MOTIVATING REVISIONS OF MANAGEMENT ACCOUNTING SYSTEMS: AN EXAMINATION OF ORGANIZATIONAL GOALS AND ACCOUNTING FEEDBACK

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ABSTRACT

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Organizations often revise their management accounting systems (MAS) to adjust for changes in markets, products, organizational designs, and technologies. Successful revisions are likely to require input from accountants and other employees throughout an organization. These individuals, however, have competing demands on their time. These demands and the uncertainty of the benefits of MAS revisions can make it challenging to motivate these individuals to revise MAS. It has been suggested that providing individuals with feedback that small-scale and/or short-run MAS changes have been a success can motivate continued change efforts. My study provides theory, based on motivational psychology, and experimental evidence about why and when this strategy predictably either increases or decreases individual motivation to exert further effort in revising MAS. Experimental results indicate, as predicted, that accounting feedback about the success or failure of MAS revisions can increase or decrease motivation to exert additional effort on revising MAS depending on the goal(s) activated in individuals' minds by language in the accounting report.

DEDICATION

I dedicate this work to my family.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Academic and practitioner literature has long stressed both the value and difficulty of revising management accounting systems (MAS)[1] in response to changes in markets, products, organizational designs, and technologies (Keegan, Eiler, and Jones 1989; Keegan and Eiler 1994; Tatikonda and Tatikonda 1998; Waldrup, MacArthur, and Michelman 2009; Wouters 2009; Chapman and Kern 2011). Successful revisions can improve accounting information quality, but MAS revisions can pose significant challenges for motivating the individuals involved with the revision. One challenge is that these individuals have competing demands on their time. Further, MAS revisions can be uncertain projects in which the path to the goal is not always clear and the expected benefits of these revisions and thus appropriate compensation for revision effort can be difficult to estimate. This uncertainty of achieving success can discourage effort.

Research has examined a number of determinants of successful MAS revisions, such as top management support, adequate resources, and training (Cooper et al. 1992; Shields 1995; Krumwiede 1998; Balakrishnan, Hansen, and Labro 2012). This research has not disentangled the enabling and motivating effects of these factors, however, and little accounting research has addressed motivation as such. One suggested strategy to motivate continued effort in revision projects is that when possible, a major revision should be initiated with a small-scale activity that is likely to be a success, and these short-run successes should be prominently reported. Prior successes—for example, in a pilot or demonstration project or a previous revision—are expected to motivate further revision efforts by increasing enthusiasm and estimates of the probability of further success, reducing the uncertainty about the outcomes of effort (O'Hara, Watson, and Kavan 1999; Hankinson and Lloyd 2000; Horngren, Datar, and Rajan 2012). Feedback

[1] Examples of MAS are product costing systems and performance measurement systems.

concerning success can be provided through accounting reports and research has shown that the presentation and format of accounting reports can affect individual attention to information and decision-making (Cardinaels 2008; Bloomfield et al. 2011). In my study I bring the two literature streams of MAS revision and accounting report presentation and format together by examining whether accounting reports about the success of prior MAS revision and language accompanying these reports can affect future effort on MAS revision.

Report presentation and format can include language or graphics that influence effort by affecting how people interpret feedback provided by the report. I argue, based on theories from motivational psychology (Fishbach and Dhar 2005; Fishbach, Dhar, and Zhang 2006), that how individuals interpret feedback indicating success (or failure) on prior MAS revision can increase or decrease their effort on continued MAS revision, dependent on goal framing. If individuals interpret prior success in terms of goal commitment, then success can motivate further effort by invigorating individuals and increasing their belief that the goal can be achieved (Locke and Latham 2002; Ilies and Judge 2005). If the same feedback is interpreted as goal progress, however, then prior success can lead to less subsequent effort as individuals believe that the goal is (at least partially) fulfilled and feel free to exert effort elsewhere (Dhar and Simonson 1999; Fishbach et al. 2006). Whether feedback is interpreted in terms of goal commitment or goal progress can depend on whether a high-level goal (e.g., improving accounting for making better decisions) or a low-level goal (e.g., choosing a better cost driver for specific activities) is activated in individuals' minds during MAS revision.

Individuals often have goal hierarchies that consist of high-level goals that are abstract and long-run focused and low-level subgoals that are concrete and immediate. Even if individuals know their goals equally well at multiple levels of the hierarchy, one goal level is

often more strongly activated in their minds and is more likely to influence their behavior and decisions at a given time (Anderson, Reder, and Lebiere 1996). I argue that language accompanying accounting information, not in the standard body of the accounting report, can act as a prime that affects the goal that is activated in individuals' minds and thus influence their subsequent behavior. Priming is an implicit memory effect in which exposure to a stimulus can affect behavior in response to a subsequent stimulus (Schacter 1994; Neely 2003), by activating affect, knowledge, or goals (Higgins 1996).

If a high-level goal is more activated in individuals' minds during MAS revision, for example through priming, then prior success compared to prior failure is expected to motivate more revision effort. Following success, individuals feel more committed to the high-level goal and want to exert more effort towards this goal (Fishbach et al. 2006; Zhang, Fishbach, and Dhar 2007). Conversely, when a low-level goal is more activated—as low-level goals often are in the absence of a high-level goal prime, because they are more concrete and immediate—prior failure will motivate more revision effort compared to prior success. With success, individuals will feel as though sufficient progress has been made on the low-level goal and thus their effort can be exerted elsewhere. Therefore, the effect of a small-scale and/or short-run success depends crucially on whether high-level or low-level goals are activated.

I use an experiment to examine how the interaction between priming of the high-level goal of improving accounting for making better decisions and prior success/failure affects additional effort exerted on MAS revision. In this setting, individuals are involved in improving the organization's costing system by recommending new cost drivers for multiple production activities. Following their first cost-driver choice, participants receive an accounting feedback report indicating whether their choice was successful or not (i.e., whether usage of the chosen

cost driver relates to overhead resource usage). Some participants receive a prime with this accounting feedback report in the form of an accounting slogan which is expected to activate the high-level goal, whereas others do not receive this prime with the accounting report. Participants then have the opportunity to continue revising the MAS, and I measure the effort they exert in additional revision of the costing system.

Consistent with my hypothesis, the experimental results indicate that accounting reports influence motivation not only by providing feedback about a prior success or failure of MAS revision, but also by influencing the interpretation of this feedback through the presence or absence of language accompanying these reports that activates high-level goals. As predicted, prior success while priming the high-level goal leads to more effort in MAS revision than prior failure, but prior failure leads to more effort in MAS revision than prior success when the high-level goal is not primed. Also as predicted, prior success in MAS revision leads to more effort when the high-level goal is primed than when it is not primed, but *not* priming the high-level goal with prior failure leads to more effort than if this goal is primed.

This study provides insight to managers on how to motivate employees to be involved in and exert effort towards MAS improvement to support better decision-making throughout the organization. My results show that language as a peripheral communication (e.g., a slogan) can affect the goals that are activated in individuals' minds, affecting their motivation to persist in MAS revision. As a project proceeds successfully managers can increase motivation by reporting this success and activating the overall goal of the project (e.g., using a slogan pertaining to this goal). If the project is not proceeding successfully, however, this feedback needs to be reported with a focus on the task at hand to keep the short-term goal at the forefront of employees' minds to motivate them to continue in the revision process and make successful progress.

My study further makes three contributions to the accounting literature. First, it provides theory and evidence on why and when the often-recommended strategy of seeking and reporting small-scale and/or short-run success actually does or does not increase individuals' motivation to exert further effort on MAS revision. This strategy can be effective when individuals are primed with the high-level goal for the project. In the absence of such a prime, however, low-level goals are likely to be more activated in individuals' minds, because they are more concrete and immediate; and if this is the case, then prior success can be counterproductive, leading to less subsequent effort on MAS revision.

Second, my study adds to the literature on accounting report design. Prior studies have examined how report presentation and format, including the addition of graphics in reports, can affect decision-making (e.g., Cardinaels and Van Veen-Dirks 2010; Bloomfield et al. 2011; Jiang, Petroni, and Wang 2012). This research has focused on cognitive and attention-directing effects and the weights that individuals place on different cues. My study examines how a prime—a slogan—accompanying an accounting feedback report, can affect motivation and effort. Reports of accounting feedback can include not only information about success or failure but also language (or other information, such as graphics) that can make high- or low-level goals more activated in individuals' minds. The combination of prior revision feedback and the more strongly activated goal can increase or decrease motivation in revising MAS.

