum turnover of 10 million Euros and a minimum of 50 employees[2]. In order to control the potential, spurious effects of unanalysed variables, we circumscribed our database to unlisted manufacturing firms located in Catalonia[3] from which we excluded subsidiaries of multi-national companies with headquarters outside Spain[4]. Our use of the SABI 2008 (Iberian Balance Sheet Analysis System) database yielded 554 active firms meeting the screening criteria that were object of survey.

Questionnaires were distributed and returned by mail. Following Dillman's guidelines (Dillman, 2006), several procedures were employed in order to increase the likelihood of a high response rate and in order to increase the likelihood of the CEO actually receiving and personally replying to the questionnaire. To encourage completion of the questionnaire, participants were informed of the anonymity of their responses and were promised a summary of the research findings. Before survey implementation, the questionnaire was pre-tested among four top executives for clarity, understandability, ambiguity, and face validity (Dillman, 2006).

A four-step implementation procedure was applied (Dillman, 2006). Therefore, four submissions were done. First, a prenotice letters was sent informing about the research. This was followed by a first round of the questionnaire package (one week later, in May 2010). This package included a cover letter, a two-page questionnaire, and a postage-paid envelop. Two weeks later, reminder postcards were sent out. Follow-up phone calls (two weeks after the reminder postcard) were made to ask the collaboration of non-respondents. Finally a second round of questionnaire package was distributed in June 2010. After the two rounds, 126 questionnaires were returned, representing a response

rate of 22.7%. This compares well with the response rate of similar studies (Van der Stede et al, 2006). The final sample was made up of 120 usable questionnaires.[5]

T-tests supported the absence of differences between early and late respondents and of non-response bias (see Table 3.1)[6]. Harman's one-factor test on the 37 questions used to form the constructs resulted in 7 factors with eigenvalues>1 (first factor explaining to 37% of the total variance), suggesting that common method variance due to single source biases was not a serious threat in this study (Podsakoff and Organ, 1986). Table 3.2 reports the manufacturing industry classification according to CNAE (*Clasificación Nacional de Actividades Económicas*) code.

Table 3.1. Non-response bias

Panel A: Respondents vs. non-respondents		
Variable	Respondents (n = 126)	Non-respondents (n = 428)
Sales (in millions)	53.312	40.025
Number of employees	185	157
Panel B: Early respondents vs. late respondents		
Construct	Early respondents (n = 68)	Late respondents (n = 52)
Cultural Controls	4.98	5.09
Interactive Controls	5.32	5.10
Diagnostic Controls	5.75	5.36
Coordination Capability	4.97	4.84
Collective Mind	4.93	4.77
Cross-Functional Integration	5.31	5.11
Filtering	4.84	4.79
Organisational Creativity	4.93	5.08

** Means are significantly different at p-value < 0.05.

Table 3.2. Manufacturing industry classification

CNAE† manufacturing industry classification	Frequency	%
10 – Food	8	6.7%
11 – Beverage	1	0.8%
13 – Textile	6	5.0%
14 - Manufacture of wearing apparel	2	1.7%
16 - Manufacture of wood and cork, except furniture	1	0.8%
17 – Paper	9	7.5%
18 - Printing and reproduction of recorded media	5	4.2%
20 – Chemical	18	15.0%
21 – Pharmaceutics	13	10.8%
22 - Rubber and plastic products	4	3.3%
23 - Non-metallic mineral products	7	5.8%
24 – Metallurgy	4	3.3%
25 - Metal products, except machinery and equipment	11	9.2%
26 - Computer, electronic and optical	4	3.3%
27 - Electrical equipment	7	5.8%
28 - Machinery and equipment	9	7.5%
29 - Motor vehicles, trailers and semitrailers	5	4.2%
31 – Furniture	2	1.7%
32 - Other manufacturing industries	4	3.3%
Total sample	120	

†Clasificación Nacional de Actividades Económicas

3.5.2. Definition and measurement of constructs

The constructs used in this research were measured by multiple indicators. Scales already available in the literature were employed where possible and adapted to the specific context of the research. All scales and indicators are provided and discussed in this section.

In this research, we used Miller and Friesen (1982) distinction between entrepreneurial and conservative firms to organise strategic typologies. Miller and Friesen (1982)'s classification involves dimensions of risk taking and product innovation. The dimension risk taking was measured by the two indicators previously developed by Miller and Friesen (1982). The dimension product innovation was measured using the instrument used by Bisbe and Otley (2004), which measures through 7-point Likert scales the rate of introduction of new products in comparison with competitors, the tendency of firms to pioneer, and the percentage of the product portfolio corresponding to newly launched products. Firms whose average of scores on new product performance and risk taking were less than or equal to the median ($\leq$4.6) on the 7 point scales were classified as

conservative (n = 62). Firms whose score on new product performance and risk taking was greater than the median were classified as entrepreneurial (n = 58).

The conceptualisation and operationalisation of cultural control has been ambiguously described in literature. Previous research has associated and/or overlapped the concept of cultural control with other forms of controls such as, group control (Abernethy and Brownell, 1997), clan control (Govindarajan and Fisher, 1990; Ouchi, 1980), social control (e.g., O'Reilly, 1989; Rockness and Shields, 1988), personal control (Wiersma, 2009), professional control (Abernethy and Stoelwinder, 1995; Orlikowsky, 1991), ideological control (Collier, 2005; Ditillo, 2004) and informal control (Cravens et al., 2004). In this paper, we adopted Merchant and Van der Stede (2007)'s conceptualisation of cultural controls which includes both informal (e.g. management philosophy, ideology, values) and formal (e.g. codes of conduct, codes of ethics, written mission statements) elements. In line with this approach, we define cultural controls as the set of written and unwritten values, rules, attitudes and ways of behaving that organisations foster as an attempt to shape their organisational culture, to encourage mutual monitoring and influencing employees' behaviours.

This research measures cultural control (CCS) through five survey questions that asked to indicate on a 7-point Likert scale the extent to which: a) top managers communicate the organisational values, b) the company use code of conducts to inform employees about undesirable behaviours, c) the environment encourages group feeling at departments, d) employees are aware of co-workers activities, e) employees are aware of organisational values. The instrument used to measure cultural controls was based on a combination of the measures of informal cultural control developed by Jaworski et al (1993) and the measures of formal beliefs and boundaries systems previously tested by Widener (2007).

Interactive control systems (ICS) are formal control systems used by managers to get involved in the decision activities of subordinates, to debate on strategic uncertainties and to encourage dialogue between managers and lower level of management as well as among organisational members (Simons, 1995, 2000). In this paper, we followed Bisbe et al. (2007) to identify five specific constitutive dimensions of ICS: (1) an intensive use by top management; (2) an intensive use by operating managers; (3) a pervasiveness of face-to-face challenges and debates; (4) a focus on strategic uncertainties; and (5) a non-

invasive, facilitating and inspirational involvement. These dimensions were measured with indicators assessed with 7 point Likert scales. Indicators for (1) and (2) were based on items developed by Widener (2007) and (3) on an item developed by Henri (2006). Items corresponding to (4) and (5) were developed on the basis of the conceptualisation described in Bisbe et al. (2007). ICS was modelled as a first-order formative construct derived from these five constitutive dimensions.

Diagnostic control systems (DCS) represent the traditional feedback role of MACS. Those systems are used on an exception basis to monitor the achievement of pre-established goals (Simons, 1995, 2000). In order to measure DCS we adapted the instruments of Naranjo-Gil and Hartmann (2007) and Widener (2007). Therefore DCS was captured by 4 items that asked respondents about the use of controls systems for: a) monitoring financial results, b) focusing on critical success factors, c) comparing outcomes, and d) tracking progress toward goals. Those questions were assessed in a 7 point Likert scale.

Organisational creativity refers to the capability of creating valuable and useful ideas, procedures, or products by individuals that work together in a complex social system (Amabile et al., 1996; Woodman et al, 1993; Zhou and Shalley, 2008). In this research, organisational creativity is measured by the instrument developed by Lee and Choi (2003), which addresses how the organisation perceives its production of novel and creative ideas for new products. Five survey questions asked respondents to indicate on a 7-point Likert scale the extent to which the firm in the last three years a) had produced many novel ideas, b) fostered an environment that is conductive to the ability to produce novel and useful ideas, c) spent much time for producing novel and useful ideas, d) considered producing novel and useful ideas as important activities, and e) actively produced novel and useful ideas.

In this research we assessed knowledge integration through: a) the ability to integrate the thought and knowledge of multiple individuals into a pattern of mindful interrelations (i.e. collective mind, Weick and Roberts, 1993), and b) the quality of interaction among diverse functional areas (i.e. cross-functional integration, Sherman et al., 2000). Accordingly, in this research knowledge integration was measured as a reflective second-order construct that considers two specific domains of integration: collective mind and cross-functional integration. Both collective mind and cross-

functional integration were measured through an adapted, 7-point Likert scale (1 = strongly disagree to 7 = strongly agree), version of the questionnaire items developed and validated by Pavlou and Sawy (2006). Hence, collective mind was measured by three questionnaire items that capture the effectiveness of interrelating activities in face of rapid changing conditions, awareness of group members about the skills and knowledge of co-workers, and successfulness of interconnection among activities. Cross-functional integration was measured using the two-item scale first developed by Song and Parry (1997) and subsequently used by other researchers (Pavlou and El Sawy, 2006), that captures the interaction among departments involved in NPD projects, and the perceived cross-functional effort of NPD projects.

In this study, we separated the notion of coordination from knowledge integration (Teece et al., 1997) to concentrate on the coordination capability understood as the ability to manage and synchronise businesses resources and tasks on a continuing basis (e.g., Helfat and Raubitschek, 2000). The coordination capability was measured based on the response of three questionnaire items aiming to capture the effective synchronisation, dependency and usefulness of the activities developed by employees that participate in NPD work units (Pavlou and El Sawy, 2006).

Filtering practices refers to the operating procedures that organisations use to filter away excess complexity and extraneous signals facilitating on the selection of specific initiatives (Cooper, 1998; Simons, 1995: 15). In this research we considered this definition to develop an instrument that ask respondents to assess through 7-point Likert scales the extent to which their companies: a) promoted frequent meetings to assess projects, b) were able to rule out undesirable initiatives, c) developed technological appraisals of on-going projects, and d) developed financial appraisals of on-going projects.

Descriptive statistics for the multi-item variables are reported in Table 3.3.

Table 3.3. Descriptive statistics for survey items

	Min	Max	Mean	Median	Std. dev.
Cultural Controls					
Top managers communicate values *(CC1)*	2	7	5.16	5.00	1.24
Code that defines appropriate behaviour *(CC2)*	1	7	4.51	5.00	1.76
Environment fosters group feeling *(CC3)*	1	7	5.42	6.00	1.19
Awareness of co-workers' activities *(CC4)*	1	7	4.39	4.71	1.35
Workforce is aware of values *(CC5)*	2	7	5.42	6.00	1.25
Interactive Controls					
Intensive use by top management *(ICS1)*	1	7	5.72	6.00	1.37
Intensive use by operating managers *(ICS2)*	1	7	5.07	5.00	1.33
Face-to-face debate *(ICS3)*	1	7	5.05	5.00	1.58
Focus on strategic uncertainties *(ICS4)*	1	7	4.94	5.00	1.49
Non-invasive enabling decision making *(ICS5)*	1	7	5.37	6.00	1.32
Diagnostic Controls					
Monitor financial results *(DCS1)*	1	7	5.75	6.00	1.51
Focus on critical success factors *(DCS2)*	1	7	5.29	6.00	1.40
Compare outcomes to expectations *(DCS3)*	2	7	5.47	6.00	1.35
Track progress towards goals *(DCS4)*	1	7	5.88	6.00	1.20
Organisational Creativity					
Constant production of new ideas *(CRE1)*	2	7	4.98	5.00	1.35
Environment that fosters novel (useful) ideas *(CRE2)*	2	7	4.96	5.00	1.30
Time spent for producing novel (useful) ideas *(CRE3)*	2	7	4.60	5.00	1.34
Importance devoted to novel (useful) ideas *(CRE4)*	2	7	5.40	6.00	1.39
Last year's production of new (useful) ideas *(CRE5)*	1	7	5.03	5.00	1.46
Coordination Capability					
Work tasks fit together *(COO1)*	2	7	4.79	5.00	1.18
Usefulness of outputs by other groups *(COO2)*	2	7	4.95	5.00	1.24
Work is synchronised *(COO3)*	2	7	4.99	5.00	1.25
Collective Mind					
Interrelated activities meet conditions *(COL1)*	2	7	4.66	5.00	1.24
Awareness of group members' skills *(COL2)*	2	7	5.20	5.00	1.21
Successful relation among group activities *(COL3)*	2	7	5.00	5.00	1.25
Cross-functional Integration					
Frequent interactions between departments *(CFI1)*	2	7	5.23	5.00	1.34
NPD projects are multi-departmental efforts *(CF2)*	2	7	5.18	5.00	1.43
Filtering NPD activities/initiatives					
Frequent meetings to evaluate projects *(FIL1)*	2	7	5.14	5.00	1.24
Processes to rule out undesirable initiatives *(FIL2)*	1	7	4.31	4.00	1.46
Technological appraisal of on-going projects *(FIL3)*	1	7	4.87	5.00	1.46
Budgetary appraisal of on-going projects *(FIL4)*	1	7	4.97	5.00	1.45
Risk Taking					
Strong proclivity to low risk projects (rev.)	1	7	4.18	4.00	1.40
Gradually exploring environment (rev.)	1	7	4.49	5.00	1.54
New Product Performance					
New products launched in the last 3yrs	1	7	4.96	5.00	1.52
First to market new product development	1	7	4.51	5.00	1.63
% of new products in portfolio	1	7	4.70	5.00	1.34

n = 120

3.5.3. Research Method

We tested our hypotheses using partial least squares (PLS) regression analysis through SmartPLS version 2.00 (Ringle, et al., 2005). PLS is particularly suited to this study because it is especially accurate for small sample size and robust for formative models (Ringle, et al., 2009). Previous research has observed that covariance-based methods

such as LISREL are appropriate to the analysis of formative constructs only under certain conditions and usually result in non identified models (Jarvis et al., 2003).

First, we assessed the reliability and validity of the measurement model. Second, the structural model is assessed and bootstrapping (1000 samples with replacement) is used to evaluate the statistical significance of each path coefficient. These separate analyses guarantee that the constructs' measures are reliable and valid before the nature of the relations between the constructs is assessed (Hair et al., 2006; Hulland, 1999). As our hypotheses are framed in the existence of two strategic patterns, results for the measurement and structural models were performed separately for both entrepreneurial and conservative firms.

3.6. Results

Individual item reliability for reflective constructs was assessed on the basis of the factor loadings. Table 3.4 reports factor loadings for first-order (Panel A) and second-order (Panel B) constructs. All items loaded on their respective reflective constructs with factor loadings above 0.50 (Hulland, 1999) and only two items for the entrepreneurial model, namely CC3 and CC4, loaded less than 0.70. Even though individual item reliability is considered satisfactory when factor loading is greater than 0.70, which implies that more than 50% of the variance in the variable is shared with the construct (Chin, 1998), in this study we decided to keep those two items in the analysis as the composite of reliability of their constructs were above 0.8. The reliability of each construct was assessed through both the Fornell and Larcker's (1981) measure of composite reliability (Dillon-Goldstein ρ) and Cronbach's alphas (see Table 3.4).

Table 3.4. Estimation of the measurement model parameters first and second order constructs

Panel A. First-order constructs						
	Entrepreneurial Model (n = 58)			Conservative Model (n = 62)		
	Loading	Cronbach alpha	Composite Reliability ρ	Loading	Cronbach alpha	Composite Reliability ρ
Cultural Controls		0.750	0.830		0.874	0.907
CC1	0.803			0.854		
CC2	0.801			0.866		
CC3	0.568			0.714		
CC4	0.754			0.888		
CC5	0.570			0.736		
Interactive Controls		(F)	(F)		(F)	(F)
ICS1	0.926			0.891		
ICS2	0.362			0.704		
ICS3	0.566			0.571		
ICS4	0.799			0.614		
ICS5	0.658			0.847		
Diagnostic Controls		0.835	0.890		0.927	0.948
DCS1	0.812			0.907		
DCS2	0.889			0.919		
DCS3	0.853			0.909		
DCS4	0.712			0.885		
Organisational Creativity		0.901	0.927		0.906	0.930
CRE1	0.849			0.875		
CRE2	0.904			0.901		
CRE3	0.888			0.851		
CRE4	0.828			0.802		
CRE5	0.762			0.829		
Coordination		0.909	0.943		0.901	0.937
COO1	0.941			0.891		
COO2	0.941			0.932		
COO3	0.875			0.912		
Collective Mind		0.843	0.905		0.850	0.909
COL1	0.908			0.896		
COL2	0.811			0.851		
COL3	0.895			0.883		
Cross-functional Integration		0.788	0.904		0.782	0.901
CFI1	0.904			0.921		
CFI2	0.912			0.889		
Filtering Practices		0.801	0.870		0.779	0.857
FIL1	0.709			0.733		
FIL2	0.792			0.718		
FIL3	0.847			0.853		
FIL4	0.813			0.791		
Panel B.Second-order construct						
	Loading	Cronbach alpha	Composite Reliability ρ	Loading	Cronbach alpha	Composite Reliability ρ
Knowledge Integration		0.897	0.924		0.896	0.924
COL1	0.906			0.858		
COL2	0.727			0.805		
COL3	0.870			0.875		
CFI1	0.832			0.898		
CFI2	0.868			0.764		

CCS = Cultural Controls; ICS = Interactive Control Systems; DCS = Diagnostic Control Systems; CRE = Organisational Creativity; COO = Coordination Capability; COL = Collective Mind; CFI = Cross Functional Integration; FIL = Filtering Practices; F = Formative Measurement Models

As depicted in Table 3.4, the composite reliability and Cronbach's alphas for each variable are above 0.75, which demonstrates acceptable reliability (Nunally, 1978). Convergent validity of the constructs was evaluated by the average variance extracted

(AVE) (Fornell and Cha, 1994). In Table 3.5 and Table 3.6, all first-order reflective constructs' exhibit AVE greater than 0.50, indicating convergent validity (Chin, 1998; Hair et al., 2006).

Table 3.5. Discriminant validity coefficients, correlations and square root of average variance extracted per first-order construct (entrepreneurial firms, n = 58)

	AVE	CCS	ICS	DCS	COO	CFI	COL	FIL	CRE
CCS	0.501	**0.707**							
ICS	(F)	0.449	**(F)**						
DCS	0.671	0.370	0.764	**0.819**					
COO	0.846	0.555	0.417	0.349	**0.920**				
CFI	0.825	0.537	0.497	0.397	0.718	**0.908**			
COL	0.761	0.551	0.378	0.250	0.867	0.803	**0.872**		
FIL	0.627	0.318	0.410	0.327	0.587	0.536	0.519	**0.792**	
CRE	0.718	0.453	0.324	0.357	0.644	0.649	0.630	0.527	**0.848**
SIZ	1.000	0.051	0.085	0.206	-0.031	0.030	-0.061	0.202	0.020

Diagonal elements (bold) are the square root of the variance shared between the constructs and their indicators (AVE). Off-diagonal elements are the correlations among constructs; for discriminant validity, diagonal elements should be larger than off-diagonal elements. F = formative measurement model; CCS = Cultural Controls; ICS = Interactive Control Systems; DCS = Diagnostic Control Systems; CRE = Organisational Creativity; COO = Coordination Capability; COL = Collective Mind; CFI = Cross Functional Integration; FIL = Filtering Practices; SIZ = Size

Table 3.6. Discriminant validity coefficients, correlations and square root of average variance extracted per first-order construct (conservative firms, n = 62)

	AVE	CCS	ICS	DCS	COO	CFI	COL	FIL	CRE
CCS	0.664	**0.815**							
ICS	(F)	0.618	**(F)**						
DCS	0.819	0.598	0.775	**0.905**					
COO	0.832	0.590	0.643	0.544	**0.912**				
CFI	0.820	0.490	0.631	0.519	0.701	**0.905**			
COL	0.769	0.599	0.714	0.616	0.861	0.792	**0.877**		
FIL	0.601	0.540	0.591	0.483	0.606	0.539	0.671	**0.775**	
CRE	0.726	0.279	0.304	0.205	0.441	0.417	0.487	0.258	**0.852**
SIZ	1.000	0.238	0.107	0.196	0.081	0.238	0.065	0.151	-0.131

Diagonal elements (bold) are the square root of the variance shared between the constructs and their indicators (AVE). Off-diagonal elements are the correlations among constructs; for discriminant validity, diagonal elements should be larger than off-diagonal elements. F = formative measurement model; CCS = Cultural Controls; ICS = Interactive Control Systems; DCS = Diagnostic Control Systems; CRE = Organisational Creativity; COO = Coordination Capability; COL = Collective Mind; CFI = Cross Functional Integration; FIL = Filtering Practices; SIZ = Size

Tables 3.5 and 3.6 report the assessment of discriminant validity. Comparison of the square root of AVE statistics to the correlations among the latent variables reveals adequate discriminant validity since the square roots of the AVEs (diagonal) are greater than the respective correlations between variables (Fornell and Larcker, 1981). Discriminant validity was also supported by the cross-loading of constructs (Tables 3.7 and 3.8) since all the loadings of the scale items on their assigned construct were larger than their loading on any other construct (Barclay et al., 1995; Chin, 1998). Overall, the results from the PLS measurement model suggest that each construct exhibits adequate reliability and validity.

The formative measurement models for ICS were evaluated for multicollinearity. We assessed multicollinearity based on (a) the tolerance level of the indicators and (b) the condition index of the indicators. Results for the construct ICS for both the entrepreneurial and the conservative model indicated that tolerance levels were between 0.34 and 0.74 (above the 0.10 level under which there would be indications of multicollinearity (Hair et al., 2006, p. 208). Condition indexes were between 9.70 and 19.16 (values between 10 and 30 suggest moderate multicollinearity while values larger than 30 would suggest severe multicollinearity) (Belsley et al., 1980, 117). Consequently, we considered that tests did not indicate problematic multicollinearity on the formative construct.

Table 3.7 - Cross-Loading (Entrepreneurial Firms, n = 58)

	Cultural control	Interactive control	Diagnostic control	Creativity	Coordination	Cross integration	Collective mind	Filtering
CCS1	**0.8032**	0.3366	0.2108	0.3011	0.4083	0.3028	0.3567	0.2122
CCS2	**0.8010**	0.3388	0.2934	0.3507	0.4007	0.3818	0.3714	0.1821
CCS3	**0.5675**	0.3832	0.2373	0.0605	0.3098	0.1333	0.2366	0.2233
CCS4	**0.7543**	0.1960	0.2288	0.4495	0.5469	0.5753	0.5813	0.2140
CCS5	**0.5699**	0.4387	0.3673	0.3053	0.2121	0.3520	0.2810	0.3231
ICS1	0.3717	**0.9259**	0.7874	0.3265	0.3792	0.4927	0.3478	0.3488
ICS2	0.2165	**0.3624**	0.5183	0.1312	0.1169	0.1672	0.0804	0.2060
ICS3	0.2427	**0.5663**	0.5859	0.1703	0.2634	0.0731	0.0666	0.4007
ICS4	0.3749	**0.7991**	0.4978	0.2217	0.3167	0.4482	0.3788	0.3075
ICS5	0.4392	**0.6577**	0.3157	0.2000	0.2811	0.3620	0.2842	0.2378
DCS1	0.3878	0.7635	**0.8121**	0.2006	0.2645	0.3751	0.1990	0.2341
DCS2	0.2904	0.6803	**0.8895**	0.3687	0.3555	0.3823	0.2584	0.2758
DCS3	0.3382	0.6261	**0.8529**	0.3623	0.3148	0.3230	0.2128	0.3066
DCS4	0.1741	0.3914	**0.7116**	0.2039	0.1755	0.1906	0.1263	0.2567
CRE1	0.2946	0.3335	0.3170	**0.8489**	0.5225	0.4236	0.4562	0.4253
CRE2	0.3377	0.3211	0.3116	**0.9035**	0.5116	0.5403	0.4932	0.4008
CRE3	0.4195	0.2841	0.2921	**0.8879**	0.5776	0.5907	0.5969	0.4115
CRE4	0.4816	0.3242	0.3849	**0.8283**	0.5989	0.6625	0.6110	0.5961
CRE5	0.3845	0.0763	0.1849	**0.7620**	0.5165	0.5268	0.5139	0.3846
COO1	0.5302	0.4355	0.3470	0.5692	**0.9413**	0.6474	0.7804	0.5379
COO2	0.5523	0.3747	0.3595	0.6218	**0.9410**	0.6507	0.7965	0.5032
COO3	0.4424	0.3315	0.2469	0.5897	**0.8751**	0.6911	0.8262	0.5879
CFI1	0.4152	0.3113	0.2471	0.5922	0.6017	**0.9043**	0.7113	0.4367
CFI2	0.5569	0.5859	0.4703	0.5869	0.7000	**0.9125**	0.7474	0.5350
COL1	0.4709	0.3984	0.1650	0.5855	0.7360	0.8005	**0.9085**	0.4914
COL2	0.4316	0.1582	0.1628	0.4961	0.7344	0.5581	**0.8110**	0.3935
COL3	0.5364	0.4053	0.3220	0.5629	0.8041	0.7229	**0.8946**	0.4669
FIL1	0.2576	0.3407	0.2115	0.5253	0.4575	0.5114	0.4593	**0.7087**
FIL2	0.3044	0.3368	0.2627	0.4299	0.4363	0.4741	0.4384	**0.7923**
FIL3	0.2043	0.1514	0.1982	0.3726	0.5046	0.3610	0.4354	**0.8472**
FIL4	0.2193	0.4075	0.3314	0.3340	0.4663	0.3322	0.3179	**0.8128**

CCS = Cultural Controls; ICS = Interactive Control Systems; DCS = Diagnostic Control Systems; COO = Coordination Capability; CFI = Cross Functional Integration; COL = Collective Mind; FIL = Filtering Practices; CRE = Organisational Creativity; INN = Product Innovation

Table 3.8 - Cross-Loading (Conservative Firms, n = 62)

