

# 台灣管理會計文獻之回顧與評估

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## 摘要

本文回顧 1997 年到 2009 年間，在台灣主要期刊上所發表之管理會計研究。統計結果顯示，管理控制系統是最常被探討的議題，其次則依序為存貨管理、成本會計與管理、一般管理議題、決策方法與其他。若依據研究方法進行分類，則以分析性研究為最多，其次為問卷研究、實證研究、個案研究、實驗研究與規範性研究。本文分析管理會計文獻所引用的理論，除了少數文獻外，多數研究都建立在理論基礎上，並以引用經濟理論的文獻為最多，其他領域理論依被引用的頻率高低分別為組織行為理論、生產與作業管理理論、策略、心理學、財務與資訊科學等領域之理論。最後，依據台灣管理會計文獻的產業背景設定區分，則可發現除了存貨管理相關文獻外，多數文獻以單一產業進行研究。本文回顧過去文獻，並提出未來研究之建議，包含實證研究應將自我選擇問題納入考量以及問卷研究必須注意樣本取得對於研究結果的影響等。整體而言，儘管仍有改善的空間，但台灣管理會計之研究無論在議題設定、研究方法與理論依據等方面，皆達一定的水準。

**關鍵詞：**管理會計研究、台灣、研究方法

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# Management Accounting Research in Taiwan: A Review and Assessment

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## Abstract

In this study, we review management accounting research in Taiwan during the period 1997-2009. The results indicate that issues related to management control systems are most extensively examined, followed by inventory management, cost accounting and management, management accounting in general, decision-making methods, externally oriented management accounting, and others. In terms of research methods, analytical modeling is applied most frequently, followed by survey, field-archival, case study, experimental study, and normative/conceptual type of research. In terms of theories applied, economic theory is applied most frequently, followed by organizational behavior, production and operations management, strategy, psychology, finance, and information science. Only a few studies do not apply theories. With respect to research settings, except for the inventory management studies, most studies are conducted with an industry as the setting. While there is room for improving research quality, the articles reviewed in this study have produced acceptable quality. The areas for improvement include paying attention to self-selection bias in the field-archival research, sample selection issues in the survey research, among others. Overall, our assessment of management accounting research in the above aspects suggests that management accounting research in Taiwan has achieved a certain level of quality.

**Keywords:** *Management accounting research, Taiwan, Research methods.*

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## 1. INTRODUCTON

A survey on the citations in the *Taiwan Social Science Citation Index* (TSSCI) journals shows that papers published in TSSCI journals are rarely cited by other TSSCI-journal articles (Airit Book 2010). Huang (2005) raises a similar concern. This finding may suggest that scholars in Taiwan do not refer to papers in domestic journals because their quality is perceived to be lower. Another possible reason is that papers published in domestic journals do not examine issues of interest to domestic scholars. However, we do not have empirical evidence available for an assessment because the journals in Taiwan generally do not publish review or survey-type (hereafter “review-type”) articles. Usually, a review-type article provides a classification and overview of, as well as commentary on, articles under investigation based on research topics, methods, and findings. The lack of review-type articles plus the low rate of citations of domestic-journal articles means that we know more research about other countries than about ourselves. However, different countries encompass different cultures and institutions even in today’s global environment. Research topics of importance to one country may not be so to another, research methods that are well developed and applied in one country may still be novel to another, and research findings obtained in one country may not apply to another. Thus, it is important and imperative to fill this gap by systematically reviewing articles published in domestic journals to enhance the understanding of research of our own.

The current study is a first step toward this goal by reviewing management accounting research in Taiwan. Management accounting systems are designed to help decision makers manage an organization (Luft and Shields 2003). Understanding how management accounting works and how it changes to fit the needs of an organization as well as how it affects firm performance through reviews of research is important because research findings can provide feedback for suggesting ways of effectively implementing and designing management accounting systems. Such understanding can also suggest research topics for future study, as well as room for improving research. While there are papers reviewing management accounting research in the United States (Shields 1997; Maher 2001), the United Kingdom (Hopper, Otley and Scapens 2001), German-speaking countries (Ewert and Wagenhofer 2006), and China (Duh, Xiao and Chow 2008), little is known about the status quo and historical development of management accounting research in Taiwan.

In this study, we limit the review to journals that publish management-related papers and are on the TSSCI list and *Taiwan Accounting Review* because these journals are recognized by most universities. The following journals are included in the review: (1) *Asia Pacific Management Review*, (2) *Chiao Da Management Review*, (3) *Journal of Accounting Review* (previously *International Journal of Accounting Studies*), (4) *Journal of*

*E-Business*, (5) *Journal of Financial Studies*, (6) *Journal of Information Management*, (7) *Journal of Management*, (8) *Journal of Management & Systems*, (9) *Management Review*, (10) *NTU Management Review*, (11) *Review of Securities and Futures Markets*, (12) *Sun Yat-Sen Management Review*, and (13) *Taiwan Accounting Review*.<sup>1</sup>

The National Science Council (NSC) announced the TSSCI journal list in October 2000 for the first time. Prior to the announcement, a journal must have had a publication history of three years or more for the evaluation by the NSC. As a result, we chose 1997 as the beginning year of our sample period. We concluded with 2009 because we began this study in 2010, and this was the last year for which complete volumes for these journals were available at the time of data collection. We identified 125 management accounting (MA) articles from the above journals. Most papers came from the *Journal of Management & Systems* (21) and *Journal of Management* (20), followed by *Journal of Accounting Review* (previously *International Journal of Accounting Studies*) (15), *Chiao Da Management Review* (14), *Sun Yat-Sen Management Review* (12), *Asia Pacific Management Review* (10), and *Management Review* (10).<sup>2</sup> The remainder are the *Journal of E-Business* (6), *Taiwan Accounting Review* (5), *NTU Management Review* (5), *Journal of Information Management* (4), and *Journal of Financial Studies* (3). *Review of Securities and Futures Markets* did not publish any management accounting papers during the sample period.

Following Shields (1997), we classify the articles by topic, method, setting, and theory. The 125 articles cover a wide range of topics, including management control systems, inventory control systems, cost accounting and management, decision-making methods, and externally oriented management accounting. To organize the articles by research method, these articles will fall into one of the following categories: analytical modeling, case study, field-archival research, laboratory experiments, literature review, normative/conceptual paper, and survey study. Specifically, an analytical modeling study is one that involves mathematical proof of propositions or searching for solutions through, for example, optimization techniques (Maher 2001). A case study involves the observation in natural settings of policies, practices, people, structures, and contexts within an organization (Birnberg, Shields and Young 1990; Yin 1994). Field-archival research is similar to a case study, except that the data of interest are publicly available through databases or provided by the firms (Abdel-khalik and Ajinkya 1979). Laboratory experiments are defined as those that involve the observation of the manipulating effect of the independent variables on the dependent variables (Birnberg et al. 1990; Sprinkle 2003). Normative/conceptual papers

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<sup>1</sup> We do not include the *International Journal of Information and Management Science* and *Journal of the Chinese Institute of Industrial Engineers* in the review because these two journals focus on industrial engineering issues. We thank a reviewer for the suggestion.

<sup>2</sup> The figure in parentheses is the number of articles.

develop ideas or arguments without using data or modeling (Maher 2001). A survey study involves the use of questionnaires to collect data from respondents (Van der Stede, Young and Chen 2005). Most of the studies use the analytical modeling methodology, followed in descending order by survey studies, field-archival studies, case studies, normative/conceptual papers, experimental studies, and literature reviews.

In the 125 articles, 65 focus on single industry or activity settings. In terms of theoretical underpinnings, economics theory is most frequently applied, followed by organizational behavior, production and operating management (POM), and strategic management. To assess the quality of the articles, the criteria of construct validity, internal validity, external validity, and reliability are used for evaluating empirical research (Abdel-khalik and Ajinkya 1979; Birnberg et al. 1990; Van der Stede et al. 2005; Yin 1994). To evaluate analytical modeling research, Demski's (2007) criteria, such as the importance of research questions, preparation of models, and ability to satisfy the Ralph test, will be used.<sup>3</sup>

In the following four sections, we summarize the contents of the papers by research topic, research method, research setting, and the application of theory.<sup>4</sup> In Section 6, we follow Luft and Shields (2003) to map and connect management accounting research that investigates similar issues. Section 7 assesses the overlap between management accounting research and practice. Section 8 additionally reviews management accounting research by Taiwanese scholars published in international journals but with Taiwan as the research setting. The final section concludes our paper.

## 2. DISTRIBUTION OF RESEARCH TOPICS

To avoid an overly fragmented discussion, the general approach of Shields (1997) is followed. Table 1 presents the distribution of research topics. The 125 articles are assigned to the following categories: management control systems (67 articles, 53.6 percent), inventory management (18 articles, 14.4 percent), cost accounting and management (14 articles, 11.2 percent), MA in general (12 articles, 9.6 percent), decision-making methods (7 articles, 6.4 percent), externally oriented management and accounting (3 articles, 2.4 percent), and a catch-all "other" category (4 articles, 3.2 percent). In some topics, articles can be separated into several subtopics. For instance, the topics subsumed under management control systems contain operating budgeting, performance

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<sup>3</sup> The Ralph test assesses whether a research project is of classroom importance and whether the answer provided by the research is useful (Demski 2007).

<sup>4</sup> Tables showing descriptive statistics along these dimensions and a summary of the 125 articles are not presented for brevity but are available from the first author upon request.

measurement, performance evaluation systems, responsibility accounting, transfer pricing, and performance-based compensation.

## 2.1 MANAGEMENT CONTROL SYSTEMS

In the topics under management control systems, operating budgeting (14), performance measurement (24), and performance evaluation systems (19) receive the most attention. Other topics include performance-based compensation (6), transfer pricing (3), and responsibility accounting (1).

### 1. Operating Budgeting

Fourteen articles examine issues about operating budgeting. Three of them investigate budgetary slack, four focus on budgetary participation, another four examine issues related to budgetary goals, and the other three examine the budgetary control system issue. Budgetary slack studies investigate how to reduce the slack (Ni and Zhu 1998; Ni and Lin 1999) and the reasons causing the slack (Chiou 2008). Ni and Zhu (1998) find that slack will be low when budgetary participation, budgetary emphasis, and information asymmetry are high and vice versa. Ni and Lin (1999) conclude that the relationship between reward and penalty parameters in the pay scheme is important in determining the degree of budgetary slack.<sup>5</sup> Chiou (2008) analyzes the effect of attributions of the previous performance on budgetary slack. He finds that, when subordinates attribute previous success to ability or task difficulty, they will create less budgetary slack and vice versa.<sup>6</sup> Moreover, budgetary emphasis moderates the relationship between the attribution and budgetary slack.

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<sup>5</sup> The previous experimental results show that the truth-inducing pay scheme for a risk-neutral person could decrease the budgetary slack but not completely eliminate it (Young 1985; Waller 1988). The following is

the truth-inducing pay scheme: 
$$B = B_0 + \beta(\bar{y} - y_0) + \alpha(y - \bar{y}), \text{ if } y \geq \bar{y}$$

$$= B_0 + \beta(\bar{y} - y_0) + \gamma(y - \bar{y}), \text{ if } y < \bar{y}$$

where  $B$  is the subordinate's bonus,  $y$  is performance, and  $B_0$  and  $y_0$  are the initial bonus and budget proposed by the superior, respectively.  $\bar{y}$  is the budget as revised by the subordinate via participation, and  $\alpha, \beta, \gamma$  are reward and penalty parameters specified by the superior prior to participation (Chow, Cooper and Waller 1988). Ni and Lin (1999) point out that the relationship between these parameters determines the results. When  $\beta - \alpha > \gamma - \beta$ , a risk-neutral person and a risk-loving person would not report budgetary slack.

