An empirical analysis of the relationships between the interactive use of performance measurement systems, creativity and performance: the intervening role of psychological empowerment.

Working Paper

Carly Webster
Monash University

Abstract

There is considerable interest in the role of management control systems (MCS) in enhancing innovation and performance in organisations. An aspect of MCS that has attracted recent attention is the role of performance measurement systems (PMS) in organisational innovation. However, as yet, there has been little consideration given to identifying the nature of the relationship between PMS and creativity at an individual level. This study examines the effect of the interactive use of PMS on creativity and performance. Middle-level managers of large Australian manufacturing organisations were surveyed. The study identifies a key intervening variable, psychological empowerment, as being instrumental in the interactive use of PMS leading to the enhancement of creativity and performance in individuals. Psychological empowerment was also found to mediate the associations between the interactive use of PMS, creativity and performance.

Key words: creativity, innovation, performance measurement systems, interactive, performance, psychological empowerment, survey.

Introduction

Increasingly, attention is being paid to the role of MCS in generating and enhancing innovation and performance in organisations. Management behaviours within organisations have the potential to impact on these organisational outcomes. One aspect of MCS that is intended to influence managerial behaviour through decision making and managerial action is the role of PMS. PMS can be used to direct behaviour toward the best interests of the organisation by making explicit means-end relationships that are consistent with the strategic intent of the organisation (Otley, 1999). PMS are formal systems consisting of information-based routines and procedures that are used by managers to influence organisational activities (Simons, 1995). Control systems, such as MCS and PMS, are subject to various types of use by management. Simons (1995; 2000) was the first to describe the concept of the

* I would like to thank Professor Robert Chenhall, Dr Robyn Moroney, Dr Aldonio Ferreira, Dr Monte Wynder and participants at the EAA 2006 and AFAANZ 2006 conferences for their comments. Thank you also Wynne Chin for the use of PLS Graph Version 3.00.

** Department of Accounting and Finance, Monash University. PO Box 197, Caulfield East, Victoria, Australia 3145. Phone: +613 9903 1435; Carly.webster@buseco.monash.edu.au.
interactive use of MCS. This is often deemed “style-of-use” of controls (Abernethy & Brownell, 1999; Bisbe, Batista-Foguet, & Chenhall, 2006; Bisbe & Otley, 2004; Simons, 1995; Ylinen, 2004). The interactive use of controls can be identified when senior and operational managers regularly involve themselves with subordinates’ activities. A distinctive feature of the interactive use of PMS is where the use of controls focuses attention toward strategic uncertainties and forces dialogue throughout the organisation. There is also the pervasiveness of face-to-face challenges and debates. This can be achieved through frequent meetings between superiors and subordinates, for example. Another characteristic of the interactive use of controls is the non-invasive facilitating involvement of senior management this can assist in promoting the positive empowering involvement of subordinates, which can lead to the encouragement of information sharing (Bisbe et al., 2006; Simons, 1995). An important question for organisations becomes “does the interactive use of PMS influence performance?”.

The importance of innovation to many organisations’ survival has led to increased research interest in this field of study. Furthermore, the creativity of employees has been identified as essential to the ability of organisations to innovate in order to remain competitive (Amabile, 1988, 1996; Porter, 1990). Creative outputs include new products, services, ideas, processes and procedures (Woodman, Sawyer, & Griffin, 1993). Amabile (1996: 35) defines creativity as the outcome of the creative process, “A product or response will be judged as creative to the extent that (a) it is both a novel and appropriate, useful, correct or valuable response to the task at hand, and (b) the task is heuristic rather than algorithmic”. With the increased need for creativity in organisations has come the issue of how to design a PMS that will enable the organisation to control its resources and activities associated with efforts to generate creativity, but at the same time be consistent with encouraging creativity. An important question is whether the traditional use of PMS, to assess individual’s performance by comparing planned with actual outcomes, is inconsistent with developing creativity? Authors have argued that there is a danger that formal quantitative measures, both financial and non-financial, may stultify creativity (Amabile, 1996; Simons, 2000; Woodman et al., 1993). This traditional use of PMS is inconsistent with creativity because it can create conditions conducive to a short-term orientation, risk avoidance, and can create restrictive controls and time pressures, thereby discouraging individuals to consider possible innovations to products and processes (Amabile, 1996).

This study aims to contribute to the body of accounting literature that examines how the use of controls effects desired organisational outcomes. In this study the nature of the relationships between the interactive use of PMS and the outcomes of individual creativity and performance is explored. Simons (1995; 2000) suggests a positive association between the interactive use of PMS and innovation and performance. However, little is known about the nature of the performance consequences resulting from the interactive use of PMS and the creativity effects at the individual level. In

1 By heuristic Amabile (1996) is referring to a task that does not have a clear identifiable path to a solution.
2 Creativity is distinct from innovation; creativity is an individual trait that leads to the process of innovation once creative ideas are implemented. The implementation of creative ideas is usually done at an organisational or group level, and it is at this point that an innovation is recognised (Amabile 1988; 1996).
recent years the concept of psychological empowerment has drawn increased attention, particularly its role in enhancing organisational outcomes. Thomas and Velthouse (1990) asserted that psychological empowerment is a psychological state that is multifaceted where individuals make assessments of specific tasks with which they are personally involved. Behavioural effects of psychological empowerment are expected to include both the initiation and persistence of employee task behaviour. It has also been viewed as an important component for managerial and organisational effectiveness (Gist & Mitchell, 1992). The nature of the relationships between the interactive use of PMS with the outcomes of creativity and performance may also be indirect through psychological constructs. In this study the potential role of psychological empowerment within these relationships is also examined.

Data were collected by surveying middle-level managers of large Australian manufacturing organisations. The main findings of this study suggest that there is a positive indirect relationship between the interactive use of PMS and the outcomes of creativity and performance. The nature of these relationships is examined using Partial Least Squares (PLS) analysis. A structural model was developed that examines the intervening role of psychological empowerment. Findings indicate that psychological empowerment intervenes in the PMS-creativity and PMS-performance relationships. Psychological empowerment was also found to mediate the associations between the interactive use of PMS, creativity and performance. These findings support the literature suggesting that psychological processes intervene in the relationships between MCS and performance (Bonner & Sprinkle, 2002; Ilgen, Fisher, & Taylor, 1979).

The remainder of this paper is divided into four sections. The first section presents the theory development and hypotheses formation. The second section explains the research method. The third section presents the results. The fourth section provides a discussion and conclusions.

**Theoretical Framework**

There is a growing body of literature that explores the nature of the relationships between the MCS and innovation and performance (Bisbe & Otley, 2004; Simons, 2000). The generation of creativity and performance in organisations is believed to be, in part, a function of the controls that are used (Amabile, 1996; Simons, 1995, 2000). One key component of control identified in the literature is that of PMS. The main aim of PMS is to improve performance by setting goals and providing important performance feedback that conveys financial and non-financial information for the purposes of influencing decision making (Simons, 2000). The way in which PMS is used by management is also ultimately aimed at improving the overall performance of individuals and the organisation (Simons, 1995). Controls such as PMS have also been linked to individual creativity (Amabile, 1996; Simons, 1995; 2000). Little is known, however, regarding the extent to which PMS are used as interactive controls and the subsequent effects on individual outcomes, such as creativity and performance. The overall purpose of this study is to develop accounting theory drawing on behavioural theory and empirically examine how the interactive use of PMS is implicated in the generation of enhanced individual creativity and performance.
Behavioural theories help predict the ways in which the MCS and PMS influence individual behaviours (Amabile, 1996; Hage & Aiken, 1967; James & Jones, 1976; Van de Ven, 1986; Woodman et al., 1993). Behavioural research has suggested that the MCS may improve individual performance, and this may operate through behavioural constructs. Also, the ways in which the MCS are used in organisations has the potential to impact on the individuals’ psychological processes (Ilgen et al., 1979). In the context of this study, psychological empowerment will be implicated in the ways in which PMS are used, with a particular focus on the potential intervening role that psychological empowerment may have on the relationships between the interactive use of PMS and the outcomes of individual creativity and performance. In summary, this study will use behavioural theories to develop a theoretical model linking the interactive use of PMS to individual creativity and performance.

