Performance measurement and managerial teams

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Abstract

Organisations increasingly face greater competition and uncertainty. One important organisational development is the creation of inter- and intra-departmental teams that improve both the speed and quality of an organisation’s response. Successful teams require the empowerment of team members, an adequate information base, rewards for team performance, and the requisite abilities in team members. Management accounting systems can provide an integral part of the information base necessary for decision-making and rewarding performance. We investigate the incidence and importance of performance measurement for team performance. Team performance is positively associated with the variety and comprehensiveness of performance measures used. This relationship is enhanced if members participate in setting performance targets. Further, team performance is enhanced when team performance is given a greater weight in compensation. Finally, these effects are mutually reinforcing, such that team performance is substantially better when comprehensive performance measurement is combined with the participation of team members and a larger weight for team performance in their compensation. © 1999 Elsevier Science Ltd. All rights reserved.

Today’s organisations face complex and dynamic environments that have been attributed to increases in the globalization and competitiveness of the global economy (Mohrman, 1993). Several authors have argued that success in today’s complex environments will be predicated on organisations becoming fast, flexible, and knowledge-based, and that one method of developing these characteristics is by employing teams (Cohen, 1993; Lawler, 1993; Mohrman & Mohrman, 1993). Teams can help organisations cope with these environments in two ways. First, teams improve an organisation’s speed and flexibility of response. Second, team processes can improve the quality of the response. These benefits are achieved by focusing the skills and knowledge of appropriate organisational personnel on critical problems in a timely manner (Cohen, 1993). Both Lawler (1986) and Ledford (1993) identify four elements necessary to team success. These are: the provision of an adequate information base, rewards for performance, the extension of power to team members to make decisions, and the development or presence of the requisite abilities in team members. Management accounting systems can play an important role in team success because it can contribute toward fulfilling the first three of these elements. Performance measurement can form an integral part of the information base necessary to team success and performance measurement is necessary if members are to be rewarded for team performance. Further, providing team members with the power to make decisions,
suggests that team members participate in defining what constitutes performance and in setting performance targets.

To adequately capture all the relevant information that team members require to succeed in managing complex environments, multiple types of performance measures are likely to be needed (Kaplan & Norton, 1992). This suggests that in a team context management accounting systems should be both expanded and modified. Expansion is necessary to provide measures and systems that report directly on teams as an organisational unit. Modification is necessary to incorporate the diversity of types of measurement necessary to capture team performance. If properly done, performance measurement should facilitate the effectiveness of the increasingly important organisational phenomenon of teams.

The following questions are addressed: Should team performance be measured, and if so, how? Is it important to integrate team performance into individual compensation? What role does participation in setting performance targets play? Does employing team performance measures improve team performance? The results reported here are consistent with the organisational theory summarized above. We find that as complexity increases organisations increasingly rely on teams. Teams that feature comprehensive performance measurement, with both financial and non-financial performance measures, and encourage team members to participate in developing performance targets, perform better than those that do not. The performance improvement to be gained from performance measurement can be divided into direct and indirect components. Increasing the extent of performance measurement and participation directly increases team performance, presumably by providing useful information to the team members to help manage their tasks. In addition, there is an indirect effect of performance measurement on team performance because comprehensive measurement allows firms to increase the weight of team performance in team members’ compensation. In turn, increasing the sensitivity of team members’ compensation to performance provides an incentive that leads to an incremental significant increase in team performance. While we find that measuring performance with only financial or only non-financial measures or with less participation contributes to team performance, clearly the best team performance comes from combining comprehensive measurement with high participation. The latter combination provides an improvement in team performance that is markedly higher than would be suggested by simply summing the separate effects of performance measurement and participation. Thus, it appears to be critical to have all elements present to create the best opportunity for successful team performance.

The paper first develops the validity of the link between teams and complexity. This link forms the basis for the model and hypotheses concerning teams, performance measurement, compensation, and team performance. Participation in setting performance targets is incorporated as a moderating variable that influences the efficacy of performance measures both for setting compensation and for facilitating team performance. Next, we describe the sample and method. Then, the results are presented using both a typical path analysis that assumes linear relationships and interval scale variables, and a more general treatment that allows for non-linear relationships among the variables. The paper concludes with a discussion of the results and their implications.

Teams can also be formed for motivational purposes, under the view that a more cooperative and socially interdependent work environment will motivate employees. Motivation within a team may also come from allowing the team a greater degree of self-management; however, allowing greater responsibility to the employee can be undertaken outside a team structure through job enrichment. The motivation rationale is complementary to the complexity rationale since complexity is likely to lead to the need for cooperative interactions to solve problems and greater responsibility for the employees, which in turn provides a legitimate basis for motivation. We stress complexity here because the organisational literature emphasizes that employee involvement is a solution to increased complexity and we can outline conceptual links between complexity and the need for diverse performance measurement. To the degree that teams are formed in non-complex environments purely for motivational purposes our model is incomplete; however, in this case there should be a bias against finding results for the hypotheses pertaining to performance measurement that follow.
1. Why teams?

Global competition in the 1980s caused many organisations to evaluate their structure and processes in order to become more competitive in the dynamic global economy (Galbraith, 1993). In order to cope with increasing demands for higher quality products, faster product introductions and better service (Von Glinow & Mohrman, 1990) many organisations found that standard analytical organizing principles, hierarchic control, and coordinative mechanisms (Galbraith, 1973) were inadequate. Complex and dynamic environments require fast and innovative responses. Further, increases in capital intensity and knowledge-based work require higher levels of employee involvement and ability. As a result, organisations have become flatter with decentralized decision-making responsibility allocated to lower, and lower, levels in the organisation (Drucker, 1988; Galbraith, 1993; Lawler, 1993). This necessitates increased lateral integrative mechanisms to ensure collaboration and coordination among interdependent sub-units, as well as among the individuals within them (Lawrence & Lorsch, 1967; Mohrman, 1993; Thompson, 1967).2

Increased employee involvement is critical to managing more complex and dynamic environments because these conditions require rapid decision making, flexible approaches, knowledge work, and capital-intensive processes (Lawler, 1993). Many of the mechanisms for generating employee involvement involve the creation of formal or informal teams that are overlaid on the existing organisational structure to facilitate integration, coordination, and innovation within the organisation (Cohen, 1993). The teams we investigate are secondary to an individual’s department in the organisation’s structure, and can exist entirely within a department (intra-departmental) or across departments (inter-departmental). They are often established to solve a particular problem or meet some specific objective. For example, new product development requires collaboration between marketing, finance, production, and research and development. Formal product development teams can ensure that the communication necessary to make the appropriate design, cost, and production tradeoffs occurs efficiently. These teams may be disbanded as soon as a solution is achieved. Teams may also be long-lived or permanent units that attend to long term problem-solving or coordinating activities. For example, investment houses frequently have teams that ensure that those individuals who serve clients by developing the appropriate portfolio of investments can regularly access the individuals that specialize in analyzing and selecting stocks. The first group has specific knowledge concerning client needs, while the latter have specific knowledge concerning particular industries or types of investments. Only the team, collectively, can combine the necessary breadth and depth of investment knowledge with the detailed needs of the client to provide a comprehensive service. An organisation with many permanently overlaid sets of teams resembles a matrix organisation.