<sup>6</sup> Weiner (1985) points out four factors that influence an individual's achievements: ability, effort, task difficulty, and luck.

**TABLE 1 Distribution of Research Topics**

Number of articles	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
<b>1 Management control systems</b>														
1.1 Operating budgets	1	2	2	1	2	0	1	0	1	1	1	1	1	14
1.2 Performance measurement	2	1	1	2	2	1	5	0	2	1	0	4	3	24
1.3 Performance evaluation systems	0	0	1	1	2	3	1	2	1	3	2	2	1	19
1.4 Performance-based compensation	0	0	1	1	0	1	1	0	0	1	0	1	0	6
1.5 Responsibility accounting	1	0	0	0	0	0	0	0	0	0	0	0	0	1
1.6 Transfer pricing	0	1	0	0	0	0	0	0	0	1	1	0	0	3
Subtotal	4	4	5	5	6	5	8	2	4	7	4	8	5	67
Percentage	3.2	3.2	4.0	4.0	3.9	4.0	6.4	1.6	3.2	5.6	3.2	6.4	4.0	53.6
<b>2 Inventory management</b>														
2.1 EOQ	0	0	1	0	0	0	1	1	1	0	0	0	0	4
2.2 Perishable items	0	0	0	0	0	0	2	0	0	0	0	0	0	2
2.3 Deteriorate items	1	2	0	1	1	0	0	0	0	0	0	0	0	5
2.4 Supply chain	0	0	0	0	1	2	1	0	0	0	1	2	0	7
Subtotal	1	2	1	1	2	2	4	1	1	0	1	2	0	18
Percentage	0.1	1.6	0.1	0.1	1.6	1.6	3.2	0.1	0.1	0.0	0.1	1.6	0.0	14.4
<b>3 Cost accounting and management</b>														
3.1 ABC/ABM	0	1	0	0	2	1	0	0	0	0	0	0	0	4
3.2 Pricing	1	0	0	0	0	0	0	0	1	0	0	0	0	2
3.3 Target costing	0	0	0	0	0	0	1	1	0	0	1	0	0	3
3.4 Environment accounting	0	1	0	0	0	0	0	0	0	0	0	0	0	1
3.5 General issues	0	0	1	0	0	0	0	1	1	0	0	1	0	4
Subtotal	1	2	1	0	2	1	1	2	2	0	1	1	0	14
Percentage	0.1	1.6	0.1	0.0	1.6	0.1	0.1	1.6	1.6	0.0	0.1	1.6	0.0	11.2

TABLE 1 Distribution of Research Topics (continued)

Number of articles	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
4 Decision-making methods														
4.1 Forecast	0	0	0	0	0	1	0	1	0	0	0	0	0	2
4.2 Capital budget	1	0	0	0	1	1	0	0	0	1	0	0	1	5
Subtotal	1	0	0	0	1	2	0	1	0	1	0	0	1	7
Percentage	0.1	0.0	0.0	0.0	0.1	1.6	0.0	0.1	0.0	0.1	0.0	0.0	0.1	5.6
5 Management accounting in general														
5.1 General issues	0	1	0	1	2	0	1	0	2	1	0	0	2	10
5.2 Strategy	0	0	1	1	0	0	0	0	0	0	0	0	0	2
Subtotal	0	1	1	2	2	0	1	0	2	1	0	0	2	12
Percentage	0.0	0.1	0.1	1.6	1.6	0.0	0.1	0.0	1.6	0.1	0.0	0.0	1.6	9.6
6 Externally oriented management accounting														
6.1 Value chain analysis	0	0	0	0	0	0	0	0	0	0	0	1	0	1
6.2 Strategic management accounting	0	0	1	0	0	0	0	1	0	0	0	0	0	2
Subtotal	0	0	1	0	0	0	0	1	0	0	0	1	0	3
Percentage	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	2.4
7 Others														
Percentage	0	1	0	0	0	1	0	0	0	0	0	1	1	4
	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	3.2
Total	7	10	9	8	13	11	14	7	9	9	6	13	9	125
Percentage	5.6	8.0	7.2	6.4	10.4	8.8	11.2	5.6	7.2	7.2	4.8	10.4	7.2	100.0



Four articles focus on the issues regarding budgetary participation. Ni and Tsai (1997) demonstrate that, under high task uncertainty, high budgetary participation together with a high budgetary emphasis induce high performance and vice versa. Other articles examine the moderating and mediating variables in the association between budgetary participation and managerial performance. Ni, Zhu and Chang (1998) indicate that product standardization (but not manufacturing process automation) has a moderating effect on the association between budgetary participation and managerial performance. Budgetary participation is negatively (positively) associated with performance when product standardization is low (high). Chang, Chang, Chang and Wu (2007) analyze the effect of participative budgeting congruence on performance.<sup>7</sup> They include job-related tension and job satisfaction as mediators to explore the relationship between budgetary participation and managerial performance. Ni, Su, Chung and Cheng (2009) find that managers' self-efficacy and attitudes play a mediating role between budgetary participation and managerial performance. Moreover, self-efficacy mediates the effect of budgetary participation on attitudes.<sup>8</sup> Thus, budgetary participation studies in Taiwan extend to include psychology theories (e.g. self-efficacy) whereby mediators or moderators are incorporated into their analysis.

Four papers study issues regarding budgetary goals, including budgetary goal acceptance, budgetary goal difficulty, and budgetary goal achievement. Two of them investigate the impact of budgetary goals on performance or investment decisions. Ni and Chen (2000) find that a higher level of budgetary goal difficulty is associated with higher performance under high budgetary participation. Further, the negative relationship between budgetary goal difficulty and performance (Kenis 1979) occurs only under low budgetary participation. Chiou (2006) draws on attribution theory and prospect theory to explore the impacts of budgetary goal attainment on risky investment decisions, finding that those who do not achieve budgetary goals in the first stage will choose a risky investment project in the second stage. The results support prospect theory, which posits that decision makers are risk-seeking in choices involving sure losses. Ni and Chiou (2001) indicate that role ambiguity is a mediator between budgetary participation and goal acceptance. Role ambiguity also mediates the relationship between budgetary participation and managerial performance. Zhu, Lin and Ni (2003) find that goal acceptance's mediation between budgetary participation and managerial performance is moderated by budgetary goal difficulty. These two papers show that, when studying the roles of budgetary goal

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<sup>7</sup> The degree of participation congruence is measured by the difference between the perceived need for participation and the degree of participation allowed.

<sup>8</sup> Self-efficacy is an individual's belief about his or her capability of performing job-related tasks (Bandura 1977).

acceptance between budgetary participation and managerial performance, other moderating or mediating variables are to be considered.

Finally, three articles examine budgetary control system issues. One focuses on the budgetary process and the others on the relationship between the budgetary system and performance. Chang, Chiang, Lin and Shiau (1999) analyze the “budget consumption” behavior of government agencies, finding that budget spending in the fourth quarter of the fiscal year is greater than in the other quarters, which confirms the budget consumption behavior in government agencies. Chang, Liao and Ni (2001) examine budgetary control systems in declining organizations. They find that if a quantitative change in the competitive market is the main reason for the decline, the use of budgetary control systems can improve performance. However, if the reason is a qualitative change, performance will be worsened by the use of budgetary control systems.<sup>9</sup> Chow, Duh and Chen (2005) indicate that environmental uncertainty influences the selection of budgeting systems, as characterized by the frequency of updating operating budgets, system sophistication, and participation in the budgetary process. In addition, the selection of budgeting systems has an impact on firm performance.

## 2. Performance Measurement

Twenty-four articles examine issues related to performance measurement. Seventeen of them apply data envelopment analysis (DEA) to assess the efficiency of organizations. The industries examined in the DEA articles include research and education institutes (3), hospitals (3), banks and life insurance (3), retail and chain stores (2), government (2), non-profit organizations (2), airlines (1), and hotels (1). For example, Hsu, Lee, Shih, Hung, Yu and Tzeng (2003) apply DEA with different models, including the Charnes, Cooper and Rhodes (1978; hereafter CCR), Banker, Charnes and Cooper (1984; hereafter BCC), Andersen and Petersen (1993), cross efficiency (Doyle and Green 1994), and multi-purpose (Chiang and Tzeng 2000) models, to evaluate the research and development (R&D) performance of the Industrial Technology Research Institute (ITRI). They conclude that the cross efficiency model and the multi-purpose model provide reliable results and suggest that ITRI should expand the R&D scale to achieve better performance. Tseng, Kao and Ho (2005) find that marketing systems and the human capital of salespeople have a positive influence on technical and scale efficiency of the life insurance industry. Wu and Huang (2003) find that correctional institutions in Taiwan are inefficient, with juvenile institutions being more inefficient than adult institutions. They suggest setting up different evaluation systems for different correctional institutions.

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<sup>9</sup> The quantitative change is a reduction in niche size, while the qualitative change is modifications in the niche shape (Zammuto and Cameron 1985).

Focusing on the hospital industry, Chang et al. (1998) analyze the factors affecting efficiency, finding that hospital ownership, the scope of services, the degree of illness severity, and market competition intensity have negative effects, while occupancy rates have a positive effect. Chang and Hou (2001) evaluate the technical, allocative, and overall efficiency of provincial hospitals. They find that, regardless of size, hospitals could improve their performance if they engage in appropriate strategies. Hospitals can increase technical efficiency by strengthening operation systems and management ability. In addition, hospitals can increase their allocative efficiency by adjusting resource allocation. Chang et al. (2002) identify efficient and inefficient physician teams in hospitals. They suggest that hospital management take into account both the hospital's future development and the conditions of individual medical teams to improve their efficiency.

Seven articles that explore performance measure issues adopt methods other than DEA. Specific issues include performance measurement systems from the perspective of strategy (1), the performance effects of adopting management systems (3), the performance of a supply chain (1), a performance measure of electronic business (1), and the effects of management characteristics on firm performance (1). For example, Duh, Chiang and Lin (2000) find that different R&D strategies are associated with differential emphasis on performance measures. Firms adopting a prospector strategy differ from those adopting a defender strategy in their emphasis on performance measures regarding finance, innovation, cost efficiency, and learning and growth.

Regarding the performance of various management systems, Tsai, Chien, Leu, Hsu, Fan and Cheng (2003) construct performance measures of ERP systems based on the six factors suggested by DeLone and McLean (1992).<sup>10</sup> Young and Tsai (2006) examine the relationship among human resource management (HRM) systems, innovation, and performance and find that innovation is a mediator between the implementation of an HRM system and organizational performance. Lin, Wu and Wu (2008) investigate how information technology (IT) expenditures influence firm performance from a business life cycle perspective. The results show that IT investment is greater during the period of growth than in the period of decline. Furthermore, the performance of IT investments is better in periods of growth than in periods of decline.

Yeh (2001) identifies a set of performance indicators, including cost, quality, time, and flexibility, to evaluate e-supply chain management systems. Chen and Chuang (2003) combine the fuzzy integral process with the analytic hierarchy process and provide a

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<sup>10</sup> DeLone and McLean (1992) suggest six success factors in the implementation of information systems: system quality, information quality, user satisfaction, system use, individual impact, and organizational impact.

performance measure model of electronic business. Lin and Lee (2008) examine the impact of management characteristics on firm performance and find that management teams with more management-related educational background perform better. However, management tenure and chief executive officers serving as board chairpersons are associated with poor accounting performance.