First, this research is predicted on the belief that the interactive use of PMS enhances individual performance. Arguments are presented to support a positive relationship between the interactive use of PMS and individual performance (H1). Next, a structural model is developed that elaborates upon the relationship between the interactive use of PMS and individual performance. First, creativity alignment paths are identified where the interactive use of PMS is positively related to individual creativity (H2), and creativity is related to performance (H3). Second, psychological empowerment paths are presented where the interactive use of PMS is positively related to psychological empowerment (H4) and psychological empowerment is positively related to individual performance (H5) and creativity (H6). Figure 1 outlines the nature of these relationships.

(Insert Figure 1)

The interactive use of PMS and performance

It has been claimed that the interactive use of PMS has the potential to influence both individual and organisational performance (Simons, 1995; 2000). However, formal theories on how interactive controls can enhance performance are not well articulated. Using the PMS interactively opens up channels of communication between superiors and their subordinates. This can lead to valuable sources of ideas and information, involve engagement in creative work to generate solutions to perceived problems and exploit potential opportunities. The interactive use of PMS has also been found to motivate employees to achieve goal directed behaviour, provide employees with a voice, promote positive attitudes towards supervisors and tasks, and can be used to focus attention toward issues that affect performance, such as strategic uncertainties (Bisbe et al., 2006; Libby, 1999; Lind, Kanfer, & Earley, 1990; Simons, 1995). These outcomes from the interactive use of PMS have the potential to enhance individual performance.

The participation of senior managers within an interactive control environment takes the form of non-invasive participation through frequent interventions. This is focused toward a facilitating, integrating and inspiring type of involvement that is ultimately aimed at improving performance (Bisbe et al., 2006). Using the PMS interactively means that the PMS will be used intensively by senior and middle-level management. In the context of this study, PMS are used interactively by senior management to measure the performance of middle-level managers. In doing so, middle-level
managers will be involved in determining their performance goals and this is likely to lead to individuals being motivated to expend effort toward the achievement of these goals (Locke, Shaw, Saari, & Latham, 1981), which potentially will improve their performance. The pervasiveness of the continuous dialogue and debate provides individuals with information that assists in integrating their actions with their goals (Ilgen et al., 1979), which potentially enhances performance. In addition to this, the continuous interaction with senior managers will provide middle-level managers with information about their work role, which can also enhance performance (Kerr & Slocum, 1981). Feed-forward orientated information can also be used to manage future performance. This information can be generated from the intensive interactions between managers and subordinates through the interactive use of PMS. These arguments provide the basis to propose an association between the interactive use of PMS and individual performance.

H1: There is a positive relationship between the interactive use of PMS and individual performance.

The interactive use of PMS and creativity

Research in the area of individual creativity has emphasised the importance of the internal processes and controls within organisations. These have the potential to enhance or constrain individual creativity (Amabile, 1988). Simons (1995; 2000) claimed that using MCS interactively can result in innovation at an organisational level. Such innovation is achieved when interactive MCS create conditions conducive to individual creativity. This creativity is encouraged by opening up channels of dialogue and by encouraging an environment that values new ideas, experimentation, learning and information sharing (Simons, 2000).

The interactive use of PMS can be used to involve individuals in decision making and problem solving and construction (Lawler, 1992; Redmond, Mumford, & Teach, 1993; Simons, 1995; West & Anderson, 1996), promote autonomy, employee interaction, the production of knowledge (Amabile, 1996; Pelz, 1956), goal setting, personal discretion (Shalley, 1991), access to relevant information (Wynder & Luckett, 2006) and feed-forward techniques (Cooper, 1996), all of which have been found to be associated with creativity.

Amabile (1988) provided arguments against the use of restrictive control systems for organisations trying to create environments conducive to creativity. Restrictive control systems consisted of external constraints, lack of freedom, overemphasis on the status quo and an environment focused on external evaluation. In addition, Pelz (1956) found that lack of communication and limited individual autonomy inhibited creative achievement and that climates that encouraged creativity include those that encourage autonomy, interaction, and the production of knowledge. Using PMS as an interactive control involves individuals in the process of discussing and deciding performance goals, problem construction and communication. Moreover, these systems can orient attention toward these goals. Interactive controls can also provide the opportunity to negotiate performance goals that are acceptable for evaluation.

---

This is in addition to the personal qualities of the individual such as domain-relevant and creativity-relevant skills.
purposes (Simons, 1995; 2000). Simons (1995) asserted that diagnostic control systems\(^4\) constrain innovation and opportunity seeking; whereas an interactive control system can produce the opposite effects. This relationship is presented in H2.

**H2:** *There is a positive relationship between the interactive use of PMS and individual creativity.*

**Individual creativity and performance**

Despite scant literature examining relationships between creativity and individual performance, the purpose of engaging in creative behaviour is ultimately aimed at improving performance at some level, whether this is to create a new product or process or to look at problem solving from different perspectives (Woodman et al., 1993). It has been argued that creative work behaviours lead to successful job performance (Farr, 1990). Creativity provides the human capital for innovation. At an organisational level, innovation is necessary for organisations to remain competitive (Amabile, 1996; Simons, 2000; Woodman et al., 1993). Studies of the links between organisational climate and productivity have observed that organisational climates that provide physical support for creative efforts have encouraged independent action, which facilitates improved productivity and innovation, which are both outcomes of creativity (Andrews, 1975; Taylor, 1963; 1972). These studies suggest that individual creativity can ultimately result in improvements in organisational performance.

Amabile (1988) claims that if an individual is considered to be highly creative in their work role, then they are more likely to take the time to look at problems, or threats facing the organisation in different ways and explore alternative opportunities. This can lead to higher levels of task motivation, which is responsible for initiating and sustaining the creative process in search for solutions (Amabile, 1988). As a consequence, individuals become more willing to take risks and search widely for solutions. This includes consideration of approaches that are not obviously related to the achievement or attainment of the solution to the task (Amabile, 1988), which has the potential to lead to the development of creative alternatives. Moreover, individuals who are creative within their work role have been found to have high levels of intrinsic motivation (Amabile, 1988; 1996). Intrinsic motivation has been found to play a central role in the generation of enhanced individual performance (Kerr & Slocum, 1981; Motowidlo, 2003). To summarise, if an individual has higher levels of individual creativity, then this is likely to have a positive affect on enhancing individual performance. This relationship is presented in H3.

**H3:** *There is a positive relationship between individual creativity and individual performance.*

**The interactive use of PMS and psychological empowerment**

Several studies have acknowledged the importance of access to information as being an important antecedent to feelings of psychological empowerment (Bowen &

---

\(^4\) Diagnostic control systems are used to measure outputs and compare them against pre-set standards with the aim of correcting deviations (Simons, 1995).
Lawler, 1992; Kanter, 1989; Lawler, 1992; Quinn & Spreitzer, 1997; Randolph, 1995; Spreitzer, 1995; 1996). This is because without information individuals are not willing to take responsibility and extend themselves to employ their creative energies (Kouzes & Posner, 1987). When PMS are used interactively the individual is exposed to a variety of rich information including information about individual and organisational performance, work roles and expectations. Also, they may be provided with information on the goals of the organisation, the organisations’ strategies, strategic uncertainties and mission. Higher levels of interaction and involvement in decision making are positively associated with increased perceived psychological empowerment and this leads individuals to believe that they are important to the organisation and that they make a difference (Spreitzer, 1995; 1996). The interactive use of PMS provides the individual with the opportunity to communicate with senior managers and to be involved in decision making, such as assisting in establishing performance goals. An interactive climate between subordinates, senior and middle-level management provides a setting conducive to extensive interactions and involvement across different hierarchical levels in decision making. In summary, using PMS as an interactive control provides an environment where individuals are granted access to a variety of relevant information and are involved in decision making within the organisation through the pervasiveness of face-to-face dialogue and debate which can increase the overall perception of psychological empowerment. These arguments lead to H4.