Third, my study contributes to the emerging literature on priming in accounting. Research in accounting has provided evidence of priming effects, generally investigating primes that provide information that is an essential part of the accounting task requiring thorough cognitive processing (e.g., Hammersley, Bamber, and Carpenter 2010; Lambert and Agoglia 2011). I add to this literature by evaluating the priming of goals and showing that a peripheral stimulus

(prime) that does not require attention for the task to be completed—an accounting slogan—can either increase or decrease motivation to improve accounting information.

The remainder of my study is organized as follows: chapter 2 provides a literature review and hypothesis development. Chapter 3 describes the experiment. Chapter 4 presents the results of the experiment and chapter 5 concludes.

CHAPTER 2: LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

I first review literature on MAS revision. Then I present in more detail the problem of motivating individual effort persistence in these projects and a solution often proposed in the literature, seeking out and communicating prior revision success. I then review the psychology literature that predicts that prior success can only motivate continued effort under certain conditions and explains how this motivating effect can be influenced by priming. Finally, I identify gaps between the psychology literature and the accounting problem that makes it uncertain whether or how the psychology theory will apply in the accounting context.

MAS Revision

MAS are valuable for decision-making when they produce accurate information. As organizations change, MAS need to be revised so as not to become obsolete and reduce their effectiveness for decision-making. To fully elicit the benefits from MAS, they need to be evaluated, monitored, and revised (Ittner and Larcker 2003; Wouters 2009; Chapman and Kern 2011), which requires time and effort to be successful (Keegan et al. 1989; Wouters and Wilderom 2008; Kelly 2010). Accounting research indicates that involving accountants and non-accountants in MAS revision can lead to improvements in MAS and firm performance (Wouters 2009; Chapman and Kern 2011; Wouters and Roijmans 2011). Studies have also shown that user involvement during the revision process can improve user satisfaction and interaction with the revised MAS (Hunton and Gibson 1999; Abernethy and Bouwens 2005; Eldenburg et al. 2010).

Motivating the individuals involved in revising MAS, however, can be challenging. One challenge is that the individuals that participate in the revision often have competing demands on their time (Shields and Young 2000; Simons 2000; Wouters 2009; Eldenburg et al. 2010; Chapman and Kern 2011). Further, MAS revisions can be uncertain projects in which the path to

the goal is not always clear. These projects often require trial-and-error learning and the development of prototypes for experimenting and testing (Wouters and Wilderom 2008; Wouters and Roijmans 2011), which may be abandoned or substantially altered as a result of the experiments and tests. This can often make it difficult to estimate the benefits of MAS revision activities (and thus the appropriate amount of compensation), and the uncertainty of achieving these benefits can discourage effort from risk-averse employees. Thus, linking significant compensation to these activities can be impracticable because of the inherent uncertainty in these projects. This difficulty in contracting and compensating for effort in these activities can lead to a preference for "consummate cooperation" in which individuals work together to achieve an end without contract or enforcement (Kay 1995). This cooperation can be short lived, however, as it gives an incentive to free-ride further discouraging individual effort in these types of projects.

Research in a number of business disciplines suggests that individuals can be motivated to continue working on organizational and MAS change projects by providing information that a small-scale and/or short-run change was a success (Shields and Young 1989; O'Hara et al. 1999; Hankinson and Lloyd 2000; Kotter 2007). Anderson (1995) details GM's process of implementing an activity-based costing system throughout the organization, and shows that the initial phases of the revision process consisted of running pilot studies involving employees with varying backgrounds. To help motivate effort and involvement in the project, individuals at successful pilot plants were asked to give testimonials of their successes to those at other pilot plants to help them get energized and move forward in the process.

Feedback on the success or failure of prior MAS revision efforts can provide information about the likelihood that future efforts to revise the MAS will succeed or fail, and thus about the project's expected net benefit. Feedback about success can also generate positive affect that

energizes individuals to exert additional effort to revise MAS (Ilies and Judge 2005). For example, Horngren et al. (2012) state that for successful implementation of an activity-based costing system (ABC), individuals should focus on "Seeking small short-run successes as proof that the ABC implementation is yielding results" and that this can motivate those involved "… to stay on course and build momentum" (155). Research provides some empirical support for this strategy (Kwon and Zmud 1987; Anderson 1995), but does not fully explain the mechanism of this strategy and the limitations to its effectiveness.

Motivation and Goals

Individual motivation can be influenced by many non-monetary factors such as affect, goals, self-efficacy, and social comparison (Bargh et al. 2001; Locke and Latham 2002; Mitchell and Daniels 2003). For decision-influencing purposes, accounting information is generally used to support monetary incentives to motivate desired behavior by affecting individuals' conscious choice of actions. Accounting, however, can also affect behavior by other means, such as by influencing individuals' frame of reference and their valuation of outcomes, even when expected monetary payoffs and risks are held constant (Luft 1994; Rowe 2004; Luft and Shields 2009) and providing social comparisons that influence future behavior (Frederickson 1992; Hannan, Krishnan, and Newman 2008). Evaluating the non-monetary motivating effects of reporting prior success in MAS revision is important because it can be difficult to tie significant compensation to success in uncertain MAS revision projects. Further, even if monetary incentives are provided, non-monetary motivation could still have an effect on motivation. If the non-monetary motivation is positive, then lower monetary rewards would be required to motivate a given level of effort. Negative non-monetary motivation, however, could reduce the effectiveness of monetary benefits, requiring more monetary reward to elicit a given level of effort.

Psychology research on motivation provides theory and evidence that feedback on the success (or failure) of a prior effort can be interpreted differently and thus can influence future motivation either positively or negatively (Fishbach et al. 2006). If prior success is interpreted in terms of goal progress—the progress made towards a previously defined goal (e.g., Carver and Scheier 1998)—then an individual can experience benefits associated with goal fulfillment and feel free to pursue other goals (Dhar and Simonson 1999; Fishbach and Dhar 2005; Fishbach et al. 2006). The opposite can occur if an individual interprets prior success (or failure) in relation to goal commitment—the importance or strength of the goal—as individuals often re-evaluate their commitment to a goal in light of current circumstances (Bem 1972; Fishbach and Dhar 2005). All else equal, goal commitment increases with success by emotionally invigorating individuals and increasing their belief that the goal is attainable, which motivates continued goal pursuit (Locke and Latham 2002; Ilies and Judge 2005). Conversely, goal commitment decreases with failure, demotivating continued effort. Whether an individual interprets feedback as goal progress or goal commitment can depend on whether the goal that is more activated in individuals' minds is a high-level or low-level goal.

Individuals often have a hierarchy of goals in which high-level goals are abstract and long-run focused, and subordinate low-level goals are concrete and short-run focused (Austin and Vancouver 1996; Bateman, O'Neill, and Kenworthy-U'Ren 2002). For example, in revising a costing system individuals can focus more on trying to improve accounting information quality for making better decisions (a high-level goal) or on improving the allocation of overhead costs for specific activities (a low-level goal). The low-level goal is one of many possible improvements that can be made to the MAS to achieve the high-level goal.

Even when individuals know their goals equally well at multiple levels, one goal level is often more strongly activated in their minds than another at any given time. When a goal is more strongly activated, this does not necessarily mean that it has a higher conscious priority; in fact, activation can be unconscious even when it influences behavior (Bargh et al. 2001). Rather, when a goal is more strongly activated than other goals, the goal itself and information relevant to it are more accessible in working memory and thus more likely to influence decision-making (sometimes but not always consciously), and conflicting goals and information are more likely to be suppressed (Anderson et al. 1996; Shah, Friedman, and Kruglanski 2002; Förster and Liberman 2007). Individual attention and behavior can thus be determined by active goals (Dijksterhuis and Aarts 2010).

If a high-level goal is more strongly activated, then feedback about prior effort can affect individuals' motivation to pursue the high-level goal as they evaluate their commitment to the goal (Fishbach et al. 2006). Prior success increases goal commitment, motivating continued effort towards the high-level goal, whereas prior failure decreases goal commitment and leads to a reduction of effort toward the high-level goal. Thus, if overall improvement in the decision usefulness of accounting information is the goal that is more strongly activated in individuals' minds during MAS revision, then prior success will increase their commitment to this high-level goal and increase the effort devoted to making additional revisions to the MAS.