### 3. Performance Evaluation Systems

Nineteen articles address the topic of performance evaluation systems pertaining to the balanced scorecard (BSC; 4), quality cost and management (1), reward and incentive systems (6), cost allocation in incentive contracts (1), manufacturing performance (2), and performance evaluation systems for different organizations (5). Of the articles that focus on the BSC, Kuo, Jen and Chou (2002) apply the concept of BSC to design a performance evaluation system for a bus company. Chang, Yu and Chang (2008) design a performance evaluation system of the enterprise resource planning (ERP) system based on the concept of BSC. Moreover, they use a case company to examine the completeness and objectiveness of the performance evaluation system. Chu and Cheng (2007) apply the BSC to establish a performance management system for the Taipei City government. Chang, Fang, Shen and Luo (2008) discuss the common-measure bias addressed by Lipe and Salterio (2000). Their results are consistent with those of Roberts, Albright and Hibbets (2004) in that the disaggregated strategy can help superiors overcome the common-measure bias. Providing peripheral cues (e.g. assurance reports) reduces common-measure bias as well.

Liaw, Ma, Wang and Tsai (2002) investigate the effects of total quality management (TQM) practices and quality performance on financial and non-financial performance. Their results indicate that quality performance plays a mediating role in the relationship between TQM practice and financial performance. They also find that firms in the industry with a higher entry barrier achieve higher financial and non-financial performance by employing TQM.

Concerning reward and incentive systems, three papers incorporate non-financial or industry measures into performance evaluation system. Chi and Wang (2000) show that, when the owner believes that the probability of a good plan is high, he or she tends not to include industry performance adjustments in the incentive scheme.<sup>11</sup> Moreover, if the owner includes industry adjustments, managers make more conservative investing decisions. Tsai (2003) indicates that boards of directors tend to use non-financial performance measures to

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<sup>11</sup> The model is set up sequentially; first, the owner decides whether to include industry standards in the incentive scheme, and then the manager chooses between a new investment plan and an old investment plan. A good plan is indicated by the outcome of a new investment plan being better than an old one.

reward CEOs when the usefulness of accounting-based and market-based measures is low. Young (2001) indicates that bank branches implementing job redesign and non-financial performance measures perform better than branches implementing only non-financial performance measures.

Another three papers investigate the relationship between pay gaps and performance.<sup>12</sup> Lee (2006) finds that a high pay gap within a management team is associated with higher performance for firms facing higher operational and financial risk, but Lee, Lin and Chuang (2006) suggest that firms with higher collaboration needs should consider the negative effect of pay dispersion within top management teams.<sup>13</sup> This is because, according to equity theory, a larger pay gap gives managers feelings of unfairness and will lead to poor firm performance (Dornstein 1989). Finally, Lee (2009) discusses the correlation among job interdependence, tournament-based incentives, and performance. She finds that a company can improve its performance when it adopts compensation schemes that consider the fit between levels of task interdependence and tournament-based incentives. Regarding the role of cost allocation in performance evaluation, Lee (2002) shows that cost allocation systems are an important part of compensation contracts under asymmetric information. She further indicates that an activity-based costing (ABC) system is an optimal system to resolve the problem of moral hazard.

Focusing on manufacturing performance, Yu (2006) finds that product variety leads to higher uncertainty and that both product variety and uncertainty in manufacturing processes have a negative effect on manufacturing performance. Yu (2007) examines the relationship between manufacturing flexibility and performance. She finds that greater routing flexibility leads to better performance and that machine flexibility improves productivity but has a negative impact on product quality. Other papers examine performance evaluation for different organizations. Tang (1999) examines the performance measurement of a company's information system department. Chen and Chuang (2003) study the performance evaluation system of firms in the electronics industry. Lee (2004b) explores the performance evaluation of functional staff at a Japanese company. Li and Peng (2004) analyze the relationship between management control mechanisms and the performance of government-owned hospitals. Chu, Hsiung, Lin and Liu (2005) develop a framework of intellectual capital reporting for a research institute<sup>14</sup> and further indicate a positive relationship between intellectual capital possession and organizational performance.

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<sup>12</sup> A pay gap was defined as the difference between CEO compensation and the average compensation of the management team (excluding the CEO), both after taking natural logarithms.

<sup>13</sup> Pay dispersion was defined as the variation in compensation among members of the management team (including the CEO).

<sup>14</sup> Intellectual capital reporting describes an organization's knowledge management strategy, which includes the objectives, processes, and results of utilizing knowledge resources (Danish Ministry of Science,

#### 4. Performance-Based Compensation

Six articles deal with performance-based compensation issues, encompassing the determinants of compensation with different measures, corporate characteristics, and information characteristics. Four of them examine the use of performance measures in compensation contracts. Fu, Ou and Chang (2002) develop a linear compensation contract that integrates market-based, financial, and non-financial performance measures. Their empirical results indicate that financial performance measures and firm size are the main factors in determining executive compensation. Lin and Liu (2003) indicate that outside directors play an important role in determining executive compensation in non-family firms (but not in family firms). Furthermore, to determine executive performance, accounting-based measures are more important than market-based measures in non-family firms. Tsai (2006) suggests that, as industry competition increases, relative performance and evaluation-based performance place more emphasis on executive compensation. Hung and Wang (2008) indicate that executive compensation is more sensitive to accounting measures than to market measures if corporate risk and financial leverage are high.<sup>15</sup> Overall, the research indicates that ownership, competition, corporate risk, financial leverage, and growth opportunity will influence the choice of performance measures in compensation contracts.

Finally, two papers explore the relationship between the information characteristics of performance and compensation design. Huang, Chi and Lee (1999) identify three characteristics of performance information: outcome measurability, knowledge of transformation process, and behavior observability. Their results indicate that the relationship between organizational technology and compensation design is mediated by the characteristics of performance information. Huang (2000) indicates that characteristics of performance information affect the choice of performance measures used in a compensation scheme. For example, there is a positive relationship between outcome measurability and the use of performance-based pay.

#### 5. Responsibility Accounting

Only one paper examines the responsibility accounting issue. Liu, Yaung and Cheng (1997) investigate the effect of establishing responsibility centers on cost control in a hospital and find that the average cost and the average controllable cost rise after the implementation of responsibility centers. A possible reason is that no explicit performance evaluation is tied to cost control systems of the responsibility centers.

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Technology and Innovation 2003).

<sup>15</sup> Corporate risk is measured as the standard deviation of the stock market return for the prior eight quarters.

## 6. Transfer Pricing

Three articles examine transfer pricing issues. Two of them investigate the factors influencing international transfer pricing (ITP) schemes. Lin (1998) finds that organizational structure, transaction costs, and investment environment influence the selection of ITP schemes. Chang (2007) focuses on factors influencing multi-national corporations' ITP decision making. He indicates that the operational environment and the organizational strategy are the most important dimensions that influence the choice of ITP schemes as well as organizational performance. Kim and Yang (2006) present a model that determines the optimal transfer price and optimal order level of products simultaneously.

## 2.2 INVENTORY MANAGEMENT

Eighteen articles examine issues pertaining to inventory management, including economic order quantity (EOQ), perishable or deteriorating goods, and the supply chain. All the inventory management articles use analytical modeling methods, and most of the authors are from the fields of industrial engineering or operations management.

Seven articles address issues concerning deteriorating or perishable goods. Kim, Kim and Hwang (2003) consider a perishable item that has a stock-dependent demand rate. They develop mathematical models to maximize the retail profit. Katagiri, Ishii and Sakawa (2003) set up an inventory control model where the manager orders a perishable commodity and a nonperishable commodity at the same time. The other five papers focus on deteriorating goods and examine issues involving replenishment decisions, temporary selling price discounts, production lot size, inventory policy under permissible delays in payment, and inventory models under the condition of inflation and under a declining market (Liao and Su 1998; Ouyang and Cheng 2001; Ouyang and Hsieh 2000; Su, Tong and Liao 1997; Wee and Jong 1998). For example, Wee and Jong (1998) formulate an inventory model for deteriorating items to develop the optimal purchasing policy. They integrate the just-in-time (JIT) concept to keep the carrying cost of raw materials as low as possible.

Seven articles deal with the supply chain setting. Wu and Hsieh (2007) maximize the total supply chain profit through the determination of price and order quantity. Hsu and Wang (2003) adopt a fuzzy set approach to determine the amount of inventory for a new product. Two articles focus on deteriorating items and suggest that all entities in a supply chain should integrate their inventory policy to pursue optimal profit rather than having each individual entity make an independent decision (Dong, Du, Yang and Liang 2008; Wee and Chen 2002). Other management mechanisms related to the supply chain include the optimal schedule of the supply chain (Yu, Tsai and Li 2008), inventory systems under a lot splitting policy (Lin 2001), and vendor-managed inventory (Guo, Chiang, Liu and Liu 2002). Four

articles extend the traditional EOQ research. Huang and Su (2003) consider a temporarily reduced sales price and expected price increase to determine the optimal order quantity. Chen, Chou and Kuo (2004) and Wee, Yu, Lo and Lin (2005) examine inventory models for frequent-use or reusable goods. Huang and Chyr (1999) extend the concept of least total cost and offer a minimal total cost model.

It is interesting to note that, while only a few accounting researchers examine EOQ issues, researchers in the fields of industrial engineering and operations management are still pursuing these issues. Additionally, all the related articles use an analytical modeling method. However, as Johnson and Kaplan (1987) and Kaplan (2011) indicate, these studies use oversimplified assumptions to solve mathematically manageable but unrealistic problems.

### **2.3 COST ACCOUNTING AND MANAGEMENT**

Fourteen articles address cost accounting and management and examine activity-based costing/ management (ABC/ABM) (4), pricing (2), target costing (3), environmental accounting (1), and general issues in this area (4).

Of the four ABC/ABM papers, two apply ABC to cost analysis using the case study methodology. Tsai, Shien and Chiu (1998) examine a case in the construction industry, and Shieh and Shieh (2001) focus on a software development project. Using a questionnaire survey, Lin and Duh (2003) examine a change agent's behavioral intention in the implementation of an ABC/ABM system and find that the change agent's attitudes toward promoting ABC/ABM implementation correlate with their perception of benefits rather than costs. Lee and Liu (2001) use analytical modeling to discuss the effect of setup experience on optimal production quantity decisions, batch decisions, and product cost and find that production costs decrease and product quantity increases as setup experience increases.

Of the articles related to pricing, one analyzes the relationship between taxi fare and trip distance to develop the best fare parameters (Yan, Chen and Ho 1997). Another article proposes optimum selling prices in both linear and exponential functions (Konn and Ishii 2005). Three articles focus on target costing systems. Wang (2007) compares the implementation of target costing systems at two firms and indicates that target costing helps in the execution of strategy; meanwhile, different strategies lead to different content and methods of target costing implementation. Wang (2003) indicates that intensive training for managers is important when implementing a target costing system. Lee (2004a) emphasizes the relationship between interdepartmental interactions and cost reduction performance by examining the companies listed on the Tokyo Stock Exchange. In addition, Huang (1998)



proposes a model to calculate environmental costs by identifying environmental costs in the production process and their cost drivers.