The importance of integration in flatter organisations that delegate more decision-making authority to lower levels of the organisational hierarchy should lead these organisations to increase their employees’ involvement in teams (Mohrman & Lawler, 1992). The greater the interdependence among units or individuals, the greater should be the benefit from the collaboration possible within a group or team (Gladstein, 1984). Thompson (1967) argues that the more complex the organisation, the greater the task interdependence, and the more severe the coordination problems. He identified three types of task interdependence, pooled, sequential, and reciprocal. Reciprocal interdependence, arises from higher levels of organisational complexity, and features a work flow whereby, work passes through a department more than once, first entering

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2Organisations can adopt several different mechanisms to cope with complex and dynamic situations (Galbraith & Kazanjian, 1986). Initials reactions are often informal, such as co-location, the establishment of interpersonal networks, or rotation of individuals through multiple disciplines (Mohrman, 1993). Teams are a more formal, but common, response that serves to integrate diverse elements and foster innovation within organisations. Our purpose in this paper is not to determine the relative efficacy of alternative responses to uncertainty, but rather to examine how the success of teams is related to performance measurement.
the department, then leaving, and then returning again, possibly through several iterations. One method of achieving the inter-departmental coordination necessitated by reciprocal flows is through inter-departmental teams. In addition, intra-departmental coordination will be required if the departmental personnel who manage a task in its first pass through the department differ from those who manage the work when it returns for subsequent passes through the department. Thus, reciprocal interdependence can lead to both inter- and intra-departmental teams. In general, organizations with significant interdependence should employ teams to achieve this coordinating role.

In addition to the integrative function, Mohrman and Mohrman (1993) argue that teams and team processes are critical to innovation. When a task is simple, organizational members can use standard operating procedures and a discussion of work methods is not necessary (Gladstein, 1984; Young, Fischer & Lindquest, 1993). Complex tasks, however, require the search for and evaluation of alternatives, and these tasks are likely to require more information than is possessed by a given individual (Bamber & Bylinski, 1982; Ismail & Trotman, 1995). Groups generally should have greater collective knowledge than individuals (Burton, 1987; Hare, 1976; Stein, 1975; Taylor, Berry & Block, 1958; Yetton & Bottger, 1982). Research results indicate that group performance benefits from the combination of experiences, abilities, knowledge, and various perspectives of its members (Ismail & Trotman, 1995; Shaw, 1976). Thus, problems that require the utilization of knowledge and novel solutions (Perrow, 1972) should give groups an advantage over individuals. Even if one member of the group has more knowledge and experience than other group members, the unique knowledge of less informed individuals can serve to fill gaps in knowledge (Burton, 1987; Maier, 1970). The group can pool the unique individual information of different group members and generate new or improved ideas as a result of the collective sharing of ideas (Casey, Gettys, Pilske & Mehle, 1984).

Accordingly, teams should be more prevalent in complex environments requiring novel and innovative solutions.

Cohen (1993) captures both the integrative and innovative aspects of teams in the following premise that “at the most basic level teams are established to create synergy—to increase the coordinated application of specialized knowledge, so that the performance of the whole is greater than the sum of its parts.” She suggests that teams that respond to environmental changes or particularly difficult and complex problems, such as new product development, are likely to require fluid and inter-departmental membership. Problems that can be more narrowly circumscribed and more clearly defined may be manageable within an intra-departmental team. Intra-departmental teams may also be formed to manage regular ongoing work that requires a considerable degree of knowledge from a group of individuals who are dependent upon one another and who must adjust to each other’s actions. Thus, the association of teams with complexity applies to both intra- and inter-departmental teams; however, the underlying complexity associated with inter-departmental teams is likely to be greater on average than for intra-departmental teams for two reasons. First, as described above, inter-departmental teams will be more likely to manage unusual tasks, tasks with broader organisational implications, and tasks requiring a greater diversity of specialized skills and individuals, than intra-departmental teams. Second, the problem of designing the appropriate performance measurement and reward systems is much more complex for inter-departmental teams than for intra-departmental teams. The latter remain entirely subsumed within an existing department that has a defined place within the existing hierarchy with respect to reporting, authority, and reward systems. Team members, ultimately, continue to report to their departmental supervisor. Inter-departmental teams, however, lack clear lines of authority with respect to these issues because the team and its members overlap different departments. Thus, the question of how and who should control, evaluate, and reward inter-departmental teams, their success, and their members is more

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3The task of new product development cited earlier provides a good example of a complex task that would require several iterations through the various parties to achieve a resolution.
problematic. Accordingly, we distinguish between intra- and inter-departmental teams. 4

2. Team performance, performance measurement, and compensation

Our model begins with the link between complexity and the extent to which employees are involved in teams, because teams have the ability to integrate and to foster innovation in dynamic environments. The primary thrust of the model, however, is that more diverse performance measurement enhances team performance since diversity of measurement is necessary to capture different relevant aspects of the task facing the team. The model proceeds to link the diversity of performance measurement with the level of participation and the inclusion of team performance in compensation, and then examines whether these factors ultimately influence team performance. The full model explaining team performance is outlined in Fig. 1. 5 The expected signs for all the paths are listed next to the arrows, as are the hypotheses that relate to performance measurement. We provide formal hypotheses only for the links that relate to performance measurement. The following paragraphs explain the relationships presented in the model.

2.1. The paths that link to involvement in intra- and inter-departmental teams

Most organisational theorists posit a strong positive relationship between complexity and the extent to which employees are involved in teams

(Galbraith & Lawler, 1993) for both the integration and problem-solving or innovation purposes of teams. As described earlier, organisational theory suggests that inter-departmental teams grapple with relatively more complex issues than do intra-departmental teams. This literature implies that coordination across departments is, on average, more difficult, and that teams requiring the greater diversity of individuals, abilities, and knowledge sets that exist across departments means that the problems that inter-departmental teams face are also, on average, more complex and difficult. We, therefore, expect a positive link between complexity and the extent to which employees are involved in both intra- and inter-departmental teams, but the relationship should be most evident for inter-departmental teams.

2.2. The paths that link to the diversity of performance measurement

As organisational members become more involved in teams, the need for team performance measurement for both planning and evaluation purposes should increase. Team performance measures can enhance team performance by helping members to pool, structure, and share information. Nanni, Dixon, and Vollmann (1990) assert, based on extensive field observations, that multiple and varied performance measures are required to fit organisations’ needs. Ijiri (1975) states that the more complex the underlying reality or situation, the more varied and comprehensive the performance measures will need to be in order to adequately capture that reality. Kaplan and Norton (1992) note that multiple types of performance measurement become more critical as complexity increases, since alternate types of performance measurement can capture different dimensions of performance. Feltham and Xie (1994) show that financial measures alone are unlikely to be the most efficient means to motivate managers. All of these authors argue that traditional financial accounting measures alone are not enough in today’s competitive environment. In order to measure the innovations, skills and competencies required today, they argue that companies must use multiple measures or a “balanced scorecard” which, along with financial
measures, would include operational measures on customer satisfaction, internal company processes, and the organisation's innovation and improvement activities. Since teams are a response to increased complexity and function at the interface with this complexity, team performance should similarly require multiple and varied measures of performance. Operating on complex problems, often with no known solutions or paths to solutions, multiple performance measures should be necessary to capture group performance adequately. Thus, in the hypotheses H1a and H1b below, we expect greater employee involvement in both intra- and inter-departmental teams, to be associated with more diverse team performance measurement. Accordingly, we suggest:

**H1a:** The diversity of team performance measurement is positively associated with greater involvement in intra-departmental teams.

**H1b:** The diversity of team performance measurement is positively associated with greater involvement in inter-departmental teams.