**H4: There is a positive relationship between the interactive use of PMS and psychological empowerment.**

**Psychological empowerment and individual performance**

Psychological empowerment is expected to enhance individual performance. Individuals who have high empowerment should perform better than those who are less empowered (Liden, Wayne, & Sparrowe, 2000). Several studies have reported an association between psychological empowerment and managerial effectiveness (Conger & Kanungo, 1988; Koberg, Wayne, Senjem, & Goodman, 1999; Spreitzer, 1995; Spreitzer, Kizilos, & Nason, 1997; Thomas & Velthouse, 1990). Spreitzer (1995) found that formal rules and routines to guide work processes were inadequate to enhance individual performance. Rather, enhanced performance required individuals to be psychologically empowered because the work processes of managers cannot be completely structured by formal processes and routines. Enhanced performance might be expected from empowered individuals, these individuals see themselves as competent and are likely to be proactive in executing their job responsibilities because they can see their influence in their work environment in meaningful ways (Spreitzer, 1995). Thomas and Velthouse (1990) claim that psychological empowerment heightens managerial effectiveness. This is because individuals will increase their concentration, initiative and resiliency toward work tasks, engage in initiating behaviours with greater levels of effort, persistence, commitment, involvement, flexibility, creativity, motivation and self regulation (Deci & Ryan, 1985; Thomas & Velthouse, 1990). Spreitzer et al. (1997) also found that managers who felt that they had the necessary skills and abilities to make an impact in their work environment were seen by their subordinates as high performers. Worker productivity and effectiveness has also been found to be positively related to empowerment perceptions (Koberg et al., 1999). These studies provide evidence to
propose a relationship between psychological empowerment and individual performance, as indicated in H5.

**H5:** There is a positive relationship between psychological empowerment and individual performance.

**Psychological empowerment and creativity**

Several studies have examined the relationship between psychological empowerment and innovation variables. Often, these innovation variables are creativity-like constructs as they are focused at the individual level. For example, Spreitzer, DeJanasz and Quinn (1999) found that supervisors who felt more empowered were seen by their subordinates as being more innovative. The definition that Spreitzer et al. (1999) used for innovation\(^5\) (Woodman et al., 1993) is consistent with creativity as defined by Amabile (1996). Following the behavioural research of Woodman et al. (1993), Redmond et al. (1993), and Amabile (1988), Spreitzer (1995) examined innovation as a consequence of psychological empowerment. Spreitzer (1995) found that psychological empowerment was positively related to innovative behaviours. Empowered employees saw themselves as innovative and effective in their work role and showed less fear of trying something new. This is because when individuals are empowered they feel that they have an impact, are more autonomous and less constrained by rule-bound aspects of their work, hence they are likely to be creative (Amabile, 1988). Further, empowered employees tended to experiment, and take new approaches to old problems and produced truly innovative outcomes (Quinn & Spreitzer, 1997). These innovative outcomes contribute to the cycle of empowerment therefore once these actions are reinforced the process continues (Quinn & Spreitzer, 1997).

Several studies have also examined links between the cognitions of psychological empowerment and creativity. Mumford and Gustafson (1988) concluded that measures intended to tap into feelings of efficacy (competence), self-confidence, self-esteem or autonomy have been found to be effective predictors of creativity and increases the likelihood of innovative achievement. Redmond et al. (1993) found that feelings of self-efficacy lead to higher subordinate creativity and that leader behaviour can enhance subordinates feelings of self-efficacy subsequently influencing individual creativity. These feelings of self-efficacy increased individual motivation and willingness to pursue unique or original ideas (Mumford & Gustafson, 1988; Redmond et al., 1993). Otley (1994) suggests that empowering individuals provides a potential avenue for individuals to engage in creative activities that are involved in adapting organisations so that they can respond to rapidly changing environments. Other evidence of links between psychological empowerment and creativity are reported by Bowen and Lawler (1992) and Kanter (1983). Therefore, there appears to be considerable research to suggest a relationship between psychological empowerment and individual creativity, leading to H6.

**H6:** There is a positive relationship between psychological empowerment and creativity.

\(^5\) Woodman et al. (1993) defined innovation as involving the creation of a new product, service, idea, procedure, or process (Spreitzer et al. 1999: 513).
Research Method

Sample selection and data collection

The sample for this study is middle-level managers in large Australian manufacturing organisations. The decision to select this sample follows from the purpose of the study to examine behavioural and performance consequences arising from the interactive “use” of PMS. Middle-level managers are likely to be exposed to the use of PMS by senior management. The questions in this survey are designed to capture middle-management perceptions as to how PMS are used by senior management in evaluating their performance. The manufacturing industry was selected and extensive management accounting studies have been based in this industry (Anderson, Hesford, & Young, 2002; Anderson & Young, 1999; Chenhall, 1997; Davila, 2000; Malina & Selto, 2001; Mia & Chenhall, 1994). Organisations within this sample are likely to have a sophisticated use of their MCS, such as their PMS (Khandwalla, 1972; Simons, 2000). Details of Australia’s largest manufacturing organisations were obtained by Listbank, a commercial mailing list provider.

A survey was used to collect the data. The survey was designed in two ways. First, a paper-based version of the survey was designed. Careful consideration was given to designing this survey so that it was in-line with suggestions made by Dillman (2000), such as the ordering of the questions, numbering questions and design-layout, design of demographic information and consistency across questions regarding the direction of scales. An internet-based version of the survey was also developed. This can be found at http://www.buseco.monash.edu.au/surveys/capm/index.php. Dillman’s (2000) approach to designing an internet-based survey was carefully followed. A space was provided for a password – this was to ensure that the individuals responding to the survey were only the intended respondents. The survey was designed so that at the end of each page the participant could click onto the “next” button to get to the next page of questions and the participant could not progress further into the survey if the current page contained missing data. This ensured that there were no missing data from the internet-based survey. There was a demographic page and a section for any comments. At the bottom of the demographic page was a “Submit Survey” button and when pressed a confirmation and thank you page was presented. Once the survey had been submitted the findings were recorded on a special web-page on the internet and were also automatically downloaded onto an EXCEL spreadsheet. This gave an indication of the response rate.

The survey was pilot tested through consultations with senior academics and 15 middle-level managers, eight of which completed the internet-based survey and seven the paper-based survey. They noted any areas of difficulty and the time it took to complete the survey.

Sample

Dillman’s (2000) approach to survey implementation was followed. This approach is aimed at obtaining high response rates and enhanced validity of responses. Forty manufacturing organisations were randomly selected from the sample frame of 500. Each organisation was researched for background information using the internet prior to contact. Individuals were identified within the organisations who were likely to be
involved and interested in PMS and the predicted behavioural outcomes. Senior managers were contacted from multiple units within each organisation. All senior managers who agreed to participate in the study provided the names and email addresses of potential middle-level management participants via email. Once this information was received the intended recipients were then contacted via email and invited to participate in the study. The senior manager was also invited to email the participants notifying them of the organisation’s support for the survey. No more than three subunits were drawn from a single organisation, and most had one division per organisation. The data collection took place between October 2004 and March 2005.

A total of 177 middle-level managers were contacted to participate in the study. Of this 177 sample, 121 survey responses were received generating a 68.3 per cent response rate. The response rate is considered high when compared to some other recent accounting research in Australian manufacturing organisations. From these 121 survey responses, six contained missing data. As mentioned, controls were employed in the internet-based version of the survey to control for missing data, so the six surveys that did contain missing data were from the paper-based version of the survey. These surveys were excluded from the analysis. One survey was also received very late, after data analysis had already commenced, and was excluded from the sample. This resulted in a final sample size of 114. Table 1 provides information on the demographics of the respondents and their organisational functions.