The remaining articles are related to general issues. Chou and Chang (1999) build an analytical model to estimation of labor costs for building new ships. Chiang, Lin and Hwang (2008) develop a cost allocation method for licensing electronic resources in academic library consortia. Ou and Lee (2004) examine profit drivers that consider both revenues and cost streams to identify factors influencing performance in the American banking industry. They indicate that credit card revenue, number of credit cards issued, credit cards' outstanding balance, and the percentage of credit card revenue to a bank's total revenue are positively associated with the profit of credit card business. Yu (2005) indicates that increasing capacity utilization leads to longer waiting times, longer cycle times, and poorer production quality, thus increasing production cost.

## **2.4 DECISION-MAKING METHODS**

Studies under this category involve capital budgeting (5) and forecasting (2). Four of the capital budgeting articles apply option theory to cope with the capital budgeting problem (Chang, Jung and Lin 2001; Chen, Chang and Lin 2009; Jou 1997; Wu, Ong, and Hsu 2006). For example, Chang et al. (2001) apply a real option approach to construct an investment project valuation model for corporations in high-technology industries that face uncertainties in R&D activities and market demand. Jou (1997) applies an analytical approach to examine the choice between two mutually exclusive investment projects. He indicates that the interaction between uncertainty and irreversibility in investment results at a hurdle rate higher than that predicted from the net-present-value method. Other than applying option theory, Chiang, Liang, and Lee (2002) suggest a new capital budgeting method based on fuzzy set theory to handle the ambiguity of information.

Two papers examine demand forecasting in one-period seasonal goods production systems (Lee 2002, 2004). One article develops an analytical model to explore the expected value of perfect information in demand forecasting (Lee 2002). Another article develops a model with a Bayesian approach to determine production quantity and the budget for investment in demand forecasting (Lee 2004).

## **2.5 MANAGEMENT ACCOUNTING IN GENERAL**

Ten articles address management accounting topics in general. Seven articles examine management accounting information systems (MAS) issues and are divided into two types, with one investigating the determinants of management accounting system characteristics and the other examining the performance effects of management accounting systems. The

determinants investigated include types of strategy, organizational structure, environment uncertainty, and task uncertainty (Chang and Chang 2001; Chiou 2005; Ni and Su 2001). For example, Chang and Chang (2001) find that different strategies require different characteristics in information systems. Firms with an innovation differentiation strategy emphasize broad-scope and timely information and put less emphasis on aggregated information. However, those with a marketing differentiation strategy pursue timely information and firms with a cost leadership strategy focus on aggregated information. Chiou (2005) finds that a differentiation strategy has a direct effect on the use of broad-scope information; however, a differentiation strategy has no direct effect on the use of aggregated information. Furthermore, a differentiation strategy has an indirect effect on the use of broad-scope and aggregated information through the mediation of environmental uncertainty and decentralization. It is noted that, while MAS has four features, scope, timeliness, aggregation, and integration (Chenhall and Morris 1986), the reviewed articles involve only some but not all four characteristics.

Regarding the performance effects of management accounting systems, Chang, Chang and Ni (2000) find that task variability and information scope have interaction effects on an information user's satisfaction. Chang and Chang (2003) find that task uncertainty mediates the relationship between timeliness and management performance. Ni, Chuang and Chiou (2006) indicate that, when a manager faces a task with high perceived uncertainty, the positive relationship between the usefulness of MAS information and performance exists only under high organizational commitment. Chung, Ni, Su, Chiou and Su (2009) indicate that broad-scope management accounting systems affect managerial performance through perceived job-relevant information, and this mediating effect is more pronounced when a differentiation strategy is adopted.

In addition to the characteristics of MAS, three articles focus on the factors that influence the change of management accounting systems or the fit between management control systems and managers' preferences. Chow, Shields and Wu (1998) find that the lack of fit between a firm's management control system and the preference of its managers will induce managers' stress and communication misrepresentation. Sheu and Pan (2009) conduct analytical modeling to solve the cost system choice problem for a virtual enterprise with intra- and inter-member knowledge asymmetry: the member with higher intra-member knowledge asymmetry will adopt ABC and the member with lower intra-member knowledge asymmetry will adopt a traditional cost system. Isa, Foong, and Sambasivan (2005) extend Libby and Waterhouse (1996) to Malaysian manufacturing firms and find that changes in competition and advanced technology adoption affect the change of management accounting and control systems.

Finally, two papers in this category examine the influences of strategies on management accounting systems using the case study method (Wang 1999, 2000). Using Acer and Tatung as the two case companies, Wang (1999, 2000) analyzes the relationship between corporate strategies and management accounting systems. The results indicate that strategies have an impact on the designs and choices of management accounting systems. In addition, resources for information collection and processing are crucial to the strategy-MAS relationship.

## **2.6 EXTERNALLY ORIENTED MANAGEMENT ACCOUNTING**

Three articles are placed in this category. Wang and Lee (2008) focus on the relationship between firms' business strategies and their value chain activities, as well as the impact of such a relationship on firm performance. They find that firms with a defender strategy emphasize manufacturing activities, infrastructure, and procurement management activities, while firms with a prospector strategy concentrate on market and customer service activities. The other two articles pertain to strategic management accounting. One article examines a firm that has different strategic cost structures to maintain its competitive advantage when the degree of product substitution changes (Lee, Liu and Lin 1999). Sun and Fang (2004) find that logistics performance mediates the association between the ability to integrate the external supply chain and financial performance.

## **2.7 OTHERS**

Four articles fall into the "other" category. Chen and Lin (2002) address human resource accounting. Huang and Chang (2008) examine the effects of the ethical environment and agency problems on managers' project evaluation decisions in China. Finally, two papers are literature reviews. Duh (1998) reviews and classifies prior behavioral accounting research by issues and paradigms. Chang, Shen, Chang and Wei (2009) review and classify financial accounting research, management accounting research, and auditing research between 1998 and 2006. Because they aim to cover three main accounting research fields, they choose only 34 articles in management accounting. They classify articles into three broad categories based on the topic of the articles: cost accounting, human behavior, and application of information technology. In contrast, our study focuses on management accounting studies and reviews all the articles published from 1997 to 2009. In addition, we classify all the articles not only by topic but also by method, setting, and theory.

Taken together, although the aforementioned articles address different management accounting issues, few of them address (1) supply chain management, (2) management accounting issues related to multinational corporations or joint ventures in China, and (3)

issues particularly pertaining to electronics and high-technology sectors. Pursuing these issues can help link research and practice more closely (see Hopwood 2007; Kaplan 2011), as they mirror the industrial and economic development of Taiwan. For the research per se, researchers can identify the unique features and test the validity of theories, thereby making a potential contribution to the literature.

### **3. DISTRIBUTION OF RESEARCH METHODS**

The 125 articles adopt different research methods, Table 2 provides the distribution of research method. The analytical modeling research dominating the sample (37 articles, or 29.6 percent), followed in descending order by survey studies (34 articles, 27.2 percent), field-archival studies (32 articles, 25.6 percent), case studies (13 articles, 10.4 percent), experimental studies (4 articles, 3.2 percent), normative/conceptual papers (3 articles, 2.4 percent), and literature reviews (2 articles, 1.6 percent).

#### **3.1 ANALYTICAL MODELING RESEARCH**

Eighteen out of 37 articles that use analytical models deal with inventory management issues. These studies examine issues including economic order quantities, inventory control of perishable or deteriorating goods, and inventory management in a supply chain. Most of them use optimization techniques to minimize costs or maximize profits. The decision variables include inventory level, order quantities, reorder point, or cycle time. Most of them provide a numerical analysis or simulation to demonstrate the implications, which helps in understanding the application of models. Most of their research questions are concerned with how to choose inventory policy in a specific situation. Examples include determining the optimal amount in a declining demand situation (Su et al. 1997) or determining the optimal ordering quantity of different goods (Liao and Su 1998; Huang and Su 2003). Although the assumptions may simplify real-world situations, the results of the studies provide a reference.

Four articles use analytical modeling to examine cost accounting-related issues such as pricing, cost sharing, and the ABC system. They apply optimization or game theory to build their models. For example, Yan et al. (1997) analyze taxi fare. They take both the distance and waiting time into account and find that the fare calculated by their formula is fairer than the formula used in Taiwan. Chiang et al. (2008) discuss the bidding mechanism and cost sharing for licensing electronic resources in academic library consortia. They build a model according to a discount coalition game and provide a stable consortium. Lee and Liu (2001) set up a model based on the ABC system to analyze production decisions. They indicate that increasing setup experience will reduce the required time of setup, decrease the

batch-level cost, and increase the production quantity. Overall, the solutions included in the above studies provide useful insight for practitioners and policy makers. Therefore, these studies conform to the criteria of the Ralph test.

The other topics include performance evaluation systems (3), performance measurement (1), budgeting (1), transfer pricing (1), strategic cost structure (1), and cost system choice (1). These studies adopt an optimization technique, game theory, or fuzzy set theory to develop models. For instance, Chi and Wang (2000) examine the relationship between an incentive scheme and managers' investing decisions by modeling a signaling game to identify the sequential equilibrium of owners and managers. Lee (2002) examines cost allocation systems and performance evaluation. She suggests that, under information asymmetry, it is essential to include cost allocation systems to avoid moral hazard problems. Moreover, the marginal contribution of an agent's effort, the agent's risk attitude, and output variance influence incentive intensity.

All articles (7) that discuss decision-making techniques apply an analytical modeling methodology. Five articles focus on capital budgeting, while others focus on forecasting. Related to capital budgeting, Chiang et al. (2002) examine an optimal capital structure based on fuzzy capital cost and fuzzy capital budgeting under fuzzy economic scenarios. Of the four studies based on option theory, Jou (1997) explores the choice between two mutually exclusive investment projects under uncertainty. This model assumes that investment projects have infinite lives and do not incur any operating costs; future research needs to relax the assumptions to make the model more realistic. Chang et al. (2001) construct compound options for the evaluation of an investment project with uncertainty in R&D activities and in market demand. Wu et al. (2006) evaluate the value of an ERP investment based on option theory and provide practitioners with a different approach from the conventional net present value (NPV) method. Using a real options approach, Chen et al. (2009) develop an optimal investment decision model to explore the impact of innovation on the product life cycle. A case is applied to check the usefulness of the model in the real world. Therefore, except for Jou (1997), these studies pass the Ralph test.

Regarding demand forecasting, Lee (2002) develops a single-product and single-period model to determine the maximum amount of budget spent on demand forecasting. Lee (2004) employs a Bayesian approach to determine the production quantity and optimal amount of budget invested in demand forecasting. He finds that, when unit price, inventory disposal cost, and shortage cost are large, as well as when the production setup cost is small, demand forecasting becomes more important. While the propositions are intuitively appealing, these models are based on single-product and single-period settings that are at odds with settings in the real world. As such, they fail to pass the Ralph test.