	Cultural control	Interactive control	Diagnostic control	Creativity	Coordination	Cross integration	Collective mind	Filtering
CCS1	**0.8536**	0.5535	0.4491	0.1812	0.5318	0.4766	0.5155	0.4771
CCS2	**0.8659**	0.4824	0.5283	0.1793	0.4384	0.3270	0.4260	0.4528
CCS3	**0.7139**	0.2780	0.3404	0.1566	0.2493	0.1880	0.3242	0.3044
CCS4	**0.8883**	0.5972	0.5545	0.3384	0.6299	0.5628	0.6205	0.5300
CCS5	**0.7357**	0.5185	0.5278	0.2335	0.4359	0.3130	0.4688	0.3766
ICS1	0.5633	**0.8914**	0.7261	0.2978	0.6153	0.5472	0.6120	0.4794
ICS2	0.5168	**0.7044**	0.7762	0.1420	0.4987	0.3091	0.4997	0.5020
ICS3	0.3871	**0.5728**	0.5477	0.1272	0.3412	0.3018	0.3579	0.4700
ICS4	0.4530	**0.6138**	0.5678	0.1521	0.3573	0.3533	0.3713	0.4910
ICS5	0.5392	**0.8480**	0.6631	0.2157	0.5044	0.5311	0.6251	0.5733
DCS1	0.5553	0.6758	**0.9073**	0.1317	0.4716	0.4323	0.5788	0.4140
DCS2	0.5762	0.7676	**0.9192**	0.2548	0.6042	0.5661	0.6246	0.4322
DCS3	0.5190	0.7000	**0.9086**	0.2107	0.4978	0.4840	0.5800	0.4838
DCS4	0.5108	0.6477	**0.8853**	0.1219	0.3551	0.3638	0.4117	0.4165
CRE1	0.2217	0.2121	0.1081	**0.8753**	0.2400	0.2498	0.3300	0.1701
CRE2	0.2113	0.3175	0.2103	**0.9006**	0.4348	0.4225	0.4659	0.2457
CRE3	0.1974	0.2097	0.1313	**0.8507**	0.3386	0.3759	0.3545	0.1931
CRE4	0.2638	0.3154	0.2253	**0.8022**	0.3834	0.3844	0.4377	0.2416
CRE5	0.2797	0.2170	0.1768	**0.8294**	0.4544	0.3294	0.4577	0.2354
COO1	0.4436	0.4994	0.3732	0.4158	**0.8913**	0.5522	0.7455	0.4749
COO2	0.5765	0.6117	0.5076	0.3790	**0.9321**	0.5534	0.7708	0.5211
COO3	0.5679	0.6242	0.5674	0.4145	**0.9120**	0.7739	0.8279	0.6325
CFI1	0.5413	0.6357	0.5099	0.5017	0.7403	**0.9214**	0.8070	0.5010
CFI2	0.3290	0.4969	0.4239	0.2315	0.5130	**0.8891**	0.6134	0.4744
COL1	0.5564	0.6274	0.5398	0.5206	0.8369	0.6923	**0.8962**	0.5867
COL2	0.4804	0.6585	0.5183	0.3778	0.6879	0.6363	**0.8509**	0.6073
COL3	0.5355	0.5954	0.5610	0.3804	0.7386	0.7513	**0.8831**	0.5735
FIL1	0.4294	0.5022	0.3731	0.4516	0.5640	0.5657	0.6254	**0.7333**
FIL2	0.2805	0.4077	0.2661	0.0840	0.3260	0.2954	0.4309	**0.7175**
FIL3	0.4426	0.4579	0.4027	0.0759	0.4572	0.4411	0.4738	**0.8528**
FIL4	0.4868	0.4475	0.4303	0.1251	0.4824	0.3175	0.5149	**0.7909**

CCS = Cultural Controls; ICS = Interactive Control Systems; DCS = Diagnostic Control Systems; COO = Coordination Capability; CFI = Cross Functional Integration; COL = Collective Mind; FIL = Filtering Practices; CRE = Organisational Creativity; INN = Product Innovation

Tables 3.9 and 3.10 present results of the analysis of the structural model, including the path coefficients, their associated t-values, R^2 and Q^2 of the endogenous constructs. This table depicts results for the relationships between control variables and capabilities related to innovation processes as predicted in H1 to H3.

The results presented in Table 3.9 show that, as predicted by H1a, in entrepreneurial firms cultural controls are positively associated with organisational creativity (β = 0.387, t = 4.463, $p < 0.01$). Moreover, and also in line with H1a, the positive association between cultural controls and organisational creativity seems to be stronger than the association between interactive control systems and organisational creativity (β = 0.152, t = 1.960, $p < 0.05$).

As far as hypothesis H2a is concerned, the results for coordination and knowledge integration practices suggests that, as predicted, in entrepreneurial firms cultural

controls systems have positive effects on coordination (β = 0.460, t = 5.602, p < 0.01) as well as on knowledge integration (β = 0.465, t = 6.769, p < 0.05). Also in accordance with H2a, these effects appear to be stronger than the effects produced by the use of interactive controls on respectively coordination (β = 0.160, t = 1.423, p > 0.05) and knowledge integration (β = 0.291, t = 2.151, p < 0.05), respectively.

Further results depicted in Table 3.9 suggest that in entrepreneurial firms, as expected by H3a, interactive control systems are associated with higher levels of filtering (β = 0.347, t = 2.174, p < 0.05) and that this association is more positive than the association between cultural controls and filtering, which was not found to be significant (β = 0.166, t = 1.639, p > 0.05) (H3a). Contrary to our expectation, we did not find evidence of a significant association between the use of diagnostic control systems and filtering practices associated to innovation.

Table 3.9. PLS structural model: path coefficients, t-statistics, Stone–Geisser Q^2 – test and R^2

Dependent	Independent					
	Cultural control	Interactive control	Diagnostic control	Size	Q^2	R^2
Entrepreneurial firms (n=58)						
Creativity	0.387**	0.152*			0.169	0.229
	(4.463)	(1.960)				
Coordination	0.460**	0.160	0.074	-0.083	0.294	0.351
	(5.602)	(1.423)	(0.686)	(1.209)		
Knowledge	0.465**	0.291*	-0.044	-0.064	0.270	0.389
Integration	(6.769)	(2.151)	(0.477)	(1.042)		
Filtering	0.166	0.347*	-0.035	0.171*	0.127	0.218
	(1.639)	(2.174)	(0.392)	(2.112)		

Note. Cells report the path coefficient (t-value). Blank cells specify the path was not tested in the PLS model.
**Significant at p-value <0.01 (one-tailed). *Significant at p-value <0.05 (two-tailed).

Table 3.10. PLS structural model: path coefficients, t-statistics, Stone–Geisser Q^2 – test and R^2

Dependent	Independent					
	Cultural control	Interactive control	Diagnostic control	Size	Q^2	R^2
Conservative firms (n=62)						
Creativity	0.148	0.216*			0.072	0.107
	(1.311)	(1.671)				
Coordination	0.318**	0.428**	0.032	-0.046	0.387	0.477
	(2.856)	(3.466)	(0.462)	(0.900)		
Knowledge	0.211*	0.536**	0.061	0.023	0.388	0.548
Integration	(1.978)	(4.375)	(0.755)	(0.618)		
Filtering	0.277**	0.439**	-0.031	0.044	0.235	0.401
	(2.618)	(3.089)	(0.324)	(0.823)		

Note. Cells report the path coefficient (t-value). Blank cells specify the path was not tested in the PLS model.
**Significant at p-value <0.01 (one-tailed). *Significant at p-value <0.05 (two-tailed).

Table 3.10 reports results for conservative firms. In our findings, we observe that as predicted by H1b, interactive control systems are positively associated with organisational creativity ($\beta = 0.216$, $t = 1.671$, $p < 0.05$). In conservative firms, cultural controls are not significantly associated with creativity. As far as hypothesis H2b is concerned, our results support the expectations that interactive controls systems are positively associated with both coordination capabilities ($\beta = 0.428$, $t = 3.466$, $p<0.01$) and knowledge integration capabilities ($\beta = 0.536$, $t = 4.375$, $p < 0.01$) and that these associations are stronger than the associations between cultural controls and respectively coordination ($\beta = 0.318$, $t = 2.856$, $p < 0.01$) and knowledge integration ($\beta = 0.211$, $t = 1.978$, $p < 0.05$).

Finally, results reported in Table 3.10 indicate that in conservative firms, cultural controls are associated with filtering practices ($\beta = 0.277$, $t = 2.618$, $p < 0.01$), as posited by H3a. However, and contrary to the expected, we did not find evidence of a significant association between diagnostic control systems and filtering practices, and instead we did find evidence of a strong association between interactive control systems and filtering practices ($\beta = 0.439$, $t = 3.089$, $p < 0.01$).

In order to test the statistical differences in the effects as predicted by hypotheses H1a to H3b, we further performed a battery of partial F tests for the cultural and interactive control system path coefficients. Results for the partial F tests are presented in Table 3.11 and they indicate statistical significance of the difference between the tested paths, hence supporting the previously observed findings.

Table 3.11. Partial F test for Cultural and Interactive Control Systems

	Entrepreneurial Firms			Conservative Firms		
	Path coeff.	Partial F test	p-value	Path coeff.	Partial F test	t-stat.
Effect on Org. Creativity						
Cultural Control > Creativity	0.385	7.902	0.001	0.148	3.488	0.037
Interactive Control > Creativity	0.152			0.212		
Effect on Coordination Capability						
Cultural Control > Coordination	0.460	8.898	0.000	0.318	9.751	0.000
Interactive Control > Coordination	0.162			0.428		
Effect on Integration Capability						
Cultural Control > Integration	0.465	11.505	0.000	0.211	11.273	0.000
Interactive Control > Integration	0.292			0.537		
Effect on Filtering Practices						
Cultural Control > Filtering	0.167	3.143	0.051	0.277	7.795	0.001
Interactive Control > Filtering	0.348			0.440		

Note: The table presents path coefficients, partial f tests and respective p-values for cultural control systems and interactive control systems effects as an independent variable. Although not presented in the table diagnostic control systems and size were included in partial f tests where suitable.

3.7. Discussion and Conclusion

Evidence provided by a recent stream of empirical research offers solid grounds to conclude that management accounting and control systems (MACS) may positively contribute to the innovation effort in organisations facing uncertain environments (Davila et al, 2009). However, little is known yet about the channels by which and how the different components of the complex control packages that firms have in place influence the different stages of the innovation process. This paper aims to shed light on this under researched issue by investigating the extent to which three forms of control systems within the control package (i.e. cultural controls (Merchant and Van der Stede, 2007), diagnostic control systems and interactive control systems (Simons, 1995)) are associated with different stages of the innovation process such as creativity and three facets of conversion ability (i.e. coordination, knowledge integration and filtering).

Empirical results obtained from a sample of 126 medium and large Spanish companies provide evidence suggesting that entrepreneurial firms (Miller and Friesen, 1982; Langfield-Smith, 2007) rely primarily on cultural forms of control to encourage creativity as well as to develop knowledge integration and coordination. In entrepreneurial firms, interactive control systems are used to a lesser extent to promote creativity and knowledge integration, and they are the primary form of control associated with filtering practices. Diagnostic control systems do not appear to be

associated with any of the capabilities associated with conversion ability. As far as conservative firms are concerned, our findings suggest that creativity is associated with the use of interactive control systems. Interactive control systems are also related to conversion ability through the development of coordination, knowledge integration and filtering. In this context, cultural controls are not associated with creativity, but they appear to be helpful in promoting coordination and knowledge integration. Our data also indicate that in conservative firms, filtering practices are channelled through both cultural systems and interactive control systems, but not through diagnostic control systems.

From these results, it can be inferred that entrepreneurial firms balance cultural controls as means for both encouraging creativity and strengthening the effects of creativity on innovation through higher knowledge integration and coordination on the one hand with interactive controls that develop filtering capabilities that mitigate the association between creativity and innovation on the other hand. In contrast, conservative firms use interactive control systems as means to encourage creativity in the first place but also to strengthen the effects of creativity on innovation through higher knowledge integration and coordination. This is balanced by cultural controls, which develop filtering capabilities that mitigate the association between creativity and innovation. It is worth noticing the absence of association between diagnostic control systems and filtering practices in both entrepreneurial and conservative firms. It is plausible that this lack of association is caused by the fact that diagnostic systems focus on correcting deviations from preset standards of performance and are rather mechanistic in tracking and supporting the achievement of predictable goals (Henri, 2006; Simons, 1995) whereas innovation activities tend to be not programmable, highly uncertain and prone to exceptions (Abernethy and Brownell, 1997). Therefore, it is reasonable that the nature of diagnostic control systems makes them unsuitable for activating filtering practices related to innovation. Instead, interactive control systems involve a continuous challenge and debate of data, assumptions and action plans and a focus on strategic uncertainties and therefore can be instrumental in fostering such filtering practices.

Overall, our findings support that each specific form of control within the control package has different influences on the different components or stages of the innovation process. Moreover, the significance and direction of these influences varies between

entrepreneurial and conservative firms. By associating specific forms of control within the control package with specific components or stages of the innovation process, our results highlight the simultaneous complementarities and supplementarities between specific MACS. Firms use different specific MACS in different stages of the innovation process and hence sets of specific MACS are collectively bundled as complements in order to achieve successful innovation (e.g. entrepreneurial firms use cultural controls as a primary means for promoting creativity whereas filtering is achieved primarily through interactive control systems). At the same time, however, our findings indicate that both creativity and conversion ability can be achieved through alternative ways, and that firms pursuing different strategic patterns use different specific MACS as alternative ways (or use MACS with different emphasis) to develop a given capability (e.g. creativity is associated with cultural controls in entrepreneurial firms but it is associated with interactive control systems in conservative firms). Hence, our findings challenge the traditional dilemma between specific MACS as complements and specific MACS as supplements (Davila et al., 2009; Fisher, 1998). Rather, our findings suggest that specific MACS are both supplements (i.e. different specific MACS can enable and support a given stage of the innovation process, and firms choose different specific MACS in order to enable and support the same component of the innovation process depending on their strategic pattern) and complements (i.e. for the innovation process to be successfully carried out, the different stages must be integrated and therefore the different specific MACS chosen or emphasised in each stage become integrated with other specific MACS chosen for or emphasised in the remaining stages). Hence from an overall view of the innovation process perspective MACS are complements. In summary, we argue that MACS are simultaneously supplements and complements.

This paper contributes to the literature that examines the effects of management accounting and control systems on innovation in three ways. First, it provides deeper insights into the relationship between MACS and innovation by focusing on the components or stages of the innovation process and providing large scale evidence about the channels through which MACS influence the different components of the innovation process. Second, it explores whether specific MACS within the control package (Malmi and Brown, 2008), including both formal and informal forms of control, influence differently the distinct components of the innovation process. Third,

this paper highlights that firms under different strategic patterns engage differently in this interplay between specific MACS within the control package.

While the results of this study shed some light on the role of MACS as antecedents of product innovation processes, some limitations must be noted which can be addressed in subsequent research. First, our study takes the organisation as the unit of analysis, and therefore is not able to delve into potential differences in the type and source of innovation initiatives (e.g. radical versus incremental). Second, the sample of this study was selected from medium and large-sized manufacturing organisations firms in a given specific geographical context. Potential generalisations of the results obtained in this study in other contexts should be done with caution. Some limitations of our study are inherent to the selected research methodology. We opted for a large-sample, cross-sectional study in order to test some associations at a given point in time. This methodological choice raises concerns about causality (Chenhall and Moers, 2007). Further similar studies could use longitudinal case studies to extend and complement our findings (Modell, 2010).

3.8. Notes

[1] Other studies have analysed whether the association between different forms of control and the coordination and knowledge integration capabilities is dependent on variables such as the nature of the knowledge complexity (Ditillo, 2004).

[2] This criteria follows the definition of medium and large sized companies provided by the European Commission (European Commission, 2003).

[3] Catalonia refers to the north-eastern area of Spain with the Barcelona metropolitan area as its manufacturing centre.

[4] In this study subsidiaries of multi-national companies (MNCs) with headquarters outside Spain were removed from original sample as defined by location and minimum turnover and number of employees. This decision was motivated by empirical evidence that suggests most often subsidiaries of non-Spanish MNCs do not locate their innovation activities in Spain (Barcelo, 1993; Hermosilla, 2001). Consequently we excluded subsidiaries of MNCs that are owned by a global ultimate owner in a country other than Spain. In order to be considered a subsidiary of a global ultimate owner, a company must have at least one of its shareholders known and a path from a subject company up to its ultimate owner of at least 50.01%.

[5] We used a semantic differential scale question to identify whether respondent firms are appropriate to be part of the sample by ruling out firms that do not ever participate in new product development projects. In this way, we were able to identify and exclude 5 firms that had not been involved at all into new product development projects. One further observation was not included in the final sample as respondent reported not to be a member of the top management team.

[6] Among the returned questionnaires 16 contained missing data (14 cases with one item missing and two cases with three items missing). Little's MCAR test was performed to check whether missing data were completely at random. Results confirm missing data is MCAR (Chi-Square = 552.762, degrees of freedom = 514, $p > 0.10$). Imputation of missing data values was computed through maximum likelihood estimation. More specifically we relied on the EM (expectation maximisation) algorithm provided by SPSS. According to Pickles (2005), this method is less demanding in terms of statistical assumptions and is usually considered superior to imputation by other methods, such as multiple regression or mean substitution.

[7] For preliminary bias tests variable scores based on the average item scores for the Likert-type instruments were used.

3.9. References

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Chapter 4: Assessing Performance in Management Accounting Research

4.1 Introduction to chapter 4

The fourth chapter in this thesis examines the most assessed variable in contingency-based research, commonly referred as effectiveness, performance, or success. This paper contains a literature review and a theoretical note that investigates how management accounting research has assessed such variable, emphasising potential problems and proposing guidelines that could contribute to improve future research. Several versions of this paper have circulated in academic settings. The paper presented in this thesis was discussed in the *9th Manufacturing Accounting Research Conference*.

4.2. Abstract

This paper aims to review how the construct performance has been assessed in prior contingency-grounded, survey-based management accounting and control systems research, to analyse the alternative approaches that have been adopted in the literature, and to provide some insights for enhancing the assessment of performance in future survey-based empirical research. First, the paper identifies a total of 82 survey-based, contingency-grounded papers published in top accounting journals in the period 1982-2008 where performance was used as a variable of analysis. Specifically, this study examines the problems of a) conceptualisation that are reflected on threats to construct validity and b) measurement. The article emphasises issues that could assist researchers in selecting between the various available choices of performance measurement by considering their respective weaknesses and strengths.

4.3 Introduction

The importance of performance for management has long been recognised. High or improved performance is considered the ultimate goal of the specific configurations of activities and resources that companies deploy in order to develop their competitive advantages (Collis and Montgomery, 2005). Consequently, management research has widely discussed on the use of performance as a variable, to the extent that performance is one of the most studied variables in

organisational and management literatures (Venkatraman and Ramanujam, 1987; Bommer et al., 1995).

Within the specific area of contingency-based management accounting and control systems (MACS) research, a number of studies disclosed interest for investigating the relationship between MACS and performance (Hayes, 1977; Khandwalla, 1977). The interest in the construct performance in MACS literature increased even further after researchers appended to the earlier contingency studies the notion of "fit" between attributes of MACS and outcomes and claimed that outcome variables related to dimensions of desired organisational or managerial performance should be included in contingency-based studies (Merchant and Simons, 1986; Otley, 1980; Otley and Wilkinson, 1988). A good fit between MACS and context should mean enhanced performance, while a poor fit should imply diminished performance (Chenhall, 2003).

Even though in recent years noteworthy progress has been made by MACS researchers to ensure proper construct conceptualisation, measurement and a greater correspondence between concepts and measures (Bisbe et al., 2007; Chenhall and Moers, 2007; Gerdin and Greve, 2008; Luft and Shields, 2003), some concerns are particularly striking when performance is the construct of interest (Lebas and Euske, 2008). March and Sutton (1997) for instance, show scepticism regarding the use of such variable due to the conflicting basis surrounding the use of performance as a dependent variables[1], the unstable advantages of higher performance, and the endogeneity problems associated with the choice for the variable performance as an criterion[2] variable.

Notwithstanding the criticisms performance continues to be constantly assessed in management research and therefore it warrant appraisal and discussion. This paper aims to review how performance has been assessed in prior contingency-based empirical quantitative MACS research. In order to organise this analysis we present the discussion on subjects related to conceptualisation, measurement and correspondence between concepts and measures. The contribution of this study is threefold. First, it provides an exhaustive review of the different approaches to measurement of performance that have been used in extant survey-based MACS research grounded on contingency theory. Using an adaptation of Venkatraman and Ramanujam's (1986, 1987) classification scheme, an organised inventory of papers is proposed in order to identify and assess the relative frequency of use of the different measurement approaches used in previous MACS literature. As a result of this organised inventory, the paper

provides specific supporting evidence that self-reported perceptual measures are clearly the predominant approach being used for assessing performance in extant MACS research.

Consequently, and as a second contribution of the paper, it discusses some of the most relevant problems associated with such a predominant method of performance assessment. This article organises these problems into, on the one hand, conceptualisation problems (reflected as potential risks of misspecification) and, on the other hand, problems of operationalisation (caused by different sources of potential bias). This paper evaluates several alternatives concluding that none of them is free of concern. As a third contribution of the paper, it provides insights that are expected to assist researchers in enhancing conceptualisation and measurement of subsequent quantitative research using the variable performance.

The paper is divided into five sections. Following this introduction, Section 4.4 defines the sample that will be the object of this study. Section 4.5 examines the literature on MACS to identify the various methods applied for assessing performance and proposes a classified inventory of prior studies. Section 4.6 discusses the concerns associated with the conceptualisation and operationalisation of performance as a variable. This section also elaborates on alternatives to improve (minimise) the quality (problems) of the construct and its measurement. Following this, Section 4.7 concludes and comments on the contributions of the paper.

4.4 Sampling

In order to depict conceptualisation and measurement issues regarding the treatment of the construct performance that has been proposed in contingency-based MACS research, a systematic review was conducted of the empirical survey-based MACS studies published in accounting journals in the period 1982-2008.

In this study only research on formal MACS is considered. Management accounting and control systems is defined here as the set of procedures and processes that managers and other organisational participants use in order to help ensure the achievement of their goals and the goals of their organisations (Otley and Berry, 1994), and it encompasses formal control systems as well as informal personal and social controls (Chiapello, 1996; Otley, 1980; Ouchi, 1977). Formal MACS consist of purposefully designed, information based and explicit sets of structures, routines, procedures and processes (Maciarello and Kirby, 1994) that help managers

ensure that their organisation's strategies and plans are carried out or modified if conditions warrant (Merchant, 1998; Simons, 1995).

For the period 1982-2001 we relied on Van der Stede et al. (2007)'s review in order to obtain an enumeration of survey-based studies that could be found in MACS literature. Following Van der Stede et al. (2007) selection criteria we extended the inventory through the period 2002-2008, by a review focusing on the following journals: *Abacus; Accounting, Organizations and Society*; *Behavioral Research in Accounting*; *Contemporary Accounting Research*; *Journal of Accounting and Economics*; *Journal of Accounting Research*; *Journal of Management Accounting Research*; *Management Accounting Research*; and *The Accounting Review*.[3] Furthermore, in order to provide continuity with Van der Stede et al.'s (2007) paper, our review did not include experimental or qualitative studies.[4] It also excluded third party-surveys, surveys that were combined with case method, interview-protocols, on-site interviews, as well as studies conducted in class settings.

This review identified 222 MACS survey-based studies published in the journals mentioned above in the period 1982-2008 (132 in the period of 1982-2001, 130 of those as identified by Van der Stede et al., 2007; 90 in the period of 2002-2008, as per our own review). Eighty two of these (44 in the period of 1982-2001; 38 in the period of 2002-2008) analysed a variable labelled as performance or a similar term such as effectiveness and financial success. [5] These 82 studies constitute the sample of analysis in this paper.

4.5 Descriptive Analysis

As expected, most of the 82 analysed papers modelled performance as a dependent variable (Otley, 1980). Six articles did not, i.e. (Chenhall and Langfield-Smith, 1998; Dossi and Patelli, 2008; Indjejikian and Matejka, 2006; Lamminmaki, 2008; Merchant, 1985; Wier et al., 2002). For instance, Merchant (1985) modelled performance as an independent variable, and Chenhall and Langfield-Smith (1998) used performance as a component for clustering firms.

Previous studies on MACS had concentrated on investigating performance within two levels of analysis: individual and organisational (Luft and Shields, 2003). Williams and Seaman (2002) noticed that a significant proportion of the management accounting research deals with the performance outcomes of managers and analysis is often referred to as located at the individual level. Accordingly, in this paper we use interchangeably the terms managerial and individual

performance. Moreover, in our study papers in which the unit of analysis was referred as strategic business unit (SBU), firm or organisation, e.g. (Maiga and Jacobs, 2005) were considered organisational level research.

Among the inspected papers, it was observed that 40 (49%) of them analysed organisational performance while 33 (40%) examined individual performance. Other levels of analysis, such as teams, projects or departments were present in only 9 (11%) studies. While the prevalence of studies looking at the individual level was constant over the years, there was a notable increase in interest in the last decade of researchers measuring organisational performance. From 1982 to 2001, published papers on the organisational level amounted to 17 (39%), compared to the 22 (50%) papers published at the individual level. In the last seven years of this review, from 2002 to 2008, studies on the organisational level amounted to 23 (61%), compared to the 11 (29%) studies at the individual level. While our discussion on the remainder of this paper focuses on these two, most studied levels, it is expected that the largest part of the arguments presented here could be extended to levels such as project or team performance.

The subsections below describe in detail how was performance assessed in terms of conceptualisation and measurement.

4.5.1 Conceptualisation

Conceptualisation (or conceptual specification) refers to the process in which fuzzy notions of constructs are made more precise (Babbie, 2004). Although performance is a recurrent dependent variable in research, the analysis of the evidence reveals it is seldom explicitly conceptualised in empirical MACS research.