If a low-level goal is more strongly activated—as low-level goals often are, because they are concrete and immediate and can pertain to the task at hand—then individuals tend to interpret outcome feedback about prior actions related to this goal in terms of goal progress and focus on attainment of the more defined low-level goal (Fishbach et al. 2006). If it is attained, then individuals can feel free to allocate their effort to other activities. But if the low-level goal is not

attained, then individuals will be motivated to continue their efforts towards achieving this goal. Thus, if a low-level goal is more strongly activated, then individuals are more likely to interpret their prior MAS revision success as an indication that they have made sufficient progress on revising the MAS for the time being and can turn their effort elsewhere.

These arguments can provide insight into how and when the strategy of reporting prior success will be effective in motivating persistence in MAS revision. Prior success can be effective in motivating continued effort when the high-level goal is activated, which increases commitment and encourages effort, but will not be if the low-level goal is more activated as individuals are more likely to believe that sufficient progress has been made. If the prior MAS revision action is unsuccessful, then activating the high-level goal can be demotivating by decreasing goal commitment. If the low-level goal is more activated, however, then prior failure can actually be motivating as individuals are focused on achieving the low-level goal and continue to allocate effort to it.

Accounting Report Design and Priming

Accounting research has provided evidence that the presentation and format of accounting reports can influence individual behavior and decision-making. How accounting information is organized and presented has been shown to influence decisions made by users of financial statements (Maines and McDaniel 2000; Bloomfield et al. 2011; Clor-Proell, Proell, and Warfield 2013) and performance evaluations (Cardinaels 2008). Studies have also provided theory and evidence that graphics included on accounting reports can influence the weight that individuals place on different pieces of information, both in financial and management accounting reports (Malina and Selto 2001; Cardinaels and Van Veen-Dirks 2010; Jiang et al. 2012). These studies focus on the cognitive and attention-directing effects of the presentation and

format of accounting reports (influences on cue-weighting in judgments and decisions), but they do not focus on how presentation and format can influence motivation and individual effort. In my study I evaluate the motivational effects of accompanying language in accounting reports through the mechanism of priming.

How strongly a high-level goal is activated in individuals' minds can be influenced by exposure to a prime, that is, a stimulus that activates constructs in individuals' minds (Bargh 2006). Priming is an implicit memory effect in which exposure to a stimulus affects the response to a subsequent stimulus (Schacter 1994; Neely 2003; Hsu and Schütt 2012). Exposure to the prime can unconsciously influence individual attention, behavior, and decision-making by activating affect, knowledge, or goals (Higgins 1996; Bargh et al. 2001; Linkenauger 2012).

One example of a priming effect on behavior comes from a study of employees working in a call center (Shantz and Latham 2009). Employees who received shift instructions that included a small picture of a woman winning a race—to prime achievement—raised 60% more money during the work shift than those employees who received the same instructions but without the picture.[2] This prime activated the concept of achievement for employees, which then influenced their work motivation. Shantz and Latham's (2009) study and other research in industrial-organizational psychology have demonstrated that, holding goals and monetary incentives for achieving these goals constant, priming the goals motivates additional effort both in laboratory and field settings (Latham, Stajkovic, and Locke 2010).

Recent studies in accounting have investigated priming (Clor-Proell and Nelson 2007; Hammersley et al. 2010; Elliott, Hobson, and Jackson 2011; Lambert and Agoglia 2011). These

[2] Those who received shift instructions with the prime raised $349 compared to $217 raised by those who received shift instructions without the prime, on average.

studies provide evidence of priming effects in accounting tasks using primes that provide information that is an essential part of the accounting task requiring thorough cognitive processing. For example, Hammersley et al. (2010) ask participants to list specific firm fraud risks that were previously brainstormed, to prime a fraud frame, and Lambert and Agoglia (2011) have participants read reviewer notes that prime either a conclusion-frame (e.g., to reach an appropriate conclusion) or a documentation-frame (e.g., to have defensible documentation).[3] These studies evaluate how the priming of different information can affect decisions, but they do not, however, examine the priming of goals and its effect on effort.

I argue that goal priming through language that accompanies accounting information for peripheral communication (e.g., a slogan) that does not require attention for completion of the task can influence individual behavior and either increase or decrease effort on MAS revision. Language with accounting information can help to determine which goal is more activated in individuals' minds during MAS revision, and goal activation can then influence their interpretation of prior MAS revision outcomes and their future effort on MAS revision, holding monetary incentives constant. This language can prime the high-level goal (e.g., improving accounting for making better decisions) during MAS revision making it more activated, but if not the low-level goal (e.g., choosing a better cost driver for specific activities) is likely to be more activated since it is more concrete and immediate and the task itself can activate this goal. This effect on which goal is more likely to be activated will lead to the consequences of goal activation described in the previous section.

[3] Hammersley et al. (2010) provides the clearest evidence of priming, and, similar to my study, indicates that its effects are not always in the intuitive direction. Their task, prime, and theory, however, are different than those in my study.

Effects of Goal Priming in the Accounting Context

Psychology research has evaluated the effects of goal priming and the interpretation of success or failure on prior low-level goal actions (e.g., Fishbach and Dhar 2005; Fishbach et al. 2006). The accounting context, however, differs from that studied in psychology in several ways, and thus it is uncertain whether the findings in the psychology literature apply to accounting.

The first and most important difference is the type of goals of interest. Studies in psychology focus on individual goals to which individuals are already committed, e.g., academic success or healthy living. My study examines the role of organizational goals on individual effort. Organizational or assigned goals could reduce the personal relevance of and commitment to the goal and motivation for an individual to achieve the goal. Employees from different areas of the firm involved in MAS revision might not view the benefit that it can provide or how the revision project positively affects them personally or their department.

The second difference is the task used to examine motivation. Tasks in psychology studies include predicting the amount of exercise time in the next week or the selection of food. Shantz and Latham (2011, 291) note that similar tasks used in psychology priming studies can have "… questionable relevance for most work settings." Further, many of these tasks rely on predictions of effort and not on actual effort exertion.

The third difference is the feedback used for evaluation. Much of the feedback in the psychology studies focuses on social comparison (i.e., participants' performance and effort compared to others). Although accounting feedback sometimes provides relative performance information, it does not always do so, as is the case in my study. There is considerable evidence that relative performance information can have stronger motivational effects than information

about an individual's own performance only (Frederickson 1992; Hannan et al. 2008). Therefore, feedback about MAS revision outcomes could have less of an effect on individuals' motivation.

Theoretical Predictions

Figure 1 illustrates the hypothesis of my study. I predict that if the accounting feedback report primes the high-level goal of improving accounting for making better decisions, then a report of prior success in MAS revision will motivate more effort on subsequent MAS revision than a report of prior failure, (1 > 3 in Figure 1). Conversely, I predict that if the report does not prime this high-level goal (and thus a more concrete and immediate low-level goal is more likely to be activated), then a report of prior failure in MAS revision will motivate more effort than a report of prior success (4 > 2). Thus, I argue that reporting success can prompt high goal commitment and invigorate and encourage further effort when the high-level goal is activated. The reporting of success can also be counterproductive, however, when the low-level goal is activated, giving individuals the belief that sufficient progress has been made and that their effort can be allocated elsewhere.

These two predictions specify the different signs of the slopes of the two lines in Figure 1, indicating that prior success does not always increase effort. They do not specify the relative vertical locations of the lines, however. For example, priming a high-level goal is predicted to motivate more effort with prior success than with prior failure, but this does not address whether priming will have a positive effect on effort even with prior failure. Psychology theory also supports predictions about the relative location of the two lines. Thus, I predict that feedback indicating a prior success will motivate more revision effort when a slogan priming the high-level goal is included than when it is not (1 > 2). In contrast, if feedback indicates a prior failure, *not* including the slogan will motivate more revision effort than will including the slogan (4 > 3).

That is, I propose that language accompanying accounting reports (e.g., a slogan) can have a positive motivating effect which stimulates future effort on MAS revision when prior revision effort is successful. The same language, however, can backfire if prior efforts fail, thus reducing future effort on MAS revision.