(Insert Table 1)

Measures

The survey captured data on the interactive use of PMS, creativity, performance, psychological empowerment and demographic information. Established instruments were used to measure the constructs in this study. A copy of the survey instruments is provided in the Appendix. Abernethy and Brownell’s (1999) instrument was used to measure the interactive use of controls with adaptations to incorporate PMS. This involved four questions and a further question to capture the interactive use of PMS was adapted from Bisbe and Otley (2004). Factor analysis, with oblique rotation, was conducted to identify the extent to which there may be separate attributes for each of the constructs. Table 2 (panel A) shows a single factor confirming the construct validity of this measure.

Performance was measured using Mahoney, Jerdee and Carroll (1965). This is a self-rated measure of performance and is commonly used to measure individual performance in management accounting research. This instrument includes measuring performance on eight functional dimensions and measuring overall performance. A factor analysis revealed that two factors were generated as indicated

---

6 Each senior manager was promised a summary report of the results at the conclusion of the study.
7 It was not possible to test for non-response bias due to the administration of the survey spanning 6 months (meaning it was not possible to compare early with late responses) and due to responses being anonymous. In addition, on visual inspection of the six surveys with missing data, there were no distinct patterns.
8 A decision was made to use the multi-items (Perf1 – Perf8) to measure performance as this has the advantage of capturing performance in multiple areas in contrast to using a single measure of performance. For further analysis, the PLS model was also run using only the overall performance measure as the dependent variable and no significant differences were found.
in Table 2 (panel B). The component matrix indicates that Perf1, Perf3, Perf4, Perf5, Perf6 and Perf7 load onto factor one and Perf2 loads onto factor two while Perf8 loads almost equally onto factors one and two. This indicated the multi-dimensionality of the construct. The factor analysis was re-run with the removal of Perf2 and Perf8, resulting in the generation of one factor.

Psychological empowerment was measured using Spreitzer’s (1995) instrument. This is a 12-item instrument to measure the four cognitions of psychological empowerment: meaning, competence, self-determination and impact (Spreitzer, 1995; Thomas & Velthouse, 1990). This instrument has received support in much empowerment research (Koberg et al., 1999; Liden et al., 2000; Spreitzer et al., 1997). The construct psychological empowerment is modelled as a second-order construct in the PLS measurement model (Spreitzer, 1995, 1996; Spreitzer et al., 1999; Spreitzer et al., 1997). Table 2 (panel C) indicates that the factor analysis generated three factors with the competence questions, Comp1 and Comp3 loading onto a second factor. No questions loaded clearly onto the third factor.

Creativity is a construct which is still in its infancy in terms of measurement. In this study creativity was measured using questions drawn from three studies. Denison, Hooijberg and Quinn (1995) developed two questions to empirically measure an innovator role of leadership, these questions combined had an Cronbach’s alpha of 0.66 and were slightly adapted and used in this study. This approach was adopted by Spreitzer (1995) and Spreitzer et al. (1999). These studies used four innovation measures. The Cronbach alpha reliability for the four items used by Spreitzer et al. (1999) was 0.88. Two additional measures were slightly adapted and also used in the current study. Further, Wang and Netemeyer (2004) developed a seven item scale for measuring the creativity of salespeople, and was evaluated based on its suitability for their study involving two samples. The Cronbach alphas for these two samples were 0.89 and 0.84. A further four questions were adapted from Wang and Netemeyer (2004) and used in this study. The creativity items for this study were measured on a seven-point Likert scale with the anchors ‘almost never’ (1) and ‘almost always’ (7). Participants were asked to indicate the extent to which they engaged in certain creative activities within their work role. The factor analysis on the creativity construct can be found in Table 2 (panel D), confirming construct validity for this instrument.

Statistics for Bartlett’s test of sphericity were significant for all final factors and all Kaiser-Meyer-Olkin measures of sampling adequacy were above 0.65. These statistics confirm the factorability of the items. Cronbach alphas are provided in Table 2 and indicate satisfactory internal reliability for each of the constructs. To test for the...

---

9 This approach is consistent with Amabile’s (1996) definition of individual creativity.
10 These measures were also consistent with measuring creativity at the individual level.
11 The first sample involved real estate agents affiliated with a regional brokerage firm and the second account executives employed by a national outdoor billboard advertising company.
12 Further tests were conducted on the creativity construct due to it being relatively new to empirical research. This included testing the dimensionality and convergent validity of the construct. A single factor was generated, as indicated in Table 2 (panel D) with a Kaiser-Meyer-Olkin statistic of 0.88. Pearson’s correlation analysis indicated that all questions within the creativity construct were significantly correlated at the 0.01 level (2-tailed), indicating convergent validity of the construct.
13 The term ‘final factors’ refers to the questions used in the final PLS measurement model (after adjustments for questions with unacceptable loadings).
multivariate normality of the data Mardia’s (1970) test statistic was used in this study. This is based on functions of skewness and kurtosis. This test statistic should be less than 3 to assume multivariate normality (Mardia, 1970). Mardia’s (1970) statistic indicated test statistics $\geq 3$ ($p < 0.05$) for each of the constructs. This means that multivariate normality cannot be assumed. This could potentially be a problem when using many statistical techniques, for example structural equation modeling (SEM). However, in this study the statistical technique, PLS has been adopted and PLS does not assume multivariate or univariate normality of the data (Chin, Marcolin, & Newsted, 1996; Chin & Newsted, 1999). Mahalanobis distance values and scatter plots were also examined confirming the skewness of each of the constructs. All observations were retained.

Descriptive statistics, based on the weighted average scores for the multi-item constructs, are provided in Table 3.

(Insert Table 3)

**Results**

This section describes the statistical technique used in this study to test the path model, Partial Least Squares (PLS), and the results of the hypotheses testing.

**Structural equation modelling: Partial Least Squares**

Although use of PLS is not as widespread as SEM or path analysis, recently this technique has been used to test path models in accounting research (Anderson et al., 2002; Chenhall, 2004, 2005; Ittner, Larcker, & Rajan, 1997; Vandenbosch, 1999). PLS makes no specific distribution assumptions about the data and, therefore, has the ability to accommodate non-normal data. PLS is also well suited to studies with small sample sizes (Chin, 1998; Chin & Newsted, 1999; Hulland, 1999; Nijkamp & Wrigley, 1985; Roos, Yip, & Johanson, 1997; Wold, 1985). As a general rule of thumb for PLS, the minimum sample size can be ten times the number of maximum paths leading to any single construct in the model (Barclay, Higgins, & Thompson, 1995; Chin & Newsted, 1999; Hulland, 1999). PLS is considered a very general and flexible technique for causal predictive inferences (Hulland, 1999; Nijkamp & Wrigley, 1985). Like SEM it involves testing a measurement model and a structural model, however unlike SEM, these two models are tested simultaneously (Vandenbosch, 1999).

PLS is well suited to explaining complex relationships, such as causal-predictive analysis in situations of low theoretical information (Fornell & Bookstein, 1982; Fornell, Lorange, & Roos, 1990; Joreskog & Wold, 1982). PLS can be used for both theory confirmation and for developing propositions for further testing (Chin & Newsted, 1999). A two-step approach will be used to interpret the PLS model. First, the construct validity and reliability of the multi-item variables will be assessed in PLS prior to estimating the final PLS structural model. Second, the refined structural model will be assessed. These two steps are used to ensure that reliable and valid

---

14 Due to the ability of PLS to accommodate non-normal data it was not considered necessary to perform any data transformations.
measures of constructs are used before drawing any conclusions about the nature of the relationships (Hulland, 1999). This method has been used in prior management accounting studies using PLS (Anderson et al., 2002; Chenhall, 2004, 2005). The structural model specifies relationships between latent constructs and the measurement model, between observed items and the latent constructs that they represent. The indicators can be modelled as either formative or reflective (Chin & Newsted, 1999). Indicators were assumed to be reflective in the study, therefore affected by the underlying latent variable.