TABLE 2 Distribution of Research Method

Number of articles	1997	1998	1999	2000	2001	2002	2003
Normative/Conceptual	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	1 (7.7)	1 (8.3)	0 (0.0)
Case studies	2 (28.6)	1 (10.0)	1 (11.1)	1 (12.5)	1 (7.7)	1 (8.3)	1 (7.7)
Surveys	1 (14.3)	4 (40.0)	2 (22.2)	4 (50.0)	5 (38.4)	2 (16.7)	3 (23.1)
Field-archival studies	1 (14.3)	1 (10.0)	3 (33.3)	1 (12.5)	2 (15.4)	2 (16.7)	5 (38.5)
Analytical modeling	3 (42.8)	2 (20.0)	3 (33.3)	2 (25.0)	4 (30.8)	6 (50.0)	4 (30.7)
Experiment	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Literature review	0 (0.0)	1 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Total	7 (100.0)	10 (100.0)	9 (100.0)	8 (100.0)	13 (100.0)	12 (100.0)	13 (100.0)

Number of articles	2004	2005	2006	2007	2008	2009	Total
Normative/Conceptual	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.4)
Case studies	1 (14.3)	1 (11.1)	0 (0.0)	2 (28.6)	1 (7.7)	0 (0.0)	13 (10.4)
Surveys	3 (48.8)	3 (33.3)	2 (25.0)	2 (28.6)	1 (7.7)	2 (22.2)	34 (27.2)
Field-archival studies	1 (14.3)	3 (33.3)	3 (37.5)	2 (28.6)	5 (38.4)	3 (33.3)	32 (25.6)
Analytical modeling	2 (28.6)	2 (22.2)	2 (25.0)	1 (14.2)	3 (23.1)	3 (33.3)	37 (29.6)
Experiment	0 (0.0)	0 (0.0)	1 (12.5)	0 (0.0)	3 (23.1)	0 (0.0)	4 (3.2)
Literature review	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (11.1)	2 (1.6)
Total	7 (100.0)	9 (100.0)	8 (100.0)	7 (100.0)	13 (100.0)	9 (100.0)	125 (100.0)

\* Figures in parentheses are percentages.

### 3.2 SURVEY RESEARCH

Thirty-four articles use the survey methodology to examine topics related to budgetary participation, budgetary slack, characteristics of management accounting systems, performance measures, transfer pricing, and newly developed management accounting techniques. Following Van der Stede et al. (2005), we assess the survey studies in terms of the research purpose, the research design, the sample representativeness, and the validity and reliability of the research instrument.

Survey research can be used for two main purposes: description and explanation (Van der Stede et al. 2005). The purpose of descriptive studies is to determine the characteristics of a given population, and the purpose of explanative studies is to test a theory that has the expected causal relationship among variables (Pinsonneault and Kraemer 1993; Van der Stede et al. 2005). The explanative studies dominate the survey research in Taiwan, and only one article involves a descriptive study. Tsai et al. (2003) identify the performance measures for an ERP system but do not test any theories. All the survey articles choose a cross-sectional design instead of a longitudinal design. A cross-sectional design is limited in making causal inferences because the temporal priority is difficult to establish (Pinsonneault and Kraemer 1993). Therefore, a strong theory is needed to make causal inferences if the purpose of the study is to test a theory (Van der Stede et al. 2005). Among the 33 explanative articles, 19 articles propose hypotheses based on organizational behavior theory, five based on strategic management theory, four based on psychological theory, two based on economic theory, and the other three based on the finance, information science, and operations management theories, respectively.

In terms of the level of analysis, 12 articles analyze data at the individual level, and the remainders perform analyses at either the organizational unit level or the organizational level. When analyzing data at the organizational unit level or at the organizational level, multiple respondents instead of a single respondent should be considered, as a single respondent may not be representative of the unit under investigation, so internal validity and external validity may be weakened (Van der Stede et al. 2005). Our review indicates that only 3 of 22 articles adopting organizational units or organizations as the level of analysis have multiple respondents.

About half of the articles report their target population (15 of 34 articles), and all articles report their survey population.<sup>16</sup> The survey population is listed companies or the

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<sup>16</sup> The target population is conceptually defined as the set of all respondents to be studied (e.g. all companies' managers). The survey population is the set of respondents that is accessible to the researcher and is actually selected (e.g. managers on the list of an electronic industry association membership in Taiwan).

employees of listed companies in Taiwan, except in two studies that focus on Japanese and on Malaysian firms, respectively. The survey population of the 34 studies is an average of 523 respondents, with a standard deviation of 349. Nine articles do not report the sample selection process. For the other eight articles, the authors mailed the questionnaires to the entire survey population; while, in other studies, the authors adopted a probability sampling process (e.g. random sampling or stratified proportional sampling). Reporting only the survey population makes the assessment of the representativeness of the survey population with respect to the target population infeasible. Further, if the survey population includes respondents not in the target population or omits respondents in the target population, mailing to an entire survey population still yields biased inferences. In sum, the population definition and sample selection are important, and studies in Taiwan still have room to improve.

Regarding sample size, only two articles involve a sample size greater than 200, which is the lower bound of the judicial standards in the United States (Morgan 1990). The mean sample size is 131, with a standard deviation of 74. The smallest sample size is 45, and the largest sample size is 399. The average response rate is 32 percent, the highest response rate is 80 percent, and the lowest response rate is 9 percent. To increase the response rate, 13 articles (38 percent) report that they employ follow-up procedures, but only one article reveals the response pattern.<sup>17</sup> Although follow-up procedures could enhance the response rate, a comparison between different waves of surveys should be employed. However, only 4 of the 13 articles provide a comparison of early and late respondents.

Twenty-six articles (76.5 percent) adapt prior studies' instruments or measurement scales; others develop their own instruments based on the literature. As noted by Van der Stede et al. (2005), even if the survey instrument has been previously used and validated, researchers still need to pretest their instrument to ensure that the terminology has been modified to reflect the respondent's frame of reference. However, only 16 articles have pretested survey questionnaires. The respondents include MBA and EMBA students, practicing managers, or experts. Fourteen articles report that they pass the validity test, including convergent validity and discriminant validity. Finally, all but two articles report the reliability of their instrument. Thirty studies adopt Cronbach's alpha as an indicator of internal consistency. Seventeen of the 30 articles report that their lowest value is over 0.70, 8 report a value between 0.60 and 0.69, and 5 report a value between 0.50 and 0.59.

The survey research has the following features: lack of information on the target population, a low to medium response rate, a lack of non-response analysis, a lack of report

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<sup>17</sup> Chang et al. (2007) report a 73 percent response rate two weeks after sending the initial mail. They sent follow-up mails and received more responses.



on the follow-up procedures, and medium frequency of pretesting the instrument. While most studies assess the reliability of the instrument, less than half of the papers report on the validity assessment. Survey studies in management accounting still have room for improvement.

### 3.3 FIELD-ARCHIVAL RESEARCH

Thirty-two articles use field-archival data to examine the research issues. Among them, fifteen articles use a DEA-related method to evaluate the efficiency of financial institutions, educational institutes, hospitals, post offices, retailers, and hotels.<sup>18</sup> Other than the DEA articles, five articles investigate the factors that influence manufacturing performance. Eight articles discuss firm performance and compensation schemes. Four articles investigate budget consumption in governmental agencies, profit drivers in the financial industry, cost estimation for building ships, and capacity utilization in the manufacturing industry, respectively.

DEA assumes homogeneity in the evaluated units. The units are engaged in similar activities and provide comparable products or services. In addition, all units access similar resources and operate in similar environments (Dyson, Allen, Camanho, Podinovski, Sarrico and Shale 2001). Nine articles do not mention the assessment of homogeneous units; they assume that the units undertake similar activities. These units include, for example, insurance corporations, banks, hotels, district courts, correction institutes, and college departments. The articles that mention homogeneity discuss the similarity of operating activities (Chang et al. 2002; Chang and Hou 2001; Chang et al. 1998; Hsu et al. 2003) and the selection criteria for units (Hung, Lin and Wang 2008; Hwang, Lin and Chang 1997). For example, Hwang et al. (1997) claim that, while post offices are located in different areas, they have the same goals and similar operating environments. Another source of non-homogeneity comes from the existence of economies or diseconomies of scale. Dyson et al. (2001) recommend testing data for scale effects; only one article demonstrates testing for return of scale (Chang et al. 1998).

The multiple input/output set is a distinguishing feature of DEA. All research studies report definitions of the inputs/outputs. The selection of input and output variables is based on the literature, the results of interviews with staff in the organizational units under investigation, and the judgments of experts. Golany and Roll (1989) suggest a rule of thumb to achieve a reasonable level of discrimination; namely, the number of units should be at

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<sup>18</sup> There are seventeen articles using DEA approach. Fifteen articles of them belong to field archival research, one belongs to case study research, and another one belongs to analytical modeling research.

least twice the number of inputs and the number of outputs. All studies satisfy this criterion and ensure discrimination of factors.

All the articles that use the DEA approach report their data source, including government statistics, organizations' internal data, and other archival databases, such as COMPUSTAT. Except for two articles that evaluate the performance of a private corporation and a college, the studies report the data periods. Four articles use single-year data, and the others collect data from multiple years. Two articles use window analysis to increase the number of evaluated units (Charnes, Clark, Cooper and Golany 1984). Half of the articles report the descriptive statistics of focal variables of their studies. Furthermore, half of the articles have isotonic tests to ensure the positive relationship between inputs and outputs. All studies reveal the models used for analysis. The CCR and BCC models dominate the methodology. The relative efficiency, technical efficiency, and scale efficiency are reported and analyzed. Six articles evaluate the efficiency change over time, and the Malmquist Index is applied. Two articles also report efficiency improvement by analyzing the slack variables. Finally, two studies further conduct regression analysis to identify the determinants of efficiency.

The remaining 17 field-archival studies adopt approaches other than DEA. They develop research hypotheses according to theory and literature; two articles further construct analytical models according to agency theory and tournament theory to develop hypotheses (Fu et al. 2002; Lee 2009). Ten articles examine the correlation between explained variables and explanatory variables, and seven articles infer that one variable has a causal effect on another variable. They all adopt linear models with a proper functional form.<sup>19</sup> The operational definition of variables is explained, and the measurements of variables follow prior literature.

The research samples include listed companies in Taiwan (9), commercial banks in Taiwan (1), commercial banks in the United States (1), an automobile retailer (1), a shipbuilding company (1), a semiconductor wafer fabrication company (3), and the central government (1). All studies report the sample period, descriptive statistics, and the structure of data.<sup>20</sup> All except one article report the sample selection criteria and provide descriptive statistics of the variables under investigation.<sup>21</sup> However, only two articles show the procedures for outlier assessment, and only six articles mention that the missing data are

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<sup>19</sup> Most of them adopt a level-level model, while log-level, level-log, and log-log models are each adopted by one article.

<sup>20</sup> The data structure includes cross-sectional (1), time series (3), pooled cross-sectional (3), and panel (9) data.

<sup>21</sup> Chou and Chang (1999) indicate that their data come from a shipbuilding corporation's manufacturing reports of different ships. However, they do not report the sample selection process and do not report the descriptive statistics of the variables used in their study.

excluded from the final sample. None of the articles discusses the self-selection bias; however, Hamilton and Nickerson (2003) indicate that endogeneity is a central problem for researchers in the field of management. They also point out that, without modeling self-selection, a regression may lead to an erroneous estimate. Management accounting research is one field of management research; the internal validity and external validity of the studies are weakened if the studies do not address the endogeneity issue. For example, Lin et al. (2008) examine the relationship between IT investment and the business life cycle and the relationship between IT investment and firm performance. Since the IT investment decision is endogenously made by the company, firms with better performance may tend to make larger IT investments. Thus, in examining the association between IT investment and firm performance, factors affecting the IT investment decision should first be controlled for. The Heckman two-stage procedure can also be considered (Heckman 1979; see also Lennox, Francis and Wang 2012).

All articles report statistical methods, such as ordinary least square regression, the inclusion of firm and industry fixed effects in the regression analysis, path analysis, duration model, and structural equation modeling. Nine articles adopt procedures to correct the consequences of heteroskedasticity for ordinary least squares estimation. Fourteen articles assess the potential multicollinearity problem by using correlation coefficients or the variance inflation factor. Fifteen articles provide sensitivity or additional analysis to examine the robustness of their research results. As to the omitted variables, most studies include in the analysis control variables suggested in prior literature. Overall, the research hypotheses are developed from the relevant theories and prior literature, and the statistical analyses are performed appropriately; both are helpful in ensuring internal validity.