The construct of performance is one of the clearest examples of risk of misspecification in MACS studies. Babbie (2004) highlights the need for a sound conceptual specification of research constructs prior to fitting them to explanatory models. The measurement instrument should not be regarded as an antecedent of the variable conceptualisation. It seems logical to think the definition of a construct (independent of what it is) should prior the measurement of it. However MACS research has been unconcerned about this issue when performance is to be conceptualised. In most cases it is almost as if the conceptualisation is defined by measurement method and not by the attribute being measured. [6]

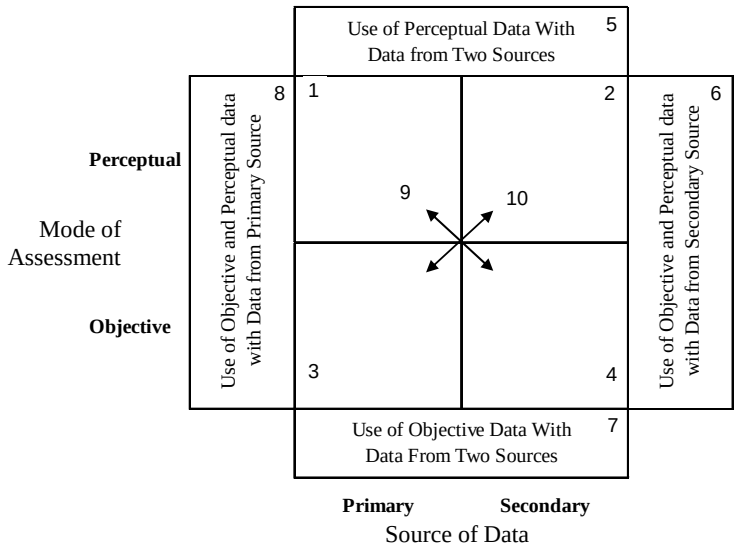
Given the uncountable calls that alert researchers in social science to the problems associated with the conceptualisation of the construct performance (Venkatraman and Ramanujan, 1986, 1987), it is hard to believe MACS research assume the idea of performance is a given, a trivial notion free from conceptual concerns to be explicitly disclosed. A most probable explanation for the lack of conceptualisation could be found in the problems that are inherent to the term performance (March and Sutton, 1997). The apprehension of defining performance in management research is not novel (Cameron, 1986). Different conceptualisations of performance are discussed on Section 4.6.

4.5.2 Measurement

Venkatraman and Ramanujam (1986, 1987) proposed a classification scheme to examine the construct performance in empirical research. According to the authors, two dimensions provide different approaches to the measurement of the construct performance, i.e., 1) the mode of assessment and 2) the source of data. The mode of assessment can be either perceptual or objective. Perceptual data are constructed from the judgments and opinions of respondents that are surveyed about their perceptions, evaluations, and/or experiences (e.g. the superior's rating of employees' performance; a CEO self-report of overall organisational performance). Objective data refer to data that can be duplicated or captured with a very high degree of consensus by independent assessors using the same measurement methods (Riahi-Belkaoui, 2002, p. 6) (e.g. stock price; total production output per hour). Ultimately, objective data are expected to be free from perceptual judgments.

As far as the second dimension of the classification scheme is concerned, researchers can use primary or secondary data sources. Primary (i.e. self-reported) data refer to data collected directly from the specific individual or organisation whose performance is being assessed (e.g. the assessment of an SBU's overall performance by its manager, assuming that the SBU manager is the representative of the SBU; an employee's self-report about his performance in several tasks). In contrast, secondary data are collected from sources external to the target individual or organisation (e.g. information acquired from governmental agencies' about firms' turnover; external observers' perception of company decision-making process).[7] Based on these two dimensions of analysis developed by Venkatraman and Ramanujam (1986, 1987), an eight-cell classificatory model is depicted in Figure 4.1.[8]

Figure 4.1. Measurement Performance: Classificatory Scheme by level of analyses



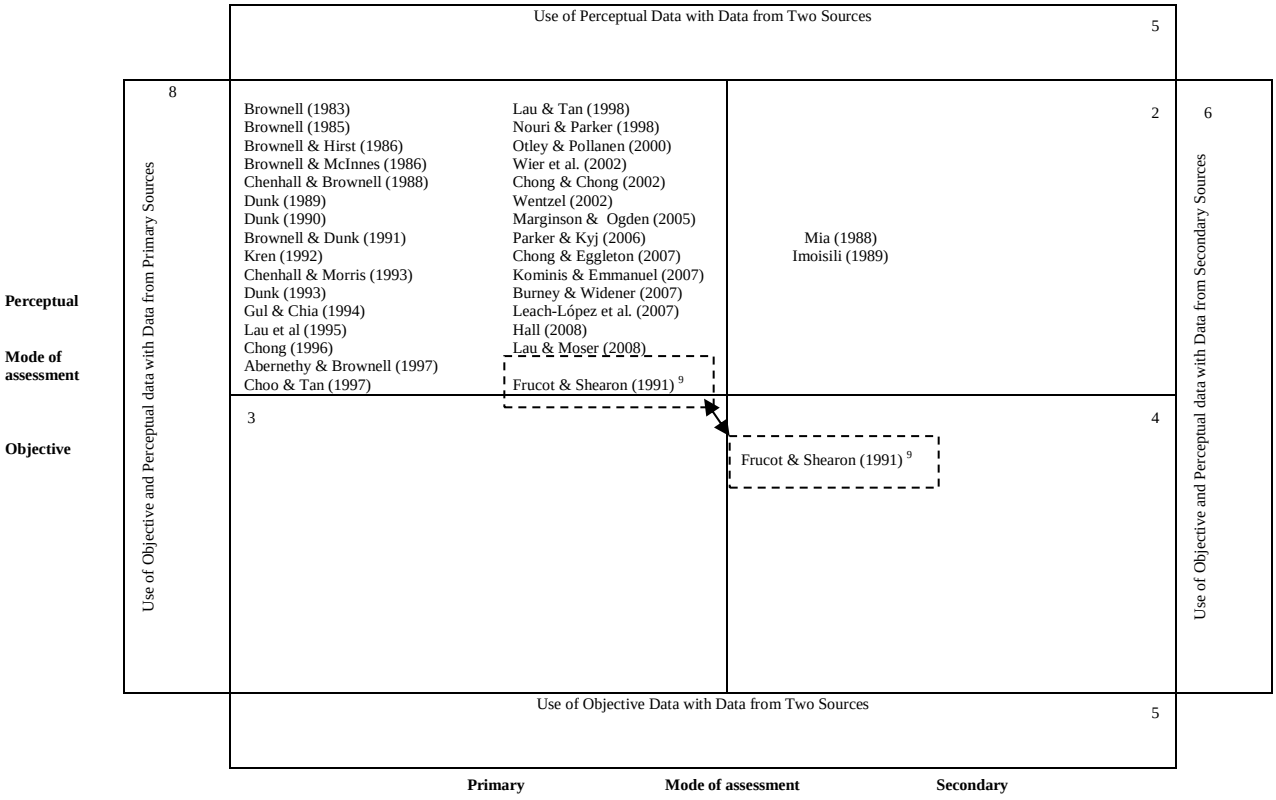
Source: Adapted from Venkatraman and Ramanujam (1986, 1987)

In Figure 4.1, cells 1 through 4 represent approaches that are restricted to operationalisation within one single cell. For example, cell 1 and 2 represent perceptual data obtained respectively by either primary or secondary sources. Cells 3 and 4 refer to objective data obtained respectively by either primary or secondary sources. In contrast, cells 5 through 8 represent operationalisation via the combination of multiple distinct methods (multiple method approach). For example, cell 5 includes use of perceptual data with data from two sources, while cell 8 refers to the use of both objective and perceptual data with data from primary sources. Finally, Arrows 9 and 10 refer to multiple method approaches that combine different approaches within each of the two dimensions. Hence, Arrow 9 encompasses measurements that apply perceptual primary and objective secondary methods. Finally, Arrow 10 refers to methods that use objective primary and perceptual secondary data.

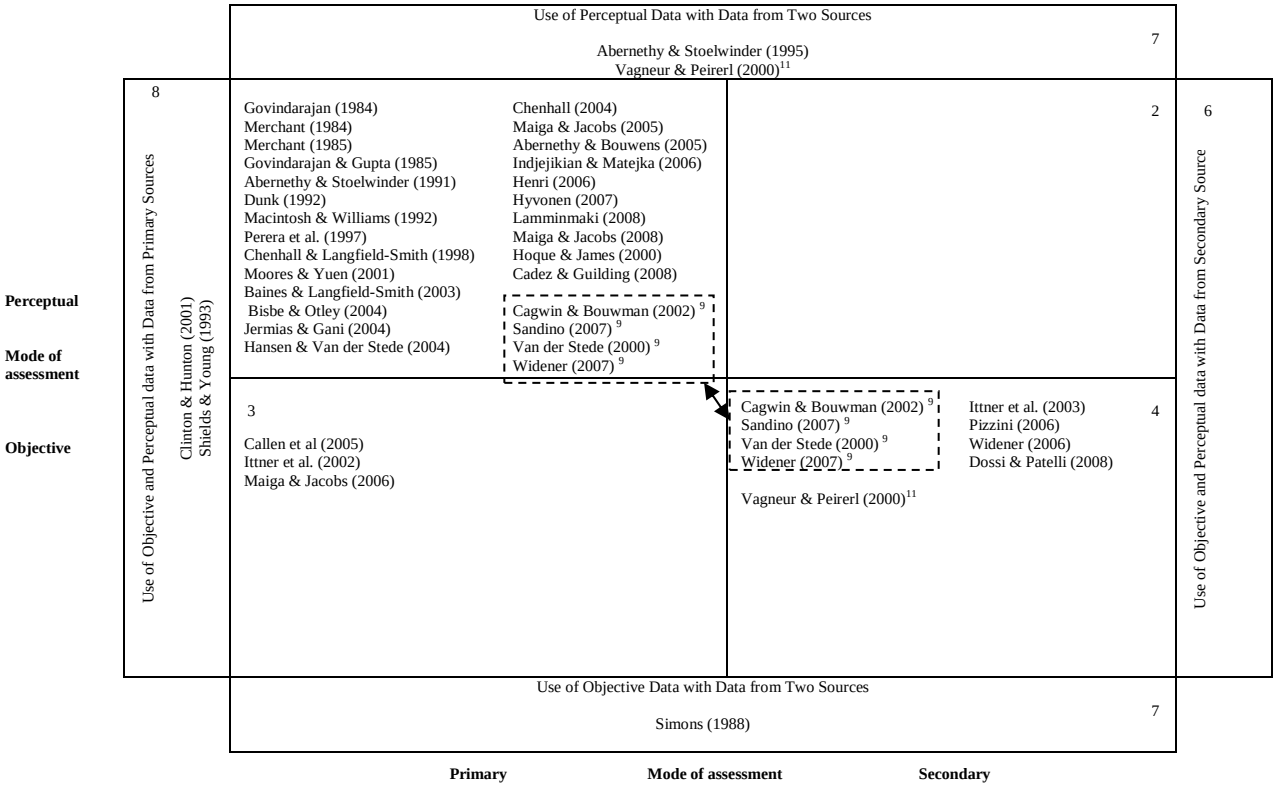
Figure 4.2 depicts the papers that are part of our sample and allocate them according to this classificatory scheme. Panel A in Figure 4.2 classifies the papers that included individual performance as a variable of interest. Panel B classifies the papers that refer to organisational performance.

Figure 4.2. Classificatory scheme for the treatment of performance in survey-based MACS studies

Panel A. Individual Level



Panel B. Organisational Level



This review confirms a previous observation (Chenhall, 2003) that most researchers employ perceptual data from primary sources to capture performance. Studies that exclusively use primary and perceptual measures of performance (cell 1) account for 91% and 60%, respectively at the individual and organisational levels.

At the individual level of analyses, as discussed next, nearly all of the articles employed the Mahoney's self-reported instrument for assessing individual performance (82% of 33 observed papers). In contrast, the range of methodologies used for capturing performance at the organisational level is moderately more diverse. These vary from measurements that assess firm performance through self-reported measurement of overall firm performance (Merchant, 1984) (cell 1) to methods that use objective archival data about firm return on sales (ROS) and return on assets (ROA) (Van der Stede, 2000; Widener, 2006) (cell 4). However, and despite this moderate diversity of approaches, research at the organisational level is largely dominated by the employment of primary and perceptual measures of performance. Of the eight studies that rely on secondary objective measures, four of those employed solely such measures while the other four articles utilised combinations of secondary objective with primary perceptual measures (i.e. Arrow 9 on the classificatory scheme).

Studies assessing individual performance can be found in cells 1, 2 and 9 of Figure 4.2 (Panel A). Studies assessing organisational performance can be found in all cells (1 to 9), except cells 2 and 6. On Appendix 1 there is a more detailed presentation of methods utilised for assessing performance at the individual and organisational levels in contingency survey-based MACS research. Studies are also allocated according to the classificatory scheme proposed.

4.6 Concerns and Proposed Improvements

4.6.1 Conceptualisation

Performance is not different from other social science constructs and its conceptualisation is required. For instance, it is also difficult to identify consensus on what defines a Balanced Scorecard (Bisbe et al., 2007) however definitions are still observed in empirical MACS research. The absence of a clear conceptualisation of the construct leads to ambiguity regarding the specific meaning of the construct under consideration. Conceptualisation has implications for the way constructs are operationalised, and therefore ambiguity threatens the subsequent operationalisation of the construct by hindering construct validity. Consequences are revealed on

the use of inappropriate measurement instruments that cannot capture the true notion of the construct. Finally, deficient conceptualisation would mislead towards flawed conclusions regarding the existence, magnitude and direction of the relations (Babbie, 2004) between performance and other variables. Therefore, "the clearer the specification of performance, the more appropriately its reliability can be estimated and the greater the benefit for estimation of the validity coefficient or its analog" (Campbell, 1990, p. 698).

The nature and meaning of the construct performance depends on the purpose of the research. Some attributes might be required to capture certain features of performance, while other attributes are required to capture certain other purposes. This indicates performance has a context-specific nature and that there is no universal construct of it. A context-specific nature of performance would reinforce the argument that the conceptualisation of performance entails the explicit establishment of the domain of the construct, including consideration of the purposes or contexts of interest.

Conceptualisation improvement is needed when firm or managerial performance is being assessed. Far from requiring a universally-accepted definition, which has long been recognised as unfeasible (Chow et al, 1994; Lebas, 1995) [9], in this paper we invite for any context-specific conceptualisation.

In the following section, we present some conceptualisations of performance that were proposed in management literature and that could assist MACS researchers to properly conceptualise the construct. The conceptualisations we present next are neither exhaustive (other conceptualisations exist; see for instance Campbell, 1977, p. 36-9, Cameron, 1986, p. 542 or Lebas and Euske, 2008), nor precise (they leave space for discussion). Nevertheless, the following conceptualisations are general starting points for conceptualisation improvements.

4.6.1.1 Managerial Performance

At the individual level the conceptualisation of managerial performance in industrial psychology and management literature has been closely associated with the understanding of managerial work (Campbell, 1990). We can identify in the literature at least three major groups for conceptualising managerial performance, which are: a) goals and tasks attainment (Kotter, 1982), b) managerial actions (Campbell, 1990; Mintzberg, 1973) and functions (Mahoney et al., 1963), and c) skill or competencies (Boyatzis, 1982; Carrol and Gillen, 1984; Katz, 1974).

According to the goal and tasks approach, managers have basic goals that they are committed to based on their strategic evaluations of the organisations and their environments. Managers act as "consummate opportunists" to take advantage of every situation to move others in the organisation toward their basic goals (Kotter, 1982). Therefore performance is the attainment of the work agenda.

The idea of managerial performance as actions, inter-actions, and thinking can be found in researchers such as Mintzberg (1973) and Campbell (1990). Mintzberg (1973) found that the manager's job was characterised by many brief episodes carried out with a wide variety of different people from inside and outside the organisation. Accordingly, Campbell (1990) defines performance as behaviour. To the author, performance is “something that people do and is reflected in the actions that people take. (…) Performance is not the consequence(s) or result(s) of action; it is the action itself” (Campbell, 1990, p. 704). While behaviour is not always observable like the cognitive behaviour used to solve a problem, the solutions, statements or answers produced as a result of the cognitive behaviours are included as actions that can be defined as performance. Furthermore, into the conceptualisation of performance as action we can identify the functional approach. This last approach comprehends the degree of progress on purposes of activities. Therefore, managerial performance is conceptualised as the action of doing a set of managerial functions in a correct or successful manner.

Managerial performance can also be understood as key management skills or competencies (Boyatzis, 1982; Carrol and Gillen, 1984; Katz, 1974) neither goals nor functions. Katz (1974) names three basic skills – technical, human, and conceptual – that every successful manager must have in varying degrees, according to the level of management at which he is operating. This approach is based not on their innate traits and characteristics, but rather on the kinds of skills which they exhibit in carrying out their jobs successfully. The concept of skill, as an ability to translate knowledge into action, should enable one to distinguish between the three skills: performing the technical activities (technical skill), understanding and motivating individuals and groups (human skill), and coordinating and integrating all the activities and interests of the organisation toward a common objective (conceptual skill).

4.6.1.2 Organisational Performance

At the organisational level, we can identify in literature at least three most applied conceptualisations of performance. These concepts that follow were mostly studied by organisational theorists through models of organisational effectiveness. Kanter and Brinkerhoff (1981) and Ford and Schellenberg (1982) summarise those studies in a reduced framework, identifying perspectives of performance such as, effectiveness or goal approach, systems resource approach, and environmental adaptation. The goal approach considers that organisations pursue ultimate goals. According to this perspective, performance is defined in terms of goal attainment. The second framework also refereed as efficiency, defines performance in terms of the outcome of a business' programs in relation to the resources employed in implementing them (Walker and Ruekert, 1987). It considers the relationships between performance outcomes to the inputs required to achieve those (Katsikeas et al., 2000)[10]. The environmental adaptation approach, also known as adaptiveness, emphasises the relationship between the organisation and its environment. Performance focuses on the ability of an organisation to respond to environmental changes (Katsikeas et al., 2000). Thus, performance is referred to in terms of the organisation's ability to secure scarce and valued resources. Along this line, organisational survivor has been suggested as the ultimate criterion.

4.6.2 Construct Space and Epistemic Relationship

Once the conceptualisation is delineated, researchers move to map constructs onto phenomena that can be directly observed and measured (Bollen and Lennox, 1991). In this respect a major difficulty of assessing performance is to define the construct space of the concept. The problem arises on the fact that it is not clear which criteria are indicators of performance, which are predictors of performance and which criteria are outcomes of performance (Whetten and Cameron, 1994). Some choices have to be made in order to define the conceptual boundaries of the construct. Bisbe and Otley (2004), for example, adapted Govindarajan's (1984) instrument for assessing performance excluding the product innovation dimension from the original set of indicators, as this dimension was modelled as an antecedent to performance.

In order to build a construct that specifies, through indicators, the signs of the presence or absence of the construct under investigation two alternative models are available. The reflective and formative models represent different natures and directions of epistemic relationships[11] between constructs and indicators (Bollen and Lennox, 1991).

In MACS research, performance has been commonly measured using reflective indicators. For reflective models, indicators are reflections of a construct, while for formative models; indicators are constitutive facets of a construct. In reflective models indicators are expected to covary, changes in the construct necessarily cause changes in the indicators, and the deletion of an indicator should not alter the conceptual domain of the construct. On the other hand, formative models the indicators are not expected to covary, changes in the indicators should cause changes in the construct, and the deletion of an indicator should cause changes in the construct (Bollen and Lennox, 1991).

The choice for constructing the variable performance by using reflective indicators may not be the most appropriate. For instance, constructs of performance that are operationalised through Mahoney et al. (1965) instrument assemble the space for managerial job through an inventory of eight dimensions that exhaustively contain what the authors considered to be the entire set of managerial performance activities. According to Mahoney et al. (1965, p. 100) “These functions include all performance activities”. Additionally, Mahoney and colleagues assert their model comprises mutually exclusive indicators of the construct performance - “experience to date has proved them to be mutually exclusive” (1965, p. 100). Such characteristics clearly specify a formative model. Other example can be found in the instrument developed by Govindarajan (1984). In this instrument performance is conceived as combinations of twelve indicators among which are market share and new product development and, thus, they should be formative, because in the end, firms are considered of high performance because they have high market share and high levels of new product development; they do not have high market share and high levels of new product development because they are high performers. Under a formative model, if only a narrow and incomplete set of indicators is operationalised content validity would be undermined since the relevant domain of the construct would not be properly covered by the measures (Bisbe et al., 2007; Bollen and Lennox, 1991). Therefore, the selection of which indicators represent the formative construct is not easy given the potential implications for construct validity.

4.6.3 Link: conceptualisation and measurement

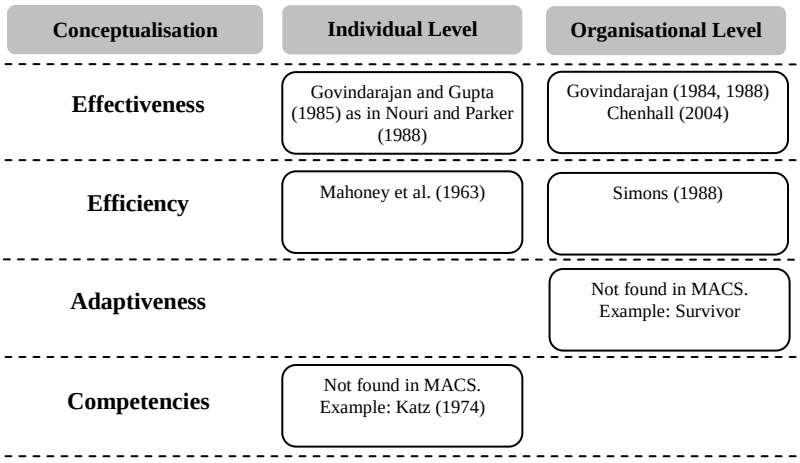
The link between the construct and its measures is done through the choice the appropriate instrument. As observed by Edwards and Bagozzi (2000), researchers use to emphasise causal relationships among constructs, however devotes little attention to relationships between constructs and measures. These relationships are essential because they provide the means by

which constructs become accessible to empirical research. The relationships between concept and measure are the core of construct validity, since construct validity concerns the degree to which a measure apprehends its intended theoretical construct (Bisbe et al., 2007).

Within the specific sample of our study, it was not viable to evaluate the degree of correspondence between conceptualisation and measurement in previous MACS research, simply because, as stated before, conceptualisation was scarcely described. However, the analysis of the measures that were applied in previous research allows us to infer, in some cases, what are the possibly used conceptualisations. Therefore, an examination among the different measurements for assessing the individual level suggests that MACS studies follow an implicit conceptualisation of performance as efficiency (means of action / functions). Virtually all MACS research that assessed managerial performance has drawn upon the measuring managerial functions. More specifically, they drew upon the Mahoney et al. (1963) instrument. There is no theoretical justification for this choice other than the ritual and the convenience of replicating a "validated" instrument. The systematic use of the same instrument by MACS researchers' can be read in two ways. On one hand, it could be considered advantageous because focus moves from "agreed" criterion to the predictors that represent the MACS attributes. As a result, comparability among studies increases. On the other hand, it could be disadvantageous because it narrows down the possibilities for the understanding that managerial performance may also derive from other perspectives; potentially leading the field of MACS research toward a dead end road in which other possibilities are ignored or not accepted.

Through the inspection of performance at the organisational level, we observe that most survey-based contingency studies in MACS, although not often explicitly, emphasise effectiveness (goal attainment) (e.g. Govindarajan, 1984) and, to a lesser extent, efficiency (e.g. Simons, 1988).[12] Figure 4.3 depicts some the implicitly derived conceptualisations discussed for the construct performance associating such concepts to some of the measurement instruments that are applied to measure them.

Figure 4.3. Performance: Conceptualisation and Measurement



Particular implications on the link between conceptualisation and measurement are encountered when the measurement involves the use of a multi-methods approach (cells 5 to 8, arrows 9 and 10). In recent years we observe a tendency toward the use of multi-methods approaches, e.g. (Sandino, 2007; Widener, 2007). As discussed in the next section, this choice is beneficial in many methodological senses. Nevertheless, special care needs to be place on the appropriateness of correspondence between concept and measurement. Because there is a risk of assessing a single construct with different and non-convergent measures. For instance, suppose a researcher conceptualises performance exclusively as goal attainment. As measurement instrument the researcher uses self-rating measures combined with secondary, objective data. Presume the researcher applies the self-rating instrument developed by Govindarajan (1984), which measures goal attainment, and combines it with an archival indicator of efficiency such as ROI. The researcher concludes then with basis on these two measurements. The conclusions of a study with the above characteristics will potentially be flawed because different conceptualisations of performance are being assessed and different measures are being compared as if they were measuring the same construct.

4.6.4 Measurement - Examining Performance in MACS research

Different measures have been used in MACS literature to capture the construct performance. In general, none of the choices among the diverse options used in research is free of concern.[13] Caution is required while selecting the assessment method, because rather than being trivial, this choice carries substantial meaning for the research, having direct implications on the type and

magnitude of measurement error present in the research (Bommer, et al. 1995). Since performance is mostly treated as a dependent variable the negative implications of measurement error rather than influencing the estimators (i.e. bias) have direct consequences on the statistical power of the model.

In this section, we discuss the benefits and shortcomings of different approaches for measuring performance as a dependent variable and we highlight and explore some further themes of particular interest to MACS researchers. In order to systematise such analysis we employ the framework presented in Figure 4.1. As a result, the following discussion is organised and offered under labels that characterise specific dimensions of analysis and cells on the classificatory scheme framework.

4.6.4.1 Two dimensions

According to the framework presented in Figure 4.1, performance can be analysed in two dimensions: 1) mode of assessment and 2) source of data.

Mode of Assessment

The mode of assessment can be either perceptual or objective. However perceptual measures are, by far, the most common in extant MACS survey-based research to assess performance (89% of 82 observed papers, as reported in Section 4.5, used some perceptual measure). This is hardly surprising given the use of perceptual data has long being criticised in MACS research (Van der Stede et al., 2006).