PLS was chosen as the most appropriate statistical technique for this study for two reasons. The first of these reasons is due to the sample size. PLS is particularly well suited to small sample sizes (such as sample sizes < 300). SEM would require a sample size of at least 200 observations. The second reason is that PLS can be used where the data is multivariate non-normal. As indicated, the data from this study is considered multivariate non-normal.

The first step of the PLS measurement model involves examining the construct reliability and validity of the multi-item variables within the structural model. Reliability of the individual items can be determined by examining the composite reliability statistics for each of the constructs. Composite reliability (also termed convergent validity) is important when multiple measures are used for an individual construct. For each of these, the closer the statistic is to one the better, and a modest threshold is 0.70. The composite reliability statistics generated in PLS were all greater than the threshold of 0.70, indicating satisfactory reliability for each of the constructs.

To assess construct validity, individual item loadings were obtained for each question within the PLS measurement model. Each item loading represents the correlation between each item and its construct (Chin, 1998). Each item loading needs to be assessed in deciding whether to retain the question. Hulland (1999) and Chin (1998) suggest a threshold 0.50, meaning that items with a loading of less than 0.50 should be considered for removal from the analysis. For this study, the threshold of 0.50 has been chosen. PLS indicated that all individual items had acceptable construct validity with the exception of the question Comp 3 that has an individual item loading of 0.4522 (all other loadings for the competence cognition were acceptable and therefore retained), confirming earlier factor analysis. Deleting Comp3 from the analysis resulted in one factor being generated for the construct psychological empowerment.

The average variance extracted (AVE) statistic can be used to test for the convergent validity of constructs within the PLS model (Chin, 1998). A threshold of greater than 0.50 is recommended meaning that 50% or more of the variance should be accounted for (Chin, 1998; Fornell & Larcker, 1981). The AVE statistics were and these statistics were all greater than 0.50 with the exception of the performance construct with an AVE of 0.446. This indicates acceptable convergent validity for the constructs in the model with the exception of performance. Further inspection of the output from PLS indicated that this is likely to be due to questions Perf2 and Perf8, both of which have individual item loadings close to the threshold of 0.50. By excluding Perf2 and Perf8 from the final PLS measurement model, the AVE statistic for performance increased from 0.446 to 0.527 which is above the acceptable threshold. The PLS analysis also confirmed earlier factor analysis. It was for these
reasons, that Perf2 and Perf8\textsuperscript{15} were excluded from the final PLS measurement model and from any further analysis.

*Final PLS measurement model*

After adjustments were made to the initial PLS measurement model the final PLS measurement model was generated. This can be found in Table 4.

(Insert Table 4)

As mentioned, the AVE statistic can be used to assess the convergent validity of the constructs in the model. These can be found in Table 4 and indicate acceptable convergent validity for each of the constructs (Chin, 1998; Fornell & Larcker, 1981). Hulland (1999) recommends using the AVE statistics to examine the discriminant validity of the constructs in the model by examining the correlations between variables and comparing these to the square root of the AVE statistic. These correlations as generated in PLS and their corresponding square root value (in bold) can be found in Table 5. The square root of the AVE statistic was manually calculated from the AVE statistics generated in PLS. The diagonal elements are the square root of the AVE. The square root of the AVE should be greater than the correlations that are in the off-diagonal elements, and this can be seen for each of the constructs, indicating acceptable discriminant validity for each of the constructs.

(Insert Table 5)

Reliability of the final model was assessed by the composite reliability statistics generated in PLS and also the Cronbach’s Alpha statistics generated in SPSS. These statistics can be compared and are in Table 6. This table indicates that there are similarities between the two statistics and that all constructs generate satisfactory reliability.

(Insert Table 6)

To examine the explanatory power of the model, multiple $R^2$’s are calculated in PLS. These can be found in Table 4. $R^2$’s are used to evaluate the explanatory power of the PLS model because traditional parametric-based techniques for significance testing and evaluation, such as those available in SEM (e.g. AMOS, LISREL), are not appropriate as PLS makes no distributional assumptions. In this case, to evaluate PLS models, predication-orientated measures, such as $R^2$, should be applied (Chin, 1998).

*Test of hypotheses*

\textsuperscript{15} It is acknowledged that the removal of these items has the potential to damage the construct validity of the performance construct and this was considered before the removal of these items. The decision to remove these items was based on the importance placed on achieving an acceptable AVE statistic and individual item loadings in PLS. It should be noted that additional tests were run in PLS with the inclusion of the questions Comp3, Perf2 and Perf8 to see if this resulted in any different outcomes in relation to hypotheses testing. No differences were found. Despite this, the deletion of these items is still desirable according to Hulland (1999) and Chin (1998).
The structural model was tested using PLS-Graph Version 3.00. Bootstrapping was performed in PLS. Bootstrapping is a nonparametric approach for estimating the precision of the PLS estimates and it is used to test the statistical significance of each path coefficient (Chin, 1998). The default number of bootstrap in PLS-Graph Version 3.00 is 100, which was used in this study. Path coefficients and t-values are reported in Table 4. One-tailed tests were performed due to the directional nature of the hypotheses and the t-values were compared against the critical values of $p < 0.05$ (1.645) and $p < 0.01$ (2.326) (Mason, Lind, & Marchal, 1994). An overview of the model is provided in Figure 2. This figure indicates the nature and the strength of the hypothesised relationships between the variables in this study.

(Insert Figure 2)

The study sought to first establish whether there was a positive relationship between the interactive use of PMS and individual performance (H1). A structural model was then developed to examine the way in which the interactive use of PMS influenced the individual outcomes of creativity and performance. This was done by examining the extent to which the interactive use of PMS was associated with creativity (H2) and psychological empowerment (H4) and how these variables, in turn, relate to performance (H3 and H5) and each other (H6). The results are mixed but show partial support for the hypothesized relationships. Table 4 indicates that there is not a direct relationship between the interactive use of PMS and performance, therefore the study does not support H1. Rather, the PLS structural model shows that there are indirect paths between the interactive use of PMS and performance. The structural model indicates how psychological empowerment acts as an intervening variable in the associations between the interactive use of PMS and the outcomes of creativity and performance. Figure 2 shows some support for the hypothesized relationships. For the positive relationship between the interactive use of PMS and creativity (H2), it can be seen in Table 4, that this hypothesis was not supported. However, support was found in the PLS structural model for the proposed positive relationships between creativity and performance (H3), the interactive use of PMS and psychological empowerment (H4), psychological empowerment and performance (H5) and psychological empowerment and creativity (H6).

Figure 2 also indicates the way in which psychological empowerment provides mediating effects on the associations between the interactive use of PMS with the outcomes of creativity and performance (Baron & Kenny, 1986)\(^{16}\).

Discussion and conclusions

This study aimed to explore the nature of the relationships between the interactive use of PMS and the outcomes of creativity and individual performance. Results suggest that there was not a direct significant relationship between the interactive use of PMS

\(^{16}\) Baron and Kenny’s (1986) study identifies the conditions under which full or partial mediating effects are identified. A variable functions as a mediator when the variations in the levels of the independent variable significantly account for variations in the presumed mediator and variations in the mediator significantly account for variations in the dependent variable, and when both paths are controlled for, a previously significant relation between the independent and dependent variables is no longer significant, p. 1176.
and performance. Thus it appears that while there are variables that explain how interactive use of PMS have indirect associations with individual performance, these do not translate through to a significant relationships between the interactive use of PMS and individual performance. These findings provide some support for Simons (1995; 2000) assertion that interactive use of PMS can influence individual performance, despite this influence being indirect. In sum, the interactive use of PMS does not significantly influence individual performance directly, rather there are indirect affects that are apparent within these associations. This can be seen in the PLS structural model through the intervening variables, where intervening variables provide significant paths that link the interactive use of PMS with individual performance.