To summarize, the DEA studies report the characteristics of decision-making units, the selection of the input/output set, definitions of input/output variables, the data source, and the models used in the analysis, whereby reliability, internal validity, and external validity can be assessed more readily. While, in general, these studies have achieved acceptable quality in these regards, researchers need to pay more attention to the homogeneity of units and environments, as it is the assumption of DEA. The field-archival research that adopts methods other than DEA also reports information for assessing internal validity, external validity, and reliability and has generally achieved acceptable quality in these dimensions. However, the researchers must address the self-selection bias problem.

### **3.4 CASE STUDY RESEARCH**

Thirteen papers use the case study methodology to investigate issues regarding ABC/ABM, target costing, responsibility accounting, performance measurement, and performance evaluation systems. They encompass a variety of industries, including

electronics, automotive, steel, construction transportation, research and development, charities, and hospitals.

The articles can be divided into explanatory (2), descriptive (7), and exploratory (4) studies.<sup>22</sup> In the explanatory studies, the causalities are established from theories or prior literature, which makes the validity of causal inferences more convincing. For example, Wang (1999) applies Eccles's (1983) proposition of the relationship between strategy and transfer pricing.

All of the articles that use statistical analysis report the operational measures of the concepts in their studies. Four articles that explore "how" and "why" issues also explain the main construct. With respect to attributes relevant to reliability, ten articles report how the study was conducted and the sources of data. Three articles report either research procedures or data collection. Regarding external validity, three articles reveal the reasons for the site selection and two articles use multiple sites, while others only reveal either the name or the industry of the site. Overall, the reported procedures of these studies provide acceptable quality.

### **3.5 EXPERIMENTAL RESEARCH**

Four studies use laboratory experimental methods. The hypotheses are developed from psychology or economics theories and provide connections between the theories and the features of management accounting. For example, Chiou (2006) uses attribution theory and prospect theory to explore risky investment behavior. Chiou (2008) focuses on whether achieving a budget goal influences the magnitude of budgetary slack. Chang et al. (2008) adopts the elaboration likelihood model to explain the common measures bias in balanced scorecard.

All of the experimental tasks are adapted from prior research, and three of them show a portion of their instruments. Two studies have executive MBA students as participants. These studies briefly describe the participants' task-related experience, making the evaluation of the appropriateness of the participants and, therefore, the internal validity and external validity more feasible. Other studies have undergraduates as participants, which may harm the validity. The number of participants ranges from 120 to 193; however, there are no explanations about the sample size determination. Regarding sample selection, one article reveals that the participants are volunteers. All articles report that the participants are

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<sup>22</sup> Explanatory studies address causal relationships. Descriptive studies discover phenomena or the settings in which they exist. Exploratory studies help to identify pertinent hypotheses and propositions for further inquiry (Yin 1994).

randomly assigned to either a treatment or control group. Finally, three studies provided financial incentives to participants.

All articles use a factorial design. Two studies use ANOVA, and another two use ANCOVA for statistical testing. The definitions of testing variables are explained, and descriptive statistics are reported. All four articles describe their tasks and procedures. All the studies provide manipulation checks to ensure that participants comprehend the instructions in the way intended by the authors. Overall, these studies develop causal relations and perform appropriate statistical analysis.

### **3.6 OTHERS**

Three articles are categorized as normative/conceptual studies. These papers provide suggestions and discussions regarding management accounting systems. Most of them are based on reviews of prior literature and the authors' observations. Huang (1998) explores a model to calculate an enterprise's environmental cost. Chen and Lin (2002) classify a company's human capital by using two dimensions: uniqueness and value.<sup>23</sup> Yeh (2001) identifies a set of performance indicators for evaluating supply chain management.

Two papers use a literature review method. Duh (1998) reviews the main behavioral accounting studies from 1970 to 1996. He develops a framework to classify behavioral studies in managerial accounting along the dimensions of research issues and research paradigms. Chang et al. (2009) review financial accounting research, management accounting research, and auditing research in Taiwan conducted from 1998 to 2006. They review 34 management accounting studies and classify them into one of the three categories: cost accounting, human behavior, and application of information technology.

## **4. DISTRIBUTION OF RESEARCH SETTINGS**

Table 3 report the distribution of research settings. Thirty-four articles (27.2 percent) are based on generic settings. Nine papers are conducted using inter-organizational settings to deal with supply chain issues. Almost all studies (98.4 percent) are conducted in a domestic setting, and only two articles are conducted in multi-national settings (Lin 1998; Chang 2007). Fifteen studies address multiple industries, while other focus on a single organization.

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<sup>23</sup> "Uniqueness" refers to human capital that is not easy to employee, imitate, and cultivate by competitors, whereas "value" indicates the merit of human capital to the firm.

TABLE 3 Distribution of Settings

Number of articles	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Generic (abstract/stylized/simplified)	2	4	3	2	2	5	3	2	1	3	0	4	3	34
Inter-organizational	0	0	0	0	2	2	1	0	0	0	1	2	1	9
International	0	1	0	0	0	0	0	0	0	0	1	0	0	2
Multiple industries or activities	0	0	1	1	2	2	3	0	0	3	1	2	0	15
Single industries or activities:														
Construction	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Distribution	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Education	0	0	1	0	0	0	1	0	0	0	0	1	0	3
Financial	0	0	0	0	1	0	0	1	1	0	0	1	0	4
Government	1	0	1	0	0	0	0	0	0	0	1	0	1	4
High tech	0	0	0	1	1	0	0	0	0	0	0	0	0	2
Hospital	1	1	0	0	1	1	0	1	0	0	0	0	0	5
Hotel	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Manufacture	1	3	3	3	3	1	3	3	4	2	3	2	2	33
Non Profit	1	0	0	0	1	0	2	0	1	0	0	0	0	5
Retailer	0	0	0	0	0	0	0	0	2	0	0	1	1	4
Transportation	1	0	0	1	0	1	0	0	0	0	0	0	0	3
Subtotal	5	5	5	5	7	3	6	5	8	2	4	5	5	65
Total	7	10	9	8	13	12	13	7	9	8	7	13	9	125

Fifteen articles (12 percent) cover multi-industry settings. For example, Lee et al. (2006) use the industries of manufacturing, construction, marine, tourism, and department stores as their research settings. Other articles focus on single industries. Overall, a wide range of industries is covered, and manufacturing industries (33), hospitals (5), nonprofit organizations (5), and financial institutions (4) are the most frequently covered. Since Taiwanese companies have been famous for fast and flexible production, manufacturing industries draw particularly high attention (33, or 26.4 percent). Among the 33 articles, 8 focus on electronics companies. Other manufacturing industry settings primarily consist of automotive, semiconductors, shipbuilding, and steel. Most settings in these articles are relevant to Taiwan. However, five articles adopt samples in Japan, Malaysia, and the United States.

## 5. APPLICATION OF THEORY

Theory is essential in guiding research design, data collection, and interpretation of the results (Kinney 1986; Kerlinger and Lee 2000). We group theories into economics, finance, psychology, organizational behavior, strategy, production and operations management, and information science categories. Table 4 shows the application of theory. Among the 125 articles, 116 articles apply a single theory, another five articles apply more than one theory, and the other four articles do not apply theories or the use of theories cannot be detected. Two of the articles that do not apply theories are based on the researchers' observation, and another two are literature review papers.

Among the 116 articles that apply a single theory, 43 articles apply economic theory; most of them discuss performance measurement, performance evaluation systems, performance-based compensation, and cost accounting. The second most frequently applied theory (24 articles) is organizational behavior (e.g. contingency theory). The topics include operating budgets, management accounting in general, performance measurement and evaluation, and target costing. Production and operations management theory is applied by 21 articles, primarily due to inventory management issues such as EOQ and supply chain management being greatly discussed. Thirteen articles apply the strategic management theory. Theories in the fields of psychology (7), finance (6), and information science (2) are less extensively applied.

TABLE 4 Application of Theory

Number of articles	1997		1998		1999		2000		2001		2002		2003	
	No theory applied or detected	Total	No theory applied or detected	Total	No theory applied or detected	Total	No theory applied or detected	Total	No theory applied or detected	Total	No theory applied or detected	Total	No theory applied or detected	Total
No theory applied or detected	1	(14.3)	1	(10.0)	1	(11.1)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Economics	3	(42.8)	3	(30.0)	4	(44.4)	2	(25.0)	4	(30.7)	4	(33.3)	5	(38.4)
Finance	1	(14.3)	0	(0.0)	0	(0.0)	0	(0.0)	1	(7.7)	1	(8.3)	0	(0.0)
Psychology	0	(0.0)	0	(0.0)	0	(0.0)	1	(12.5)	1	(7.7)	0	(0.0)	1	(7.7)
Organization behavior	1	(14.3)	3	(30.0)	2	(22.2)	1	(12.5)	2	(15.4)	0	(0.0)	3	(23.1)
Production and operations management	1	(14.3)	2	(20.0)	1	(11.1)	1	(12.5)	3	(23.1)	4	(33.3)	3	(23.1)
Strategy	0	(0.0)	0	(0.0)	1	(11.1)	2	(25.0)	1	(7.7)	2	(16.7)	0	(0.0)
Information science	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(8.3)	1	(7.7)
Economics and organization behavior	0	(0.0)	1	(10.0)	0	(0.0)	1	(12.5)	0	(0.0)	0	(0.0)	0	(0.0)
Economics and psychology	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Organization behavior and strategic management	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(7.7)	0	(0.0)	0	(0.0)
Total	7	(100.0)	10	(100.0)	9	(100.0)	8	(100.0)	13	(100.0)	12	(100.0)	13	(100.0)
<hr/>														
Number of articles														
No theory applied or detected	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(11.1)
Economics	2	(28.6)	3	(33.3)	3	(37.5)	1	(12.5)	4	(30.7)	5	(55.5)	43	(34.4)
Finance	0	(0.0)	0	(0.0)	2	(25.0)	0	(0.0)	0	(0.0)	1	(11.1)	6	(4.8)
Psychology	0	(0.0)	0	(0.0)	1	(12.5)	0	(0.0)	2	(15.4)	1	(11.1)	7	(5.6)
Organization behavior	3	(42.8)	2	(22.2)	1	(12.5)	3	(37.5)	2	(15.4)	1	(11.1)	24	(19.2)
Production and operations management	1	(14.3)	2	(22.2)	1	(12.5)	1	(25.0)	1	(7.7)	0	(0.0)	21	(16.8)
Strategy	1	(14.3)	2	(22.2)	0	(0.0)	1	(12.5)	3	(23.1)	0	(0.0)	13	(10.4)
Information science	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	2	(1.6)
Economics and organization behavior	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(7.7)	0	(0.0)	3	(2.4)
Economics and psychology	0	(0.0)	0	(0.0)	0	(0.0)	1	(12.5)	0	(0.0)	0	(0.0)	1	(0.8)
Organizational behavior and strategic management	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)	1	(0.8)
Total	7	(100.0)	9	(100.0)	8	(100.0)	7	(100.0)	13	(100.0)	9	(100.0)	125	(100.0)



Five articles apply more than one theory. Three of them investigate management control systems, including operating budgets, performance evaluation, and performance-based compensation. For example, Lee et al. (2006) apply tournament theory and equity theory to explain the relationship between pay dispersion within top management teams and firm performance. They apply both economics theory and psychology theory. One study applies economics and organizational behavior theory to examine the influence of agency problems and the ethical environment on managers' decisions (Huang and Chang 2008). Another one applies organizational behavior theory and strategic management theory to examine the relationship between the performance and characteristics of management accounting information systems (Chang and Chang 2001).