H: Priming of the high-level goal will interact with the success of prior MAS revision to affect the effort exerted on subsequent MAS revision such that:

a) When the high-level goal of improving accounting for making better decisions is primed, prior MAS revision success will lead to more effort than prior failure (1 > 3),

b) When the high-level goal is not primed, prior MAS revision failure will lead to more effort than prior success (4 > 2),

c) When the prior MAS revision is a success, priming the high-level goal will lead to more effort than not priming the goal (1 > 2),

d) When the prior MAS revision is a failure, *not* priming the high-level goal will lead to more effort than priming the goal (4 > 3).

CHAPTER 3: EXPERIMENTAL METHOD

Participants and Design

Participants in the experiment are 118 upper-level undergraduate accounting and full-time MBA students currently taking management accounting courses. Their mean age is 26 (range 20 – 42) and 25% are female. Participants have taken an average of 3.6 accounting courses and have a mean of two years of professional work experience. All participants receive $15 for participation in the experiment,[4] which takes about 20 minutes to complete.

The experiment has a 2 x 2 between-subjects design. The independent variables are the priming or not of the high-level goal of improving accounting for making better decisions (*Priming*) and feedback of success or failure on prior MAS revision (*PriorSuccess*). The dependent variable is future effort on MAS revision.

Task and Procedure

The experiment is conducted in a computer lab at a large university using a web-based computer program which assigns participants randomly to the priming and prior success/failure conditions. Participants receive two envelopes that contain pertinent information for different production activities and are informed that they should only open the envelopes when requested by the computer program. The production activity information is provided on paper for ease of reference during the task. Figure 2 presents a graphic representation of the sequence of events and participants' decisions in the experiment.

Participants in the experiment assume the role of production managers for Michigan Inc. (Michigan), an industrial firm that produces two products, Green (its basic product) and White (a

[4] To examine the motivating effects of the independent variables separately and independently of the motivating effects of monetary incentives, participants receive a fixed payment for participation without any performance-dependent compensation.

more complex product), in three manufacturing activities: Painting, Fabrication, and Finishing (see Appendix C for the experimental instrument used in the study).[5] They are provided with information describing Michigan's cost accounting policy, which explains that manufacturing overhead costs are allocated based on direct labor costs along with an example of how product costing can affect firm profit. Along with this information all participants are presented with the slogan "*Better Accounting for Better Decisions*" at the top right corner of the page which displays the cost accounting policy. The policy information indicates the importance that Michigan places on the quality of accounting in the firm and identifies Michigan's high-level goal as improving accounting to facilitate making better decisions.[6] Participants are then told that a competitor is offering a product similar to Michigan's Green at a lower price, and top management wants to determine whether Michigan can have sufficient long-run profits at this lower sales price. Michigan might not be able to compete at this price because this more focused competitor could be more efficient at making the product. Another possibility is that Michigan is as efficient as the competitor but is over-allocating manufacturing overhead costs to Green.

To determine if Green can be profitable at a lower price, top management has requested that managers assist in revising Michigan's costing system. Participants receive information about the production process and about overhead cost for the first manufacturing activity (Painting),[7] which uses a significant amount of manufacturing overhead resources. They then choose a cost driver from a list of potential drivers that can be tracked using Michigan's current

[5] The experimental setting is adapted from Booker (2000).

[6] This information makes the high-level goal available to participants and thus able to be activated (Higgins 1996).

[7] This information is contained on paper in envelope #1.

manufacturing information system.[8] Participants are informed that Michigan's management accountants will observe production in the Painting activity to determine if there is a relationship between their selected cost driver and manufacturing overhead resource usage.

In order to provide some uncertainty about whether revision to the costing system will be successful, participants are told that the cost driver they choose may or may not provide a better estimate of product costs. A cost driver that provides highly accurate estimates might require information that the manufacturing information system does not currently capture; or the overhead costs in the Painting activity may be too diverse to be captured by a single cost driver, and data limitations make tracking smaller cost activity pools and multiple cost drivers for these activity pools infeasible in the near term.

After selecting a cost driver for the Painting activity, participants receive feedback in an accounting report with data gathered by the management accountants during their observation of the production process, which compares the percentage change in the use of their chosen cost driver and the percentage change in the use of each manufacturing overhead resource to determine if a relationship exists (shown in Table 1). Half of the participants receive feedback indicating that their choice of cost driver was successful, (i.e., there is a relationship between their chosen cost driver and overhead resource usage, Table 1, Panel A) and the other half receive feedback indicating that their choice of cost driver was unsuccessful (i.e., there is no relationship between their chosen cost driver and overhead resource usage, Table 1, Panel B).

The slogan "*Better Accounting for Better Decisions,*" presented earlier in the experiment to all participants, is now used to prime the high-level goal of improving accounting for making better decisions when the feedback is given. For half of the participants, this slogan (prime) is

[8] Participants are made aware that modifying Michigan's information system to collect different information is not feasible in the immediate future.

now presented at the top right corner of the accounting feedback report, and for the other half of the participants this slogan is absent from the accounting feedback report.[9]

After receiving the accounting feedback report, participants are informed that several weeks have passed since they made a decision about the Painting cost driver and that they have returned to their regular production management responsibilities, which "… continue to fill your entire work week." They then learn that top management would like to determine whether revisions should be made to the cost drivers for the other two production activities (Fabrication and Finishing). Participants receive production process and overhead cost information for these two activities[10] and then decide how much time they want to use to continue revising the costing system. This decision has four levels: Participants can (i) make no further revisions, (ii) examine and recommend (or not) a suggestion to use one cost driver for both activities, (iii) examine more overhead and activity information to select a cost driver for one of the two activities, or (iv) examine still more overhead and activity information to select cost drivers for both activities. When participants choose to stop revising the costing system or at the completion of all the possible costing system revisions in the experiment, they are directed to answer post-experiment questions that collect demographic information and explanations for participant decisions (see Appendix D for the post-experiment questionnaire).

[9] The slogan is exactly the same as that was previously displayed to all participants with the description of the firm's cost accounting policy earlier in the experiment.

[10] This information is contained on paper in envelope #2.

CHAPTER 4: RESULTS

Manipulation Check

In this section I check whether the manipulation of prior success/failure on MAS revision was successful. In the post-experiment questions participants were asked how successful they believed their first cost-driver choice was at improving Michigan's costing system and responses were given on an 10-point Likert scale with 1 = Extremely Unsuccessful and 10 = Extremely Successful. Participants in the prior success condition rated their success at improving the costing system higher (mean = 7.65) than those in the prior failure condition (mean = 5.53). This difference is significant ($t = 7.99$, $p < .01$, one-tailed) providing evidence that the manipulation was successful.

Descriptive Statistics and Measures

Table 2 presents descriptive statistics on the dependent variable, future effort on MAS revision. This variable is measured two ways. *Time* is the time in seconds that participants spend on revising the costing system after receiving accounting feedback on their first cost driver choice. *#TimesContinued* is the number of times participants choose to continue revising the costing system after receiving accounting feedback about their first cost-driver choice, measured on a scale of zero to three.[11]

In preliminary tests, I found that these measures of the dependent variable were significantly (p's < .10) affected by a number of the participants' characteristics, three of which differ across treatment conditions: the number of accounting courses taken, knowledge of ABC,

[11] This measure corresponds to the participants' four possible revision decisions; 0 = make no further revisions, 1 = examine and recommend (or not) a suggestion to use one cost driver for both activities, 2 = examine more overhead and activity information to select a cost driver for one of the two activities, and 3 = examine still more overhead and activity information to select cost drivers for both activities.

and interest in the experiment.[12] These variables are thus included as covariates in the empirical models used to test the hypothesis. Table 3, Panel A provides a correlation matrix for the measures of future effort on MAS revision, *Time* and *#TimesContinued*, and the covariates. General descriptive statistics for these variables are shown on Table 3, Panel B, and Table 3, Panel C provides descriptive statistics by cell for the covariates in the study.