Results suggested that psychological empowerment is an important intervening variable within these relationships. That is to say, the psychological processes of the individual are implicated in helping explain the relationships between the interactive use of PMS and individual outcomes. A non-significant relationship between the interactive use of PMS and creativity was found in PLS. This finding is inconsistent with the literature linking the nature of interactive controls and PMS with creativity (Amabile, 1988; Redmond et al., 1993; Shalley, 1991; Simons, 1995; 2000). However, the structural model indicates that an indirect relationship explains, in part, the association between the interactive use of PMS and creativity acting through the intervening variable psychological empowerment. The results from the analysis indicated that there was a direct positive relationship between individual creativity and performance. This is consistent with the view that creative individuals are likely to have higher levels of performance (Amabile, 1988; Andrews, 1975; Farr, 1990; Taylor, 1963; 1972). The interactive use of PMS and psychological empowerment were found to have a significant relationship in the PLS structural model. This finding supports the literature linking the features underlying the interactive use of controls, with enhanced feelings of psychological empowerment (Bowen & Lawler, 1992; Kanter, 1983; Lawler, 1992; Quinn & Spreitzer, 1997; Randolph, 1995; Spreitzer, 1995, 1996). Psychological empowerment was found to have a significant association with creativity within the PLS structural model. This finding is consistent with prior literature that has held the view that individuals who felt psychologically empowered are more likely to be creative within their work role (Bowen & Lawler, 1992; Kanter, 1983; Mumford & Gustafson, 1988; Quinn & Spreitzer, 1997; Redmond et al., 1993; Spreitzer, 1995; Spreitzer et al., 1999). Psychological empowerment was also found to be significantly associated with performance in PLS. This finding confirms the view that empowered individuals are likely to have high levels of performance (Conger & Kanungo, 1988; Koberg et al., 1999; Liden et al., 2000; Spreitzer, 1995; Spreitzer et al., 1997; Thomas & Velthouse, 1990). In addition, psychological empowerment was also found to mediate the associations between the interactive use of PMS and creativity and between the interactive use of PMS and performance (Baron & Kenny, 1986). Therefore, results from the structural model indicated that when PMS are used interactively, this affects the psychological processes of enhancing psychological empowerment and it is these processes that translate into outcomes (e.g. creativity and performance). This provides support for the view that attention needs to be paid to the psychological processes by which behaviour can be influenced (Ilgen et al., 1979). This is also consistent with the view that psychological processes can mediate the relationship between the MCS and performance (Bonner & Sprinkle, 2002).
This study makes several contributions to research. An aim of this study was to develop a model that explained the relationship between the interactive use of PMS and performance. The study identified that the interactive use of PMS can directly lead to feelings associated with psychological empowerment which can lead to the outcomes of enhanced individual creativity and performance. This study contributes to the growing body of MCS literature that examines the nature of the relationships between the interactive use of PMS and performance (Bisbe et al., 2006; Bisbe & Otley, 2004; Collier, 2005; Ferreira & Otley, 2005; Frow, Marginson, & Ogden, 2005; Henri, 2004, 2006; Nixon & Burns, 2005; Pierce & Sweeney, 2005; Tuomela, 2005). This study contributes to this research by examining how the interactive use of PMS influences desired outcomes. The study also identified the mediating effects of psychological empowerment on the relationships between the interactive use of PMS and individual performance and creativity. These findings further highlight the importance of psychological processes in the MCS-performance relationship. This study also contributes and has implications for research in management accounting involving creativity. Recently, management accounting research has started to explore innovation and creativity (e.g. Bisbe and Otley 2004 and Wynder and Luckett 2005), as an outcome from MCS. The study adds to this developing body of research and has implications for designers and users of MCS. By using PMS interactively, organisations can create an environment conducive to creativity through enhancing feelings of psychological empowerment. These findings open up the possibility for future research in this area by further exploring these relationships. This research also contributes to the literature by empirically validating the creativity measure used in this study. Creativity is difficult to measure, and it is not traditionally captured using a survey instrument. This study provides a foundation in management accounting research that can be used in future research.

This study has several limitations. A limitation includes the cross-sectional nature of the research design. The creativity instrument is also relatively new to survey research and the items to test for creativity were derived from three different studies. A potential limitation to this study is the measurement of this construct. Amabile (1988; 1996) asserted the difficulty in capturing creativity. While this study attempted to empirically measure creativity, there is the risk that the questions used do not fully capture the nature of individual creativity. A further limitation to the measurement of constructs is the measurement of the interactive use of PMS. Recently Bisbe et al. (2006) released a working paper with new multi-item measures to capture the interactive and diagnostic use of controls. This working paper was circulated after the data for this study was collected. There is the potential that an improved instrument (Bisbe et al., 2006) could better capture the interactive use of PMS. Another potential limitation to the study is the self-evaluation of performance. However, several studies report positive correlations between superiors’ and subordinates’ subjective ratings of subordinate performance (Bommer, Johnson, Rich, Podsakoff, & Mackenzie, 1995; Furnham & Stringfield, 1994; Heneman, 1974; Riggio & Cole, 1992; Venkatraman & Ramanujam, 1987). It is possible that important explanatory variables were omitted from this study. The possibility of

---

17 A recent issue of Management Accounting Research (2005) was devoted to important issues underlying management control in the 21st century. Within this issue, several articles referred to Simons (1995; 2000) framework within their research i.e. Tuomela (2005); Pierce and Sweeney (2005); Collier (2005); and Frow et al., (2005).
omitted variables becomes particularly important if they are the source of endogeneity problems\(^\text{18}\) (Chenhall & Moers, 2006). PLS also has a limitation in that it does not provide a goodness-of-fit measure that would be desirable to assess how well the data fits the theoretical model.

There are several potential areas for future research. Measurement of the interactive use of controls can be further refined and validated. Bisbe et al. (2006) have attempted to address this by developing new measures capturing the interactive and diagnostic use of controls, these new measures can now be empirically tested and verified. Further research in refining the measurement of creativity is also warranted. The eight questions used in this study can be developed further in future empirical research. Experimental and longitudinal studies can also be used to provide stronger empirical evidence to support causality in the relationships among the constructs in the theoretical model. Future research could also involve a larger sample size leading to statistical techniques such as SEM. Drawing different samples could also lead to additional insights, such as sampling managers at different hierarchical levels, educational backgrounds and functional positions. These insights could include differences in the psychological processes and behaviours of different samples. Additional insights could also indicate under which conditions using controls interactively would result in the best outcomes. The use of the internet-based survey is relatively novel in management accounting research. In this study it was noteworthy that many managers still preferred to complete the paper-based version of the survey. Future research could benefit from developing methods to employ internet survey design. Methods used in this study can provide a basis for developing internet-based surveys.

\(^\text{18}\) Omitted variables cause “endogeneity problems” when the variable is correlated with both dependent and independent variables (Chenhall and Moers, 2006)
Figures:

Figure 1  Theoretical Model

H1

H2

The interactive use of PMS

H4

Psychological Empowerment

H6

Creativity

H3

Performance

H5

Figure 2  Final Model

Meaning

0.8177*

Competence

0.6113*

Impact

0.9172*

Self-Determination

0.8437*

Psychological Empowerment

0.3772*

0.3083*

0.0024

The interactive use of PMS

Creativity

0.0070

0.3772*

Performance

* p<0.01
### Tables

**Table 1. Respondents demographics and organisational functions**

#### Panel A: Respondent and organisational demographics

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>21</td>
<td>61</td>
<td>39.61</td>
</tr>
<tr>
<td>Time in current position</td>
<td>0.25</td>
<td>25</td>
<td>3.69</td>
</tr>
<tr>
<td>Time in this company</td>
<td>0.25</td>
<td>34</td>
<td>8.57</td>
</tr>
<tr>
<td>Employees in business unit</td>
<td>2</td>
<td>5000</td>
<td>155.49</td>
</tr>
</tbody>
</table>

#### Panel B: Gender

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>77</td>
<td>67.5</td>
</tr>
<tr>
<td>Females</td>
<td>37</td>
<td>32.5</td>
</tr>
</tbody>
</table>