Fig. 1 indicates complexity should have a positive indirect effect on the diversity of team performance measurement because complexity is expected to lead to more extensive employee involvement in teams, and this in turn leads to more extensive team performance measurement. The expected sign of the direct influence of complexity on the diversity of team performance measurement, after controlling for the extent to which individuals are involved in team activities, is not clear. Complexity prompts a need for performance measurement and information; however, complexity makes the design and availability of adequate performance measures problematic. This suggests allowing for a direct influence for complexity on the diversity of performance measurement, although we cannot say which effect will dominate.

### 2.3. The paths that link to the weight of team performance measures in compensation

An important use for performance measurement is compensation. Cohen (1993), Lawler
(1993), Ledford (1993), and Mohrman (1993) all argue that achieving the high personal involvement necessary to a team’s success requires that rewards be linked to team performance. These writers emphasize that achieving the collaboration and communication necessary for success implies rewarding members based on the team as a whole. Attempts to differentiate the contributions of various team members are not desirable because it can lead to a divisiveness that undermines collective effort (Hackman, 1987). Thus, organizational theory suggests when organizational members work in teams, it is important to incorporate team performance in their compensation and that the link between compensation and team performance be made using the performance of the team as a collective. Failure to measure team performance comprehensively implies that a significant portion of an employee’s work, and the related contribution, is inadequately assessed with respect to setting his/her compensation. The more time an employee spends in teams, the greater the omission. Given that we examine secondary teams comprised of individuals with duties outside the teams, we suggest that the extent to which team performance measurement is incorporated into individuals’ compensation will be associated with the extent to which employees work in teams.

H2a: The weight given team performance in an individual’s compensation is associated with greater involvement in intradepartmental teams.

H2b: The weight given team performance in an individual’s compensation is associated with greater involvement in interdepartmental teams.

Mohrman et al. (1992) argue that performance in teams needs to be recognized in members’ compensation. As described earlier, multiple types of measures are necessary to adequately capture performance in the complex circumstances in which teams function, and thereby, provide a basis for compensation that is satisfactory to both the organisation and its members. Agency research (Banker & Datar, 1989; Feltham & Xie, 1994; Holmstrom, 1979) also supports this reasoning by demonstrating that increasing the number of performance measures improves the employment contract by reducing uncertainty concerning the employee’s performance. The greater the uncertainty, the greater the need for additional measures.

H3a: The weight of team performance in an individual’s compensation is associated with the use of diverse team performance measures.

Ijiri (1975), Lawler (1981) and Tiessen and Waterhouse (1983), all argue that to properly motivate employees with an incentive system that bases compensation on performance, the participants must both fully understand the performance measurement system and perceive it to be fair. Participation should improve team members’ understanding of the performance measures, as well as their understanding of the link between the performance measures and compensation. Participation should also improve perceptions of fairness. Participation should be particularly important to members’ understanding of the measures if the environment is complex and the measures are novel.

H3b: The weight of team performance in an individual’s compensation is greater if team performance measurement is accompanied by greater participation in setting performance targets.

2.4. The paths that link to team performance

Ultimately, if management accounting systems can be applied constructively to teams, then properly designed performance measurement systems should enhance team performance. As described earlier, performance measurement can form an important part of the information base supporting
team decisions and helping team members to structure tasks and assess progress. This planning or enabling aspect of performance measurement should enhance team performance. Drucker (1988, 1995) and Nanni, Dixon and Volmann (1990) emphasize this aspect of making management accounting systems more accessible and useful to organisational participants in an effort to improve organisational performance. Structuring tasks and deciding upon the appropriate path to pursue, may be problematic for teams since they are often established to solve an atypical problem or to initiate an innovative improvement in an organisation’s activities. Failure to provide teams with alternate types of performance measurement may limit their ability to function in complex environments that lack established solutions. Financial measures alone are unlikely to be sufficient because they either completely fail to capture critical aspects of performance or fail to do so in a timely manner (Feltham & Xie, 1994; Kaplan & Norton, 1992). Thus, financial measures must be augmented with non-financial performance measures in complex environments to properly assess organisations. We argue, analogously, that if teams arise out of complexity and operate on complex tasks, then it is unlikely that any single performance measure or class of performance measures, will adequately capture all relevant aspects of team performance. Accordingly, we suggest that:

H4a: Team performance is better when performance measures are more diverse and include both financial and non-financial measures.

Similarly, participation should enhance members’ familiarity and understanding of performance measures in complex environments and enhance team performance. Discussion among team members encourages cognitive stimulation that enhances the generation or retrieval of ideas by group members which would not have been thought of if it were not for the comments of another member which contained task relevant stimuli (Ismail & Trotman, 1995; Lamm & Trommendorf, 1973). Discussion also allows for the identification and correction of errors. Critical observations and analysis by another group member can help the group to make a correct choice by rejecting wrong solutions. Disagreements are common, but can be useful, in group-decision making (Wanous & Youtz, 1986). This may be because group discussion allows for careful examination of the dissenting views leading to higher quality and diverse solutions (Ismail & Trotman, 1995; Nemeth, 1986). For performance measures to be useful to team members, the members must understand the measures and how the measures relate to the task at hand. Given the greater complexity that gives rise to the formation of teams, participation in setting (and perhaps selecting) performance measures should enhance members’ familiarity and understanding of these measures and the underlying organisational properties (Ijiri, 1975) which they are attempting to capture. Team members having such familiarity and understanding are more likely to use these measures successfully, than those who do not. Therefore, a participative process should lead to better team performance.

H4b: Team performance is better if performance measurement is accompanied by greater participation in setting performance targets.

Much of economic theory assumes that incentives are necessary to increase performance. Similarly, Cohen (1993), Lawler (1993), Ledford (1993), and Mohrman (1993) stress that team success requires that participants’ rewards be linked to team performance. Conventional practice incorporates incentives into many employment situations, although the link between pay and performance is often implicit or imprecise, rather than explicit or formula driven. Despite this it is unclear whether increasing the weight of team

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7As Appendix A indicates we capture the incidence of five categories of non-financial measures. The hypothesis below is stated in terms of financial versus non-financial performance measurements; however, we will indicate the sensitivity of our results to using a finer measure of performance measure diversity that includes financial performance and all five categories of non-financial performance.
performance in an individual’s compensation or the use of incentive compensation improves team performance. Mohrman et al.’s (1992) research suggests that organisation-level incentive programs such as profit-sharing, gain-sharing, and employee stock option plans (ESOPs) show no connection with improved productivity. Blinder (1990) suggests that these types of incentive programs are useful when accompanied by employee involvement. The work of Pritchard, Jones, Roth, Stuebing and Ekeberg (1988) suggests that incentives have little impact on group performance. In a controlled experiment, they investigated whether adding an incentive to workgroup procedures would improve performance. They found that performance feedback to the group was, by itself, capable of boosting performance 50% over a productivity baseline. When involvement in goal setting was added, productivity was boosted another 25% over the original baseline. Adding group incentives brought the gain up to 1%. More generally, Pavlik, Scott and Tiessen’s (1993) review of the literature on compensation and performance reports that improving the sensitivity of pay to performance has, at best, a weak influence on future performance. Under Hypotheses 2a, 2b, 3a, and 3b, we examine whether organisations increase the weight of team performance in individual compensation as team activities consume an increasing portion of a respondent’s time and as the level and diversity of team performance measurement increases. We now extend this line of reasoning to inquire whether increasing the weight given to team performance in compensation, ultimately pays off in superior performance.