Almost all management accounting research in Taiwan has theoretical underpinnings. However, integrating more unique features of the Taiwanese environment will contribute more to the research and practice of management accounting.

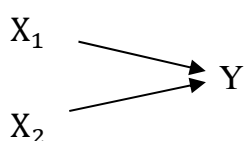
## 6. MAPPING MANAGEMENT ACCOUNTING RESEARCH

Luft and Shields (2003) provide a summary graphic representation of management accounting research. Figure 1 displays various forms of causal models that they classify and represent the relationships among variables. We follow Luft and Shields (2003) to connect management accounting research on similar topics. We attempted to maximize the number of issues that could be connected together in a map, resulting in three research topics. Figure 2 depicts the articles examining issues about the characteristics of budgeting systems and their performance effect, with moderators and mediators being considered. Figure 3 represents the articles that investigate the effect of performance measurement and incentive schemes (PMISs) on performance. Figure 4 includes articles on the topic of performance measurement. Since only those applying DEA can be linked together, Figure 4 is confined to DEA research on performance measurement.

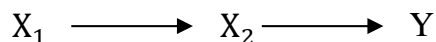
### FIGURE 1 Various Forms of Causal Models

The causal-model forms in the maps are denoted as follows.

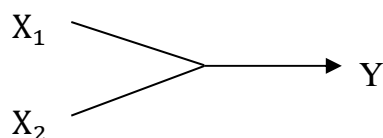
1. In the additive model, each independent variable ( $X_i$ ) has an effect on the dependent variable ( $Y$ ) that is not conditional on the value of any other  $X_i$ .



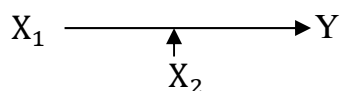
2. In the intervening-variable model, the effect of  $X_1$  on  $Y$  occurs on the condition that  $X_1$  affects  $X_2$  and  $X_2$  in turn affects  $Y$ .



3. In the independent variable interaction model, the effect of  $X_1$  on  $Y$  is conditional on the  $X_2$ . In addition, the effect of  $X_2$  on  $Y$  is conditional on the  $X_1$ .



4. In the moderator variable interaction model, the moderator variable influence operates by changing the effect of  $X_1$  on  $Y$ .



5. Signs of the above relation can be positive ( $\longrightarrow$ ) or negative ( $\dashrightarrow$ )

As shown in Figure 2, most studies (links 1, 2, 3, 4, 5, 6, 7, and 9) examine the relationship between the level of individual participation in budget setting and performance. These studies indicate that the participation-performance association is mediated by several variables (e.g. trust in superiors, self-efficacy, organizational commitment, role ambiguity, and goal acceptance; see form 2 in Figure 1) and moderated by variables such as budgetary difficulty. It is interesting to note that budgetary difficulty is a moderator in link 6 (i.e. form 4 in Figure 1), whereas it is an independent variable that, together with participative budgeting, jointly affects performance in link 2 (i.e. form 3 in Figure 1). In addition, link 7 suggests that participative budgeting is not exogenously given; it is affected by environmental uncertainty. Links 11 to 13 examine factors affecting budgetary slack: budgetary emphasis, participative budgeting, prior performance, and information asymmetry. It is noted that budgetary emphasis influences performance (link 5) and budgetary slack (links 11 and 12).

While performance and budgetary slack are the two most frequently examined dependent variables in these links, how they are correlated with each other (if they are), and through what mediating mechanism their relationship emerges are not explored in the articles.



INVD	Investment decision
ATT	Attribution
PPER	Prior performance
BS	Budgetary slack
IA	Information asymmetry
BBC	Budget-based compensation
RP	Risk preference
GBS	Government budget spending
BC	Budget consumption

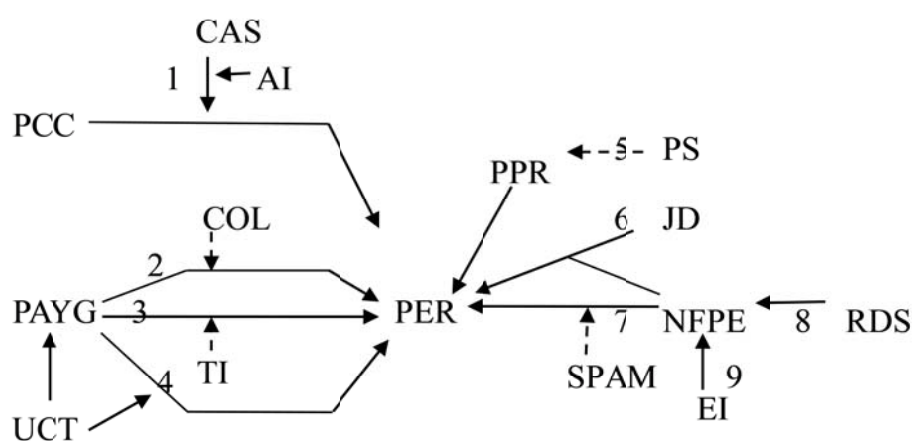
Prior research:

- 1 Ni, Su, Chung and Cheng (2009)
- 2 Ni and Chen (2000)
- 3 Ni and Chiou (2001)
- 4 Chang, Chang, Chang and Wu (2007)
- 5 Ni and Tsai (1997)
- 6 Zhu, Lin and Ni (2003)
- 7 Chow, Duh and Chen (2005)
- 8 Chang, Liao and Ni (2001)
- 9 Ni, Zhu and Chang (1998)
- 10 Chiou (2006)
- 11 Chiou (2008)
- 12 Ni and Zhu (1998)
- 13 Ni and Lin (1999)
- 14 Chang, Chiang, Lin and Shiau (1999)

Figure 3 presents articles discussing the effect of PMIS on performance. Links 2 to 4 indicate that, although a pay gap within the management team is associated with higher performance, firms should consider the negative effect of a pay gap on performance under circumstances when collaboration needs are high. Links 6 and 7 analyze the effect of including non-financial performance measures in CEO contracts. Their results indicate that the adoption of non-financial measures has a positive influence on performance. Like budgeting studies, PMIS studies introduce moderators in the PMIS-performance association (e.g. collaboration needs, task interdependence, and the sensitivity and precision of performance measures). It is worthy of note that link 8 indicates that the use of non-financial performance measures is determined by the strategy that a firm adopts.

Future research can consider integrating links 7 and 8 to examine the determinants and performance effect of PMIS. Further, incorporating corporate governance mechanisms can be a fruitful research area. In addition, with increasing research (both experimental and field studies) that yields findings that are inconsistent with the balanced scorecard ideas (Ittner and Larcker 1998; Banker, Potter and Srinivasan 2000; Lipe and Salterio 2000; Ittner, Larcker and Meyer 2003), certainly more efforts should be exerted on this area, particularly in view of the little research conducted in Taiwan.

**FIGURE 3 Effects of Performance Measurement and Incentive Scheme on Performance**



Variable identification:

- PER Performance (current or future performance)
- CAS Cost allocation system
- PCC Performance contingent compensation
- AI Information asymmetry
- PAYG Pay gap
- COL Collaboration needs
- UCT Uncertainty
- TI Task interdependence
- PS Probability of success
- RRP Relative return on assets (ROA) performance compared to industry
- JD Job design
- NFPE Use of non-financial performance measures
- SPAM Sensitivity and precision of accounting and market performance measures

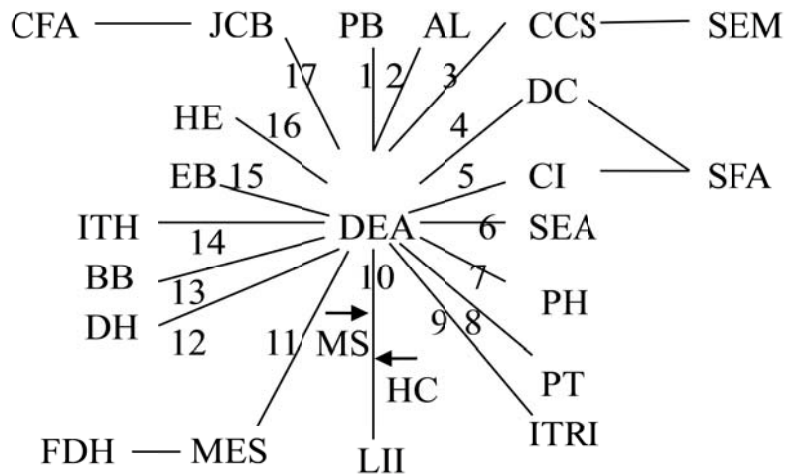
RDS R&D strategy  
 EI Employee involvement

Prior research:

- 1 Lee (2002)
- 2 Lee, Lin and Chuang (2006)
- 3 Lee (2009)
- 4 Lee (2006)
- 5 Chi and Wang (2000)
- 6 Young (2001)
- 7 Tsai (2003)
- 8 Duh, Chiang and Lin (2000)
- 9 Chang, Fang, Shen and Luo (2008)

Figure 4 includes articles that apply the DEA method to measure an organization’s efficiency. Some of them apply multiple methods to measure efficiency (i.e. links 3, 4, and 5) and conclude that the results are almost equivalent across different approaches. With only a few exceptions, the organizations in these studies are non-profit organizations whose missions are different from those of profit organizations, so performance measures such as profit or return on investment are not suitable for these institutions. Therefore, using efficiency as a performance measure and using DEA and variants as the analytic method are both appropriate. It is noted that, while some studies first estimate a decision unit’s efficiency and then examine the determinants of efficiency, others fall short of doing the analysis of determinants.

**FIGURE 4 Performance Measurement**



## Variable identification:

DEA	Data Envelopment Analysis
PB	Post branches
AL	Airlines
CCS	Coffee chain store
SEM	Super efficiency model
DC	District courts
CI	Correctional institutions
SFA	Stochastic frontier analysis
SEA	Social welfare agency
PH	Provincial hospitals
PT	Physician teams
ITRI	Industrial Technology Research Institute
LII	Life insurance industry
HC	Human capital
MS	Marketing system
MES	Military education sector
FDH	Free disposal hull
DH	District hospitals
BB	Bank branch
ITH	International tourist hotel
EB	Electronic business
HE	Higher education units
CFA	Cross-frontier analysis
JCB	Japanese commercial banks

## Prior research:

- 1 Hwang, Lin and Chang (1997)
- 2 Huang and Huang (2000)
- 3 Yeh and Cheng (2005)
- 4 Wang, Chang and Chen (2009)
- 5 Wu and Huang (2003)
- 6 Chang, Hwang and Shen (1997)
- 7 Chang and Hou (2001)
- 8 Chang, Chen and Hou (2002)
- 9 Hsu, Lee, Shih, Hung, Yu and Tzeng (2003)
- 10 Tseng, Kao and Ho (2005)
- 11 Sun (2003)

- 12 Chang, Wang and Hsiao (1998)
- 13 Hsieh and Hsu (2009)
- 14 Cheng, Lu and Chung (2009)
- 15 Hung, Lin and Wang (2008)
- 16 Guh (1999)
- 17 Jeng (2008)

## **7. OVERLAP OF RESEARCH WITH TOPICS CONSIDERED IMPORTANT BY MANAGERS**

To explore whether MA research in Taiwan leads, lags, or is unrelated to topics that managers view as important, we conducted a survey. Our target population was the senior executives of listed companies, and we used senior managers or executives attending a series of seminars as the sample frame. We distributed 380 copies of questionnaires to the attendees and obtained 142 returned responses, among which 10 responses were discarded due to too many missing answers. We compared the 132 respondents with those not providing returned responses and found no significant difference between them in the demographics, including gender, net sales, and the industry distribution of the companies for which they were working. Thus, non-response bias may not be a serious concern. A majority of the 132 respondents are from finance and accounting departments, and half of them are males. The 132 respondents had been at their positions for around 9 years. Thus, they were experienced managers and were qualified to answer the questions. The average net sales of the companies they work for is NT\$7,790 million. The industry coverage is wide and includes food, plastics, textiles, electrical engineering, electrical appliances, chemistry and biotechnology, paper, steel, rubber, automobiles, electronics, construction, marine, tourism, banking, and insurance. Electronics firms dominate the sample (41 percent).