Due to the imperfections of human cognition, that plays a greater confounding role (Kahneman and Tversky, 2000) in data gathering, several researchers recommend the use of objective measures (Ittner and Lacker, 2001) over perceptual data. The major argument of those researchers is associated with the fact that objective measures are resistant to several of the biases that distort people's judgments. For instance, objective measures are likely to diminish the possibility of leniency[14] or overrating performance, which is, among MACS researchers, one of the most cited problems of perceptual measures, (e.g. Chong and Eggleton, 2007; Marginson and Ogden, 2005). Accordingly, Govindarajan (1984) claimed that one important advantage of an objective over a perceptual measure of performance is that the former can be confirmed and replicated by other researchers.

In spite of its apparent advantages, objective data could also be troublesome. In this regard, at least three points should be considered. First, there is a probability that "objective" performance measures in fact, do not exist (Campbell, 1990, p. 713). Campbell (1990) observes that every objective measure involves subjective judgments about how to build those measures. For instance, the simple indicator of quality control entails the subjective evaluation of what determines a low quality product. Second, similar to what happens with perceptual measures, errors in objective measures could also be systematic (Spector, 2006). For instance, earnings management can constantly be influencing financial and accounting outcomes. Therefore, there is no reason to blindly trust objective data are completely accurate. Finally, objective data on performance is not available for specific research questions, such as studies that examine performance in cross-organisational settings (Govindarajan, 1984).[15] Perceptual assessment allows researchers to gather data in the desired format. However it requires complex judgments from respondents.

One would expect that the recommendation for the use of objective measures, rather than perceptual, would result from a non-covariation among these two types of measures and from a higher degree of validity of the objective measures. However, Parks (1984) found out that objective and perceptual indicators that were conceptually similar were found to be associated statistically. He argues that explanations for the independence between objective and perceptual indicators include the: a) lack of conceptual congruence between previously used indicators, which means that those perceptual and objective indicators do not measure the same concept; and b) potential misspecification of models used in previous research. Accordingly, Venkatraman and Ramanujam (1987, p. 110) argued that neither objective nor perceptual measures are intrinsically superior to one another "in terms of consistently providing valid and reliable performance measures".

Whilst some researchers suggest equivalence among perceptual and objective measures, others examined the multidimensionality of organisational performance to argue this construct contains broader societal/environmental and employee/community dimensions rather than the more narrow and strictly economic perspective. Hence, perceptual measures may be useful to operationalise wider and non-economic dimensions of organisational performance (Dess and Robinson, 1984). Akin, Govindarajan and Fisher (1990) determined that in the specific context of their research, the use of objective performance indicators were of limited value because of several reasons. According to the scholars, "it is not possible to use the same set of criteria to

evaluate every SBU since, by definition; different SBU strategies imply quite different goals and priorities. At a minimum, we would have needed to attach different weights to various performance criteria, and there is no objective way of deriving such weights. Second, no objective measure can capture some of the factors critical to the success of certain strategies. For instance, success in basic research and product engineering— both key for SBUs practicing differentiation—defy objective, short-term measurement. Third, industry factors influence SBU performance and should be controlled for, but objective performance data for the industry in which an SBU competes may be very difficult to secure" (Govindarajan and Fisher, 1990, p. 269). Consequently, it is plausible to think that more than preferring one mode of assessment over the other, perceptual and objective data could be used as supplementary choices for assuring convergent validity and/or complementary solutions for increasing content validity.

The use of either perceptual or objective measures as indicators of performance is also of concern when establishing the appropriate time horizon and indicator for capturing the hypothesised variability of the predictor on the criterion. Different temporal lags have been tested in MACS literature. For instance, Ittner et al. (2003) examined the relationship between measurement system, satisfaction, economic performance, and two general approaches to strategic performance measurement and assessed performance through return on assets and 3-year sales growth and two stock return measures (1-year and 3-year returns). Hansen and Van der Stede (2004) demonstrated a link between the performance of the individual reasons-to-budget and overall budget satisfaction and organisational SBU performance by asking managers about their SBUs' performance in the last budget period. Given the inexistence of a generic theory of time lags (Goodman, 2001; Mitchell and James, 2001) the blindness on the question of when the criterion might occur may be minimised through a better understanding of the nature of predictors (i.e. organisational activities, nature of work, and feedback cycles) and its time series properties (Goodman, 2001). As observed by Mitchell and James (2001) the use of multiple measures over time could also help to determine the lag for a particular criterion and predictor relationship. The choice of the appropriate indicator to be used should also be based on the attributes of specific indicators. Thus, short-and long-term measures of performance usually produce different results. For instance, Van der Stede (2000), who computed ROS as the indicator of performance, comments on potential bias towards short-termism that the use of such a measure could produce which could make it improper for testing several different relations in MACS. A second reason that organisational assessment outcome may be affected by timing is related to the life cycle view of firm. As firms progresses through different life cycle stages the

organisational performance and the importance attributed to diverse measures change (Moores and Yuen, 2001).

Source of Data

According to the framework presented in Figure 4.1, the source of data can be either primary or secondary. Both sources of data are subject to systematic measurement error, although this characteristic is most commonly criticised when primary sources are chosen. A major cause of systematic measurement error is method effect (Saris and Gallohofer, 2007a), which is the influence of the measurement instrument on variance in a measure (i.e. method variance). The method of measurement can affect observed data in two ways: a) by changing the underlying construct of interest or b) by altering the measurement process and not the construct itself (Spector, 2006). The first is likely to happen when assessing behaviour, for example people's attitudes, since a person's attitude might change merely because it is the object of assessment. The second effect refers to the potential bias resulting from characteristics of the instrument, people and environment that can affect measurement.

The main problem associated with primary (i.e. self-reported) sources consists of the consequences of the common method variance which refers to the variance that is attributed to the measurement method rather than to the constructs that the measurement is intended to assess. "Common method bias is the magnitude of the discrepancies between the observed and the true relationships between constructs that result from common method variance" (Doty and Glick, 1998, p. 376). Method biases are potentially a powerful concern in studies in which the data for both the predictor and criterion variable are obtained from the same respondent or rater, in the same measurement context using the same item context and similar item characteristics. In MACS research we identified that 76% (62 out of 82) among all examined studies used exclusively primary sources and consequently were subject to common rater biases.

Method bias is a problem because it is one of the major sources of measurement error (Podsakoff et al., 2003) whose errors threaten the validity of the conclusions about the relationships between variables. Method bias may suggest alternative explanations for the observed relationships between measures of different constructs that are independent of the one expected. There is a significant amount of evidence that method bias can have a substantial effect on the observed relationships between measures of different constructs (Podsakoff, et al 2003). In MACS this concern was attenuated. Dunk (1993) associated the notion of the systematic bias with the

addition (subtraction) of a constant that is positively (negatively) signed to the otherwise "true" scores for the dependent variable. As an added (subtracted) constant to (from) the dependent variable, effects on the relation between the dependent and independent variables in multiple regression models would not change and no coefficient other than the intercept would be affected. The author concluded that, “while errors may be present in the responses to the measure of managerial performance in any study involving self-ratings, these errors, per se, are unlikely to confound research findings” (Dunk, 1993, p. 580). Although the mathematical explanation of the author is correct, it assumes that the method effect will have the same impact across all respondents, which is quite unlikely to occur. Either the magnitude of the common method bias produced by the method factors or the direction of its effects can vary. Method variance can either inflate or deflate observed relationships between measured constructs, thus leading to both Type I and Type II errors (Podsakoff, et al 2003, p. 880). Method variance arises from a variety of sources (Bagozzi and Yi, 1991).

Some researchers in MACS have overemphasised the selection of respondents as a solution for common method bias. For instance, Cagwin and Bouwman (2002, p. 13) wrote “The selection of unbiased, objective, and knowledgeable internal auditors is believed to eliminate most, if not all potential effects from common-method bias that may be present in other research”. The authors also emphasised that “in addition to their independence and objectivity, internal auditors are appropriate subjects because they are knowledgeable, possess varied talents and expertise, and have access to relevant information” (Cagwin and Bouwman, 2002, p. 13). Carefully selecting respondents can contribute to overcoming common-method bias (Miller and Roth, 1994) however the sources of common method bias are beyond simple respondent selection. Therefore, it is unlikely that the choice of an “appropriate” respondent would be enough to eliminate the common-method bias. Two ways have been identified to control for method bias: a) procedural remedies that act on the design of the study (i.e. ex-ante), and b) statistical remedies which are alternatives when the procedural remedies are not met (Podsakoff et al., 2003). These controls can be used to exclude potential biases as long as those biases can be evaluated (Spector, 2006). In Appendix 2, we present the sources of common method bias, some proposed remedies and examples of such remedies utilised in MACS research in which the performance is the dependent variable.

Resistance to method bias is the main advantage of using secondary data over primary data for measuring performance in survey-based research. This resistance is maximised when objective

data is considered. However the choice for secondary sources requires some special attention. First, when obtained from archival sources, secondary data may not always be precise because of criteria inconsistency among database providers (Lara et al., 2006; San Miguel, 1977; Yang et al. 2003). Second, when obtained from secondary respondents (e.g. superiors, auditors, and researchers) answers could be potentially inaccurate depending on the degree of acquaintance of the respondent with the subject that is assessed.

4.6.4.2 Examining Different Measurements Approaches

In this subsection we continue examining the different measurements of variable performance. In order to organise the discussion, we employ the cells from the classificatory scheme framework. Additionally, at the end of this subsection we present on Figure 4.3 a set of topics that should be considered to help future research assess the construct performance.

Cell 1 (Primary Perceptual Data)

The evidence is that perceptual primary measures of performance dominated MACS research. The main advantages of this method are two. First, whether survey is already in place for other variables, the introduction of some items to measure performance can be used as a means of easily obtaining data. Second, the use of primary perceptual sources permits researchers to capture various specific dimensions of performance that would not be obtained in other mode of assessment.

Several researchers alert readers to the limitations and cautions that are needed before conclusions are made from self-assessed measures (e.g. Dunk, 1992, 1993; Govindarajan, 1984). As already commented most concerns of such measurement refer to problems derived from sources of common method bias (Podsakoff et al., 2003). However this measurement can also be problematic in other particular cases. For instance, designs based on a single respondent to a mail survey are exposed to a single rater bias (Boyer and Verma, 2000). It refers to the possibility that a respondent provide a skewed or warped perspective on the larger SBU being considered. The disparate ratings that could be obtained whether two independent respondents in similar positions assessed manufacturing plant's performance weaken the validity of the overall research.

Within the primary perceptual measurements employed for assessing individual performance we observe a particular interest of MACS researchers for the so called Mahoney et al. (1963, 1965)

instrument. This composite of functions that was firstly designed to evaluate what managers do and not how they perform constitute the most currently used means to assess managerial performance in contingency survey-based MACS literature. Eighty one percent of all papers that examine performance at the individual level used this instrument or some adaptation of it. Mahoney and colleagues argue that managerial time can be allocated to a set of eight basic managerial functions which can be called the "PRINCESS" factors (Planning, Representing, Investigating, Negotiating, Coordinating, Evaluating, Supervising, and Staffing). By asking about performance on these eight dimensions additionally to a ninth dimension that wrap overall performance, MACS researchers' intent to capture the multidimensionality of performance. Although tests for criterion validity such as the regression of the eight indicators on the overall dimension to check whether the eight dimensions represents at least 55% of the variation in the overall criteria (e.g. Brownell and McInnes, 1986) or tests of independence of the dimensions by rotated factor analysis (e.g. Chong and Eggleton, 2007) are performed, the instrument as used today in MACS carries potential concern caused by the use of 1) a single indicator and 2) reflective indicators. The Mahoney et al (1965) is built as multiple indicator instrument however in 80% of the studies that used it, researchers clearly stated they used only the overall effectiveness dimension as a surrogate variable for representing the variable performance. Recently significant progress was made by MACS researchers to ensure the employment of multiple indicators given the constant insurmountable problems caused by the use of single indicators (Bollen and Paxton, 1998). As observed by Hair et al. (2006) the use of a single surrogate variable has the disadvantage of not representing all the aspects of a factor and being prone to measurement error. Few researchers decided to exploit other construct operationalisation, such as some sort of summated scale (e.g. Kominis and Emmanuel, 2007; Kren, 1992; Leach-Lópes et al., 2007) or the integration of all dimensions as formative indicators of managerial performance (e.g. Wentzel, 2002). These later methods would be recommended for increasing measurement variability allowing for a better differentiation among cases. It is also important to note that as Mahoney and colleagues first defined this instrument as formative model. Consequently, because in formative models covariance between indicators is not required, traditional reliability evaluation instruments based on internal consistency (e.g., Cronbach's α and Confirmatory Factor Analysis) and tests of convergent and discriminant validity are meaningless and inappropriate (Bisbe et al., 2007; Bollen, 1989).

Govindarajan (1984) or some adaptation of it is the preferred instrument applied by MACS researchers to assess organisational performance through perceptual primary sources. The

instrument as originally developed by Govindarajan is a multidimensional measure that relies on twelve dimensions of overall firm performance. Those dimensions include sales growth rate, market share, operating profits, profit to sales ratio, cash flow from operations, return on investment (ROI), new product development, market development, R&D, cost reduction programs, personnel development and political/public affairs. Even though the examined dimensions might potentially be measured objectively, the instrument is classified as perceptual since it asks respondents to assess performance of their organisation relative to the importance attached by their superiors across the twelve dimensions by using a scale that ranges from "of little importance" to "extremely important". Therefore, the instrument asks respondents to exercise their personal judgments. Moreover, respondents rank each dimension to reflect actual performance in terms of "superiors' expectations", using a scale that commonly ranges from "not at all satisfactory" to "outstanding". Scores for each dimension are determined by multiplying the respective "importance" and "performance" scores. A final performance score is calculated by taking an average of all items. Some researchers argue that the instrument developed by Govindarajan has some advantages over other methods. This instrument measures effectiveness through a comparison between actual performance and expected performance rather than on an absolute scale. Thus, Govindarajan claims to indirectly control the effect of industry and other external factors on performance.[16] Furthermore, the measure evaluates self-ratings along a multiplicity of dimensions rather than on any single dimension, attending the request of Steers (1975). Finally, such a multivariate approach with criterion weights was seen as particularly appropriate in a context where diverse strategic missions mean quite different sets of priorities (Jermias and Gani, 2004).

Cell 2 (Perceptual Secondary Data)

In this cell we observe the judgments of third parties for assessing organisational and managerial performance. Mia (1988) and Imoisili (1989) which used superior's ratings are examples of this method approach. One advantage of using expert judgments is that their reliability is respectable and can be improved by using more than one rater (Campbell, 1990, p. 714). However, concerns about ratings arise from the potential contamination of this measurement with systematic variance unrelated to the performance of the person being assessed.

Cell 3 (Objective Primary Data)

Primary objective measures are mostly used when researchers' intent is to assess particular indicators of performance that are not available from public databases. Although not observed in extant MACS research that assessed performance at the individual level, this approach could be valuable to overcome problems that result from the anonymity of disclosing managerial performance. For instance, questions about percentage of bonus received, or in-company promotions in the last years could be objective proxies for performance. Such as other data from primary sources it is likely to be bias by common method variance. For this reason, the use of multiple respondents is recommended to minimise method bias when objective primary data is regarded.

Cell 4 (Secondary Objective Data)

The emergence of several databases in the 90s offering accounting and financial data for companies worldwide have augment the interest of researchers to explore secondary objective measures (Lara et al., 2006). Consequently, we observe in Figure 4.2 a trend towards assessment organisational performance through secondary objective measures (Itnner et al., 2003; Pizzini, 2006; Widener, 2006).[17]

Several are the scholars who argue that a key difference between assessing performance in cell 4 and assessing it in cell 1 is that the later is often less accurate, less reliable, and more open to raters' biases (Campbell, 1990 and Heneman, 1986; in Van der Stede et al., 2006). Moreover, some researchers recommend secondary objective data claiming that "harder data" (i.e., more objective data) can support the validity of measures (Ittner and Larcker, 2001).

By working on cell 4 researchers may face problems for associating multiple goals of organisations. Whilst considering the nature of performance as firm specific (Lebas, 1995), for instance depending on internal policies or strategy, researchers naturally could conclude different measures might produce different incentives for managers and organisations. In this context one of the major challenges of those studies concentrating in cell 4 is of how to weight different indicators of performance without incurring in subjectivity.

Multiple Method approach (Cells 5, 6, 7, 8 and ARROW 9 and 10)

As observed in Figure 4.2, there is recently moderate trend in MACS research toward the use of multiple methods for measuring performance. Those approaches, such the ones presented in cells

5-8 and arrow 9-10, are included to produce convergent validation or confirmation based on independent measurement procedures (Bollen and Paxton, 1998). Multiple-method approaches allow for triangulations offering the advantage of simultaneously reducing measurement error and also improving construct validity (Venkatraman and Ramanujam, 1987). These advantages of convergent validity are nonetheless conditional upon the fact that the multiple measures are hitting the same theoretical domain or different coexisting conceptualisations are considered.

In spite of the apparent advantages of multiple methods, the use of this approach is restrictive by the almost constant difficulty to obtain data from different sources. Several researchers in MACS have noticed the problem of gaining access to different sources of performance measurement, (e.g. Abernethy and Brownell, 1997; Brownell and McInnes, 1986; Chenhall and Brownell, 1988; Kren, 1992; Kominis and Emmanuel, 2007). This issue is a particularly strong area of concern for researchers who try to assess the individual level of analysis given the trade-off between assuring anonymity and identifying the respondent. Lastly, researchers that find themselves inclined for obtaining more than one respondent per firm, which could allow for a triangulation and would minimise memory and interpretation biases, have to be aware of the sometimes prohibitive financial and time investments required by this method (Sandino, 2007).

Cell 5 (Use of Perceptual Data from two Sources)

The advantage of working with perceptual data from two sources is that it allows for assessing convergent validity which enhances the quality of measurement. Among the reviewed studies, Abernethy and Stoelwinder (1995) and Vagneur and Peirerl (2000) were the only ones that examined organisational performance through perceptual data from both primary and secondary sources. Abernethy and Stoelwinder (1995) analyse the performance of sub-units by asking superiors to rate the best performers and worst performers to validate respondents' self ratings. Vagneur and Peirerl (2000) assessed organisational performance by self-reporting and researcher-rating.

Particularly, Vagneur and Peirerl (2000) was the only design that used a single rater (i.e. researcher rater) across all cases (i.e. firms). On one hand, this design could be considered problematic due to the potential bias caused by an individual's limited access to information and unique perspective. On the other hand, this design could make common method variance less problematic on multiple regression models, once the common method variance on the raters' responses could be more likely to be treated as a constant effect without changes on coefficients

other than the intercept (Dunk, 1993). In general MACS researchers had allowed each case in the sample to be rated by a different respondent but usually only one rater per case.

Cell 6 (Use of Objective and Perceptual Data from Secondary Sources)

The examined literature in MACS has not exploited multi-methods that combine objective and perceptual data from secondary sources. None of the 82 examined studies could be allocated in this cell. The two types of data are not merely substitutes for one another. They can function as complements; "perhaps serving to make up for the inadequacies of the other or providing confirmation" (Cowton, 1998, p. 431) through triangulation. Especially the use of secondary data can increase the credibility of research findings (Cowton, 1998). In sum, this design is particularly advantageous because it enables researchers to examine the relationship between objective indicators of performance and other subjective and potentially broader aspects of performance with comparatively lesser common method effect than the measures that rely on primary sources.

Cell 7 (Use of Objective Data from Two Sources)

Simons (1988) computed organisational performance by asking firms to provide accounting-based ROI data for the three most current years. The computed indicator of performance was an average of the three gathered years self-reported ROI. The researcher checked the reported ROI figures against published financial statements for each firm in which values were available. Simons (1988) found out substantial accuracy between the two measures. The advantage of using this multi-method approach resides in the fact that this design enables for assessing convergent validity of objective data via two different sources. This advantage is conditional to the availability of public information on the examined firms. Nevertheless, this approach does not consider other broader aspects of performance apart of the return on investment.

Cell 8 (Use of Objective and Perceptual Data from Primary Sources)

The exercise of objective and perceptual data from primary sources enables researchers to examine the relationship between broader subjective indicators of performance and more objective economic oriented aspects of performance. Although in such design researchers are not allowed for validation across different data sources, multiple raters would be very desirable to augment convergent validity. Working on cell 8 is mainly suitable for SBU in with secondary data is usually scarce. Predominantly, drawing on of objective data from primary sources puts

into question the ability of respondents to remember precise changes on objective indicators such as net income, stock prices, and ROI.

Table 4.1. Issues to be considered when assessing the Construct Performance

1-	The notion of performance should never be taken for granted. Define the meaning of the variable performance in the context of each particular piece of research. Performance is no different from other variables; therefore researchers should consider conceptualisation for research to take place.
2 -	For each particular research project, researchers should ensure not to include antecedents into the construct performance.
3 -	Build or select a measurement instrument that is able to measure the variability associated with the construct "performance" as it is conceptualised. Check the adequacy of the chosen measurement according to the particular meaning of the variable performance in your research.
4 -	If a single concept of performance is assessed, make sure the multiple-method instruments used are not measuring different conceptualisations of it. If different concepts of performance are being measured, make different conceptualisations explicit.
5 -	Supplement perceptual indicators with objective indicators, where available.
6 -	Short-and long-term measures of performance usually produce different results. While assessing organisational performance consider indicator timeframe effects.
7 -	Organisational performance changes as the organisations progressed through different life cycle stage therefore it is needed to control for firm life cycle.
8 -	Always prefer secondary data for assessing dependent variables.
9 -	Do not compute traditional reliability evaluation instruments based on internal consistency (e.g., Cronbach's α and Confirmatory Factor Analysis) and tests of convergent and discriminant validity in models that consider performance as a formative construct.

4.7 Conclusion

It has long been recognised that outcome variables related to performance should be included in management accounting and control systems (MACS) contingency-based studies. This paper aims to review how performance has been assessed in prior contingency-based survey MACS research. In order to organise this analysis we present the discussion on subjects related to conceptualisation, measurement and correspondence between concepts and measures in MACS constructs.

The literature review covered in this paper examines empirical MACS studies in which surveys were conducted and where performance was used a variable of analysis. A total of 82 papers were identified as survey-based, contingency-grounded papers published in nine accounting journals over a 27-yr period (1982–2008). It was identified that most of the studies assessed performance concentrated either on the individual (33) or the organisational (40) levels. For both the individual and organisational level, the use of self-reported, primary measures predominates

(91% at the individual level; 60% at the organisational level), followed at a distance by objective secondary measures (0% at the individual level; 10% at the organisational level). The use of combined multiple methods is very scarce. While in recent years there has been a moderate trend towards the increased use of approaches other than self-reported, primary measures, these are still the most widely used.

Besides identifying the papers and the corresponding techniques that have been used to assess performance in MACS research, this study identifies the main problems associated with the assessment of performance as a variable of interest in survey-based research. The study identified conceptualisation and measurement as two major areas of concern. The first of these concerns refers to the lack of attention given by researchers regarding the conceptualisation of the variable performance. Performance may be associated with many different ideas (e.g. goal attainment, decision making improvements, financial results, customer satisfaction, production quality) however researchers seem to ignore or underestimate the need for a clear definition of the term itself. In some cases the instrument of measurement seems to be the only definition of the term. The evidence shows that the concept is not so obvious and that the production of a specific agreed upon meaning and domain for each construct of interest is needed.

The second concern refers to measurement. On this regard, the paper develops an analysis through a classificatory scheme to identify that no measurement is free of concern but each different measurement design carries advantages and disadvantages. Several methodological issues concerning the assessment of performance in MACS research are discussed. Mode of assessment, data source and the use of multiple approaches are reviewed to find some potential themes of improvement. For instance, the paper encourages the use of secondary data mostly in order to overcome problems of common method bias, aware researchers to identify short-and long-term indicators effects and to control for firm life cycle stages, and stimulates researchers to supplement perceptual indicators with objective indicators.

The paper further aims to contribute to the literature on management accounting by recommending some guidelines to help conceptualisation and measurement of performance as a variable. In doing so, the paper aims to contribute to the discussion on how to better capture performance constructs in survey-based research. Performance is a central variable of interest in MACS research in general, and in contingency-based MACS research in particular. Improvements in the conceptualisation and measurement of such construct are likely to be

instrumental in achieving a better understanding of the relationships between attributes of MACS and performance in subsequent studies.

4.8. Notes

[1] In this paper we do not discuss the legitimacy of studying performance as a dependent variable. Some scholars claim the variable performance should not be understood as a dependent variable even in contingency theory. The idea emerges from the natural selection argument in which fit is the consequence of an evolutionary process of adaptation that only the best-performing firms survive. Contrary, in our paper we follow Donaldson (2001) to understand the contingency theory driven by states of performance that create constant disequilibrium. Therefore, "by adapting its structure to its contingencies, the organisation moves from misfit into fit, which raises its performance, which feeds back to increase its contingencies that create misfit again and so on" (Donaldson, 2001, p. 248-249).

[2] "Criterion is any variable one wishes to explain and/or predict by resorting to information from another variable(s)" which are referred as predictors (Pedhazur and Schmelkin, 1991, p. 32).

[3] Caveat: 1) Although Abacus was not included in Van der Stede et al. (2007), it was examined in this literature review given this journal is consistently referred among the high-quality accounting journals in listings such as Beattie and Ryan (1989) and Bonner et al. (2006), and 2) We did not identify any study among the published articles in Journal of Accounting and Economics that fulfils the established criteria of this literature review.

[4] For a discussion on the topic of performance assessment on experimental research check Sprinkle (2003). Qualitative studies are not included in this research, given the less standardised approach used by researchers for measuring each construct. In qualitative research "questions are designed to elicit stories of performance, because stories are vivid, contextual devices for relating personal knowledge and experience. By telling stories of how the organisation functions and the factors leading to success, participants make explicit what might have remained tacit knowledge about goals, processes, performance, and outcomes (Ambrosini and Bowman, 2002; Boje, 1991)" (Abernethy et al, 2005, p. 140-141).

[5] Some researchers distinguish between the terms performance and effectiveness. For instance, Venkatraman and Ramanujam (1986) understand business performance as a subset of the overall concept of organisational effectiveness. Different conceptualisations of performance are discussed on Section 4.1.

[6] Researchers should be particularly careful not to confound conceptualisation and measurement. For instance, performance cannot be defined/conceptualised by parameters such as return on assets, market share and/or profit growth. Those are measurement instruments.