H5: Team performance is better the greater the weight team performance is given in compensation.

In summary, performance measurement will have both a direct effect on performance (H4a, H4b), and an indirect effect on performance through compensation (H5). Participation in setting performance targets is expected to enhance the importance of performance measurement for both compensation (H3b) and team performance (H4b).

3. Sample and method

3.1. Sample

In developing the sample, our intent was to sample vertically down the management hierarchy and across as many units as possible so as to obtain information from as broad an area of management as possible. Our organisational contact persons agreed to distribute the questionnaires in the manner requested. The sample organisations represent a variety of industrial, financial, government, and not-for-profit organisations. The for-profit organisations included representatives from the banking, utility, energy, forestry, and manufacturing sectors. The not-for-profit sector included government departments, 100% government-owned (crown) corporations, a school board, and a private health-care management organisation8. Confidentiality was guaranteed to both participating organisations and respondents. Both organisations and all individual respondents were promised feedback on the results of the study.

The data were obtained through two questionnaires. The first questionnaire requested brief demographic information of each organisation. This questionnaire was completed by the organisational contact person. The second questionnaire, which is the primary source for the data in this study, requested performance measurement, compensation, incentive, and related contextual information from each respondent. These data were requested for respondents’ primary departments and organisations, in addition to the teams that form the basis for this study. Both questionnaires were pre-tested through Ernst and Young Consulting and by colleagues, and revised as necessary. The respondents are individual organisation members, selected by the contact person, who are in managerial positions or positions of significant responsibility. Thus, there are several respondents from each organisation. Respondents reported that it took them approximately one hour to complete the questionnaire. The sample was obtained with the

8Qualitatively similar results are obtained when we run the analysis separately on the for-profit and not-for-profit sectors.
help of Ernst and Young Consulting, the Certified Management Accountants of Alberta, and the University of Alberta Faculty of Business Advisory Council. Members of these groups were approached and apprised of the study and its goals. They, in turn, offered to discuss the project with their own contacts and recommend firms, not-for-profit organisations, or government departments for our study. We then contacted and explained the project in detail to representatives of the recommended organisations who were willing to seriously consider the survey. Of those organisations that expressed a serious interest only five organisations later decided against participation. These were all in the for-profit sector. Thus, the sample is not random and the appropriate caveats concerning generalization apply. Those that agreed to participate were sent a questionnaire packet that included an organisational questionnaire and the number of individual respondent questionnaires requested by the organisational contact person. The number of respondents selected within any organisation was entirely at the discretion of the organisational contact person. The sample was gathered during the summer of 1994.9 In total 193 surveys were requested by the twelve for-profit sector organisations, of which we received back 126 or 65%. In total, 390 surveys were requested by the 15 not-for-profit sector organisations, of which we received back 273 or 70%. Only a subset of the respondents completed all of the items necessary to carry out the path analysis model on team performance described previously. Thus, the final sample for our study of teams is reduced to 248 respondents. Most of those dropped apparently perceived themselves as not working in teams.

3.2. Measurement of variables

Our variables fall into seven groups: complexity, the proportion of a respondent’s involvement in teams, diversity of team performance measurement, participation, the weight given team performance in setting compensation, and team performance. These groups and the corresponding variables are listed in Table 1 and described more completely below.

We measure team involvement as the percentage of each respondent’s time spent in teams. This is a more objective measure than asking respondents to subjectively weigh the importance of teams, and can be contrasted easily across respondents. Organisations emphasizing teams should feature employees that spend a greater percentage of their time, on average, working in teams. Additionally, if employees’ time is valuable, and organisations rationally allocate their employees’ time based on the value of the task, then having employees spend a greater percentage of their time in teams, implies that these organisations place a high value on team activities. Otherwise, the employees’ time would be allocated to alternative tasks. Respondents reported the percentage of their time spent working in teams for both intra- and inter-departmental teams. These were distinguished as being drawn entirely from the respondent’s own department (intra-department teams), versus teams with members drawn from other departments (inter-department teams). Teams were defined to be secondary or ancillary to the respondent’s primary department, to focus on specific tasks or processes, and could be either permanent or temporary.

Complexity is difficult to capture with a single measure, since it arises from a multitude of sources. Accordingly, similar to Gladstein (1984), we use several measures to capture different dimensions of complexity. The first is Perrow’s task complexity, which we measure using the first eight items of his technology scale (Perrow, 1972; Daft & Macintosh, 1981). These are presented in Appendix B. Several studies have reported factor analyses that derive two component factors that correspond to the first four and last four items in Appendix B. The former, most often labeled routine, focuses on the repetitiveness of the elements of tasks. The latter, often-labeled knowledge, focuses on whether the tasks rely on established bodies of knowledge or require newer, novel solutions. We ran a confirmatory factor analysis and also

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9The responses from the individuals within any one organisation were received within a one-week interval. Since individuals were selected by the organisational contact person and granted anonymity we had no way of going back to individuals that did not respond.
obtained this pair of factors. Once we reduce the factors to the four highest loading elements in each case, the two factors are strongly correlated. For the purposes of this study, we combine them into one item through a simple averaging. This scale has a cronbach alpha reliability of 0.87. All reported results are comparable whether task complexity is measured with the combined scale or the two component factors.

Thompson's (1967) interdependencies can also be used to capture organisational complexity. He suggested that inter-departmental interdependence could be pooled, sequential, or reciprocal. Pooled describes a workflow, whereby, each unit takes on work and completes it without the work ever passing to another unit. Sequential describes a workflow, whereby, a unit receives work directly from outside the organisation or from an upstream unit and then passes the work on to the next unit in the organisation and then ultimately out of the organisation. Sequential interdependencies are linear with work moving in one direction only. Reciprocal describes a workflow, whereby, once work enters an organisation it is passed back and forth among departments prior to exiting the organisation; it implies multi-directional workflows and is the most complex case. Thompson argues that organisations facing greater complexity and uncertainty will feature greater reciprocal interdependence. Respondents reported the percentage of their departments’ work that falls in each of the three categories so that all responses summed to 100%. The percentage for the reciprocal workflow indicates higher levels of interdependence and complexity.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Variable names and definitions</th>
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<tr>
<td><strong>Complexity variables</strong></td>
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<td>Task complexity: Perrow’s technology, aggregate of eight (5-point) items ranging from most routine and certain to least routine and certain. (see Appendix B).</td>
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<td>Reciprocal: proportion of a department’s work that passes to another department and then returns.</td>
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<td>Hierarchical flatness: degree to which an organisation’s hierarchy is vertical (vs horizontal). Measured as the inverse of the number of levels in the organisation divided by the log of the number of employees.</td>
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<td>Place-in-hierarchy: Respondent’s relative place in hierarchy, measured as the respondent’s level divided by the total number of levels.</td>
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<td><strong>Proportion of time spent in teams variables</strong></td>
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<tr>
<td>Intra-departmental: proportion of the respondent’s time spent working in teams consisting of members drawn exclusively from his/her own department.</td>
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<tr>
<td>Inter-departmental: proportion of the respondent’s time spent working in teams consisting of members drawn from at least one other department external to the respondent’s own department.</td>
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<td><strong>Team performance measurement variables (see Appendix A)</strong></td>
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<td>Measure012: Respondents’ teams have no performance measures (0), at least one financial or one non-financial performance measure but not both (1), at least one financial and one non-financial performance measure (2).</td>
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<td>Measure6: Number of performance measurement categories (0 to 6) used in respondent’s teams (financial, productivity, quality, service, innovation, personnel).</td>
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<td><strong>Participation in setting performance targets variables</strong></td>
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<td>Part: average participation across all performance measures used in the respondent’s teams based on a five-point scale ranging from almost never, to almost always.</td>
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<td>Part (H/L): above divided into high/low at mean response level.</td>
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<td>Partnon: average participation across all non-financial performance measures used in the respondent’s teams.</td>
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<td>Partfin: participation in setting financial performance measures in the respondent’s teams.</td>
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<td><strong>Compensation variables</strong></td>
<td></td>
</tr>
<tr>
<td>Compensate: proportion of respondent’s compensation attributable to team performance.</td>
<td></td>
</tr>
<tr>
<td><strong>Team performance variables</strong></td>
<td></td>
</tr>
<tr>
<td>Performance: performance of respondents’ teams, five-point scale ranging from far below to far above expectations, mid-point is met expectations.</td>
<td></td>
</tr>
</tbody>
</table>
The last two complexity measures, hierarchical flatness and place-in-hierarchy capture the link between hierarchy and complexity. Many managers and theorists argue that in response to more dynamic environments, society is moving toward flatter knowledge-based organisations that employ inter-departmental work teams (Galbraith & Lawler, 1993) and a less vertical hierarchy. We first measure organisational steepness as the number of hierarchical levels scaled by the natural log of the number of employees in the organisation. Steep organisations have more levels per employee, while flatter organisations have less levels per employee. We then invert this ratio to obtain a measure of hierarchical flatness that is conceptually linked to complexity.