I also test whether participant type (*PartType*, undergraduate accounting or full-time MBA students) influenced the measures of the dependent variable.[13] In a general linear model with *Time* as the dependent variable and *Priming, PriorSuccess,* and *PartType* as independent variables, the p-value (two-tailed) for the three-way interaction of *PartType* with the experimental manipulations is .10. The natural log of *Time* (*LNTime*), however, is used for the hypothesis tests (discussed later) and using either *LNTime* or *#TimesContinued* as the dependent variable in the general linear model no interaction with *PartType* is significant (p's > .10). Further, there are no significant interactions with *PartType* (p's > .10) when the covariates are added to the general linear model using *Time, LNTime,* or *#TimesContinued* as the dependent variable. Thus, *PartType* is not included in the tests of the hypothesis.

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[12] Interest in the experiment could proxy for participants' general interest in the task and/or how their interest is affected from the experimental treatment. Therefore, including this variable as a covariate could remove some of the treatment effect which would bias against significant findings. For accounting courses and knowledge of ABC, differences in interpretation of these questions could have driven some of the cell differences. For example, even though the mean number of accounting courses taken was less than four, five participants noted that they had taken 10 or more accounting courses and four of these students were in cell four, potentially increasing the cell mean differences for this variable.

[13] The psychology theory that forms the basis for my hypothesis does not require specialized knowledge or experience and thus should apply to a diverse population.

The first covariate is the time spent on the experimental materials before participants view the feedback report containing the experimental manipulations, including the time spent on the first cost-driver choice. This measure captures a variety of factors other than the experimental manipulations that could affect the two dependent variables such as reading speed, facility in using an unfamiliar website, time pressure (e.g., whether the participant wanted to finish quickly in order to go on to another activity), and intrinsic motivation (unaffected by the manipulations) to perform the task. It is measured as the total time spent on the experiment before viewing the feedback screen (*TimeBefore*).

Accounting knowledge and work experience also have a significant effect on the dependent variable. Dearman and Shields (2001) shows that an individual's level of accounting knowledge, and more specifically ABC knowledge, can influence costing decisions. Further, work experience can affect the involvement and familiarity that participants have with costing systems, which in turn can affect the time needed or taken to make the cost driver decisions in the experiment. Accounting knowledge is measured as the number of accounting courses completed (*AcctgCourses*), and ABC knowledge (*ABCNonClass*) is captured from a self-rated question asking participants, "How familiar are you with activity-based costing in a non-classroom setting?" This rating is on a 10-point Likert scale with 1 = Extremely Unfamiliar and 10 = Extremely Familiar.[14] Work experience (*WorkExp*) is measured as participants' number of months of professional experience.

[14] Participants are also asked on the same 10-point Likert scale "How familiar are you with activity-based costing in a classroom setting?" This variable, *ABCClass*, is not significantly related to the dependent variable in any of the analyses performed and does not change any inferences when included. Thus, it is not included in the tests of the hypothesis.

Lastly, how interesting participants find the experiment can have an impact on the amount of time they spend on the experimental task and the required cost-driver decisions. This measure, *Interesting*, is also captured through a self-rating by asking participants on a 10-point Likert scale, "How interesting did you find this exercise?" with end points as 1 = Extremely Uninteresting and 10 = Extremely Interesting. This self-rating of interest in the exercise can potentially be affected by the experimental manipulations. To remove this influence I regressed *Interesting* on the independent variables *Priming* and *PriorSuccess* and saved the standardized residual from this regression. This residual, *InterestRes*, was then included in the tests of the hypothesis to control for interest in the exercise unrelated to the experimental manipulations.

Hypothesis Tests

Time

Figure 3 reports the marginal means of *Time*, adjusted for the covariates of *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes*.[15] The form of the interaction is consistent with my prediction, however, the distribution of *Time* is slightly skewed with the potential for outlier influence, and thus the natural log of *Time* (*LNTime*) is used in the tests of the hypothesis. Figure 4 reports the marginal means of *LNTime*, adjusted for the covariates of *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes*.

To first test the significance of the interaction I use a general linear model (ANOVA) in which the dependent variable is *LNTime* and the independent variables are *Priming* and *PriorSuccess*, without the covariates included (untabulated). In this model the main effects of *Priming* and *PriorSuccess* are not significant (p's > .10, two-tailed), but their interaction is

[15] Marginal means adjusted for covariates are means of the dependent variable as predicted by the empirical model used in hypothesis testing, with the covariates held at their mean levels.

marginally significant (p = .08, one-tailed), supporting the hypothesis. This model has an R-squared of .017. To further test the significance of the interaction I use a general linear model (ANCOVA) in which the dependent variable is *LNTime*, the independent variables are *Priming* and *PriorSuccess*, and the covariates are *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes* (Table 4, Panel A). In this model the main effects of *Priming* and *PriorSuccess* are again not significant (p's > .10, two-tailed), but their interaction is significant (p = .01, one-tailed, partial η^2 = .052), which provides support for the hypothesis. The ANCOVA shows that the covariates do have significant effects on the dependent variable and this model has an R-squared of .282, demonstrating a substantial increase in explanatory power over the simple ANOVA. Thus, the covariates are included in the remaining tests of the hypothesis.

The hypothesis makes specific pairwise predictions and thus pairwise contrasts within the general linear model are used to test these predictions. P-values of the pairwise tests are Bonferroni-adjusted to provide a family-wise alpha of .05 for the four tests.[16] Table 4, Panel B provides a summary of the pairwise contrast results. My hypothesis predicts that when the high-level goal of improving accounting for making better decisions is primed, prior MAS revision success will lead to more effort than will prior failure, but when this goal is not primed prior MAS revision failure will lead to more effort than will prior success. Results show that, as predicted, when the goal is primed participants spend more time on subsequent MAS revision following prior success (adjusted marginal mean of the natural log of time in seconds = 4.948) than they do following prior failure (mean = 4.621). This difference is significant (p = .03, one-tailed, Cohen's d = .52). Also as predicted, when the goal is not primed, however, participants spend more time on subsequent MAS revision following prior failure (mean = 4.916) than they

[16] That is, the original p-values are multiplied by four, providing more conservative p-values than if family-wise error was not considered.

do following prior success (mean = 4.674). This difference is marginally significant (p = .07, one-tailed, d = .39).

I also predict that when the prior MAS revision is a success, priming the high-level goal of improving accounting for making better decisions will lead to more effort than will not priming this goal, whereas when the prior MAS revision is not a success *not* priming the goal of improving accounting for making better decisions will lead to more effort than will priming this goal. As predicted, when the prior MAS revision is a success, participants spend significantly more time on subsequent MAS revision (p = .05, one-tailed, d = .44) when the goal of improving accounting for making better decisions is primed (mean = 4.948) than when this goal is not primed (mean = 4.674). Conversely, also as predicted following prior MAS revision failure, participants spend significantly more time on subsequent MAS revision (p = .04, one-tailed, d = .47) when the goal is *not* primed (mean = 4.916) than when the goal is primed (mean = 4.621).

Number of Times Continued

Figure 5 reports the marginal means of #*TimesContinued*,[17] adjusted for the covariates *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes*. The form of the interaction is consistent with my hypothesis. To test the significance of the interaction I use a general linear model with #*TimesContinued* as the dependent variable, *Priming* and *PriorSuccess* as independent variables, and *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes* as covariates (Table 5, Panel A). Similar to the model using *LNTime* as the dependent variable, the main effects of *Priming* and *PriorSuccess* are not significant (p's > .10,

[17] #*TimesContinued* has a relatively small range as participants' continuation choices can range from zero to three.

two-tailed), but their interaction is significant (p = .03, one-tailed, partial η^2 = .031), which provides support for my hypothesis.[18]

Pairwise contrasts are also performed with this measure of the dependent variable to test the pairwise predictions, with p-values of these tests Bonferroni-adjusted to provide a family-wise alpha of .05 for the four tests. Table 5, Panel B provides a summary of the pairwise contrast results with *#TimesContinued*. Consistent with the predicted effect, when the high-level goal of improving accounting for making better decisions is primed participants choose to continue more with subsequent MAS revision following prior revision success (mean = 1.43) than prior failure (mean = 0.98), and the difference is marginally significant (p = .10, one-tailed, d = .35). Also as predicted, when the goal of improving accounting for making better decisions is not primed individuals choose to continue more with MAS revision following prior revision failure (mean = 1.71) than prior success (mean = 1.28) and this difference is marginally significant as well (p = .10, one-tailed, d = .34).