[7] Notice that in this research we conceptualise secondary data differently from many textbooks in which secondary data refers to data collected from a different person from the current researcher, usually for an entirely different purpose from the current research purpose (Tharenou et al., 2007).

[8] Other dimensions might be considered in addition to the ones proposed in Figure 4.1, based on Venkatraman and Ramanujam (1986, 1987). For example, a dimension that distinguishes absolute and relative measurement (Bommer et al., 1995) could also be considered. Absolute measurement refers to the measurement of traits on a group-invariant scale (e.g. stock price, profit, or self-rating of managerial performance on a specific point in time – Mahoney et al., 1963, 1965), while relative measurement refers to the within-group measurement of traits, in which the scale of measurement is expressed in terms of the within-group position on a trait (e.g. self-reported measurement of performance relate to other employees or companies) (Borsboom et al., 2002).

[9] As discussed by Whetten and Cameron (1994, p. 139) the search for an ideal type, the Holy Grail of organisational theory, meaning the definitive and universal definition of organisational effectiveness was framed in the first model of organisation effectiveness. Represented by authors such as Weber, Barnard and Price, this school supported effectiveness should be measured against the standard of an ideal type, although there was disagreed over the criteria for assessing effectiveness.

[10] Ratios of profitability as a percentage of sales and return on investment – ROI are instruments usually used to assess conceptualisations of performance based on efficiency.

[11] Epistemic relationship refer to the conceptually relationships between constructs, dimensions and indicators (Hulland, 1999).

[12] Mahoney (1988, p. 19) identifies other measures of efficiency such as, net earnings per share, labour cost per unit produced, profit per sales dollar, production cost/standard cost, and output per employee.

[13] Campbell (1990, p. 691) identified ten measurement methods to assess performance at the individual level are: psychological tests, interviews, structured questionnaire, simulations, assessment centres, references, rating by others, self-rating, educational records, employment records.

[14] Leniency bias refers to the propensity of respondents to attribute socially desirable traits, attitudes, and/or behaviours to someone they like than to someone they dislike.

[15] If measured by objective bottom line figures, further concern is required because measures may not represent the actual performance (Campbell, 1990). Specifically, this last concern was made at managerial and organisational levels of analysis. At the individual level, bottom line measures are often accused of being far removed from individual performance and consequently those measures should not be the focus of performance measurement (Campbell, 1990). At the organisational level, bottom line measures are said to be unable to reflect actual firm contingencies, particular strategies and multiple objectives on a diversity of environmental contexts. For example, start up firms may pursue market share growth rather than profits, organisations facing good economic conditions, may associate their performance with higher levels of capital investment; while under poor economic conditions capital liquidity may become a more relevant performance criteria (Steers, 1975).

[16] Some researchers noticed the difficult of controlling for the industry effect in assessing performance. It is difficult to ensure that respondents of a given firm as well as across firms have a similar "referent" or "peer" set of organisations (Dess and Robinson, 1984).

[17] The use of secondary objective data is less common in the case of individual level of analysis due to employee confidentiality matters. The particular case of CEO compensations is an exception.

[18] Even though the examined dimensions might potentially be measured objectively, the instrument is classified as perceptual since it asks respondents to assess performance of their organisation relative to the importance attached by their superiors across the twelve dimensions by using a scale that ranges from "of little importance" to "extremely important". Therefore, the instrument asks respondents to exercise their personal judgments. Moreover, respondents rank each dimension to reflect actual performance in terms of "superiors' expectations", using a scale that commonly ranges from "not at all satisfactory" to "outstanding". Scores for each dimension are determined by multiplying the respective "importance" and "performance" scores. A final performance score is calculated by taking an average of all items.

[19] The main idea behind the procedural remedies is to identify what the measures of the predictor and the criterion variables have in common and eliminate these commonalities through the design of the research.

4.9 References

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Appendix 1 - Review of 27 years of performance assessment on survey based management accounting research

Author	*Measurement*
Individual level: primary source and perceptual measure (Panel A, Cell 1) (n = 30/33)	
Brownell (1983); Brownell (1985); Brownell & Hirst (1986); Brownell & McInnes (1986); Dunk (1989); Dunk (1990); Brownell & Dunk (1991); Kren (1992); Chenhall & Morris (1993); Dunk (1993); Gul & Chia (1994); Lau et al (1995); Chong (1996); Abernethy & Brownell (1997); Choo & Tan (1997); Lau & Tan (1998); Chong & Chong (2002); Wentzel (2002); Marginson & Ogden (2005); Parker & Kyj (2006); Chong & Eggleton (2007); Kominis & Emmanuel (2007); Leach-López et al. (2007); Hall (2008); Lau & Moser (2008)	Mahoney et al's. (1963)*: eight performance dimensions and one overall effectiveness dimension. The instrument asks for ratings on eight potentially important dimensions of managerial performance, which include planning, investigating, coordinating, evaluating, supervising, staffing, negotiating, and representing. A ninth indicator asks for a single overall rating, taking into consideration that different managerial positions are likely to require different mixes of the eight dimensions.
Chenhall & Brownell (1988); Otley & Pollanen (2000)	Self-rating instrument, which asked managers to evaluate their overall performance with a question on 1 overall.
Nouri & Parker (1998)	Modified Govindarajan and Gupta (1985): (1) self rating 8 performance dimensions (2) respondents were asked to weight their individual performance in terms of superiors' expectations (3) managerial performance is the weighted average of the responses.
Wier et al. (2002)	Two questions asked about the importance of differing processes that are consistent with a tournament models: (1) at-rank comparisons based on actual job performance and (2) at-rank comparisons based on expected next-rank job performance.
Burney & Widener (2007)	Self-rating of two questions asking whether the use of an SPMS is positively associated with the performance outcome for both strategic planning and decision making.
Individual level: secondary source and perceptual measure (Panel A, Cell 2)(n = 2/33)	
Mia (1988)	Superior ratings. With list of managers and after six month the superior of each of the managers was requested to evaluate as accurately as possible the overall performance of the participating manager directly reporting to him.
Imoisili (1989)	Van de Ven & Ferry (1980): Superior's ratings self-rating on 7 dimensions, taking into consideration all subordinates superior had supervised over the previous 3 years.
Individual level: perceptual primary and objective secondary methods (Panel A, Arrow 9) (n = 1/33)	
Frucot & Shearon (1991)	Mahoney et al's. (1963): (1) eight performance dimensions and one overall effectiveness dimension (2) the overall assessment of performance was used as the dependent variable in data analysis + Objective: percentage salary increase received in the past year.
Organisational level: primary source and perceptual measure (Panel B, Cell 1) (n = 24/40)	
Govindarajan (1984); Govindarajan & Gupta (1985); Abernethy & Stoelwinder (1991); Chenhall & Langfield-Smith (1998); Baines & Langfield-Smith (2003); Bisbe & Otley (2004); Jermias & Gani (2004); Abernethy & Bouwens (2005), Hyvonen (2007); Lamminmaki (2008)	Govindarajan (1984, 1988)*[18]: (1) self-ratings along 12 dimensions, (2) weight the various performance dimensions in terms of their relative importance for the unit, and (3) an weighted average performance index was obtained for each SBU. Those dimensions include sales growth rate, market share, operating profits, profit to sales ratio, cash flow from operations, return on investment (ROI), new product development, market development, R&D, cost reduction programs, personnel development and political/public affairs.
Merchant (1984); Merchant (1985); Dunk (1992)	Merchant (1984)*: (1) self-rating of overall performance gathered by asking the managers to rate their department (2) fully-anchored single item Likert scale asks for rating the overall performance of their departments

Macintosh & Williams (1992)	Van de Ven and Ferry's (1980): (1) Self-rating of department performance relative to other similar departments on 7 categories (2) The performance score for each department was computed by pooling the ratings on the seven items.
Perera et al. (1997)	(1) self-rating instrument (2) respondents were asked to rate performance against industry average on each of the three dimensions of annual rate of growth in sales, profitability and ROA over the past 3 years (3) performance was scored as the mean of the responses to the three questions
Moores & Yuen (2001)	Self-rating measured by multiple measures of financial performance (1) Firm to rate: (a) its performance comparative to industry performance on operating cash-flows, sales growth rates, profit margins, and ROI (b) the extent to which it uses measures of these performance indicators (importance) (2) a single performance weighted score for each firm was then calculated by taking weighted average of these scores of four measures (3) final performance weighted score for each stage was then the simple average of the weighted scores of all firms in the stage
Hansen & Van der Stede (2004)	Self-rating of global performance of organisational unit: Three components: (1) unit's performance in the past budget period in relation to direct competitors, (2) ideal overall performance of unit as 100%, and rating of unit's actual performance over the budget period relative to ideal performance, (3) units' performance relative to competitors on two dimensions: market-related performance and internal operations-related performance
Chenhall (2004)	Financial success- asks the extent to which financial benefits had been received.
Maiga & Jacobs (2005)	(1) quality performance was measured using four indicators in which respondents were asked to report improvement in these indicators over a three-year time frame; (2) financial performance was measured based on an instrument used by Chenhall (1997) on which a respondents were asked to rate subunit performance, over the last three years, against their industry average on each of the three dimensions.
Indjejikian & Matejka (2006)	Self-rating of business unit overall performance in the last three years, relative to budget and to the overall firm performance.
Henri (2006)	Organisational performance is measured with a subjective instrument using three indicators: (i) sales volume; (ii) return on investment; and, (iii) profits.
Maiga & Jacobs (2008)	Four perceptual self-reported measures capture improvement in plant profitability: market share; return on sales (ROS), turnover on assets (TOA), and return on assets (ROA). Asset turnover as a measure of productivity and ROS as a measure of efficiency — the ability to control costs at a given level of sales activity. All of these performance measures relate to improvement over the previous three years.
Hoque & James (2000); Cadez & Guilding (2008)	Organisational performance was measured by appraising five dimensions of performance: return on investment, margin on sales, capacity utilisation, customer satisfaction, and product quality. Respondents were asked to indicate their organisation's performance compared to their competitors along the above five dimensions. Cadez & Guilding (2008) included two additional dimensions to this instrument. Those are (6) development of new products, and (7) market share.
Organisational level: primary source and objective measure (Panel B, Cell 3) (n = 3/40)	
Callen et al (2005)	(1) EFFICIENCY = stochastic frontier technical efficiency scores, and (2) PROFIT = earnings before taxes normalised by the value of production at retail prices.
Ittner et al. (2002)	Self-reporting of six measures to assess plant performance: (1) ROA; (2) QUALITY is computed using average standardised responses to two questions on product quality; (3) TIME is computed using average standardised responses to two questions on manufacturing speed; (4) ΔCOST is the extent to which manufacturing costs changed over the last five years; (5) ΔQUALITY is the extent to whih finished-product first-pass quality yield changed over the last five years; and (6) ΔTIME is the percentage change in manufacturing cycle time over the last five years.
Maiga & Jacobs (2006)	Return on assets (ROA). Respondents were asked to provide net income before corporate expenses, sales for the years 2000 and 2001, and total net operating assets data for the years 1999, 2000, and 2001. This information was used to compute profitability improvement.

Organisational level: secondary source and objective measure (Panel B, Cell 4) (n = 4/40)	
Ittner et al. (2003)	Economic Performance evaluated using two publicly available accounting measures (return on assets and 3-year sales growth) and two stock return measures (1-year and 3-year returns) (Compustat and CRSP).
Pizzini (2006)	Hospital financial performance is assessed with objective, publicly available information on: Profit margin, Cash flow, Administrative expense, and Expense per admit.
Dossi & Patelli (2008)	Economic performance was measured through average growth of return on assets (ROA) computed over 4 years.
Vagneur & Peirerl (2000)	(1) Objective: a) abnormal shareholder returns: Five-year average of data (from Datastream) reflecting the difference between company returns and a market index with the same beta b) actual returns: Five-year average of accounting profit plus dividends.
Widener (2006)	Performance (PERF) is measured as return-on-assets (ROA). ROA is calculated as net income divided by total assets, as reported in Compustat.
Organisational level: use of perceptual data with data from two sources (Panel B, Cell 5) (n = 2/40)	
Abernethy & Stoelwinder (1995)	As in Merchant (1984) + superior rating.
Vagneur & Peirerl (2000)	(Additionally to cell 4) (2) Self-reported: weighted strategic performance on a comprehensive set of strategy factors (3) Researcher-rated: two independent investigators scored within-unit variation in interviewees' views on objectives and priorities, following the method of Machin and Tsai (1983).
Organisational level: use of objective data with data from two sources (Panel B, Cell 7) (n = 1/40)	
Simons (1988)	Self reported three year ROI for the business and archival ROI (average of the 3 years was used for analyses).
Organisational level: use of objective and perceptual data with data from primary sources (Panel B, Cell 8) (n = 2/40)	
Shields & Young (1993); Clinton & Hunton (2001)	Firm-wide performance was measured through answers to four questions. These were: (1) percentage change In net income, (2) percentage change in common stock price, (3) percentage change In ROI and (4) a subjective rating of the overall performance of the firm, anchored by (1) "Worst Possible Performance" and (7) "Best Possible Performance."
Organisational level: perceptual primary and objective secondary methods (Panel B, Arrow 9) (n = 5/40)	
Cagwin & Bouwman (2002)	Self-reported of ROI Change Industry median-adjusted relative to other business units in the industry + Archival (Compstat) ROI
Sandino (2007)	Three measures of business performance: a) PERCPERFORM: self-report of overall performance since founding, relative to the retail industry b) SALESGROWTH and STOREGROWTH: geometric average of the annual growth in sales and number of stores, respectively, since the year of introduction of initial MCS. Data obtained from Compustat and Lexis-Nexis.
Van der Stede (2000)	Performance was measured by: (1) return on sales (ROS) in 1993 (ROSt2), 1994 (ROSt1), and 1995 (ROSt) (2) two additional self- typing performance measures were obtained from the questionnaire a) overall business unit performance (relative to the industry average) b) financial results of business unit performance in the past year (3) given all measures are significantly correlated ROS is used as the main measure of performance.
Widener (2007)	a) self-rating of organisational performance related to firm goals on four dimensions: overall, portability, market share, and delivery system, and b) archival data available in Compustat for computing ROA.

** It also includes "adaptation" of the mentioned instrument.*

Appendix 2 - Common Method Bias: sources, remedies and examples in MACS research in which the dependent variable is performance

Sources of Common Method Bias (CMB)	Minimising CMB: Some procedural remedies[19]	Examples in MACS research and additional recommendations
Method effect caused by a Common Source or the Rater Artifactual covariance that emerges when the respondent provides responses for both the predictor and the criterion variables. Specific sources are: consistency motif (effect), implicit theories and illusory correlations, social desirability, leniency biases, acquiescence biases, mood state, and transient mood state.	***Different sources of predictor and criterion*** – consists in collecting criterion and predictor variables from different respondents or sources. This procedure makes it impossible for the mindset of the rater to bias the observed relationship between the predictor and criterion.	Mia (1988) and Imoisili (1989) used superior's rate for measuring the performance of subordinates. Chong and Eggleton (2007) emphasise the need for incorporating superiors' ratings to compare with the managers' self-ratings as a means of assessing validity. At the organisational level, different sources for the criterion were used from researchers that employ only objective measures (e.g. Widener, 2006, ROA from Compustat) and by researchers that combine objective secondary data with perceptual primary measures, e.g. (Simons, 1988); (Van der Stede, 2000).
	Separation – refers to the techniques that allow separation of the predictor and the criterion. It can be done through methods such as, creating a temporal separation by introducing a time lag between the measurements of the predictor and criterion, creating psychological separation by masking the connection between the variables, and methodologically separating the measures by allowing respondents to complete the predictor and criterion measures under different conditions.	Sandino (2007) evaluated firm's overall performance through a scale described as "1 if the firm's performance is in the bottom 10 percent" to "5 if it is in the top 10 percent", methodologically separating the criterion from the Likert seven-point scale used in predictor variables. Besides different response formats (i.e. semantic differential, Likert scales, faces scales, open-ended question) other techniques such as the use of different media (e.g. computer based, paper based, and interview) and locations (e.g. different rooms or sites) for measuring predictor and criterion where not observed in MACS research. Separation techniques, such as longitudinal data, bring into play potential contamination factors that may threaten the research internal validity (i.e. history, mortality, and maturation threats), (see Shadish et al., 2001).
	Anonymity - Anonymity allows for what some researchers have called "honest responses" (Young and Selto, 1993) which would mean the reduction of common method bias caused by many factors including social desirability.	Widely use in MACS research, e.g. (Abernethy and Brownell, 1997); (Chenhall and Langfield-Smith, 1998); (Shields and Young, 1993). This technique combined with the procedures that assure respondents the scientific-only use of the responses, the non existence of right or wrong answers, and the request for respondents to answer questions as honestly as possible, should reduce people's evaluation apprehension and make responses less socially desirable, lenient, and acquiescent (Podsakoff et al., 2003).
Method effect caused by Item Characteristics Artifactual covariance among variables produced by the manner in which items are presented to respondents. Specific sources are: item characteristics, item complexity and/or ambiguity, scale format and scale anchors, negatively worded (reverse-coded) items.	***Improving items***	MACS' researchers have been aware of some of the possibilities of reducing method bias through the correct construction of the items (i.e. questions), e.g. (Abernethy and Stoelwinder, 1995); (Wentzel, 2002). A generally used reference is Dillman (1978) who suggested pre-testing of instruments for achieving clarity, understandability, ambiguity, and face validity. Other recommendations are: a) defining ambiguous or unfamiliar terms; b) avoiding vague concepts and providing examples; c) keeping questions simple, specific, and concise; d) avoiding double-barrelled questions; e) avoiding complicated syntax (Podsakoff, et al., 2003), g) avoiding implications that one response is preferred over another, h) making all responses of equal effort (Nunnally and Bernstein, 1994, p. 379).
	Improving response scale – refers to the response scales that minimise method bias. For instance, the use of response scales with gradation (i.e. "How much" questions) positive effect on the reliability of items but is often associated with method effects like rounding off (Saris and Gallhofer, 2007b: 34).	Although not discussed in MACS research, other scales than the typically employed 7 point Likert Scale as line production and stepwise procedures invite to less problems of rounding off. While numeric scales are affected by rounding off (Tourangeau et al. 2000) it does not happen with line responses (Saris and Gallhofer, 2007b). Before final propositions are made, more investigation is needed to test the effects of these various types of scales on response quality. The use of verbal labels for the midpoints of scales and the use of bipolar numerical scale values (e.g. -5 to +5) have been suggested to reduce acquiescence bias (cf. Tourangeau et al., 2000). Similarly, Saris and Gallhofer (2007b) showed improvements on question reliability when at least some labels but not complete sentences are used, while the use of a neutral middle category and fixed reference points have been associated with reliability and validity improvements.
Method effect caused by Item Context The context and order in which	***Scale reordering*** – consists in reordering the criterion and predictor variables, controlling or at least reducing the effects of consistency artifacts caused from priming effects, item-context-induced mood states, and bias derived from question	Parker and Kyj (2006) assessed potential order response bias by distributing two versions of their survey that differed only by question order. Besides the apparent advantages of reordering questions, this method breaks down the logical flow of questionnaires in which general questions would give space for more specific ones as the questionnaire reaches its end (Podsakoff et al., 2003). Saris and Gallhofer (2007b)

items on a questionnaire are provided to respondents is another possible source of CMB. Specific sources are: item priming effects, item embeddedness, context-induced mood, scale length, and intermixing items of different constructs on the questionnaire.	context.	found that validity and reliability increase throughout whole range of the questionnaire, therefore questions placed at the beginning would be less valid or reliable than questions placed at the end.
	Increasing scale length - although no consensus exist about the effect of an increase in the number of categories in the scale, Saris and Gallhofer (2007b) identified category scales can be improved with regard to reliability by using more categories (e.i. 11 categories) without harming the validity. "(…) one should use as many categories as possible in a category scale (more than 7) but with clear short labels" (Saris and Gallhofer, 2007b, p. 38).	Different number of categories has been used in MACS for measuring the same theoretical construct. For measuring performance through the same instrument such as the Mahoney et al. (1965) researchers used a variety of scales that goes from 1-5 to 1-9.
Method effect caused by Measurement Context Artifactual covariation observed between constructs due to context in which measures are obtained. Specific sources are: time, location, and the use of common medium.		Consider and report relevant mood connotations. Researchers should be attentive to the (in)appropriateness of conducting a survey during particular periods. For instance, asking for performance prior to managerial yearly managerial evaluations, or during a process of layoffs may result in responses that differ from those that would be observed during other periods.
	Minimising CMB: Some statistical remedies	**Examples in MACS research and additional recommendations**
	Harman's single-factor test - is an ex-post technique that is performed across the survey items. The idea is that if a substantial amount of common method variance exists in the data, a single factor on the unrotated factor solution will emerge when all variables items are entered simultaneously in an exploratory factor analysis.	Widely employed in recent self-reported research in MACS (Bisbe and Otley, 2004); (Chalos and Poon, 2000); (Kominis and Emmanuel, 2007). This technique does not control for method effect (Podsakoff, et al., 2003). A single-factor test may provide an indication of whether a single factor accounts for all of the covariances among the items. Therefore it can be said to be a diagnostic technique for evaluating the extent to which common method bias may be a problem.
	Partial correlation approach - refers to techniques that use a measure of the assumed source of method variance as a covariate in the statistical analysis. These procedures allow the effect of a method factor to be partialed out.	Parker and Kyj (2006) established correlations between the social desirability scale and variables in the theoretical model. The authors concluded that for their research the social desirability bias did not influence the proposed relations between the variables in the theoretical model. One of the major problems of this procedure is that it only controls for the CMB source for which the specific surrogate was measured (e.g. social desirability). Other CMB sources are not controlled. Besides partialling out CMB sources, researches could partially out an unrelated marker variable or a general method factor (Podsakoff et al., 2003). The marker refers to a construct that is not correlated with the constructs of interest and it acts as a surrogate for method variance (Lindell and Whitney, 2001). Partialling out a general method factor requires researchers to perform an exploratory factor analysis and isolate the first unrotated factor from the relation between the predictor and criterion (Podsakoff et al., 2003).

Chapter 5: Strategic Performance Measurement Systems Strategy Formulation and Organisational Performance

5.1 Introduction to chapter 3

The fifth chapter in this thesis examines the process through which a particular management accounting and control system contribution to organisational performance is mediated by the comprehensiveness of strategic agendas and is moderated by environmental dynamism. Preliminary versions of this paper were discussed in some conferences. The research paper in this thesis is an updated version of the paper presented at the *Global Management Accounting Research Symposium*.

5.2 Abstract

This paper examines the extent to which the use of Strategic Performance Measurement Systems (SPMS) influences organisational performance through the shaping of the strategic agendas and the strategic decision arrays that result from strategy (re)formulation processes. In this research we defined SPMS as management tools that are characterised by a combination of high levels of four constitutive dimensions (i.e. the integration of long-term strategy and operational goals, the presence of multi-perspective metrics, the inclusion of cause-effect linkages, and the presence of a sequence goals/targets/action plans). We argue that organisations that use SPMS achieve enhanced performance (in comparison with those firms that use other performance measurement systems not qualified as SPMS) and that this enhancement is associated not only with a better implementation of intended strategies as it has been assumed in previous empirical research, but also with the comprehensiveness of the strategic agendas and strategic decision arrays obtained in the processes of (re)formulation of intended strategies. Results from tests of a structural model using Partial Least Squares (PLS) regressions on archival and survey data collected from Chief Executive Officers of 279 medium and large Spanish companies provide support in favour of hypotheses suggesting that a) the positive effect of the use of SPMS on organisational performance is mediated by the comprehensiveness of the strategic decision array (i.e. variety and number of decisions) that result from strategy (re)formulation processes; and that (b) the

greater the environmental dynamism, the more positive the effect of the comprehensiveness of the strategic decision array on organisational performance.

5.3 Introduction

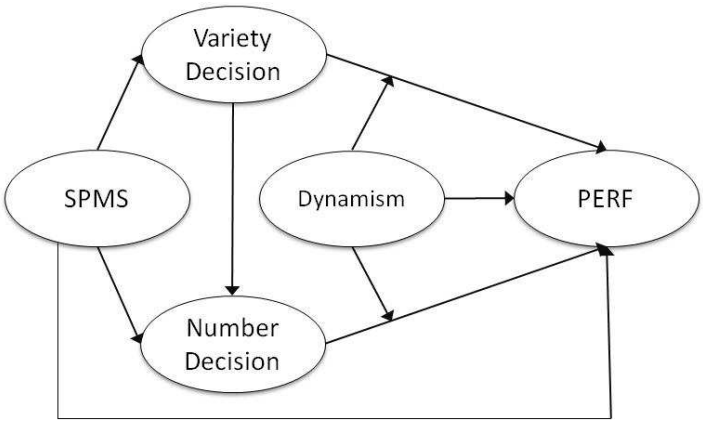
Available data suggest that a large number of firms have significantly transformed their performance measurement and management systems in the last decade. Most of this transformation has been centred in the adoption of Strategic Performance Measurement Systems (SPMS) such as Balanced Scorecards, Performance Prisms or full-fledged *tableaux-de-bord* (Michele and Manzoni, 2010; Neely, 2007, 2008; Rigby, 2009; Speckbacher et al., 2003). Underpinning the rationality of these widespread processes of adoption, it has often been claimed that 1) SPMS have the potential to be effective tools to close the gap between the strategic vision of a firm and the management of its operating activities and that, consequently, the alignment achieved through the use of SPMS has a beneficial impact on performance (Crabtree and DeBusk, 2008; Davis and Albright, 2004; de Geuser et al., 2009; Kaplan and Norton, 1996, 2000, 2004, 2006; Malina and Selto, 2001) and that 2) these beneficial effects are primarily achieved through the contribution of SPMS towards a successful implementation (i.e. a better communication, a better execution, a more effective follow-up) of intended strategies (Garengo et al., 2005; Kaplan and Norton, 1996, 2000, 2004, 2006; Murby and Gould, 2005).