Rosen (1982, 1986) argues that individuals at higher levels of the organisation manage more complex tasks. Mohrman (1993) argues that within organisations, lateral integration can occur at multiple levels, indicating a hierarchy of teams with the top levels dealing with more strategic decisions. Thus, an individual’s place in the hierarchy reflects the complexity of tasks assigned. Place in hierarchy is measured by the number of levels at or below the respondent divided by the total number of hierarchical levels in the organisation. Place in hierarchy is also an important control variable for the compensation hypotheses, since compensation is linked to place in hierarchy (see Pavlik et al., 1993).

The diversity of team performance measurement is captured using the information in Appendix A. Appendix A provides a variety of performance measurements that can be grouped into financial performance (cost, revenue, or return); and five categories of non-financial performance (productivity, quality, service, innovation, and personnel). Respondents indicated whether each of these types of measures was provided for team performance measurement. In our analysis, we test the influence of the diversity of performance measurement based on the existence of financial and non-financial team performance measures. This produces a variable, labeled Measure012 that has a value of zero for no performance measures, a value one if the firm has either a financial or a non-financial measure, but not both, and a value of two if both types of measures are present. We do not distinguish between only one financial versus only one non-financial measure because of the relatively small number of occurrences of the former (see Table 3). Measure012 is our primary measure of the diversity of performance measurement and is designed to capture the importance of having both financial and non-financial measures. We will also note results for a second diversity of performance variable, labeled Measure6, that ranges from zero to six. It counts one for each of the five non-financial performance measurement groups represented and adds one if there is financial performance measurement.

Participation is captured using a five-point scale measuring the degree to which the respondent participates in setting targets for the performance measures. The scale items range from almost never to almost always participate. We measure participation in total (across six performance measurement categories) and for the financial and non-financial (five categories) measures. For the total and non-financial participation variables, participation is the average participation across each measurement category that the respondent reports as present for his/her teams.

Cronbach alphas for the total and non-financial participation variables are above 0.8. We then create a simpler dichotomous participation variable by dividing the respondents at the mean level of participation. The latter dichotomous variable is then used to moderate the influence of the diversity of performance measurement on both weight in compensation and team performance in our analysis. Participation can only be used interactively with performance measurement, since one cannot participate in setting a measurement target that does not exist.

The weight given team performance in compensation is measured relative to the compensation weights given to individual, department, and organisational performance, as well as the weight given to personal human capital and the weight given to a respondent’s interpersonal relationship

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10Measure012 can be treated as an either an interval scale or categorical variable. The implications of treating it as a categorical variable are discussed later under statistical methods.
with his/her supervisor. The weights of these different factors summed to 100% for all respondents. Respondents provided these weights for each of three different components of change in compensation: bonus, merit pay, and promotion (see Lawler, 1981) for a discussion of these components. The percentage weight of team performance in compensation represents the average across the three components of compensation.

Team performance is measured with a five point scale with three representing met expectations, then 4(2) representing above (below) expectations, and 5(1) representing well above (below) expectations. We chose to use a coarse description of performance and to define performance in terms of the respondents’ and their organisations’ expectations. We did this to obtain reliability and comparability across respondents. A simple coarse measure loses precision, but should result in more consistent comparisons across respondents. Relating performance to expectations provides a meaningful frame of reference for respondents.

3.3. Statistical methods

Table 2 provides spearman rank correlations to permit readers to assess and compare the simple relationships among the variables.11

The main analytical tool used to test our hypotheses is a simultaneous multivariate path analysis. All the variables are standardized prior to inclusion, thereby precluding the need for any intercept terms. Path analysis has the advantage of estimating all the relationships indicated in Fig. 1 simultaneously. Thus, all the relationships are specified, estimated, and tested, while controlling for all the other relationships. This provides a complete and integrated test of the model presented in Fig. 1.

Path analysis generally assumes linear relationships among interval scale variables in testing hypotheses. The linearity assumption implies that adding an additional class of performance measurement has the same effect whether one is moving from no measurement to one category of measurement, or from having one category of measurement to two. Similarly, it assumes that the marginal effect of moving from low to high participation is the same regardless of how many categories of performance measure are involved. It is possible that these assumptions are overly restrictive. It may be that both diversity of measurement and high participation are necessary to high performance in teams. If so, there may be an added performance bonus, or a non-linear jump in performance for this special case. Alternately, if performance measurement alone is the major factor, we should see the greatest impact on team performance when we go from no performance measures to one type of measure. In fact, the concept of diminishing returns would suggest that the second type of measure added should have a lesser impact on performance. In a similar vein, the moderating effect of participation on performance should be equally important whether one or two types of performance measure are used under a presumption of linearity. Alternatively, participation may have its most pronounced effect when coupled with a more comprehensive performance measurement system that includes both financial and non-financial measures. A more general non-linear analysis can evaluate these alternatives.

A more general non-linear model is also justified by the categorical (or ordinal) nature of some of our variables, such as Measure012. Measure012 reports ‘0’ when no team performance measures are used; ‘1’ if either a financial or a non-financial performance measure is used, but not both; and ‘2’ if both financial and non-financial performance measures are used. Clearly, using both financial and non-financial measures can be treated as a greater and more diverse level of measurement than using just one type of measure or no measures. It may, however, be inappropriate to assume that the distinction between no measures and one type of measure versus the distinction between one and both types of measures should be considered as interval scale (equal in size).