#### Panel C: Organisational function

<table>
<thead>
<tr>
<th>Category</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>23</td>
<td>20.18</td>
</tr>
<tr>
<td>Marketing</td>
<td>17</td>
<td>14.91</td>
</tr>
<tr>
<td>Accounting</td>
<td>13</td>
<td>11.40</td>
</tr>
<tr>
<td>Administration</td>
<td>12</td>
<td>10.53</td>
</tr>
<tr>
<td>Management Information</td>
<td>10</td>
<td>8.77</td>
</tr>
<tr>
<td>Operations</td>
<td>6</td>
<td>5.26</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>6</td>
<td>5.26</td>
</tr>
<tr>
<td>Human resources</td>
<td>5</td>
<td>4.39</td>
</tr>
<tr>
<td>Engineering</td>
<td>3</td>
<td>2.63</td>
</tr>
<tr>
<td>Production</td>
<td>3</td>
<td>2.63</td>
</tr>
<tr>
<td>Education</td>
<td>3</td>
<td>2.63</td>
</tr>
<tr>
<td>Advertising/Public Relations</td>
<td>2</td>
<td>1.75</td>
</tr>
<tr>
<td>Information Technology</td>
<td>2</td>
<td>1.75</td>
</tr>
<tr>
<td>Customer Service</td>
<td>2</td>
<td>1.75</td>
</tr>
<tr>
<td>Logistics</td>
<td>2</td>
<td>1.75</td>
</tr>
<tr>
<td>Field Staff Management</td>
<td>2</td>
<td>1.75</td>
</tr>
<tr>
<td>Legal</td>
<td>1</td>
<td>0.88</td>
</tr>
<tr>
<td>Distribution</td>
<td>1</td>
<td>0.88</td>
</tr>
<tr>
<td>Not specified</td>
<td>1</td>
<td>0.88</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>114</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

---

19 A t-test of a sample of means for the categories of marketing, sales, accounting, manufacturing and administration were created on their creativity scores to test if there was a significant difference in creativity between functions. These tests were non-significant.
Table 2. Factor loadings for the interactive use of PMS, creativity, psychological empowerment and performance (items are cross referenced to Appendix)

Panel A: Interactive use of PMS (all items loaded on one factor)

<table>
<thead>
<tr>
<th>Factors and Cronbach Alpha</th>
<th>Factor Loadings (component matrix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Interactive use of PMS ($\alpha = 0.918$) (Eigenvalue = 3.772, % of variance = 75.432)</td>
<td>(Eigenvalue = 3.772, % of variance = 75.432)</td>
</tr>
<tr>
<td>Questioning and debating on-going decisions (PMS1)</td>
<td>0.817</td>
</tr>
<tr>
<td>Regular and frequent use in face-to-face meetings (PMS2)</td>
<td>0.884</td>
</tr>
<tr>
<td>Interaction between senior and operational managers (PMS3)</td>
<td>0.888</td>
</tr>
<tr>
<td>Important and reoccurring agenda in discussions (PMS4)</td>
<td>0.912</td>
</tr>
<tr>
<td>Used to discuss changes occurring within business units (PMS5)</td>
<td>0.837</td>
</tr>
</tbody>
</table>

Panel B: Performance

<table>
<thead>
<tr>
<th>Factors and Cronbach Alpha</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance ($\alpha = 0.804$) (Eigenvalue = 3.575, % of variance = 44.684)</td>
<td></td>
</tr>
<tr>
<td>Planning (Perf1)</td>
<td>0.649  -0.449</td>
</tr>
<tr>
<td>Investigating (Perf2)</td>
<td>0.522  -0.659</td>
</tr>
<tr>
<td>Coordinating (Perf3)</td>
<td>0.752  -0.080</td>
</tr>
<tr>
<td>Evaluating (Perf4)</td>
<td>0.699  -0.113</td>
</tr>
<tr>
<td>Supervising (Perf5)</td>
<td>0.800  0.074</td>
</tr>
<tr>
<td>Staffing (Perf6)</td>
<td>0.767  0.165</td>
</tr>
<tr>
<td>Negotiating (Perf7)</td>
<td>0.609  0.576</td>
</tr>
<tr>
<td>Representing (Perf8)</td>
<td>0.477  0.499</td>
</tr>
</tbody>
</table>

Panel C: Psychological Empowerment

<table>
<thead>
<tr>
<th>Factors and Cronbach Alpha</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological Empowerment ($\alpha = 0.910$) (Eigenvalue = 6.144, % of variance = 51.202)</td>
<td></td>
</tr>
<tr>
<td>My job activities are personally meaningful to me (Mean1)</td>
<td>0.720  0.026 -0.571</td>
</tr>
<tr>
<td>The work I do is meaningful to me (Mean2)</td>
<td>0.745  0.211 -0.511</td>
</tr>
<tr>
<td>The work I do is important to me (Mean3)</td>
<td>0.758  0.243 -0.391</td>
</tr>
<tr>
<td>My impact on what happens in my work area is large (Impact1)</td>
<td>0.789  0.081 -0.307</td>
</tr>
<tr>
<td>I have significant influence over what happens in my work area (Impact2)</td>
<td>0.784  -0.474  0.070</td>
</tr>
<tr>
<td>I have a great deal of control over what happens in my work area (Impact3)</td>
<td>0.760  -0.343  0.073</td>
</tr>
<tr>
<td>I am self-assured about my capabilities to perform my work activities (Comp1)</td>
<td>0.593  0.614  0.340</td>
</tr>
<tr>
<td>I am confident about my ability to do my job (Comp2)</td>
<td>0.641  0.603  0.206</td>
</tr>
<tr>
<td>I have mastered the skills necessary for my job (Comp3)</td>
<td>0.445  0.523  0.485</td>
</tr>
<tr>
<td>I have significant autonomy in determining how I do my job (SD1)</td>
<td>0.716  -0.477  0.247</td>
</tr>
<tr>
<td>I have considerable opportunity for independence and freedom in how I do my job (SD2)</td>
<td>0.766  -0.435  0.283</td>
</tr>
<tr>
<td>I can decide on my own how to go about doing my work (SD3)</td>
<td>0.789  -0.128  0.352</td>
</tr>
</tbody>
</table>

Panel D: Creativity (all items loaded on one factor)

<table>
<thead>
<tr>
<th>Factors and Cronbach Alpha</th>
<th>Factor Loadings (component matrix)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity ($\alpha = 0.893$) (Eigenvalue = 4.603, % of variance = 57.539)</td>
<td>(Eigenvalue = 4.603, % of variance = 57.539)</td>
</tr>
<tr>
<td>I regularly come up with creative ideas (Creat1)</td>
<td>0.696</td>
</tr>
<tr>
<td>I regularly experiment with new concepts and ideas (Creat2)</td>
<td>0.787</td>
</tr>
<tr>
<td>I regularly carry out tasks in ways that are resourceful (Creat3)</td>
<td>0.722</td>
</tr>
<tr>
<td>I often engage in problem solving in clever, creative ways (Creat4)</td>
<td>0.819</td>
</tr>
<tr>
<td>I often search for innovations and potential improvements within my business unit (Creat5)</td>
<td>0.767</td>
</tr>
<tr>
<td>I often generate and evaluate multiple alternatives for novel problems within my business unit (Creat6)</td>
<td>0.822</td>
</tr>
<tr>
<td>I often generate fresh perspectives on old problems (Creat7)</td>
<td>0.724</td>
</tr>
<tr>
<td>I often improvise methods of solving a problem when an answer is not apparent (Creat8)</td>
<td>0.720</td>
</tr>
</tbody>
</table>
Table 3 Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Standard deviation</th>
<th>Actual range</th>
<th>Theoretical range</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS</td>
<td>3.96</td>
<td>1.524</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Creativity</td>
<td>5.085</td>
<td>1.042</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Performance</td>
<td>5.095</td>
<td>1.155</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>P.E.*</td>
<td>5.68</td>
<td>1.139</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>- Meaning</td>
<td>5.71</td>
<td>1.112</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>- Impact</td>
<td>5.57</td>
<td>1.262</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>- S.D.</td>
<td>5.59</td>
<td>1.149</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>- Competence</td>
<td>5.945</td>
<td>0.975</td>
<td>2</td>
<td>7</td>
</tr>
</tbody>
</table>