Despite their broad diffusion, these relatively well-established perceptions of SPMS have been challenged by recent research in several directions. First, some studies have highlighted the paucity of empirical evidence that actually tests the impact of SPMS on objective organisational performance as well as the inconclusiveness of the limited available evidence regarding the benefits of SPMS (Micheli and Manzoni, 2010; Neely, 2008b). Second, a stream of recent studies have suggested that SPMS may effectively be used, not only for ensuring the implementation of intended strategies as originally conceived by Kaplan and Norton (1996, 2000, 2004), but also for the purpose of shaping the processes of formulation of intended strategies and the strategic agendas and strategic decision arrays (Dutton and Jackson, 1987; Dutton, 1988; Nadkarni and Barr, 2008) resulting from such processes (Bourne et al., 2000; Campbell et al., 2008; Gimbert et al., 2010), as well as for creating a better connection between strategy formulation and strategy implementation processes (Braam and Nijsssen, 2004; Kaplan and Norton, 2008; Papalexandris et al., 2004). Finally, the traditional view of SPMS supporting firm organisational performance (be it through improved formulation of intended strategies or through successful implementation of such intended strategies) in the presence of dynamic

environments is under question. A stream of studies have pointed out that, if used interactively (Simons, 1995), SPMS can help organisational adaptation by provoking and guiding the bottom-up development of emergent strategies (Bisbe and Otley, 2004; Henri, 2006; Tuomela, 2003). However, other researchers such as Bukh and Malmi (2005) claim that uncertainty brings with it the risk that a chosen strategy may prove wrong, and consequently leaving strategy unspecified may be a more viable approach than selecting, mapping and committing to a particular strategy. On this point, some authors have highlighted that under conditions of high dynamism or high uncertainty, SPMS can be dysfunctional as long as they may tend to promote organisational inertia and create organisational paralysis (Micheli and Manzoni, 2010). In sum, the extent to which SPMS may assist in enhancing organisational performance through better formulation or better implementation of intended strategies under dynamic environments is not yet well understood.

These recent developments point out to several gaps which, in our opinion, deserve further investigation. Hence, while on the one hand limited previous research has examined (with inconclusive results) the impact of the use of SPMS on organisational performance, and while on the other hand previous studies have highlighted that firms using SPMS engage in strategy formulation and shape strategic agendas and strategic decision arrays differently than those that do not use SPMS, these two issues have not yet been connected. That is, little is known yet about the extent to which the impact of SPMS on organisational performance is channelled through enhanced formulation of intended strategies rather than through other means such as their successful implementation. In other words, a first gap we detect relates to the extent to which the influence of SPMS on the shaping of the strategic agendas and the strategic decision arrays resulting from formulation processes of intended strategy is eventually reflected in improvements in organisational performance. Or, put differently, we claim that little is known yet about the extent to which the effect of the use of SPMS on performance is mediated by the comprehensiveness of the strategic agendas and strategic decision arrays that result from the strategy formulation processes. A second gap we observe in the extant literature refers to the influence of the level of environmental dynamism in moderating the impact of the comprehensiveness of the strategic decision arrays resulting from the strategy formulation processes shaped by SPMS on performance. While we think it is plausible that such impact on performance differs between firms operating in stable environments versus firms operating in dynamic environments, this has not been explored in previous work.

This paper aims to address these gaps. The contribution of this paper is two-fold. A first research question investigates the extent to which the effects of SPMS on organisational performance are mediated by traits of the formal processes of (re)formulation of intended strategies. More precisely, we aim to show that the effects of SPMS on organisational performance are mediated by the development of the more comprehensive strategic decision arrays (expressed in the form of a larger and wider array of decisions) that result from the processes of (re)formulation of intended strategies in firms that use SPMS. In a second research question, we examine whether the effects of a more comprehensive strategic decision array on organisational performance are moderated by environmental dynamism. The generic theoretical framework of our research is illustrated in Figure 5.1. Overall, our model aims to help better understand how the comprehensiveness of the strategic agendas derived from the (re)formulation processes of intended strategies intervenes in the relationship between the use of SPMS and organisational performance, as well as to understand whether these relationships are contingent on the levels of environmental dynamism.



Notes: ___ hypothesised path; (all predicted relationships are positive)

Figure 5.1. Hypothesis model

The combination of archival and survey data gathered from 279 CEOs of medium and large-sized Spanish companies provided support in favour of a positive association between the use of SPMS and organisational performance which is mediated by the comprehensiveness of the strategic agenda (captured by the number of decisions taken in each strategic (re)formulation). We found the use of SPMS to be associated with an increased comprehensiveness of the strategic

agenda (i.e. number of decisions), and data supported in turn that comprehensiveness of the strategic agenda has a significant positive influence on enhanced organisational performance. Even though part of the variability in the relationship between SPMS and organisational performance was explained, as expected, through other means than factors related to strategy (re)formulation, our results suggested that the use of SPMS has a significant positive influence on enhanced organisational performance acting through the shaping of the strategic agendas and strategic decision arrays that result from the processes of (re)formulation of intended strategies.

In contrast to arguments that claim that SPMS would not respond efficiently under dynamic environments, the results of our research suggest the opposite. Our findings indicate that the positive influence of the comprehensiveness of the strategic decision array (both in terms of variety of decisions and number of decisions) is capitalised in the presence of dynamic environments. We find that the greater the environmental dynamism, the more positive the effect of both variety and number of decisions on organisational performance. Since the shaping of the strategic agenda and the strategic decision array are associated with the use of SPMS, our findings support that, by helping managers configure richer strategic agendas and strategic decision arrays, SPMS contribute to the successful adaptation to dynamic environments.

The remainder of the paper is divided into four sections. First, we provide a theoretical background and introduce testable hypotheses. This is followed by two sections that present in turn the research method and results. Finally, conclusions are discussed.

5.4. Theoretical Background and Hypotheses Formulation

5.4.1. Strategic Performance Measurement Systems and Performance

Performance Measurement Systems (PMS) are concise sets of metrics (financial and/or non-financial, long and/or short term, internal and/or external, ex post and/or ex ante) that support the decision-making processes of an organisation by gathering, processing and analysing quantified information about its performance, and presenting it in the form of a succinct overview (Gimbert et al., 2010; Henri, 2006; Neely et al., 1995;). *Strategic Performance Measurement Systems* (SPMS) are a subset of PMS. In this study, we define SPMS as those PMS which present distinctive features such as 1) the integration of long-term strategy and operational goals; 2) the provision of performance measures in the area of multiple perspectives (e.g., financial perspective, customer perspective, business processes perspective, learning and assets

development perspective); 3) the provision of a sequence of goals/metrics/targets/action plans for each perspective; and 4) the presence of explicit causal relationships between goals and/or between performance measures (Chenhall, 2005; Garengo et al., 2005; Gimbert et al., 2010). Instances of SPMS include tools such as the Balanced Scorecard (BSC) (Kaplan and Norton, 1996, 2000, 2004), full-fledged Tableaux de bord (Bourguignon et al, 2004), Performance Pyramid Systems (Lynch and Cross, 1991) and Performance Prisms (Neely et al., 2002).

A set of studies have argued that the use of SPMS should be expected to enhance organisational performance (de Geuser et al., 2009; Hoque and James, 2000; Ittner et al., 2003; Kaplan and Norton, 1996; Speckbacher et al., 2003). Several features of SPMS make this claim plausible. SPMS provide relevant, balanced and concise information to managers, thereby making decision-making processes more effective. SPMS facilitate the overall management of the value chain and the integration of functions and processes. Furthermore, SPMS clearly highlight the critical performance variables on which the whole organisation should focus, thus facilitating the closure of the gap between the strategic vision of the firm and the management of its operating activities. This, in turn, allows for delegation of authority and empowerment of people and sub-units while preserving alignment. Moreover, the explicit representation of the cause-effect relationships within the organisational model encourages learning (de Geuser et al., 2009; Davis and Albright, 2004, Crabtree and DeBusk, 2008; Kaplan and Norton, 1996, 2000, 2001, 2004, 2006; Malina and Selto, 2001; Speckbacher et al., 2003). Given the demands of contemporary business environments, it appears that these aspects of SPMS should have a beneficial impact on performance.

Despite these theoretical or normative arguments, the empirical evidence on the effects of the use of SPMS on economic organisational performance is still rather limited (Neely, 2008b; Micheli and Manzoni, 2010). Among the studies that have investigated so, Hoque and James (2000) found greater SPMS usage to be associated with self-reported economic performance. Davis and Albright (2004) found that bank branches implementing SPMS outperformed branches not implementing SPMS on a series of key financial measures. Crabtree and DeBusk (2008), using a long-horizon event study, present evidence supporting that firms earn greater excess returns after adoption of SPMS. This limited available evidence supporting the positive effects of the use of SPMS on economic organisational performance is accompanied by a series of studies that highlight that the use of SPMS is positively associated with the users' perceptual satisfaction with some aspects of such systems (de Geuser et al., 2009; Ittner et al., 2003; Speckbacher et al., 2003).

Nevertheless, the consistency between effects on economic performance and effects on satisfaction levels should not be taken for granted. Hence, while Ittner et al., 2003 found that the use of SPMS in financial services firms is associated with users' satisfaction, they found almost no evidence of the use of SPMS being associated with objective accounting or stock market performance, thus demonstrating that higher satisfaction levels may be not translated into improved economic performance. Moreover, a stream of studies have highlighted the potential detrimental effects that the use of SPMS may have on organisational performance since they may result in overbureaucratisation and focus on details (Braam and Nijssen, 2004) and they can promote organisational inertia and create 'ossification', i.e. organisational paralysis (Bukh and Malmi, 2005; Micheli and Manzoni, 2010).

Overall, the available evidence about the effects of the use of SPMS on organisational performance is still inconclusive[1]. However, an increasing body of evidence is progressively converging to indicate that the use of SPMS contributes to enhance organisational performance, even though if designed and used mechanistically in dynamic environments, the expected benefits of SPMS might be at risk. Given the research goals of this paper, we are not interested *per se* in testing the direct association between use of SPMS and organisational performance and we do not intend this paper makes a contribution in this specific regard. However, since we are interested here in investigating the extent to which some variables related to strategy (re)formulation processes mediate the relationships between use of SPMS and organisational performance, we have included as a starting point an initial hypothesis related to the direct relationship between use of SPMS and organisational performance. This will subsequently allow us to set forth and test a model in which we are able to isolate the effects on performance that are specifically channelled through the variables related to strategy (re)formulation which are of interest to us. Based on the previous discussion about the emerging consensus on the literature on SPMS, we think it reasonable to posit as a starting point that the use of SPMS contributes to organisational performance. Hence, we start by formalising the following hypothesis:

H1: *The use of SPMS is positively associated with organisational performance.*

5.4.2. Strategy formulation processes, strategic agendas and strategic decision arrays

In the stream of empirical studies we have reviewed in the foregoing section, most of the theoretical developments regarding the expected effect of the use of SPMS on performance are grounded on the role of SPMS as tools for facilitating strategy implementation (Braam and Nijssen, 2004; de Geuser et al., 2009). As a common thread, these studies argue that the beneficial effects of SPMS on performance are primarily achieved through their contribution towards different facets of successful implementation, such as a better communication, a better coordination and integration or a more effective follow-up of intended strategies defined in advance (Davis and Albright, 2004; Crabtree and DeBusk, 2008; Hoque and James, 2000; Micheli and Manzoni, 2010). This is in line with long-standing normative (i.e. Garengo et al., 2005; Kaplan and Norton, 1996, 2000, 2004; Murby and Gould, 2005) and empirical (i.e. Atkinson, 2006; Braam and Nijssen, 2004; Speckbacher et al., 2003) traditions which have considered SPMS primarily as tools for strategy implementation.

Since hitherto, most empirical studies have focused on how the use of SPMS influences performance through their role in communicating the firm's intended strategy and facilitating its implementation, little attention has yet been paid in empirical studies to other active roles SPMS can play. Nevertheless, an emerging body of literature is suggesting that the potential roles of SPMS go beyond mere strategy implementation of intended strategies and that, consequently, the range of roles SPMS may play in organisational life is far broader. Hence, several recent studies have looked at roles of SPMS such as promoting specific behaviours and attitudes at different organisational levels; responding to rules and regulations; providing greater accountability within and between organisations; communicating financial and non-financial results to key stakeholders (Micheli and Manzoni, 2010); supporting the bottom-up development of unintended, emergent strategies (Tuomela, 2005; Simons, 1995, 2000) or assisting in the conscious, intentional fine-tuning, revision or (re)formulation of intended strategies (Bourne et al., 2000; Campbell et al., 2008, Kald and Nilsson, 2000; Kaplan and Norton, 2008).

In this paper, we aim to focus on one of the roles of SPMS that go beyond strategy implementation, i.e. we specifically address issues related to the role of SPMS regarding the conscious, intentional (re)formulation of intended strategies. The thrust of this paper is that, additionally to the effects of SPMS to organisational performance that are attributed to strategy implementation, the influence of SPMS on the processes of (re)formulation of intended strategies

can also contribute to explain how SPMS influence performance. We next define strategy (re)formulation as well the concepts of strategic agendas and strategic decision arrays that result from strategy (re)formulation processes. These concepts will be used in the forthcoming section to develop testable hypotheses.

The realised strategy of an organisation, that is the strategy actually being followed by an organisation in practice, is the result of the simultaneous combination of the realisation of intended strategies and the production of emergent strategies (Mintzberg and Waters, 1985). Intended strategies are the expression of desired strategic direction deliberately formulated or planned by managers (Johnson and Scholes, 2008 whereas emergent strategies are evolving strategic patterns that are developed bottom up "despite or in the absence of intentions" (Mintzberg and McHugh, 1985, p. 61).

In this paper, we focus on the formulation of intended strategies. Hence, using a design lense on strategy (Johnson and Scholes, 2008), we conceive strategy (re)formulation (i.e. (re)formulation of intended strategies) as a purposeful, deliberate search to develop the way a company creates value and develops competitive advantage through the configuration of its activities and resources in the markets in which it operates. Through it, a firm defines its overall long-term direction and scope (Collis and Montgomery, 2005; Porter, 1996).[2] The strategic formulation of intended strategies is a rational, proactive process that involves activities such as establishing goals, monitoring the environment, assessing internal capabilities, searching for and evaluating alternative actions and eventually making decisions (i.e. choices) to achieve the goals (Fredrickson and Mitchell, 1984). This may be achieved by a formal strategic planning process which produces a grand and consciously integrated plan or through a series of conscious, deliberate and explicitly defined strategic decisions that are made over time when circumstances warrant it (Sinha, 1990).

Despite the paucity of studies investigating the role of SPMS in the (re)formulation strategy processes, we acknowledge that a few generic normative claims and some anecdotal evidence have suggested that SPMS are able to effectively support the (re)formulation of intended strategies and that, through this channel, they may eventually enhance performance. Thus, Kaplan and Norton (2008) suggest that SPMS help managers discover whether assumptions underlying their intended strategy are flawed or obsolete and help them rigorously re-examine their strategy and adapt it, deciding whether incremental improvements will suffice or whether a new, transformational strategy is needed. Accordingly, some limited case-based evidence

suggests that SPMS can be used to challenge and question strategic assumptions being made in strategic formulation, increasing the chance of identifying problems in mistaken assumptions and therefore encouraging strategic revision (Bourne et al, 2000). At a more instrumental level, statistical analyses of causal links between performance measures have been proposed as useful devices in identifying potential problems in the firm's intended strategy and in testing and adapting such strategy (Campbell et al., 2008; Kaplan and Norton, 2008).

While both these normative claims and this limited, mostly anecdotal empirical evidence indicate that SPMS may play an active role in strategy (re)formulation processes, an in-depth theoretical development of the mechanisms explaining this association and large-scale evidence supporting it are still missing. In particular, not much is known about the extent to which and how the association between the use of SPMS and performance is mediated by specific attributes of the strategy (re)formulation processes. We next develop a line of reasoning which leads us to expect that the positive effects of the use of SPMS on performance are mediated by two specific attributes related to the strategy (re)formulation processes. In particular, we argue that the effects of the use of SPMS on performance are mediated by two attributes related to the structure of the strategic decision array that results from the strategy (re)formulation processes. The two attributes captured in this study are the strategic decision array variety (i.e. variety of decisions) and the strategic decision array size (i.e. number of decisions).

In strategic (re)formulation processes, managers pay attention to a series of strategic issues. According to teleological approaches, strategic issues are events, trends or developments that are viewed as having important implications for organisational goals and for which future resolution is sought (Ansoff, 1980; Dutton and Ashford, 1993; Dutton and Duncan, 1987). Ecological approaches define strategic issues as suggestions for stabilisations or change over which there is disagreement as to either ends, means or spillover effects (Dermer, 1990). The two approaches agree that in strategic (re)formulation processes, decision-makers do not focus on individual strategic issues in isolation. Instead, they spread their limited attention across a limited set of issues that constitutes the strategic issue array or strategic agenda. The strategic agenda refers to the set or portfolio of strategic issues to which management are giving serious attention at any particular time in an organisation (Dutton, 1988; Dermer, 1990; Nadkarni and Barr, 2008). The structure of a strategic agenda is defined by two attributes, i.e. *issue array size* (the number of issues considered at one time) and *issue array variety* (the diversity of issues considered at one time). Hence, a strategic agenda is an issue array containing a limited number and variety of strategic issues at a given point in time (Dutton, 1988; Dutton and Duncan, 1987). Strategic

agendas gain in comprehensiveness when the agenda structure is modified to increase issue array size or issue array variety.

Top managers are more likely to recognise and actively attend to environmental change that takes place in issues that have gained the strategic agenda than to changes that relate to issues that are not placed on the strategic agenda. When top managers fail to actively attend to environmental changes, they are unlikely to make decisions and implement strategic responses. In contrast, top managers are more likely to make decisions on and formulate responses to changes related to issues that are placed on the strategic agenda. Hence, strategic agendas shape the ability to engage in strategic responses and strategic decisions (Dutton, 1988; Nadkarni and Barr, 2008) and therefore shape the strategic decision array, i.e. the set or portfolio of strategic decisions that result from a formal strategy (re)formulation process.

The concepts of strategic issue array size and variety have been extended in this study to specifically refer to the strategic decision array. We aim to capture aspects of the decision outcome of the strategy (re)formulation processes, and therefore we are interested here in the strategic *decision* array size and in the strategic *decision* array variety. Hence, a strategy (re)formulation process with a small decision array size is one in which decision-makers only make a limited number of decisions related to strategic issues contained in the strategic agenda. On the other hand, a strategy (re)formulation process with a high decision array variety focuses attention and includes decisions on a broad, diverse range of strategic issues contained in the strategic agenda. Strategic decision arrays gain in comprehensiveness when the strategic decision array structure is modified to increase the decision array size or the decision array variety. For the sake of simplicity, in this article we refer to strategic decision array size as the "*number of decisions*" and to strategic decision array variety as the "*variety of decisions"*.

5.4.3. The strategic decision arrays as mediators between the use of SPMS and performance

The first generic research question of this paper refers to whether the effect of the use of SPMS on performance is at least in part channelled through (re)formulation of intended strategies. We address this generic question by specifically analysing the following specific research question: to what extent is the positive effect of the use of SPMS on organisational performance mediated by the comprehensiveness of the strategic decision arrays (i.e. by both the variety and number of decisions taken in strategy (re) formulation processes)? For each of the two attributes of interest

(i.e. variety and number of decisions), this expectation can be decomposed in turn in two sub-arguments; 1) that the use of SPMS has a positive effect on the variety (and number) of decisions taken in strategy (re)formulation processes, and 2) that the variety (and number) of decisions taken in strategy (re)formulation processes has a positive effect on organisational performance. We next develop these two sub-arguments to derive testable hypotheses.

Regarding the first sub-argument, the literature on strategic choice (Child, 1972; Hrebiniak and Joyce, 1985) and on the role of upper echelons (Carpenter et al., 2004; Hambrick and Mason, 1984) in strategic management emphasise the importance of top managers in strategy formulation. Both streams argue that it is at the top management level where information is brought together and interpreted for company-wide action. Top managers, as boundedly rational individuals, use mental representations as cognitive structures that support them in understanding, reasoning and predicting (Markman and Gentner, 2001). Thus, the mental representations that top managers develop about their organisations and their environments are instrumental in defining the organisation's strategic agenda (Dutton and Jackson, 1987; Dutton, 1988; Nadkarni and Barr, 2008).

Prior research based on cognitive and social psychology theories has shown that PMS (including SPMS) help frame managers' mental representations because of PMS' informational effects. These informational effects "depend not only on the information [PMS] provide but also how boundedly rational individuals use heuristics to search and process this information, how [PMS] influence the choice and use of these heuristics, and how [PMS] influence the way individuals form and use mental representations of their organisations and environment" (Birnberg et al., 2007, p. 114)

Gimbert et al. (2010) have argued that the informational effects of SPMS influence the strategy (re)formulation processes. The informational effects of SPMS show themselves through decision content (i.e. extensive scanning, selective attention focus, more informed assessments) (Johnson, 1992; Nadkarni and Barr, 2008; Vandenbosch and Huff, 1997); in terms of the analytical dimensions of the strategy (re)formulation process (i.e. rigour, coordination and efficiency resulting from the multidimensionality and causal links provided by the SPMS frameworks) (Chenhall, 2005; Langley, 1988); and in terms of the social dimensions of the process (i.e. SPMS provide a forum through which top managers hammer out a shared mental representation of the firm's strategy and a forum for negotiation and legitimisation of such strategy) (Langley, 1988).

Given the informational effects of SPMS and their potential role in the decision content as well as in the analytical and social dimensions of strategy (re)formulation processes, it is reasonable to expect that their use will affect the structure of the organisation's strategic agenda present in these processes. This is a consequence of SPMS being able to gather more sophisticated information (i.e. 1) a wider diversity of acquired and processed information content and 2) a greater quantity of information content that is acquired and processed) than single-perspective or non-causal PMS (Tillema, 2005). The combination of the informational effects of SPMS fosters top management's awareness and shared understanding of the multi-faceted complexities facing their firm. Hence, SPMS make it possible that top managers ground decisions on more and more varied information content and consequently that top managers include a larger and wider range of issues in their strategic agenda (Gimbert et al., 2010). The translation of more sophisticated information content into a strategic agenda with a larger and wider range of strategic issues is likely to be further facilitated by the role of SPMS in both the analytical (e.g. rigour, coordination, efficiency) and social (e.g. negotiation, legitimisation) dimensions of the strategy (re)formulation process (Nadkarni and Barr, 2008). SPMS appear to provide more effective channels to represent these complexities and put them on the strategic agenda than other PMS or the absence of any PMS (Gimbert et al., 2010).

Since top managers are more likely to make decisions on changes related to issues that are placed on the strategic agenda (Nadkarni and Barr, 2008), it is reasonable to expect that the increased comprehensiveness of the strategic agendas of firms using SPMS will be reflected in a wider variety and greater number of strategic decisions in their processes of (re)formulation of intended strategies than is the case in organisations not using SPMS. The empirical evidence provided by Gimbert et al. (2010) supports that firms that use SPMS engage in strategy (re)formulation processes differently than those who do not and, more specifically, that whenever the top management team of an organisation engages in a process of strategy (re)formulation one can expect both the number and the variety of decisions taken during that process to be positively affected by the use of SPMS.

As far as the second sub-argument proposed to address our first research question is concerned, we expect the variety (and number) of decisions taken in each strategic (re)formulation to have a positive effect on organisational performance. To the best of our knowledge, no previous study has directly investigated whether a more diverse and larger decision array derived from a more comprehensive strategic agenda is associated to enhanced organisational performance. We are inclined to think this is likely to be the case on the basis of prior research. While there is a lack

of full consensus on the relationships between attributes of processes of (re)formulation of intended strategies and performance (e.g. McKiernan and Morris, 1994; Rhyne, 1986), studies have tended to support a positive relationship between formality of the planning processes and performance (Pearce et al., 1987a, 1987b, Schwenk and Schrader, 1993). Prior empirical evidence shows a preponderance of results supporting that formal strategy formulation processes (at least modern versions of which present conditions such as an effective link between strategy formulation and strategy implementation, or operating managers having enough room to take autonomous action) are consequential and they have positive and significant effects on organisational performance (Andersen, 2000; Miller and Cardinal, 1994; Miller *et al*., 2004).

If strategic agendas and decision arrays that are present in the strategy formulation process have been shaped by the use of SPMS, it is more likely that more angles of the emerging developments, trends or events that have important implications for the achievement of the organisation's goals are captured and that more and more varied decisions are activated as a response. Studies on the role of managerial cognition have shown that the structure of the strategic agenda (variety and number of strategic issues) and the structure of the decision array (variety and number of decisions) act as critical vehicles through which strategy formulation affects the extent and direction of the strategic response to environmental changes (Dutton and Duncan, 1987; Miller et al., 2008). Given the multi-dimensional attention focus and the causal logics introduced by SPMS, it is reasonable to expect that top managers using SPMS will be better equipped to understand what developments, trends or events mean in terms of change in environmental demands and will consequently be better equipped to develop a proper "fit" strategic response (Nadkarni and Barr, 2008). This ability to successfully respond to changes in environmental demands should be eventually reflected in enhanced organisational performance (Chenhall and Langfield-Smith, 2003). Bringing together the two sub-arguments deployed above, we therefore expect that:

H2: *The positive effect of the use of SPMS on organisational performance is mediated by the variety of decisions taken in each strategic (re) formulation, such that the use of SPMS has a positive effect on the variety of decisions taken in each strategic (re)formulation, which in turn has a positive effect on organisational performance.*

H3: *The positive effect of the use of SPMS on organisational performance is mediated by the number of decisions taken in each strategic (re) formulation, such that the use of SPMS has a positive effect on the number of decisions taken in each strategic (re)formulation, which in turn has a positive effect on organisational performance.*

5.4.4. The attributes of the structure of the strategic decision array

A strategic agenda is an issue array containing a limited number and variety of issues at any point in time (Dutton and Duncan, 1987; Dutton, 1988). Analogously, a strategic decision array contains a limited number or variety of decisions made as a result of a formal strategic (re)formulation process. We expect the two attributes of a strategic decision array, i.e. number and variety of decisions, not to be independent.