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11Two-tailed tests are used in the univariate statistics and in the multivariate analyses when a path lacks clear theoretical support for a predicted direction. One-tailed tests are used in the multivariate analyses, where the theoretical development implies a clear direction of influence.
<table>
<thead>
<tr>
<th>Complexity measures</th>
<th>Proportion of time spent in teams</th>
<th>Performance measurement</th>
<th>Participation</th>
<th>Weight in compensation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Task complexity</td>
<td>Reciprocal interdependence</td>
<td>Place-in-hierarchy</td>
<td>Intra-departmental</td>
</tr>
<tr>
<td>Task Complexity</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reciprocal Interdependence</td>
<td>0.08</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place-in-hierarchy</td>
<td>0.14²</td>
<td>0.05</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Hierarchical flatness</td>
<td>0.14²</td>
<td>−0.02</td>
<td>0.17³</td>
<td>1.00</td>
</tr>
<tr>
<td>Intra-departmental</td>
<td>−0.11¹</td>
<td>0.18³</td>
<td>0.10</td>
<td>−0.08</td>
</tr>
<tr>
<td>Inter-departmental</td>
<td>0.25³</td>
<td>0.05</td>
<td>0.21³</td>
<td>0.10</td>
</tr>
<tr>
<td>Measure 012</td>
<td>−0.17³</td>
<td>0.13³</td>
<td>0.10</td>
<td>−0.20³</td>
</tr>
<tr>
<td>Measure 6</td>
<td>−0.12¹</td>
<td>0.17³</td>
<td>−0.11¹</td>
<td>−0.15³</td>
</tr>
<tr>
<td>Part</td>
<td>−0.02</td>
<td>0.14³</td>
<td>0.32³</td>
<td>0.21³</td>
</tr>
<tr>
<td>Part non</td>
<td>0.08</td>
<td>−0.01</td>
<td>0.27³</td>
<td>0.24³</td>
</tr>
<tr>
<td>Part fin</td>
<td>0.03</td>
<td>0.11</td>
<td>0.34³</td>
<td>0.14³</td>
</tr>
<tr>
<td>Weight in compensation</td>
<td>0.00</td>
<td>−0.06</td>
<td>−0.04</td>
<td>0.08</td>
</tr>
<tr>
<td>Performance</td>
<td>0.09</td>
<td>−0.04</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Two-tail significance levels:  
1 < 0.10  
2 < 0.05  
3 < 0.01

Accordingly, we present two path analyses of the Fig. 1 model in our results, one with the usual linearity and interval scale assumptions, and a second that allows for non-linear relationships. The first treats Measure012 as an interval scale variable that is moderated by participation. In the second, we allow for non-interval scale differences between the three levels of Measure012 and low versus high participation. This produces five performance measurement and participation combinations as follows: no measurement (PM00), one type of measurement with low participation (PM10), one type of measurement with high participation (PM11), two types of measurement with low participation (PM20), and two types of measurement with high participation (PM21). Thus, the second path analysis allows for non-linear relationships between the combinations of performance measurement and participation in explaining both weight in compensation and team performance.

An important assumption in path analysis is that the distributions of the variables should be normal. To ensure that our results are robust to possible violations of the normality assumption and the use of categorical data, we reran each of the paths using general linear models (GLM). GLM is designed to handle non-normal variables, and in particular categorical variables. Although not reported the GLM analysis provides very similar results to the path analysis.

### 4. Demographics and preliminary analysis

**4.1. Time spent in teams**

On average (median) respondents spent 34(30)% of their time working in teams within their department, and an additional 23(20)% of their time working in teams with members drawn from other departments. The inter-departmental teams consist of equal proportions of teams drawn from only two departments and teams drawn from three or more departments.

**4.2. Teams and performance measurement**

Despite the respondents’ extensive involvement in teams, team performance measures are used sparingly. Out of the six categories of performance measures listed in Appendix A, 31% of respondents reported that no formal performance measures were used to evaluate team performance. Across all firms the average number of team performance measurement categories used was 1.7 out of a possible six. Among firms reporting the use of at least one team performance measurement category, the average was 3.1.

Table 3 provides the incidence of use of financial and non-financial performance measures. It indicates that non-financial performance measures are used more frequently (64.5%) than financial measures (45.5%). Further, a combination of both types of measures, is used more often (40.7%), than just one type of measure alone (28.6%). The greater incidence of both types of measures relative to only one type, as well as the greater incidence of non-financial measures relative to financial, are both consistent with teams operating in complex environments that feature novel problems.

### 5. Results

Table 4, panels A and B provide linear and non-linear versions, respectively, of the path analysis for the model presented in Fig. 1. In each case all
Table 4
Results for path analysis (see Fig. 1) linking complexity, time in teams, performance measurement, participation, compensation, and performance.

Panel A: This version uses an interval scale performance measurement variable in interaction with participation. Variable definitions are given in Table 1. This table provides coefficient and significance level.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Task complexity</th>
<th>Reciprocal</th>
<th>Place-in-hierarchy</th>
<th>Hierarchical flatness</th>
<th>Intra-departmental</th>
<th>Inter-departmental</th>
<th>Performance measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complexity</td>
<td>Proportion of time</td>
<td>Measure 012</td>
<td>Measure 012 *</td>
<td>Weight in compensation</td>
<td>$R^2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of time in</td>
<td>-0.13^2</td>
<td>0.18^a</td>
<td>0.13^b</td>
<td>-0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra-department</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of time in</td>
<td>0.21^c</td>
<td>0.03</td>
<td>0.18^b</td>
<td>0.04</td>
<td></td>
<td></td>
<td>0.097</td>
</tr>
<tr>
<td>Inter-department</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure012</td>
<td>-0.15^3</td>
<td>-0.10^c</td>
<td>-0.11^b</td>
<td>-0.15^2</td>
<td>0.22^d</td>
<td>0.13^b</td>
<td>0.11^b</td>
</tr>
<tr>
<td>Weight in compensation</td>
<td>-0.04</td>
<td>-0.09</td>
<td>-0.12^1</td>
<td>0.10</td>
<td>-0.04</td>
<td>0.25^d</td>
<td>0.11^b</td>
</tr>
<tr>
<td>Team performance</td>
<td>0.12^1</td>
<td>-0.06</td>
<td>-0.01</td>
<td>-0.01</td>
<td></td>
<td></td>
<td>0.11^b</td>
</tr>
</tbody>
</table>

Panel B: This version uses discrete combinations of performance measurement and high vs low participation. Variable definitions are given in Table 1. This table provides coefficient and significance level.

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Task complexity</th>
<th>Reciprocal</th>
<th>Place-in-hierarchy</th>
<th>Hierarchical flatness</th>
<th>Intra-departmental</th>
<th>Inter-departmental</th>
<th>Performance measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of time in</td>
<td>-0.13^2</td>
<td>0.18^c</td>
<td>0.13^b</td>
<td>-0.08</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intra-department</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of time in</td>
<td>0.21^c</td>
<td>0.03</td>
<td>0.18^b</td>
<td>0.04</td>
<td></td>
<td></td>
<td>0.097</td>
</tr>
<tr>
<td>Inter-department</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PM 10</td>
<td>0.10</td>
<td>-0.12^1</td>
<td>-0.14^2</td>
<td>-0.09</td>
<td>-0.02</td>
<td>-0.11^1</td>
<td>0.068</td>
</tr>
<tr>
<td>PM 11</td>
<td>0.00</td>
<td>0.04</td>
<td>0.06</td>
<td>-0.06</td>
<td>-0.01</td>
<td>0.05</td>
<td>0.011</td>
</tr>
<tr>
<td>PM 20</td>
<td>-0.15^2</td>
<td>0.11^1</td>
<td>-0.19^3</td>
<td>-0.11^1</td>
<td>0.07</td>
<td>-0.02</td>
<td>0.109</td>
</tr>
<tr>
<td>Weight in compensation</td>
<td>-0.06</td>
<td>0.04</td>
<td>0.09</td>
<td>0.01</td>
<td>-0.04</td>
<td>0.25^d</td>
<td>0.03</td>
</tr>
<tr>
<td>Team performance</td>
<td>0.12^1</td>
<td>-0.05</td>
<td>-0.01</td>
<td>-0.01</td>
<td>0.06</td>
<td>0.12^b</td>
<td>0.11^b</td>
</tr>
</tbody>
</table>