Consistent with my predictions, when prior MAS revision is a success, participants choose to continue more with subsequent MAS revision when the goal is primed (mean = 1.43) than when it is not primed (mean = 1.28); but this difference is not statistically significant (p = .32, one-tailed, d = .12). On the other hand, when prior MAS revision is a failure participants choose to continue more with subsequent MAS revision when the goal of improving accounting for making better decisions is *not* primed (mean = 1.71) than when it is primed (mean = 0.98), and this difference is significant (p = .02, one-tailed, d = .57), supporting the prediction. The

[18] Due to the fact that *#TimesContinued* is an ordinal variable with a restricted range (four possible values) I also use an ordered logit model to test the hypothesis using *#TimesContinued* as the dependent variable, *Priming* and *PriorSuccess* as independent variables, and *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes* as covariates. In this regression model *Priming* (p = .01, one-tailed), *PriorSuccess* (p = .09, one-tailed), and their interaction (p = .02, one-tailed) are all significant (at least marginally), providing further support for the hypothesis.

pairwise comparison results using *#TimesContinued* are somewhat weaker in support of the hypothesis than the results using *LNTime*, possibly due to the restricted range of *#TimesContinued* (four possible values ranging from zero to three). Even with the restricted range, however, the interaction is significant of the predicted form and three of the four pairwise comparisons are (at least marginally) significant after the Bonferroni adjustment.

CHAPTER 5: CONCLUSION

Successful MAS revision can improve decision-making and organization performance, and research studies have examined different determinants of successful implementation of new MAS. Research, however, has not fully addressed the effects of non-monetary factors on individual motivation to exert effort on MAS revision. One suggested strategy is to motivate MAS revision by seeking and providing feedback on short-run successes. The motivating effects of this strategy have not been directly tested.

The results of my study provide strong support for my hypothesis that priming the high-level goal of improving accounting for making better decisions and providing accounting feedback concerning prior success of MAS revision interact to affect subsequent MAS revision effort. These findings provide evidence that the strategy of encouraging and reporting short-run success in MAS revision can be successful in motivating future effort in MAS revision when those involved are primed with the high-level goal of the project. The results also indicate, however, that when the high-level goal is not primed, the strategy of encouraging and reporting short-run success can actually backfire and demotivate continued efforts in MAS revision. Further, there is evidence that language accompanying accounting feedback reports (e.g., an accounting slogan) that activates the high-level goal of the project can be beneficial to organizations during MAS revision to promote continued effort in the revision process if prior revision is successful. If those involved believe that their prior revision efforts were a failure, however, this same language can be counterproductive, resulting in less subsequent effort.

This study provides insight to managers on motivating employees to exert effort towards MAS revision to support better decision-making within the organization. As a revision project proceeds successfully managers can motivate those involved by reporting this success and

activating the project's overall goal (e.g., including a slogan related to the goal). If the project is not proceeding successfully, however, managers can motivate continued effort in the revision process by reporting this feedback while focusing on the task at hand to keep the short-term goal at the forefront of employees' minds.

My study also makes three contributions to the accounting literature. First, it provides theory and evidence on how reporting small-scale and/or short-run success can affect individuals' motivation to exert additional effort on MAS revision projects either positively or negatively. This reporting strategy can be effective when employees are primed with the project's high-level goal, but without such a prime this strategy can backfire and lead to a reduction in effort on MAS revision as individuals focus more on lower-level goals.

Second, my study adds to the literature on accounting report design. Prior studies (e.g., Maines and McDaniel 2000; Cardinaels 2008; Jiang et al. 2012) have examined how report presentation and format, including the addition of graphics in reports, can influence decision making by affecting how individuals direct their attention and weight information. My study examines how including a prime—a slogan—on an accounting feedback report can affect effort, providing evidence that feedback about prior revision success and goal activation together can increase or decrease motivation to exert additional effort in revising MAS.

Third, my study contributes to the emerging literature on priming in accounting. Research in accounting (e.g., Hammersley et al. 2010; Lambert and Agoglia 2011) has provided evidence of priming effects, generally evaluating primes essential to the task and requiring cognitive processing. My study examines goal-priming and shows that a peripheral stimulus (prime), not requiring attention for the task to be complete (i.e., an accounting slogan), can unconsciously affect whether individuals either increase or decrease their effort on MAS revision.

A limitation of my study is that it evaluates effort exerted on MAS revision, which can be a long-run process, using a laboratory setting of shorter duration. There has been evidence, however, that results from short-run experiments in a laboratory setting are consistent with decisions and behavior displayed over a longer time period outside of the laboratory. For example, Norman, Requate, and Waichman (2012) compare the generalizability of short-run experiments lasting about an hour in duration to treatments lasting a month and find no significant differences in decisions. Generalizability of short-run findings to treatments of longer durations has also been shown with unconscious effects similar to the priming effect examined in my study. In a laboratory setting, Stajkovic, Locke, and Blair (2006) provide evidence that unconsciously priming a goal leads to higher task performance. To evaluate whether these results can generalize to the workplace and last for a longer duration, Shantz and Latham (2009) and Latham and Piccolo (2012) test similar priming effects using employees in a call center. The authors find comparable results, showing that the unconscious priming of a goal can lead to significantly higher task performance in a workplace setting over a longer duration.

In my study I examine continued individual effort on MAS revision projects following feedback on prior revision efforts. There are opportunities for future research on this topic. First, these projects can involve diverse individuals working as a team to revise the MAS (Shields and Young 2000; Wouters and Roijmans 2011) and studies have demonstrated that the involvement of accountants and non-accountants in MAS revision can lead to system improvements, increased user satisfaction, and organization performance (Hunton and Gibson 1999; Wouters 2009; Eldenburg et al. 2010; Chapman and Kern 2011). Future research might examine the effect that priming a high-level accounting goal and feedback on prior success can have on team effort to revise MAS and how team composition (e.g., accountants, managers, or consultants) can

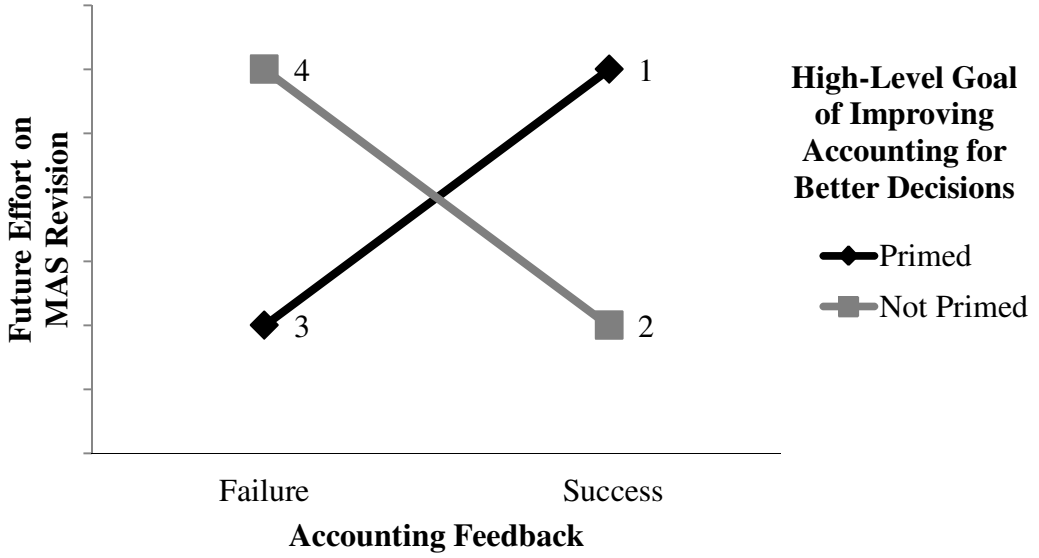
influence this effect. Second, during a MAS revision project individuals can receive multiple feedback reports concerning the success of prior revisions. Studies in psychology have shown that both the direction and the velocity (or rate) of progress towards (or away from) a goal can influence individual motivation (Hsee and Ableson 1991; Kluger and DeNisi 1996). Future research could examine the effect that multiple feedback reports during the revision process with varying levels of performance success (or failure) can have on continued effort on MAS revision.