If the variety or diversity of a first strategic decision array is higher than the variety of a second strategic decision array, this means that decisions on a wider range of distinctly different types of decisions are made in the first decision array (for example, decisions on strategic alliances or outsourcing are included in the first strategic array but not in the second one). Since expanding the strategic decision array to one new distinct type of decision means that at least one decision is made regarding that distinct new type of decision, it is reasonable to think that when the variety of decisions increases in a strategic decision array, so does the number of decisions.

However, this relationship does not need be automatic or true by definition. Strategic agendas and strategic decision arrays may have capacity limits. Because of the cognitive limitations and scarce attentional resources of managers (Dutton and Ashford, 1993; Nadkarni and Barr, 2008), strategic agendas may be restricted in size so that decision-makers implicitly or explicitly consider only a limited array of issues as legitimate concerns. Similarly, strategic decision arrays may be restricted in size because decision-makers are only able to concentrate their analysis, selection of alternatives and negotiation capabilities in a limited number of efforts. If size restrictions were in place (Dutton, 1988), an increased variety of decisions might result in a decrease of the number of decisions per type of decision, so that the overall increase in the number of decisions would not be necessarily associated with the increase in the variety of decisions.

While we acknowledge that restrictions in size of the strategic decision array may be in place so

that not all increases in variety of decisions are directly or proportionally directly translated into increases in the number of decisions, we are inclined to think that it is rare that restrictions in size of the strategic decision array are so prevalent or so strict to prevent the number of decisions to increase when variety of decisions increases. Therefore our expectation is that:

H4: *The variety of decisions taken in each strategic (re)formulation is positively associated to the number of decisions taken in each strategic (re)formulation.*

5.4.5. The moderating role of Environmental Dynamism

Our second research question examines whether the effects of more comprehensive strategic decision array on organisational performance are moderated by environmental dynamism. Environmental dynamism is defined as the rate of change in an environment (Duncan, 1972; Simerly and Li, 2000). Environmental dynamism is the product of several forces operating at one time. These include an increase in the size and number of organisations within an industry, and an increase in the rate of technological change and its diffusion throughout that industry (Simerly and Li, 2000).

Empirical research on the performance implications of strategy (re)formulation processes has supported that the apparently conflicting reported results that are found in these studies can be explained by the moderating role of environmental dynamism. In order to explain the variance in the direction and size of the effects of strategy (re)formulation processes on performance, the moderating effects of environmental dynamism has deemed to be necessary. Hence, environmental dynamism has long been considered a key determinant of the appropriateness of the attributes of strategic decision processes and of strategy (re)formulation processes (Fredrickson and Mitchell, 1984; Goll and Rasheed, 1997; Harrington et al., 2004; Hough and White, 2003; Priem et al., 1995). Echoing this line of reasoning, we argue here that environmental dynamism may play an important role in clarifying the relationship between the use of SPMS, the structure of the decision array resulting from strategy formulation processes and organisational performance.

A well-established stream of management control systems literature has related uncertainty to

the usefulness of broad scope information such as the one offered by SPMS (Chenhall, 2007; Chenhall and Morris, 1986; Gordon and Narayanan, 1984; Kaplan and Norton, 2001; Hoque, 2004). The difficulties caused by environmental uncertainty may be alleviated by provision of broad scope information which would aid control by focusing information on the sources of uncertainty (Chenhall and Morris, 1986). In contrast, an emerging body of literature in management control systems has challenged the benefits of using SPMS in the presence of volatile environments. Researchers in this stream of literature argue that under volatile environments the commitment to any strategy mapping may be riskier than facing an unspecified strategy, since any chosen strategy may prove wrong. Hence, Bukh and Malmi (2005) note the constant adjustments to strategy maps required from SPMS in order cope with changing environment cast some doubts on the claim that SPMS would be suitable for fast changing environments (Kaplan and Norton, 2001). As the argument goes, the use of SPMS may not necessarily contribute to organisational performance under the conditions of high environmental volatility.

Even if somehow related to our second research question, it nevertheless should be noted that the studies discussed in the foregoing paragraph are not directly applicable to it since they focus on strategy implementation as the primary role of performance measurement systems including SPMS. In this paper, we want to focus instead specifically on the effects of the decision array that results from strategy (re)formulation processes on performance under different levels of environmental dynamism. In this regard, and on the basis of prior theory, we think it reasonable to expect that more comprehensive strategic decision arrays (those presenting more and more varied decisions) will be particularly appropriate in dynamic environments.

A decision array limited in size and in diversity means an organisation means that the courses of action top managers pursue to respond to strategic changes are limited and pointing to a narrow scope of strategic issues. In contexts of low environmental dynamism, a large availability of alternative or complementary courses of actions and an array of decisions focused on a broad scope of strategic issues may not be necessary for enhancing performance since the stability of the environment allows for a concentration of the decision array on those issues which have proved to be relevant in the past. However, under high environmental dynamism, a large availability of alternative or complementary courses of actions and an array of decisions focused on a broad scope of strategic issues are more necessary to develop a proper strategic response which fosters the adaptive capabilities needed for competitive advantage or survival, and which will eventually have performance implications (Simerly and Li, 2000). A more comprehensive

strategic decision array (both in terms of variety and number of decisions) is likely to be particularly instrumental in situations where it is more difficult to assess accurately both the present and future state of the environment. The effects of a more comprehensive strategic decision array on performance should be capitalised in dynamic environments. Hence, we expect the influence of the comprehensiveness of the decisions array (both in terms of variety and number of decisions) on performance to be higher under high environmental dynamism than under low environmental dynamism. In other words, environmental dynamism is expected to moderate the effects of the comprehensiveness of the strategic decision array on performance. This rationale motivates the following hypotheses:

H5: *The more environmental dynamism, the greater the effects of the variety of decisions in each strategic (re) formulation on organisational performance.*

H6: *The more environmental dynamism, the greater the effects of the number of decisions taken in each strategic (re) formulation on organisational performance.*

5.5. Research Method

5.5.1. Sample selection and data collection

This research relies on a mix of survey and archival data. The gathering of empirical data involved the administration of a questionnaire to a sample of CEOs in medium and large-sized Spanish firms and the collection of archival data from SABI (Iberian Balance Sheet Analysis System) database. For the purpose of sample selection, we defined medium and large-sized firms as those with a minimum turnover of 10 million Euros and a minimum of 50 employees. In order to control the potential, spurious effects of unanalysed variables, we circumscribed our database to unlisted firms from industrial and service industries located in Catalonia (Spain). Our use of the SABI 2003 database yielded 2,021 firms meeting the screening criteria that were object of survey.

Questionnaires were distributed and returned by mail. Following Dillman's guidelines (Dillman, 2006), several procedures were employed in order to increase the likelihood of a high response rate and in order to increase the likelihood of the CEO actually receiving and personally replying to the questionnaire. A first round of questionnaires was sent out in June 2005 and 251 complete questionnaires were returned. A second round of follow-up questionnaires was set out again in September 2005 to non-respondents. After the two rounds, 357 questionnaires total were returned. Out of these, 349 were complete and usable, representing a response rate of 17.27%. T-tests supported the absence of differences between early and late respondents and of any obvious non-response bias. Harman's one-factor test indicated the absence of common method effects in our data, suggesting that common method variance due to single-source biases was not a serious threat in this study. After combining the self-reported survey data with performance data for 3 years (2005 to 2007) from the SABI database and excluding missing values, we ended up with a sample of 279 firms.

5.5.2. Variable Measurement

Specific management techniques such as SPMS are typical practice-based constructs. Practice-based constructs lack a universal definition, and they are given meaning in specific contexts by explicitly elaborating the properties or constitutive dimensions that are relevant to the purposes being studied (Bisbe et al., 2007; Luft and Shields, 2003). SPMS being a practice-based construct, the specification of what is included and what is not included in the domain of SPMS was structured through a review of the relevant literature reporting and describing the SPMS. This review allowed the identification and definition of the four constitutive theoretical properties or dimensions of SPMS.

Two of the four constitutive dimensions of SPMS (i.e., the integration of long-term strategy and operational goals and the presence of explicit causal relationships between goals and/or between performance measures) were measured using summated scales from multiple items with 5-items Likert scales drawn from prior literature (Chenhall, 2005). Items related to the first of these dimensions were the linkages between long-term strategy and short-term performance goals, and the degree of involvement of the senior manager in the design and selection of the performance measures. The items related to causal relationships were the inclusion of relationships between activities, the inclusion of relationships between functional areas, the assistance offered to managers to understand these relationships, and the participation by operating managers from different functional areas in the design and selection of the performance measures. After testing

for unidimensionality and no violation of homoscedasticity, we obtained Cronbach's α of these two constitutive dimensions. In both cases, Cronbach's α was higher than 0.9, supporting high reliability. The constitutive dimension "provision of performance measures in the area of multiple perspectives" was measured by the number of perspectives that the firm reported capturing (out of an open list with a suggested enumeration of examples of perspectives). The constitutive dimension "sequence of goals/targets/action plans" was measured by a battery of four items in which respondents evaluated whether the performance measurement system in place explicitly contained a) goals, b) metrics, c) targets, and/or d) action plans. The questionnaire items are disclosed in Appendix 1.

A firm was considered to use SPMS if it presented scores higher than a pre-determined threshold for each of the four constitutive dimensions (at least two perspectives should be gathered and, for the rest of dimensions, scores should be in the upper third of the theoretical range). Out of the usable sample of 279 firms, 102 were reported using a strategic performance measurement system (SPMS = 1) and 177 were reported as using other systems non-classified as SPMS (SPMS = 0).

The variables number of decisions (NDEC) and variety of decisions (VDEC) were captured by two indicators, each. An instrument was used to capture one of the dimensions of the NDEC and VDEC. An open list that enumerated more than twenty instances of potential strategic decisions regarding strategic issues derived from Prahalad and Doz (1987), Sinha (1990) and Dean and Sharfman (1996) (i.e., opening of foreign markets, outsourcing, acquisitions and divestitures, know-how development, etc.) were included in the instrument (see Appendix 1). This instrument enquired respondents about 22 items, each of them referred to the number of occasions strategic decisions were made regarding one of these strategic issues over the last three years. From this instrument the number of decisions was measured as the sum of the scores of these 22 items, i.e. the sum of the reported occasions in which decisions regarding any strategic issue were made as a result of the formal strategic formulation processes. The variety of decisions was measured as the count of strategic issues that were object of strategic decisions at least once in the formal strategic formulation processes over the last three years. The second indicator used to measure number and variety of decisions was built on a 5-items Likert and asked about the variation on the number of decisions and variety of this decisions in each strategic (re) formulation over the last three years (see Appendix 1).

In our research, dynamism is defined as the rate and the instability of environmental change (Dess and Beard, 1984; Simerly and Li, 2000). The environmental dynamism faced by a firm was considered to be the environmental dynamism of the industry the firm belongs to (according to the *Clasificación Nacional de Actividades Económicas* CNAE 2009 coding scheme). Based on Simerly and Li (2000) and O'Connor et al. (2008), we constructed a proxy for environmental dynamism (DYN) of an industry. Based on O'Connor et al. (2008), we measured environmental dynamism through a formative construct that builds on each firm four dimensions of industry growth between 2002 and 2004: (i) industry employment; (ii) industry value added; (iii) number of medium and large-sized firms operating in this industry; and (iv) industry sales. In our study we adapted the instrument used by O'Connor et al. to consider the absolute values of the variation between each of the industry indicators for the respective period. Therefore, in our index high values refer to either, 1) high growth industries, in which new players are added at each moment and competition or scarcity of vital resources could turn to be an issue of concern, or 2) industries that are decreasing fast translated into firms closing down and diminishing sales, value added and employment. On the other hand, low values refer to firms that are operating into stable markets.

Organisational performance (PERF) refers to operational efficiency measured through a formative construct derived from the two accounting ratios of return on assets (ROA) and return on sales (ROS). The use of these two ratios to measure performance has been common in strategy research using second generation data analysis techniques such as SEM (Johnson and Greening, 1999; Hoskisson et al., 1993). ROA and ROS data were collected for each firm in the sample for the three years between 2005 and 2007, and averaged so that an average ROA and ROS for the 2005-2007 period was obtained for each firm, s between 2005 and 2007. In order to control for industry effects on financial performance, we computed the dominant two-digit CNAE 2009 (*Clasificación Nacional de Actividades Económicas*) industry average for ROA and ROS for the 3 years between 2005 and 2007, and measured a firm's performance on the ROA (ROS) dimension as the difference between the firm's average 2005-2007 ROA (ROS) and the respective industry's average 2005-2007 ROA (ROS).

Finally, we included a control variable for organisational size (SIZE). This variable was measured as the logarithm of number of employees for each company.

Table 5.1 and Table 5.2 report the sample description and descriptive statistics of the items and variables used in the research. Additionally to providing the key descriptives, Table 5.2

compares the scores of the variables of interest between the subgroup of firms that use SPMS and those who do not use SPMS and between subsamples of different firm size. As far as the use of SPMS is concerned, a battery of t-tests suggest that variety of decisions, number of decisions and organisational performance are significantly different between the two subgroups whereas environmental dynamism is not. We also report in Table 5.2 the results of the comparison of the variables of interest between medium-size firms and large-size firms. No significant differences are found for any of the variables between these subsamples based on firm size.

Table 5.1. Sample by Size and Use of SPMS

Sample by size	Total	%
Medium size firms (<250 employees)	216	77%
Large size firms	63	23%
Total	279	100%

Use of SPMS by size	Use SPMS	%	Do not use SPMS	%	Total
Medium size firms (<250 employees)	77	36%	139	64%	216
Large size firms	25	40%	38	60%	63
Total	102	37%	177	63%	279

Table 5.2. Descriptive Statistics

	Theoretical		Actual					
	Min	Max	Min	Max	Mean	Std. Dev.	Use SPMS vs. do not use SPMS	Medium vs Large size firms
SPMS	0	1					t-stat. (p-value)	t-stat. (p-value)
Integration of long-term and operational goals	1	5	1	5	2.61	1.84		
Senior manager's involvement	1	5	1	5	3.05	2.02		
Relationships between activities	1	5	1	5	2.90	1.91		
Inclusion of cause-effect linkages	1	5	1	5	2.89	1.90		
Operational manager's involvement	1	5	1	5	2.75	1.87		
Presence of a sequence goals/ targets/action plans	1	5	1	4	2.58	1.79		
Presence of multi-perspective metrics	0	4	0	4	2.08	1.80		
Variety of Decisions								
Variety of Decisions 1	0	22	0	22	13.21	4.10	-3.511 (0.001)	-0.538 (0.591)
Variety of Decisions 2	1	5	1	5	3.68	1.07		
Number of Decisions								
Number of Decisions 1	0	110	0	68	27.17	12.95	-4.304 (0.000)	0.512 (0.609)
Number of Decisions 2	1	5	1	5	3.61	0.93		
Organisational Performance								
Average 2005-2007 (ROA firm - ROA industry)					-0.29	11.90	0.217 (0.007)	-2.254 (0.025)
Average 2005-2007 (ROA firm - ROS industry)					-0.30	14.40		
Environmental Dynamism								
Abs(ΔIndustry employment)					16.09	10.08	-0.014 (0.844)	0.542 (0.588)
Abs(ΔIndustry value added)					26.40	60.26		
Abs(ΔNumber of firms)					30.03	33.84		
Abs(ΔIndustry sales)					18.41	13.00		
Size								
Log(employees)					2.20	0.39	0.093 (0.926)	

5.6. Results

5.6.1. Measurement Model

We tested our hypotheses using partial least squares (PLS) regression analysis through SmartPLS version 2.00 (Ringle, et al., 2005). PLS is particularly suited to this study because it is especially accurate and robust for formative models (Ringle, et al., 2009). Previous research has observed that covariance-based methods such as LISREL are appropriate to the analysis of formative constructs only under certain conditions and usually result in non identified models (Jarvis et al., 2003).

Individual item reliability on the reflective measurement models for NDEC and VDEC was assessed on the basis of the factor loadings. Table 5.3 reports factor loadings were greater than 0.7, except for Ndec2 for which the loading was 0.69. As the latent variable should account for at least 50% of the variance of an indicator, it is generally considered appropriate that factor loadings are equal or greater than 0.7 (cf. Chin, 1998; Hulland, 1999). However, we opted for keeping Ndec2 in the analysis due to the acceptable construct reliability measured by Dillon-Goldstein (ρc) which exceeds the recommended threshold of 0.7.

Table 5.3. Estimation of the measurement model parameters

Construct	Loadings original sample	Loading sample mean	t-Statistic (bootstrap)	Composite reliability (ρ_c)	Average variance extracted (AVE)
VDEC				0.787	0.630
Vdec1	0.885	0.885	41.422		
Vdec2	0.709	0.704	12.522		
NDEC				0.760	0.615
Ndec1	0.869	0.871	37.842		
Ndec2	0.689	0.683	14.037		

n=279; Bootstrap = 1000 sample

Results of tests for convergent and discriminant validity are presented in Table 5.4 and Table 5.5. Convergent validity of the constructs is evaluated by the average variance extracted (AVE) (Fornell and Cha, 1994). Both constructs' exhibit AVE greater than 0.50, indicating convergent

validity (Chin, 1998; Hair et al., 2006). Discriminant validity was evaluated through the cross-loading of constructs and discriminant validity coefficients. The cross-loading indicates AVE is greater than the variance shared between any two constructs and indicators on other constructs. Table 5.5 reports correlations and suggests discriminant validity among variables as diagonal AVE values exceed all other scores.

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Table 5.4. Cross-loadings

	SPMS	VDEC	NDEC	DYN	SIZE	PERF
SPMS						
Spms	**1.000**	0.192	0.251	-0.011	0.091	0.165
VDEC						
Vdec1	0.155	**0.885**	0.714	-0.121	0.041	0.091
Vdec2	0.160	**0.709**	0.459	-0.012	-0.006	0.049
NDEC						
Ndec1	0.157	0.704	**0.869**	-0.042	-0.001	0.133
Ndec2	0.262	0.443	**0.689**	-0.111	-0.063	0.148
DYN						
Δ n º firms	-0.001	-0.073	-0.082	**0.956**	0.008	-0.232
Δ n º employees	0.035	-0.064	-0.043	**0.231**	0.013	-0.056
Δ Value added	-0.021	-0.022	-0.025	**0.133**	0.224	-0.032
Δ Sales	0.102	0.042	0.069	**0.134**	0.189	-0.032
SIZE						
Employees	0.091	0.027	-0.033	0.012	**1.000**	0.113
PERF						
Roa	0.159	0.095	0.175	-0.249	0.120	**0.997**
Ros	0.147	0.013	0.126	-0.042	-0.024	**0.522**

n=279

Table 5.5. Discriminant validity coefficients

	SPMS	VDEC	NDEC	DYN	SIZE	PERF
SPMS	**1.000**					
VDEC	0.195	**0.802**				
NDEC	0.251	0.751	**0.784**			
DYN	-0.011	-0.095	-0.104	**F**		
SIZE	0.091	-0.033	-0.033	0.012	**1.000**	
PERF	0.165	0.092	0.179	-0.243	0.113	**F**

Diagonal elements = square root of the variance shared between the constructs and their indicators (AVE). Off-diagonal elements = correlations among constructs. F = formative measurement model.

The formative measurement models for DYN and PERF were evaluated for multicollinearity. We assessed multicollinearity based on the criteria: (a) correlations between the indicators of a latent variable; (b) tolerance; and (c) condition index of the indicators (Cenfetelli and Bassellier, 2009). Tests did not indicate any problematic multicollinearity on both formative constructs.

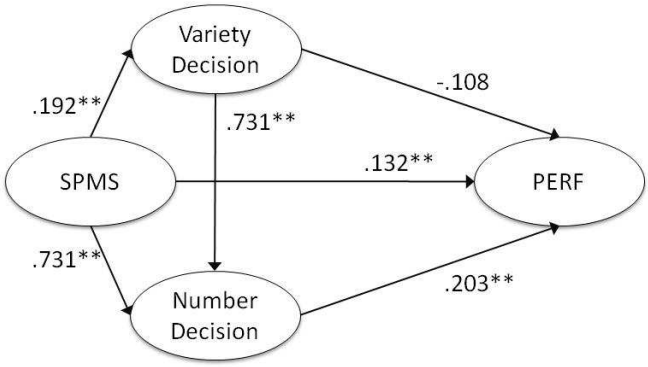
5.6.2. Test of Hypotheses

In order to test the hypotheses, four path models were tested using PLS. A first path model tested the direct effect of the use of SPMS on performance (H1). A second model extended the first one to examine the full mediation effects predicted in hypotheses H2 to H4. Figure 5.2 illustrates this estimated model for both direct and indirect effects. Another two path models examined the interaction models (Figure 5.3a and Figure 5.3b) to test hypotheses H5 and H6. This procedure of testing separate models avoids a) inappropriate simultaneous testing of main and interaction effects, and b) inappropriate simultaneous testing of unrelated interactions of the same order (cf. Hartmann and Moers, 1999; Hartman, 2005).

Bootstrapping (1000 samples) was used to assess the statistical significance of each path coefficient (Chin, 1998). The results for the general model are obtained controlling for organisational size (not reported in the figures). A summary of the path coefficients (and their associated t-values) and the R^2s of the endogenous constructs are presented in Table 5.6. We performed our analysis of the hypotheses H1 to H4 a stepwise fashion (Luft and Shields, 2003). Consequently Panel A on Table 5.6 shows a direct and a mediated path relationship which is used for testing H1 to H4. We first tested whether the use SPMS affected organisational performance through a direct effect, and subsequently we examined how this relationship is

altered by the introduction of mediators as predicted through H2 and H3. Panel B presents a specific test for indirect relationships (H2 and H3). Finally on Table 5.6 we present results referred to the moderation effect predicted in H5 and H6.

The results reported in Table 5.6 Panel A show a direct and positive relationship between the use of SPMS and organisational performance when only these two variables are considered in the first model ($\beta = 0.148$, $p < 0.01$) (H1). In the second model, when VDEC and NDEC are introduced, the direct and positive relationship between the use of SPMS and organisational performance is still observed. Moreover, this second model reports positive associations between the use of SPMS and VDEC ($\beta = 0.192$, $p < 0.01$) and between the use of SPMS and NDEC ($\beta = 0.116$, $p < 0.01$). However, the relationship between VDEC and PERF is insignificant ($\beta = -0.108$, $p > 0.05$) and therefore the findings do not support the mediation effect of variety of decisions predicted by H2. In contrast, the relationship between NDEC and PERF is significant ($\beta = 0.203$, $p < 0.01$) which appears to be consistent with the expected mediation of the number of decisions in the relationship between use of SPMS and organisational performance (as predicted by H3). The path coefficient from VDEC to NDEC is positive and significant ($\beta = 0.731$, $p < 0.01$), which supports hypothesis 4. This suggests that even though variety of decisions does not have a direct effect on organisational performance, it has an indirect effect on it acting through number of decisions.

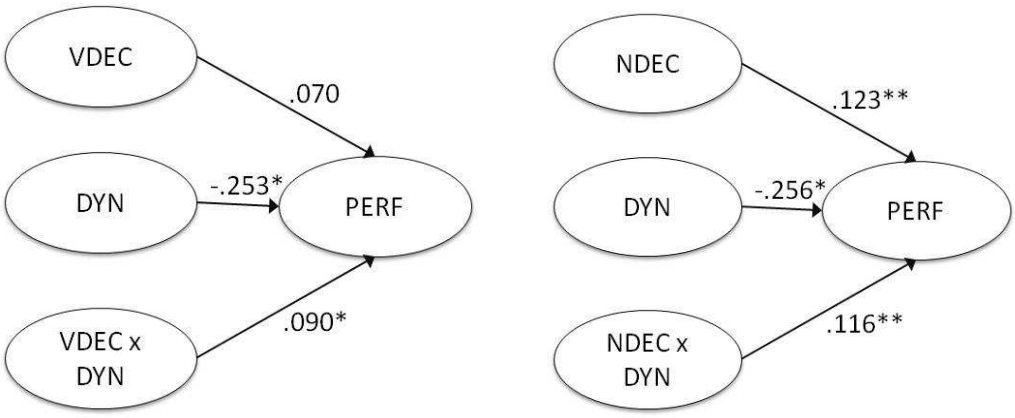


Notes: **p < 0.01 (one-tailed). n = 279 (significant paths for control variables not shown).

Figure 5.2. PLS structural model (direct and indirect effects)

We applied a specific test for multiple simultaneous mediators as proposed by Preacher and Hayes (2008) to examine the indirect effect of VDEC and NDEC on the relationship between SPMS and PERF. This technique is used in order to test the statistical significance of indirect relationships between an independent construct and a dependent construct through multiple mediators. The test generates coefficients and statistical tests for the indirect paths. Results depicted in Panel B confirm the findings of our second PLS model. Hence, we observe that while VDEC does not fully mediate the relationship between SPMS and PERF, NDEC is a significant mediator in the relationship between SPMS and PERF ($\beta = 0.119$, $p < 0.01$).

Fig. 3a illustrates the estimated model for the interaction VDEC x DYN. Although no significant positive relationship is found between the variety of decisions and the organisational performance, the effect of environmental dynamism moderates the relationship between the variety of decisions taken in each strategic (re) formulation organisational performance ($\beta = 0.090$, $p < 0.05$). Finally on Fig. 3b we show the estimated model for the interaction NDEC x DYN. The results reported in Table 5.6 Panel C indicate that the relationship between the number of decisions taken in each strategic (re)formulation and organisational performance is positively moderated by environmental dynamism ($\beta = 0.116$, $p < 0.01$). Results for control variable paths and explanatory power (R^2) are presented in Table 5.6.



(a) (b)

Notes: **p < 0.01, *p < 0.05 (one-tailed). n = 279 (significant paths for control variables not shown).