Performance measurement classes, (note, the no measurement class is omitted in the regression as it forms the base case, $n=76$)

PM 10: one type of performance measure, low participation, $n=43$
PM 11: one type of performance measure, high participation, $n=28$
PM 20: two types of performance measure, low participation, $n=43$
PM 21: two types of performance measure, high participation, $n=58$

One tail tests for predicted signs

$^d < 0.001$
$^c < 0.01$
$^b < 0.05$
$^a < 0.10$

Two tail test for paths with no predicted sign

$^* < 0.001$
$^5 < 0.01$
$^3 < 0.05$
$^2 < 0.10$
paths are estimated simultaneously. Both panels support the model. Complexity is associated with greater time spent working in teams, which in turn prompts more comprehensive team performance measurement. Comprehensive performance measurement then prompts better team performance directly, and indirectly, by allowing team performance to have a greater impact on team members’ compensation. Further, higher levels of participation appear to facilitate the use of team performance measures to incorporate team performance into team members’ compensation. Participation also appears to boost the positive direct influence of comprehensive team performance measurement on team performance. The last result is most visible in panel B, since participation’s beneficial effect only appears for the case in which both financial and non-financial measures are present.

We now review the specific paths and hypotheses leading to each node in the model. The coefficients listed under the variables can be applied to the paths outlined in Fig. 1 that lead to each of the nodes. When variables appear at a node they are referred to as dependent variables, and the $R^2$ at the end of the row corresponds to the percentage of the variance of each node that is explained by the paths leading to it. We refer to panel B only when the non-interval scale analysis offers additional insights.

The paths from the complexity measures to time spent in intra- and inter-departmental teams are generally positive and are significant in four cases. As anticipated, the strength of the association is strongest for the proportion of time spent in inter-departmental teams. All coefficients are positive, with both task complexity and place-in-hierarchy strongly significant. Intra-departmental teams provide a more ambiguous result. Their use is strongly associated with reciprocal workflows, and is also significantly associated with place-in-hierarchy, however, their use is negatively related to task complexity. The association between task complexity and time spent in inter-departmental teams is consistent with a matrix organisational structure that responds to complexity by pooling different members’ expertise. The association between reciprocal interdependence and time spent in intra-departmental teams, suggests that these teams may be created to coordinate among the department members who manage the initial sets of tasks and those who deal with the work when it returns from the external department.

Diversity of performance measurement (Measure012) is strongly associated with the proportion of time members spend in intra- and inter-departmental teams (H1a and H1b). Panel B suggests that the relationship between the proportion of time spent in teams and the diversity of performance measurement is largely attributable to the case in which both financial and non-financial measures are present along with high participation (PM21). Thus, when organisational members spend more time in intra- or inter-departmental teams, the organisation tends to measure performance comprehensively and to involve the team members in setting targets.

The weight of team performance in compensation is strongly associated with the proportion of time spent in inter-departmental teams (H2b), but not intra-departmental teams (H2a). Thus, organisations appear to attempt to incorporate team performance in compensation only when organisational members are members of inter-departmental teams. The direct influence on compensation afforded to inter-departmental team performance is consistent with a matrix organisation in which the inter-departmental teams are more formally incorporated into an organisation’s structure.

Hypotheses H3a and H3b are supported in table 4. The weight of team performance in an individual’s compensation is significantly correlated with the diversity of performance measurement, and this relationship is greatly

14This raises the question of how individuals that spend a large proportion of their time in intra-departmental teams are compensated? Mohrman et al. (1992) advocate assessing team performance with in its large organisational context. We, therefore, check the weights placed on individual, team, departmental, and organisational performance conditional on team membership. It turns out that membership in intra-departmental, teams is associated with an increased weight in compensation for department performance. Thus, intra-departmental teams appear to remain an increased component of the larger departmental for compensation purposes, with their performance subsumed within the performance of the large department.

15If we replace Measure012 with Measure6 in the path analysis we, obtain similar, but slightly weaker, results for all paths that use diversity of measurement.
strengthened when there is high participation on the part of the team members. In panel A the coefficient on the diversity of performance measurement is more than doubled when participation is high, rising from 0.12 to 0.29 (0.12 + 0.17). Panel B's non-linear analysis reveals a similar result. The coefficient (0.28) for the case in which both financial and non-financial measures are present with high participation is more than double the coefficient for the case in which there are both types of measures with low participation (0.12). It is also more than double the case where there is one type of measure with high participation (0.11). Thus, comprehensive team performance measurement when combined with high participation leads to the highest weight being placed on team performance in setting compensation.\(^{16}\)

Panel A of Table 4 indicates that both weight in compensation (H5, \(p < 0.01\)) and the diversity of performance measurement (H4a, \(p < 0.05\)) positively influence team performance. Linking team performance more strongly to respondents' compensation has useful incentive effects beyond the influence attributable to measurement and participation alone. The moderating effect of high participation on performance measurement is positive, but only approaches a 10% significance level (H4b), which is much weaker than in the path relating performance measurement with high participation to weight in compensation (H3b).

The total effect of the diversity of performance measurement on team performance includes a direct effect and an indirect effect achieved through its influence on weight in compensation, which in turn influences team performance (see the path that leads to weight in compensation). Thus, the direct effect of the diversity of performance measurement on team performance is 0.11, but this increases to 0.13 if the indirect effect is included.\(^{17}\) In cases where there is high participation the model indicates a direct effect of 0.18 that increases to 0.22 when the indirect effect is included. Thus, panel A suggests that measuring team performance comprehensively with both financial and non-financial measures and rewarding team members for team performance both contribute to better team performance. These relationships are enhanced when performance measurement is accompanied by high participation.

The results in panel B support panel A, but highlight the importance of having comprehensive measurement and high participation. The combinations of one type of performance measure with or without high participation, and the case in which both types of performance measure are present, but with only low participation, show only modest improvement, if any, over the no performance measurement situation. It is only when both financial and non-financial performance measures are combined with high participation that there is a disproportionate jump in the coefficient and significance level. The direct effect for this combination yields a coefficient of 0.19. This rises to 0.24 when the indirect effect of this combination acting through weight in compensation is included. Not surprisingly, the less constrained non-linear analysis provides more explanatory power (0.115 vs. 0.071). Thus, maximum team performance appears to require that team performance be included in team members' compensation and that team performance be measured comprehensively with both financial and non-

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\(^{16}\)The univariate data indicated a strong relationship between participation only for non-financial measures (Partnon) and weight in compensation. We tested whether there was a differential moderating effect on performance measurement for participation on non-financial vs financial performance measures. Rerunning the model in Table 4, panel A, substituting first non-financial participation and then financial participation for overall participation, we get similar results only for the interaction between performance measurement and non-financial participation. Thus, while employing both financial and non-financial measures leads to a greater weight in compensation, the increase in the weight in compensation attributable to more diverse performance measurement with high participation, appears to be most attributable to participation in setting non-financial performance targets. In making these substitutions there are cases where we have only one type of measure but we wish to employ participation on the alternate type of measure. In these cases we set participation at low.