In the survey, we first asked the respondents to rate the importance in the past five years for each MA topic under each category of articles reviewed in the sections above. They responded on a 1 to 7 scale, with “1” representing low importance and “7” high importance in the past five years. They were also asked to specify topics not included in the list but highly important to them in the past five years. Second, we asked the executives to list five MA topics that they believed important at present and in the next five years. They were asked to list the topics in descending order of importance.

For the responses to the first sections of questions, we calculated the average importance score across all respondents for each topic under a category and then calculated the average across all topics under that category to represent the perceived importance of that category of MA issues. The results indicate that issues related to management control



systems are rated most important (average importance score of 5.45) for these executives in the past five years. Immediately following management control systems is decision-making techniques (5.43). This is due to the importance of demand forecasting techniques. Cost accounting and management is perceived as the third most important, with a small difference (5.38), and followed by other issues (e.g. strategic management accounting; 5.28) and inventory management (4.60). While a few respondents mentioned issues other than those on the list, the number of respondents mentioning the same issues is very low. To compare whether MA researchers in Taiwan examine issues that are important to practitioners in the past five years, we calculated the number of articles under each category and found that, among the 46 articles published from 2005 to 2009, 28 articles (60.7 percent) belong to management control systems, followed by management accounting in general (5; 10.9 percent), cost accounting and management (4; 8.7 percent), inventory management (4; 8.7 percent), decision-making techniques (2; 4.3 percent), others (2; 4.3 percent), and externally oriented management (1; 2.2 percent). Thus, MA researchers overlap with practitioners in that they both perceive management control systems as the most important issue. Similarly, cost accounting and management was perceived the third most important by MA researchers and practitioners. A discrepancy between MA researchers and practitioners arises from inventory management being extensively examined by researchers, while decision-making techniques are regarded as second most important by practitioners. Since inventory management issues examined in research are based on assumptions that are not mapped with real-world situations, the topics examined by researchers may not be of importance to practitioners. On the other hand, practitioners are concerned with demand forecasting, but relatively little MA research deals with this issue.

For the responses to the second set of questions, we calculated the weighted average importance score for each category. In doing so, we first grouped the topics mentioned by the executives into the categories of articles reviewed in the above sections. A category that is mentioned as the most important in the next five years is given a weight of 5, 4 if perceived as the second most important, 3 if perceived as the third most important, 2 if perceived as the fourth most important, and 1 if perceived as the fifth most important. For example, if a category of issues is mentioned by one respondent as the most important issue, by two respondents as the second most important, by three respondents as the third most important, by four respondents as the fourth most important, and by five respondents as the fifth most important, then the weighted average importance score for this category will be  $[(1 \times 5) + (2 \times 4) + (3 \times 3) + (4 \times 2) + (5 \times 1)] / 15 = 2.33$ . We used this weighting scheme to calculate the weighted average importance score for each category. The results indicate that cost accounting and management is the most important issue for executives in the next five years (3.89), immediately followed by management control systems (3.79), and then followed by inventory management (1.53), other issues (1.32), and decision-making techniques (1.16). This pattern largely mirrors practitioners' concern in the past five years, except that they are

more concerned with inventory management in the future, presumably due to the fast changing market and the increasing loss incurred from inventory obsolescence. As a comparison between MA researchers and practitioners, this finding also suggests that MA researchers lead the practitioners by conducting research that deal with issues of importance to practitioners in the next five years.

## 8. MANAGEMENT ACCOUNTING RESEARCH PUBLISHED BY TAIWANESE SCHOLARS IN INTERNATIONAL JOURNALS

The main purpose of this study is to evaluate the quality of management accounting research published in the selected Taiwanese journals. As a reference and to be more inclusive, studies focusing on Taiwanese settings but published in foreign journals were also reviewed.<sup>24</sup> We searched management accounting studies published from 1997 to 2009 in the management academic journals ranked by the NSC (Liang, Chi, Chen, Hung, Chiou, Lin, Chen, Lee, Lu and Wang 2004).<sup>25</sup> These studies were published in the following journals: *Accounting, Organizations, and Society* (3), *Information and Management* (3), *Management Accounting Research* (2), *Behavioral Research in Accounting* (2), *The International Journal of Accounting* (2), *Medical Care* (2), *International Journal of Production Research* (2), *Contemporary Accounting Research* (1), *Journal of Accounting and Public Policy* (1), *European Journal of Operational Research* (1), *Journal of the Operational Research Society* (1), and *Computer & Operations Research* (1). Most studies (13 out of 21) were published before 2003, and the remainders were published in 2004, 2006, 2007 and 2009. Most studies used the experiment method (6), followed by field-archival studies (5), analytical studies (5), survey studies (4) and case studies (1).

Among the 21 studies, eight focus on the issue of cultural differences. Chow, Harrison, Lindquist and Wu (1997) indicate that Chinese nationals have a greater aversion to admitting failure. Chow, Hwang, Liao and Wu (1998) find that, when face-to-face interactions with superiors are absent, Chinese subjects relative to U.S. subjects make smaller misrepresentations of their private information. Awasthi, Chow and Wu (1998) examine the effects of individualistic and collectivist cultures on managerial decisions. Contrary to expectations, they find that U.S. subjects choose more team-based performance measures than their Chinese counterparts. Harrison, Chow, Wu and Harrell (1999) find that Chinese subjects show a lower tendency to continue an unprofitable project than their U. S. counterparts. Chow, Shields and Wu (1999) indicate that national culture affects the design

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<sup>24</sup> We followed a reviewer's suggestion to add this analysis.

<sup>25</sup> Liang et al. (2004) ranks international journals in all fields of management and is the most recent study that covers such a wide range of fields.

of and employee preferences for management controls. Chow, Harrison, McKinnon and Wu (1999) examine the cultural influences regarding informal information sharing in Chinese and American organizations. Awasthi, Chow and Wu (2001) examine the effects of cultural differences on imposing performance evaluations and reward systems. Chow, Harrison, McKinnon and Wu (2002) compare the organizational cultures of public accounting firms between Taiwanese and U.S.-affiliated firms.

Chu, Liu and Romeis (2002) evaluate the efficiency of hospitals in Taiwan and find that hospitals implementing responsibility center systems, total quality management, and physician fee programs are more efficient than hospitals that do not. Liu and Romeis (2003) find that the Taiwan's outpatient prescription drug co-payment policy does not reverse the trend of drug cost increases. Other articles examine various management accounting issues. Chang, Yen and Duh (2002) experimentally examine framing effects in a managerial accounting decision-making context. Chang, Chang and Paper (2003) examine the effects of task uncertainty, decentralization, and accounting information system (AIS) characteristics on the performance of AIS. Duh, Chow and Chen (2006) examine the relationship between IT applications and firm performance using survey data. They indicate that the link between a firm's extent of IT applications for planning and control and performance varies inversely with the level of impediments to IT implementation. Li, Chang, Chang and Das (2004) evaluate the impacts of the National Health Insurance (NHI) program on the operating efficiency of district hospitals in Taiwan. Ho, Wu and Lee (2009) examine the effects of changes in compensation plans on employee performance, recruitment, and retention. Ou, Hung, Yen and Liu (2009) analyze the relationship between automated teller machine (ATM) intensity and cost efficiency. They suggest that ATM investments are positively associated with cost efficiency in the Taiwanese banking industry.

In analytical modeling research, Li and Balachandran (1997) aim to find the optimal transfer pricing schemes for divisional managers who have private information. Tsai, Lai and Chang (2007) develop an algorithm to optimize a joint product processing decision under the theory of constraints. Tsai and Lai (2007) develop an ABC joint product decision model that incorporates outsourcing or capacity expansion problems. In addition, Tsai and Hung (2009) apply a fuzzy goal programming approach to assess and control a green supply chain under the ABC system. Finally, Tsai, Chou and Hsu (2009) propose a novel integrated model for selecting socially responsible investment (SRI) stocks.

The small number of articles in foreign journals prevents us from making meaningful comparisons between articles in domestic and foreign journals regarding research topics, methods, the application of theory, and research setting. However, it is worthy of note that many articles (8 out of 21) published in the foreign journals examine effects of national culture, whereas none of the articles published in domestic journals examines similar issues.

## 9. SUMMARY AND CONCLUSION

In this study, we review management accounting research in Taiwan conducted from 1997 to 2009. The results indicate that issues related to management control systems are most extensively examined, followed by inventory management, cost accounting and management, decision-making methods, management accounting in general, externally oriented management accounting, and others. In terms of research methods, analytical modeling is applied most, followed by survey, field-archival, case study, experimental study, and normative/conceptual types of research. The large number of analytical modeling research is at odds with that in the U.S. because the MA research reviewed in our study consists of many inventory management studies that use optimization techniques. In terms of the theories applied, economic theory is applied most, followed by organizational behavior, production and operations management, strategy, psychology, finance, and information science. The finding that theories of production and operations management are extensively applied is again due to the large number of inventory management studies. Only very few studies do not apply theories. With respect to research settings, except for the inventory management studies, most studies are conducted with an industry as the setting. While there is room for improving research quality, the articles reviewed in this study have achieved acceptable quality. The areas for improvement include paying attention to self-selection bias in the field-archival research, and handling sample selection issues in the survey research, among others.

Overall, our assessment of management accounting research in the above respects suggests that management accounting research in Taiwan has achieved a certain level of quality. In addition, the research topics encompass a wide range of management accounting issues, and the research methods are not confined to only a few. These features may suggest that, as far as management accounting research is concerned, articles published in the domestic journals can be a source for reference. As such, the low citation rate of our own research may be due to other factors.

We also found that MA researchers examine issues that are of importance to the practitioners either in the past five years or in the next five years. Thus, the research findings can have practical implications. Finally, a comparison with MA research in China (Duh et al. 2008) suggests that, while MA research in Taiwan has achieved higher quality than that in China, MA research in Taiwan is silent regarding the distinctive features of MA practice in Taiwan and does not mirror economic development in the past decade. In contrast, MA research in China is salient in identifying the features of MA practice in China and mirrors government policies. Future MA research in Taiwan should consider how MA practice has contributed to economic development in past decades. Further, in the budgeting area, researchers can explore the possible association between budgetary slack

and firm performance and their mediating mechanism. Incorporating corporate governance mechanisms into the budgeting research can be a fruitful area. Empirical investigation into how firms implement the balanced scorecard is needed in light of the few studies conducted on this topic. In addition, future research can consider reviewing papers for each specific category of topics to probe in greater detail. Finally, in our review of management accounting research in Taiwan, we assess the quality of these studies by evaluating their methodological rigor. Future research can apply citation analysis to evaluate their impact and importance as another aspect of quality.

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