APPENDICES

APPENDIX A

Figures 1 - 5

Figure 1 Theoretical Predictions



H: Priming of the high-level goal will interact with the success of prior MAS revision to affect the effort exerted on subsequent MAS revision such that:

a) When the high-level goal of improving accounting for making better decisions is primed, prior MAS revision success will lead to more effort than prior failure (1 > 3),

b) When the high-level goal is not primed, prior MAS revision failure will lead to more effort than prior success (4 > 2),

c) When the prior MAS revision is a success, priming the high-level goal will lead to more effort than not priming the goal (1 > 2),

d) When the prior MAS revision is a failure, *not* priming the high-level goal will lead to more effort than priming the goal (4 > 3).

Figure 2 Experimental Task Event Line

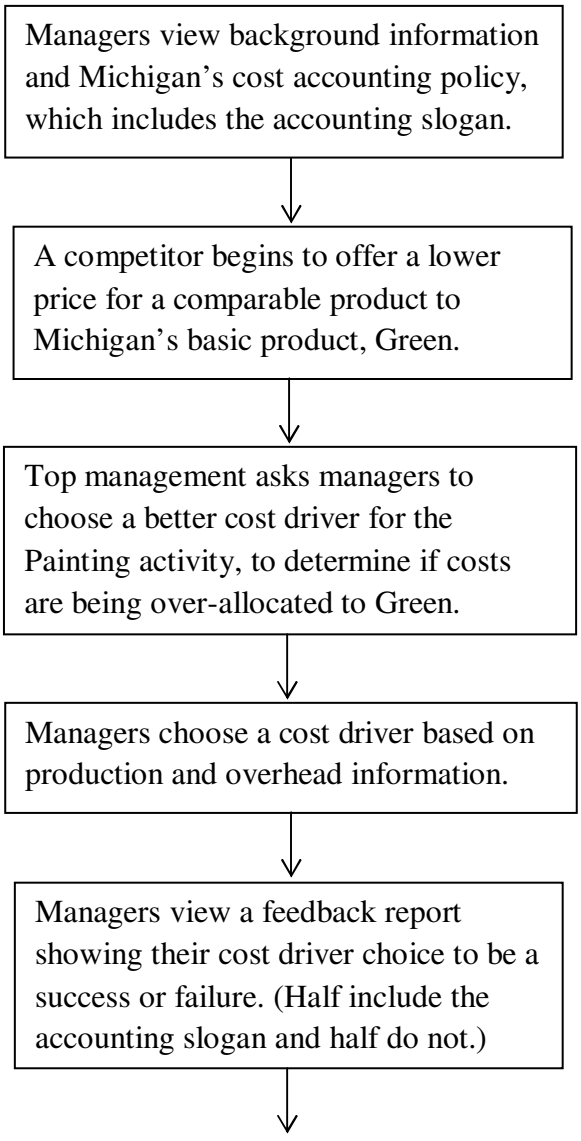


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Figure 2 (cont'd)

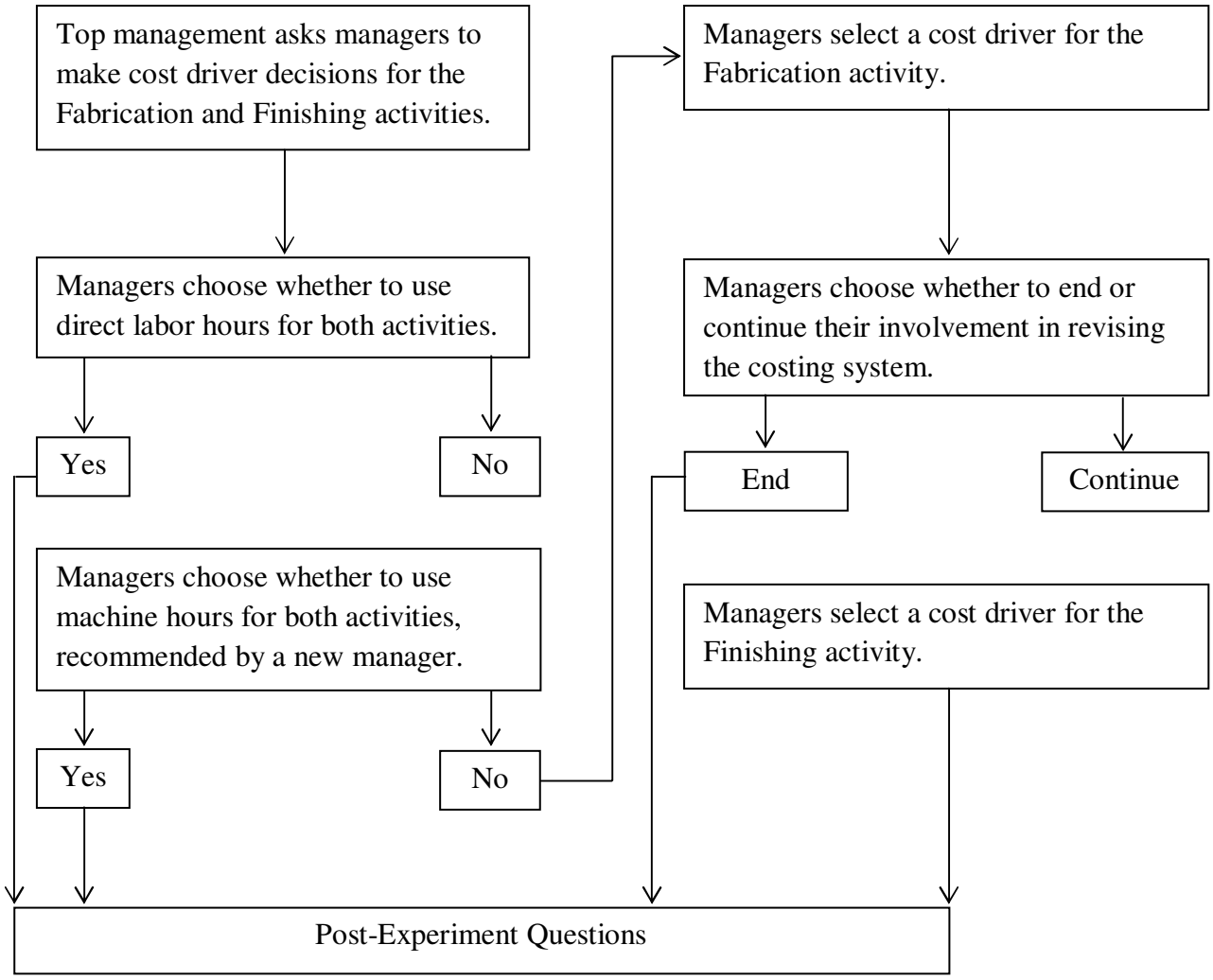
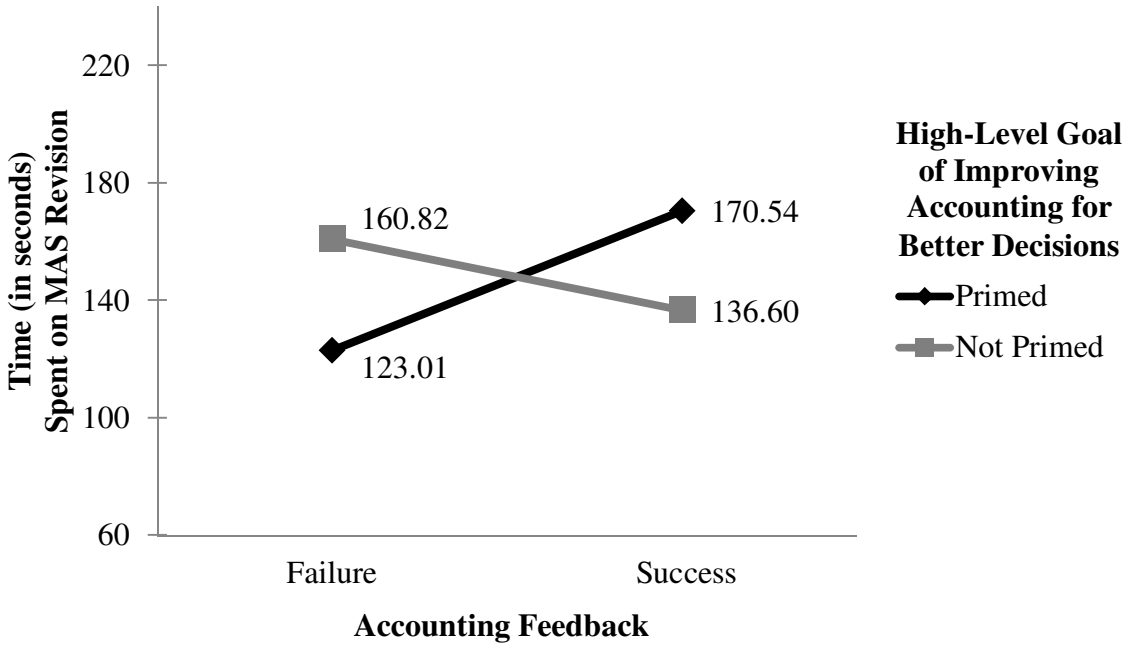
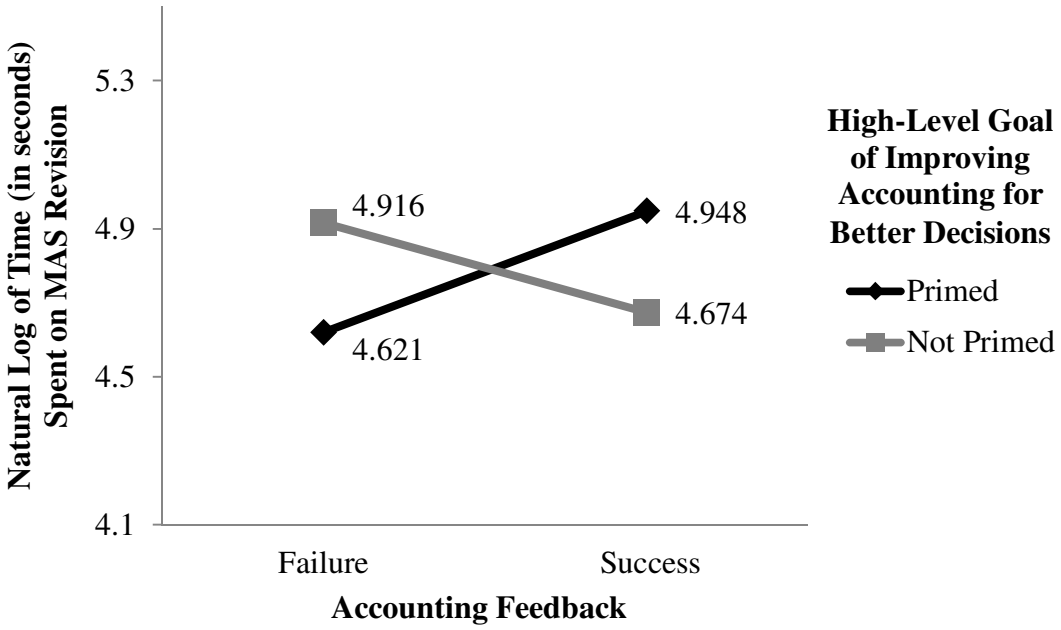