* P.E. – psychological empowerment
<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Statistics</th>
<th>Dependent Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mult. R²</td>
<td>Creativity Performance P.E. Meaning Competence S.D. Impact</td>
</tr>
<tr>
<td>PMS</td>
<td>0.753</td>
<td>0.0024 (0.3067) 0.0070 (0.2027) 0.3083 (4.0100*) 0.0000 (0.0000) 0.000 (0.000) 0.000 (0.000) 0.000 (0.000)</td>
</tr>
<tr>
<td>Creativity</td>
<td>0.1855 0.575</td>
<td>- 0.3737 (3.5809*) - - - - -</td>
</tr>
<tr>
<td>Performance</td>
<td>0.3653 0.527</td>
<td>- - - - - -</td>
</tr>
<tr>
<td>P.E.</td>
<td>0.0948 0.543</td>
<td>0.4272 (4.5084*) 0.3722 (3.2333*) - 0.8177 (19.6902*) 0.6113 (6.4672*) 0.8437 (24.1568*) 0.9172 (74.3151*)</td>
</tr>
<tr>
<td>Meaning</td>
<td>0.6591</td>
<td>- - - - - -</td>
</tr>
<tr>
<td>Competence</td>
<td>0.3849</td>
<td>- - - - - -</td>
</tr>
<tr>
<td>S.D.</td>
<td>0.7037</td>
<td>- - - - - -</td>
</tr>
<tr>
<td>Impact</td>
<td>0.8375</td>
<td>- - - - - -</td>
</tr>
</tbody>
</table>


* p<0.01 (one-tailed); each cell reports the path coefficient (t-value).
Table 5 Correlations and Square Root of Average Variance Extracted Statistics

<table>
<thead>
<tr>
<th></th>
<th>PMS</th>
<th>Creat.</th>
<th>Perf.</th>
<th>P.E.</th>
<th>Mean.</th>
<th>Comp.</th>
<th>S.D.</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>PMS</td>
<td>0.868</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creativity</td>
<td>0.123</td>
<td>0.758</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance</td>
<td>0.124</td>
<td>0.523</td>
<td>0.726</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>P.E.</td>
<td>0.308</td>
<td>0.427</td>
<td>0.496</td>
<td>0.737</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meaning</td>
<td>0.249</td>
<td>0.317</td>
<td>0.263</td>
<td>0.812</td>
<td>0.916</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Competence</td>
<td>-0.019</td>
<td>0.415</td>
<td>0.398</td>
<td>0.620</td>
<td>0.460</td>
<td>0.959</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S.D.</td>
<td>0.298</td>
<td>0.327</td>
<td>0.477</td>
<td>0.839</td>
<td>0.452</td>
<td>0.374</td>
<td>0.908</td>
<td></td>
</tr>
<tr>
<td>Impact</td>
<td>0.366</td>
<td>0.363</td>
<td>0.473</td>
<td>0.915</td>
<td>0.672</td>
<td>0.395</td>
<td>0.775</td>
<td>0.863</td>
</tr>
</tbody>
</table>

PMS – Performance measurement system; Creat. – creativity; Perf. – performance; P.E. – Psychological Empowerment; Comp. – Competence; Mean. – meaning; S.D. – self determination. All correlations above 0.20 are statistically significant (p<0.01; two tailed), there are three non-significant correlations. The diagonal elements are the square root of the AVE. The AVE was calculated in PLS. The off-diagonal elements are the correlations between the latent variables as calculated in PLS.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Composite Reliability</th>
<th>Cronbach’s Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Measurement System</td>
<td>0.938</td>
<td>0.918</td>
</tr>
<tr>
<td>Creativity</td>
<td>0.915</td>
<td>0.893</td>
</tr>
<tr>
<td>Psychological Empowerment</td>
<td>0.928</td>
<td>0.914</td>
</tr>
<tr>
<td>- Meaning</td>
<td>0.940</td>
<td>0.902</td>
</tr>
<tr>
<td>- Competence</td>
<td>0.959</td>
<td>0.910</td>
</tr>
<tr>
<td>- Self-determination</td>
<td>0.934</td>
<td>0.891</td>
</tr>
<tr>
<td>- Impact</td>
<td>0.898</td>
<td>0.830</td>
</tr>
<tr>
<td>Performance</td>
<td>0.869</td>
<td>0.815</td>
</tr>
</tbody>
</table>

* Only questions that were included in the final PLS model are included.*
Appendix

Measurement of Variables

1. The Interactive use of PMS (completely disagree = 1, completely agree = 7)

The performance measurement system is often used as a means of questioning and debating ongoing decisions and ongoing action plans. PMS1
The performance measurement system is used regularly and frequently in face-to-face meetings between operational and senior managers within your business unit. PMS2
There is a lot of interaction between operational management and senior managers in the performance measurement system process. PMS3
The performance measurement system generates information that forms an important and recurring agenda in discussions between operational and senior managers within your business unit. PMS4
The performance measurement system is used by operational and senior managers to discuss changes that are occurring within your business unit. PMS5

2. Performance (well below average = 1, well above average = 7)

**Planning:** Determining goals, policies, and courses of action such as work scheduling, budgeting, and programming. Perf1
**Investigating:** Collecting and preparing of information usually in the form of records, reports, and accounts (measuring output, record keeping and job analysis). Perf2
**Coordinating:** Exchanging information with people in the organisation other than your subordinates in order to relate and adjust procedures, policies and programs. Perf3
**Evaluating:** Assessment and appraisal of proposals or of reported/observed performance (e.g. employee appraisals, judging financial performance and product inspection). Perf4
**Supervising:** Directing, leading, and developing with your subordinates. Perf5
**Staffing:** Maintaining the work force of your responsibility area (e.g., selecting and promoting your subordinates). Perf6
**Negotiating:** Purchasing, selling, or contracting for products or services (e.g. contracting suppliers, collective bargaining). Perf7
**Representing:** Advancing the general interests of your organisation through speeches, consultations, or contacts with individuals or groups outside the company. Perf8
Overall, how do you rate your performance? Perf9

3. Psychological Empowerment (strongly disagree = 1, strongly agree = 7)

My job activities are personally meaningful to me. Mean1
The work I do is meaningful to me. Mean2
The work I do is important to me. Mean3
My impact on what happens in my work area is large. Impact1
I have significant influence over what happens in my work area. Impact2
I have a great deal of control over what happens in my work area. Impact3
I am self-assured about my capabilities to perform my work activities. Comp1
I am confident about my ability to do my job. Comp2
I have mastered the skills necessary for my job. Comp3
I have significant autonomy in determining how I do my job. SD1
I have considerable opportunity for independence and freedom in how I do my job. SD2
I can decide on my own how to go about doing my work. SD3

4. Creativity (almost never = 1, almost always = 7)

I regularly come up with creative ideas. Creat1
I regularly experiment with new concepts and ideas. Creat2
I regularly carry out tasks in ways that are resourceful. Creat3
I often engage in problem solving in clever, creative ways. Creat4
I often search for innovations and potential improvements within my business unit. Creat5
I often generate and evaluate multiple alternatives for novel problems within my business unit. Creat6
I often generate fresh perspectives on old problems. Creat7
I often improvise methods of solving a problem when an answer is not apparent. Creat8
References:


Chin, W. W., Marcolin, B. L., & Newsted, P. R. 1996. *A partial least squares latent variable modeling approach for measuring interaction effects: results from a Monte Carlo simulation study and voice mail emotion/adoption study*. Paper presented at the Proceedings from the seventeenth international conference on information systems, Cleveland, Ohio.