\(^{17}\)To obtain the indirect effect multiply the coefficient on weight in compensation by the coefficient on Measure012 in the regression having weight in compensation as an independent variable (i.e. 12×0.23). A similar procedure is used for other indirect effects.
financial performance measures combined with a high level of participation. These results are consistent with Pritchard et al. (1988), in that measurement and participation have a significant influence on performance separate from their usefulness in providing a basis for adjusting compensation. Contrary to Pritchard et al. and Mohrman et al. (1992) we find that the strength of the influence of compensation on performance is comparable to the influence attributable to measurement/participation. This may reflect the difficulty of creating meaningful incentives in the lab setting used in the Pritchard et al. study relative to the actual incentives facing our respondents. The discrepancy between our findings and those of Mohrman et al. may be attributable to the fact that they examined only explicit contractual arrangements influencing bonuses only, whereas our weight in compensation incorporated the influence on merit pay and promotion as well as bonuses.

6. Discussion

This paper has explored and developed links among performance measurement, participation, and compensation in secondary teams within organisations. These teams are secondary in the sense that they are secondary to the primary departments of which respondents are members. Mohrman (1993) has argued that teams are a response to the complexity attached to operating in today’s more dynamic environments. Kaplan and Norton (1992) argue that more dynamic environments require financial measures, as well as various types of non-financial measures to capture organisational performance. Our findings support and link these perspectives. The proportion of time spent working in these teams is associated with complexity. Thus, teams are a response to complexity and require both financial and non-financial measures to capture performance adequately. This suggests that financial and non-financial performance measures are complementary and together form a system of comprehensive performance measurement. Comprehensive performance measurement combined with participation and the linking of team performance to compensation, in turn, enhances team performance.

Performance measurement and participation in setting targets are intimately linked in teams. Several studies have shown that participation influences performance, although the relationship is often indirect and contingent on the participation being perceived as relevant and genuine (Brownell, 1981, 1982; Chenhall & Brownell, 1988). In our study of teams, participation in setting measurement goals significantly increased the weight given team performance in compensation and improved team performance. The importance of participation, however, is neither universal nor linear. Most of its impact is attributable to participation in setting non-financial, rather than financial measures. It may be that the greater novelty of these measures and members’ lack of familiarity with them made participation more important. Further, we found a consistent non-linear interaction among participation, and the financial and non-financial measures. Overall team performance and the weight placed on team performance in members’ compensation are significantly greater when a high level of participation is combined with the use of both financial and non-financial measurements. Remove any one of the three and team performance and the weight of team performance in compensation fall. Presumably, the complex environments that prompt the existence of teams, require comprehensive measurement to adequately capture the different dimensions of the tasks facing teams and also require greater participation to enhance members’ familiarity with the measures themselves and the measures’ relationship to the underlying organisational issues. Combining greater participation with comprehensive measurement appears to enhance planning and communication within teams.

We also investigated the link between performance measurement and compensation and whether team performance is linked to compensation. Team performance played a small weight in members’ overall compensation; however, that weight increased as measurement became more comprehensive and participation increased. This is consistent with both economic theory and equity theory (Lawler, 1981), both of which advocate complete measurement and the
importance of members understanding how the measurement relates to performance.

Our results complement and support research on teams in organisational theory (Galbraith & Lawler, 1993). This research suggests that successful teams require an adequate information base, that members have sufficient power to make decisions, and that team performance be rewarded. Our analysis shows that when the management accounting system measures team performance more comprehensively, includes member participation in setting performance targets, and incorporates team performance into compensation, team performance is enhanced. The multivariate analysis indicated separate main effects for measurement/participation and for weight in compensation in explaining team performance. The former can be considered as an informational effect. Comprehensive measurement combined with high participation provides more complete and better-understood information. Weight in compensation can be considered as an incentive effect. If organisational participants are to work in teams, team performance will be better if that performance is reflected in members’ compensation. Our analysis suggests that the informational and incentive purposes for team performance measurement are approximately equal in importance. The latter finding is contrary to some research on compensation and performance that finds that increasing the sensitivity of pay to performance has only a modest impact on future performance. Part of this may be explained by the fact we used field data and evaluated compensation more comprehensively, including bonus, merit pay, and promotion. Experiments may have difficulty in making incentives as salient to participants. Other field studies often examine only bonus pay, thus omitting important components of compensation.

The research presented here provides a wide scope for future work. The changing nature of organisations, with increased emphasis on team processes and knowledge-based work, has given rise to a renewed emphasis on designing performance measurement systems that capture the full diversity of the work environment. Our work suggests that in addition to providing these measures, management accountants must consider how organisational members can participate in the selection of these measures and the setting of appropriate targets. Thought must be given as to how to integrate these measures into the organisation’s reward systems either explicitly through formula-driven bonuses or implicitly in assessments concerning merit pay and promotion. Organisations wishing to improve team performance should devise a set of team performance measures that can satisfy the informational needs of the team and also provide an appropriate basis for recognising and rewarding team performance.

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Appendix A. Performance measure categories

A.1. Financial measures

A.1.1. Cost measures

- ability to meet or better budgeted costs for the period
- ability to meet or better flexible budgeted costs for the period (i.e. allowable cost per unit produced/sold, or unit of service provided)
- ability to achieve budgeted cost reductions
A.1.2. Revenue measures

- ability to achieve or better budgeted sales or sale growth target
- ability to achieve increased or targeted market share

A.1.3. Profit and return measures

- ability to reach a targeted contribution margin
- ability to reach a targeted profit or income
- ability to reach a targeted cash flow
- ability to reach a targeted profit, after an interest charge on working capital or total investment (i.e. residual income or EVA)
- ability to reach a targeted return on assets, return on investment, or return on equity (i.e. ROA, ROI, ROE)
- improvement in the market value of the company’s stock

A.2. Productivity measures

- output per employee or per labour-hour
- output per unit of raw material (i.e. minimize spoilage/waste)
- cycle time (i.e. time for one unit of product or service to be processed in either your unit or the organisation as a whole)
- proportion of value-added (or process) time to total cycle time (where total cycle time includes both value-added and idle time)

A.3. Quality measures

- percentage of defective products (i.e. rework, scrap, or product returns) or substandard service
- warranty costs or reimbursements for inadequate services
- measurements of costs of quality under a total quality management system
- customer surveys of product or service quality

A.4. Service measures

- surveys of customer satisfaction
- third party (i.e. consumer reports) assessments of product performance and/or customer satisfaction
- percentage of product or service delivered on time
- ability to adapt or tailor products to customer needs

A.5. Measures of innovation

- percent of sales or sales level attributable to new products or services
- percent of sales or sales level attributable to developing new markets for existing products or services
- new product/service introduction time (i.e. time it takes to bring a new product or service to market)
- benchmarking procedures—comparison of performance against best practices of other firms

A.6. Personnel measures

- turnover
- absenteeism
- injury lost days
- surveys of employee satisfaction/attitudes
- improvement of employee skill/knowledge levels

Appendix B. Items used to measure Perrow’s technology

(a) To what extent would you say your work is routine?
(b) To what extent do your co-workers do about the same job in the same way most of the time?
(c) To what extent are your duties repetitive?
(d) To what extent do co-workers perform repetitive activities in doing their jobs?
(e) To what extent is there a clearly known way to do the major types of work you normally encounter?
(f) To what extent is there a clearly defined body of knowledge of subject matter which can guide you in doing your work?
(g) To what extent is there an understandable sequence of steps that can be followed in doing your work?
(h) To do your work, to what extent can you actually rely on established procedures and practices?

References