Figure 5.3. PLS structural model (interaction)

Table 5.6. PLS structural model: path coefficients, t-statistics and R^2

Panel A. Mediation through PLS Model	Direct Relationship (path coeff. and t-statistics)	Mediated Relationship (path coeff. and t-statistics)	R^2
Effect on PERF			0.104
SPMS > PERF	0.148** (2.845)	0.132** (2.734)	
VDEC > PERF		-0.108 (1.410)	
NDEC > PERF		0.203** (2.660)	
Effect on VDEC			0.037
SPMS > VDEC		0.192** (5.077)	
Effect on NDEC			0.580
SPMS > NDEC		0.116** (4.188)	
VDEC > NDEC		0.731** (35.163)	

Panel B. indirect effects and t-statistics (Preacher and Hayes, 2008)	Path coefficients	Coefficient Interval	
Indirect effects			
VDEC > PERF	-0.035	Lower: -0.133 Upper: 0.256	$p > 0.05$
NDEC > PERF	0.119	Lower: 0.0311 Upper: 0.2564	$p < 0.05$

Panel C. Interaction	Path coeff. and t-statistics
Interaction Model 1	
VDEC > PERF	0.070 (1.556)
DYN > PERF	-0.253* (1.815)
VDEC x DYN > PERF	0.090* (2.157)
Interaction Model 2	
NDEC > PERF	0.123** (2.814)
DYN > PERF	-0.256* (1.971)
NDEC x DYN > PERF	0.116** (2.813)

n = 279.

5.7. Discussion and Conclusion

Previous research has demonstrated that the use of Strategic Performance Measurement Systems (SPMS) has beneficial effects on organisational performance, arguing that these beneficial effects are primarily achieved through the contribution of SPMS to a more successful implementation of intended strategies. While SPMS were initially conceived as strategy implementation tools and consequently most of the empirical studies on the effects of SPMS have focused on this role, a stream of recent studies have pointed out additional potential roles of SPMS, such as their assistance in intentional strategy (re)formulation processes. However, in-depth theoretical development and large-scale evidence about the potential influence of SPMS on organisational performance acting through issues related to deliberate (re)formulation of intended strategies are still lacking. This study contributes to a better understanding of the extent to which Strategic Performance Measurement Systems (SPMS), primarily conceived for strategy implementation purposes, influence organisational performance through its contribution to shaping the strategic decision arrays that result from conscious, intentional strategy (re)formulation processes.

Building our arguments on cognitive and social psychology theories about the informational effects of SPMS and the building of strategic agendas, our first research question aimed to investigate whether the effect of the use of SPMS on performance is at least in part channelled through strategy (re)formulation. We have addressed this generic question by specifically analysing whether the positive effect of the use of SPMS on organisational performance is mediated by the comprehensiveness of the strategic decision arrays (i.e. by both the variety and number of decisions taken in each strategic (re) formulation.

Testing our model on archival and survey data collected from 279 Spanish firms, we have found support in favour of the use of SPMS having a positive effect on the comprehensiveness of the strategic decision array (i.e. variety and number of decisions) resulting from intentional strategy (re)formulation processes. Our findings also suggest that the comprehensiveness of the strategic decision array (i.e. number of decisions) resulting from such strategy formulation processes has in turn a positive effect on organisational performance (as measured by ROA and ROS). In contrast, we could not detect an effect of the variety of decisions taken in strategy (re)formulation processes on performance, even though variety of decisions has an indirect effect on organisational performance which is mediated by number of decisions. Overall, our results indicate that the positive effect of the use of SPMS on organisational performance is in fact

mediated by the comprehensiveness of the strategic decision array (i.e. variety and number of decisions) that results from intentional strategy (re)formulation processes.

Our results also indicate a direct effect of SPMS on organisational performance that does not go through the shaping of the strategic agendas and strategic decision arrays that result from strategy (re)formulation processes. These findings are consistent with previous research that observes the contributions of the use of SPMS in order to enhance performance through channels such as a better implementation of pre-defined strategies. However, our study contributes to previous knowledge in providing evidence that, even though the use of SPMS has a direct effect on organisational performance that does come from other sources, the effects of the use of SPMS on performance are at least in part derived from the shaping of the strategic agendas and strategic decision arrays that are present in the strategy formulation processes. In doing so, we emphasise the relevance of SPMS in roles that go beyond the traditional realm of strategy implementation.

In this study, we have also examined the potential effects of environmental dynamism as a moderator in the relationship between the comprehensiveness of the strategic decision arrays that arise from strategy (re) formulation and organisational performance. We have found the comprehensiveness of strategic decision arrays (both in terms of number and variety of decisions) to contribute to organisational performance especially in the presence of greater environmental dynamism. Our results suggest that the influence of the comprehensiveness of the strategic decision array on organisational performance is capitalised in the context of dynamic environments. Although not tested, the results of this research do not rule out the plausibility that this conclusion might not hold in the presence of extreme dynamism leading to quantum-leap variability or in the presence of extremely-high environmental volatility.

While the results of this study shed some light on the effectiveness of SPMS and its role in strategic formulation processes, some limitations must be noted which can be addressed in subsequent research. First, the sample of our study was selected from medium and large-sized industrials and service firms in a given geographical context. Generalising the results to organisations in other contexts should be done with caution. Second, future studies in this area should also use more refined measurement instruments. Finally, some limitations of our study are inherent to the selected research methodology. We opted for a large-sample, cross-sectional study in order to test some associations at a given point in time. However, as is the case with all cross-sectional, survey-based designs, and to the extent that temporal antecedence is not captured, strict causality cannot be claimed. In order to better understand the dynamics and

qualitative aspects underlying the relationships found in this study, we encourage further longitudinal case studies to extend and complement our findings.

Notwithstanding these limitations, this study has contributed to previous strategy and management accounting literature in at least two ways. First, this paper has demonstrated that, despite being primarily conceived to facilitate strategy implementation, the use of SPMS has a positive effect on organisational performance which is mediated by aspects related to strategy (re)formulation. SPMS contribute to enhanced performance not only through better execution of intended strategies, but also through the development of more comprehensive strategic agendas and more comprehensive strategic decision arrays arising from conscious processes of (re)formulation of intended strategy . Second, we have examined the effects of environmental dynamism on the relationships between the nature of strategic agendas and intentional strategy (re)formulation processes on the one hand and organisational performance on the other hand, concluding that the effectiveness of SPMS is more pronounced under dynamic environments.

In conclusion, SPMS offer a powerful way forward for organisations to approach strategy formulation. By including multiple perspectives and causal chains that relate competencies and capabilities with outcomes, SPMS help managers configure the resources and activities of the firm and remind them that organisations need to be not only adaptive to changes within their current environments, but also predictive and shapers of such changes. By doing so, the use of SPMS may reinforce the conception of strategy formulation as a continuous process through which an organisation defines its scope, the way it creates value and the configuration of its activities and resources for future success.

5.8. Notes

[1] One plausible explanation for some of the observed ambiguities are the differences across studies in the way the two constructs of interest, i.e. SPMS and performance, are conceptualised (Bisbe et al., 2007). A second explanation for the apparently inconclusive results may rely on the absence of control of the different patterns or styles of use of SPMS (Simons, 1995) and on the different contexts of analysis (e.g. industry, environmental dynamism).

[2] The way organisations formulate strategy has become one of the most contested areas of debate in the strategic management field. In the conventional approach (the so-called "prescriptive" or "design" school of thought), strategy development is mainly the result of a systematic, rational process of deliberate planning by a top management team, which is then communicated to the organisation for implementation. In large companies, this process typically occurs through formal strategic planning systems. An alternative approach, based on descriptive studies of strategy formation, sees strategy as the result that emerges from a complex, multi-level process of organisational decision making. The realised strategy is thus the outcome of two simultaneous processes: on the one hand, the execution of the strategy as conceived by the top management team (intended strategy) and, on the other, the cumulative effect of day-to-day decision-making in a changing environment which eventually results in the formation of unintended, emergent strategies (Mintzberg and Waters, 1985). Overall, the descriptive perspectives see strategy-making as an iterative process involving experimentation and feedback and stress a greater overlap and interplay between strategy formulation and strategy implementation. The practice of strategic planning in large companies has undergone a significant transformation since the 1980s, as can be seen by the emergence of new types of strategic planning systems that combine the design and emergence approaches to strategy formulation and implementation. For example, while corporate headquarters set the overall direction and scope of the organisation as well as the guidelines for the development of strategic plans, once these plans are decided upon, the divisional and business unit managers have considerable leeway in adjusting, adapting and experimenting (Grant, 2003, Ocasio and Joseph, 2008; Wilson, 1994).

In sum, while conceptually different, it must be acknowledged that strategy formulation and strategy implementation (i.e.the process of turning strategy into action and monitoring and assessing the results) are interdependent since a well-formulated strategy needs to take into account the way it will be implemented, and given that it is through the learning in its implementation that a company's strategy is refined and eventually reformulated.

5.9. References

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Appendix 1 (Questionnaire Items)

Strategic Performance Measurement Systems

- Is there a performance measurement system in place in your firm which is used at top management levels? (Yes/No)
  Attached definition: Performance Measurement Systems (PMS) = concise sets of metrics (financial and/or non-financial) that support the decision-making processes of an organisation by gathering, processing and analysing quantified information about its performance, and presenting it in the form of a succinct overview. While selected metrics derived from financial statements may be included as indicators within PMS, in this survey we consider financial statements as a category of management systems in its own right, and consequently do not fall into the definition of PMS. If yes, then

- performance goals in the PMS are explicitly linked to long-term strategy *(1=fully disagree; 5=fully agree)*
- there is a high degree of senior manager's involvement in the design and selection of the performance measures *(1=no involvement; 5=very high involvement)*
- relationships between activities/functional areas are included in the PMS *(1=fully agree; 5=fully disagree)*
- PMS offer assistance to managers that helps them understand relationships between activities and of relationships between functional areas *(1=fully agree; 5=fully disagree)*
- operating managers from different functional areas are involved in the design and selection of the performance measures *(1=fully agree; 5=fully disagree)*
- the performance measurement system in place explicitly contains a) goals, b) metrics, c) targets d) action plans *(Yes=1;No=0 for each of the four items).*
- Is the performance measurement system explicitly organised in different blocks or perspectives? *(examples of perspectives follow).* If so, which blocks or perspectives are captured? *(an open list of examples follows: financial, customer, internal processes, asset development, learning, others)*

Number of Decisions and Variety of Decisions

During the last three years, how many times have strategic decisions been taken regarding the following issues:

- Redefinition of the business (needs to satisfy, segments addressed, technology / know-how)
- Redefinition of the vision / major objectives to achieve in the long-term (more than two years)
- Differentiation strategies (quality, service, image branding, design, innovation, etc.)
- Low cost strategies / cost rationalisation
- Key products or services attributes
- Brand image positioning
- Key customers
- Key suppliers
- Export / opening of new foreign markets
- Subsidiaries in other countries
- Strategic alliances or long-term strategic agreements
- Restructuring
- Redesign of key internal processes
- Outsourcing an activity / area of the company
- Diversification
- Purchase or sale of patents or licenses
- Development of technology / know-how
- Mergers or acquisitions
- Entry of new shareholders
- Disinvestment (plants, facilities, etc.)
- Others (specify)

Number of Decisions

- In the last three years, compared to previous years, in each one of the revisions of your business strategy the number of decisions taken has (1= decreased significantly; 5= increased significantly)

Variety of Decisions

- In the last three years, compared to previous years, in each one of the revisions of your business strategy the variety of decisions taken has (1= decreased significantly; 5= increased significantly)

Chapter 6: Conclusions, future research and limitations

In this study I started from what would be considered a very broad and fuzzy question: How the use of management accounting and control systems enhances organisational outcomes? The investigation of such question could be structured in uncountable different ways. In this research, I opted to analyse the topic from four different angles. The two first research papers of this thesis examine organisational outcome in terms of 'innovation outputs', whereas the third and fourth articles of this thesis concentrate on the organisational outcome in terms of 'performance'. In any case, my objective here was the one of understanding the effects and means by which the use of management accounting and control systems is capable of enabling and supporting organisational success. Building on these compendium of four researches, this thesis identifies relevant contingency variables that distinguish organisational contexts (e.g. management accounting and control systems, techniques, and uses; strategic patterns; innovation management modes; environmental dynamism), group different contexts based on such contingency variables, and determines configurations, means and paths (e.g. organisational creativity, conversion abilities, comprehensiveness of strategic agendas gained during strategy (re) formulation processes) that explain to a certain extent organisational effectiveness, efficiency and survivor. Therefore, this research argues that the use of MACS can contribute to enhance organisational outcome in a number of ways. Here, in this document, I emphasised few of them. In this chapter I aim to briefly present conclusions of each of the papers enclosed in this thesis and also to bring some insights for future research. As discussed below, this thesis opens up several opportunities for further investigation of the means through which management accounting and control systems contribute to desirable organisational outcomes.

6.1. Paper 1 (Chapter 2)

The aim of this first empirical study is to examine the relationships between innovation and MACS by providing insights on the choice made by senior managers in selecting which individual MACS are chosen for interactive use (ICS) (Simons, 1995, 2000), as well as on the impact of this choice on innovation outcomes. The empirical evidence supports the hypothesis that firms would be more likely to interactively use an individual MACS that is compatible with and presents similar characteristics to its innovation management modes (IMM), with both IMM and individual MACS supplementing each other and being mutually

supportive. Therefore we find that firms under an intuitive IMM tend to select balanced scorecard for interactive use, firms under strategic/expert IMM tend to select balanced scorecard or budgets as ICS. Less conclusive evidence was found regarding the systematic and the strategic/non-expert IMM. Our second research question concerns the extent to which fit between IMM and ICS is translated into beneficial implications on innovation outputs. The results of our study indicate that there is in fact a significant difference in the level of innovation between those firms in which the individual MACS selected for interactive use corresponds with the conceptually-derived fit and those firms in which there is no such correspondence. However, we have found this effect to occur in the opposite direction to what we had originally predicted and a fit between IMM and MACS is not translated into desirable innovation outcomes. *Ad hoc* analysis based on psychology literature suggests our findings indicate that this supplementary fit (situations in which entities possess similar or matching characteristics) does not in fact lead to an enhanced ability to mitigate the dysfunctional excesses of innovation momentum, but rather may lead to its reinforcement. Our results allow us to speculate that this ability is more likely to arise from the richness obtained by introducing elements that do not fully conform to existing patterns and offer instead new, complementary perspectives (i.e. complementary fit).

As a consequence of the limitations of this research, several research avenues are opened. For instance, by concentrating on ICS, this study does not analyse the interplay between diagnostic MACS, interactive MACS and the other MACS within the control package (Malmi and Brown, 2008). What would be the effects of the fit between IMM and ICS into product innovation if a control package was considered? Future LOC studies should strive to integrate issues surrounding the choice of the individual MACS selected for interactive use with research into the interplay between levers. We believe that this integration will enhance the ability of researchers to capture how firms successfully manage the tension between the need for the predictable achievement of pre-established objectives and the need for creative innovation and how the management of this tension is ultimately reflected in long-term performance. Yet, this research only tests the effects of IMM to explain the choice of ICS. What other factors would be significant to understand this choice? Moreover, the cross-sectional nature of this research does not allow for a process-based understanding of the dynamics of the choice of the ICS. How the choice of ICS occurs in a dynamic setting? What factors would influence the change of which MACS is selected for interactive use? Our findings provide useful insights that could form the basis for future qualitative research

examining the dynamics of the process by which an individual MACS is chosen for interactive use under different IMM, as well as the dynamics of the implications of this choice regarding innovation momentum.

6.2. Paper 2 (Chapter 3)

This paper aims to examine the extent to which three forms of control systems within the control package (i.e. cultural controls (Merchant and Van der Stede, 2007), diagnostic control systems and interactive control systems (Simons, 1995)) are associated with different stages of the innovation process such as creativity and three facets of conversion ability (i.e. coordination, knowledge integration and filtering practices). Empirical results support that each specific form of control within the control package has different influences on the diverse components or stages of the innovation process. Moreover, the significance and direction of these influences varies between entrepreneurial and conservative firms. By associating specific forms of control within the control package with specific components or stages of the innovation process, our results highlight the simultaneous complementarities and supplementarities between specific MACS. Findings challenge the traditional dilemma between specific MACS as complements and specific MACS as supplements (Davila et al., 2009; Fisher, 1998), suggesting that specific MACS are both supplements (i.e. different specific MACS can enable and support a given stage of the innovation process, and firms choose different specific MACS in order to enable and support the same component of the innovation process depending on their strategic pattern) and complements (i.e. for the innovation process to be successfully carried out, the different stages must be integrated and therefore the different specific MACS chosen or emphasised in each stage become integrated with other specific MACS chosen for or emphasised in the remaining stages).

These findings raise further questions. For instance, by concentrating on organisation as the unit of analysis this research was not able to delve into potential differences in the type and source of innovation initiatives (e.g. radical versus incremental). Are there differences between the effects of MACS into a radical and incremental innovation process? Would the contributions of MACS be perceived differently if NPD managers or employees involved in NPD processes were questioned? What are the effects of MACS to individual creativity as perceived by employees? What if creativity was not understood as the generation of useful and novel ideas but as a process, would individual MACS within a package contribute to different phases of creativity? In this research we frame MACS as a group of components but

not specific MACS is defined. Would specific MACS (e.g. budgets, project management, and balanced scorecard) contribute differently to enable and support innovation capabilities? Furthermore, previous research has noted the importance of understanding the tensions that are generated by the combined use of different levers of control (Henri, 2004; Simons, 1995, 2000). It would be appealing for future research to test how those tensions among MACS within a control package influence the innovation process.

6.3. Paper 3 (Chapter 4)

This paper aims to review how performance has been assessed in prior contingency-based survey management accounting research. In order to organise this analysis we present the discussion on subjects related to conceptualisation, measurement and correspondence between concepts and measures in MACS constructs. The examination of nine accounting journals over a 27-yr period (1982–2008) reveals the use of self-reported, primary measures predominates followed at a distance by objective secondary measures. The use of combined multiple methods is very scarce. While in recent years there has been a moderate trend towards the increased use of approaches other than self-reported primary measures, these are still the most widely used. Besides, identifying the papers and the corresponding techniques that have been used to assess performance in MACS research, this study identifies the main problems associated with the assessment of performance as a variable of interest in survey-based research. The study identified conceptualisation and measurement as two major areas of concern. The first of these concerns refers to the lack of attention given by researchers regarding the conceptualisation of the variable performance. Performance may be associated with many different ideas (e.g. goal attainment, decision making improvements, financial results, customer satisfaction, production quality) however researchers seem to ignore or underestimate the need for a clear definition of the term itself. In some cases the instrument of measurement seems to be the only definition of the term. The evidence shows that the concept is not so obvious and that the production of a specific agreed upon meaning and domain for each construct of interest is needed. The second concern refers to measurement. On this regard, the paper develops an analysis through a classificatory scheme to identify that no measurement is free of concern but each different measurement design carries advantages and disadvantages. Several methodological issues concerning the assessment of performance in MACS research are discussed. Mode of assessment, data source and the use of multiple approaches are reviewed to find some potential themes of improvement. For instance, the

paper encourages the use of secondary data mostly in order to overcome problems of common method bias, aware researchers to identify short-and long-term indicators effects and to control for firm life cycle stages, and stimulates researchers to supplement perceptual indicators with objective indicators.

This paper contributes to the literature on management accounting by recommending some guidelines to help conceptualisation and measurement of performance as a variable, however it was not able to identify potential research design that undermine concerns regarding the assessment of performance as a variable. While this research shed some light into the use of performance as a variable in management accounting research further questions remain. Could future studies propose research designs that reduce or rule out problems found while assessing performance as a variable? How to balance the use of financial and non-financial indicators to assess performance? Should the choice for specific indicators of performance be industry or geographical driven?

6.4. Paper 4 (Chapter 5)

This study contributes to a better understanding of the extent to which Strategic Performance Measurement Systems (SPMS), primarily conceived for strategy implementation purposes, influence organisational performance through its contribution to shaping the strategic decision arrays that result from conscious, intentional strategy (re)formulation processes. Statistical tests support the hypothesis that the use of formal SPMS has a positive effect on the comprehensiveness of the strategic decision array resulting from intentional strategy (re)formulation processes. Overall, the finds of this research indicate that the positive effect of the use of SPMS on organisational performance is in fact mediated by the comprehensiveness of the strategic decision array (i.e. variety and number of decisions) that results from intentional strategy (re)formulation processes. Furthermore in this study, the paper also examined the potential effects of environmental dynamism as a moderator in the relationship between the comprehensiveness of the strategic decision arrays that arise from strategy (re) formulation and organisational performance. Results suggest that the comprehensiveness of strategic decision arrays to contribute to organisational performance especially in the presence of greater environmental dynamism. Our results suggest that the influence of the comprehensiveness of the strategic decision array on organisational performance is capitalised in the context of dynamic environments. Overall the results of this research suggest the use of SPMS may reinforce the conception of strategy formulation as a

continuous process through which an organisation defines its scope, the way it creates value and the configuration of its activities and resources for future success.

While the results of this study shed some light on the effectiveness of SPMS and its role in strategic formulation processes, some limitations and potential avenues for future research must be noted. Firstly, as this research claims SPMS would be beneficial in higher levels of environmental dynamism, it would be significant to test whether the results of this research would hold in the presence of extreme dynamism leading to quantum-leap variability or in the presence of extremely-high environmental volatility. Second, future studies in this area should also use more refined measurement instruments. Finally, the inclusion of additional contingent variables in future studies may help explain in which circumstances, given a certain level of environmental dynamism, the benefits of using broad scope information outweigh the risks of ossification or otherwise.

6.5. Limitations

Based on the theoretical contingency perspective presented in the introduction of this research, I now turn to explore some general aspects of theory and method that may have influenced the results of this thesis. In this section I briefly discuss some limitations that are common throughout this thesis.

It has been argued that for various reasons contingency-based research produced a fragmented and contradictory theory (Fisher, 1998; Otley, 1980). First and foremost, it must be noted that contributions to contingency theory are usually considered to be fragmented in the sense they are usually restricted to a tractable pool of contingency factors that combined influence a particular managerial or organisational outcome (Donaldson, 2001). On one hand, this rather small number of contingency factors allows researchers to deeply investigate relationships and configurational fit among factors. On the other hand, by examining few variables, researchers may be ignoring significant relationships and constructing a biased view of a certain phenomenon (Chenhall, 2007).

Other researchers have also accused management accounting contingency-based studies of been fragmented as those studies concentrated on examining few specific MACS. As MACS do not come to be used in isolation but as in packages, most accounting literature which mainly focused on a small pool of MACS may be exposed to model under specification

threats (Malmi and Brown, 2008). Fisher (1998) and Bisbe et al. (2007) also elaborate on the potential problems derived from incongruence of variable conceptualisations. It has been said that the extant body of knowledge created by contingency studies may be inconsistent as variables are not well conceptualised. Other common criticism contingency-based studies have been exposed to refer to the inappropriate use of many different forms of fit. Drazin and Van de Ven (1985) and Gerdin and Greve (2004) elaborate in this problem by observing many researchers have not always been aware of the implications of their choice of theory building and testing. As a result, the conceptualisations of fit used seem not to be comparable (Drazin and Van de Ven, 1985) and contradictory, or supportive findings may have to be reinterpreted (Gerdin and Greve, 2004). Contingency-based research has also been criticised on its reliance on traditional and functionalist theories (Chenhall, 2007). As new 'alternative' theories in management accounting arise, criticism against the functionalist base of contingency grows, and an increasing literature invite contingency-based researchers to apply a more interpretative and critical view of the social context that surround the organisational setting (Baxter and Chua, 2003).

Those are some of the limitation of the theoretical approach chosen for this thesis. The research presented here accounts for this problem, and as a result it bases hypothesis and conclusions on solid theoretical grounds, develops appropriate research designs and applies control variables in order to reduce problems that are inherited from the theoretical perspective used. However, beside of any acknowledge caution, this research does not rule out potential misspecification caused by missing factors. As any other theoretical perspective in social and human sciences, contingency theory has its limitations that, I believe, in the context of this research, are offset by contributions achieved. The benefits of contingency theory, even as rather contained in a restrictive view of an organisational context, do add to the theory and practice in management and accounting research. This same view has been previously supported by a number of researchers (Chenhall, 2007; Donaldson, 2001). The long tradition and the continuous publications in management and accounting contingency-based research indicate the relevance and strength of this research area. As observed by Chenhall (2007) even not without methodological imperfections, this theoretical perspective has generated a substantial body of literature that has provided a basis for comprehensive propositions between elements of MACS and context. Consequently, this theoretical framework and potential strength of it provide 'a basis to uncover generalisable findings that can enhance desired organisational outcomes' (Chenhall, 2007:195).

A second often argued problematic aspect associated with contingency based studies is its methodological choice. As observed by Otley (1980) contingency-based studies that rely on purely statistical methods and survey-based data usually fail to unravel complex patterns of inter-action. Otley (1980) claims a closer involvement of researchers with organisations under investigation and longitudinal studies are needed. In this research, as each of papers enclosed here are survey-based, it is worthwhile to spend few lines to elaborate in the methodological choice employed. Previews literature has regularly celebrated the advantages of case-based studies over survey methods (Modell, 2005). For instance, it has been argued that those methods are insightful to explore processes which an accounting system develops and is changed in response to organisational contexts (Modell, 2010). Given the potentialities of case studies it may be intriguing my choice not to decide for that research methodology. Such decision was mainly based on the fact that as much as case study gains in detail, it loses in generalisability. Furthermore, a considerable body of case study research has been accused of lacking connections with the theoretical base of management accounting (Lillis and Mundy, 2005). Alternatively, in this research I used cross-sectional surveys. This method can be a source of large-scale high-quality data that can make relevant contributions to theory testing (Van der Stede et al., 2003). Along this thesis I have clearly exposed the limitations of my selected research methodology. I opted for a large-sample, cross-sectional study in order to test some associations at a given point in time. However, as it is the case with all cross-sectional survey-based designs, and to the extent that temporal antecedence is not captured, strict causality cannot be claimed. In order to better understand the dynamics and qualitative aspects underlying the relationships found in this study, this thesis encourages further longitudinal case studies to extend and complement the findings presented here.

6.6. Final considerations

This thesis is composed of a compendium of four research articles. The variety of data, methodologies and aspects used in the research process gives evidence that contributes to a better understanding of the effects and means through which the use of management accounting and control systems enhance organisational outcome. The partial answers that were obtained in these studies are a tinny contribution to the overall knowledge on the topic; however they are relevant contributions to specific areas of management and accounting research. Throughout this document I stated such contributions to the extant theoretical knowledge and practice. I hope this thesis serves as theoretical and inspiration bases for

future research that enhance our knowledge in this so controversial topic of the organisational consequences of the use of management accounting and control systems.

Chapter 7: References

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