Figure 3 Marginal Means (Adjusted for Covariates) of Future Effort on MAS Revision Following Initial Cost Driver Choice Measured as Time Spent on MAS Revision (*Time*)



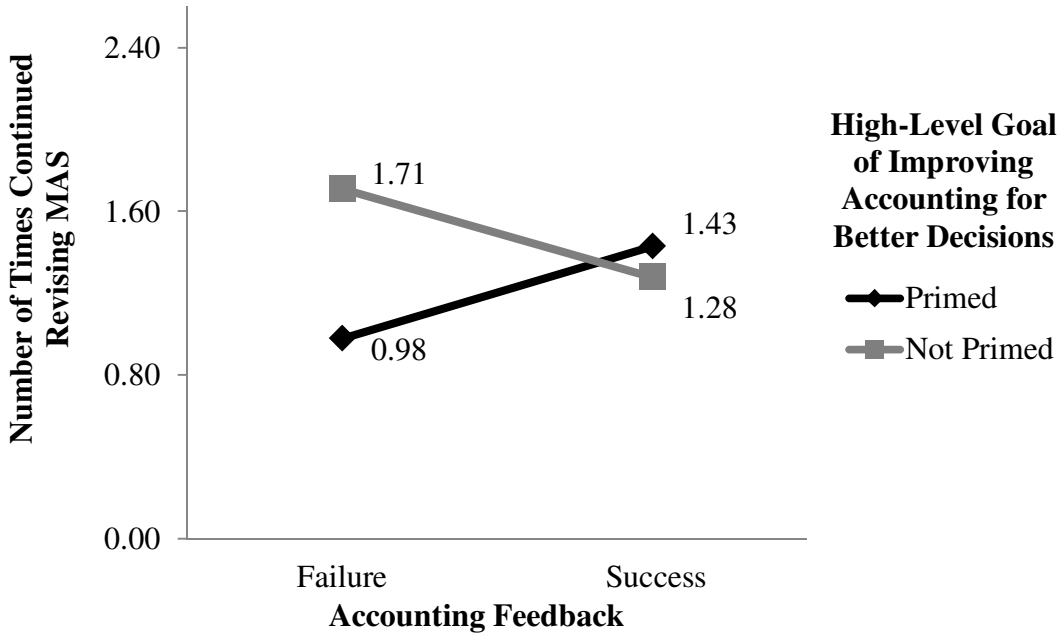
Covariates are *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes.*

Figure 4 Marginal Means (Adjusted for Covariates) of Future Effort on MAS Revision Following Initial Cost Driver Choice Measured as the Natural Log of Time Spent on MAS Revision (*LNTime*)



Covariates are *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes.*

Figure 5 Marginal Means (Adjusted for Covariates) of Future Effort on MAS Revision Following Initial Cost Driver Choice Measured as the Number of Times Continued Revising MAS (*#TimesContinued*)



Covariates are *TimeBefore, AcctgCourses, ABCNonClass, WorkExp,* and *InterestRes.*

APPENDIX B

Tables 1 - 5

Table 1 Feedback Following Cost Driver Choice for the Painting Activity

Panel A: Feedback Received if Cost Driver Choice Was Successful

Management accountants have collected sample observations of the Painting activity to test whether your chosen cost driver of (Selected Cost Driver) is related to the use of manufacturing overhead resources in this activity. The quantity of (Selected Cost Driver) has been documented over the last several weeks while monitoring the quantity of manufacturing overhead resources used. Actual resource usage was recorded and calculated in dollars for ease of comparison. During these observations it was noted that the cost driver increased by 10%, and thus the corresponding observations for overhead resource use were compared to determine whether the overhead costs changed as the cost driver changed.

Indirect Cost Category	Resource Use at Initial Level of Cost Driver	Resource Use at 10% Higher Level of Cost Driver	Percent Change in Cost of Indirect Resources Used
Indirect Labor	$750	$800	7%
Supplies	$2,000	$2,200	10%
Machining	$4,500	$5,000	11%
Maintenance	$1,800	$2,075	15%
Utilities	$1,500	$1,650	10%
Other	$1,250	$1,350	8%

From this test data the management accountants believe that (Selected Cost Driver) do relate to manufacturing overhead costs in the Painting activity and should be used to allocate these costs to the two products. Using this cost driver to allocate manufacturing overhead costs does reduce the estimated cost per unit for Green, and suggests that a competitive reduction in price is possible, while still making a profit.

(This table is continued on the next page.)

Table 1 (cont'd)

"Better Accounting for Better Decisions"

Panel B: Feedback Received if Cost Driver Choice Was Unsuccessful

Management accountants have collected sample observations of the Painting activity to determine whether your chosen cost driver of (Selected Cost Driver) is related to the use of manufacturing overhead resources in this activity. The amount of (Selected Cost Driver) has been documented over the last several weeks while monitoring the amount of manufacturing overhead resource used. Actual resource usage was recorded and the corresponding costs were calculated in dollars for ease of comparison and relative significance. During these observations it was noted that the cost driver increased by 10%, and thus the corresponding observations for overhead resource use were compared to determine whether the overhead costs changed as the cost driver changed.

Indirect Cost Category	Resource Use at Initial Level of Cost Driver	Resource Use at 10% Higher Level of Cost Driver	Percent Change in Cost of Indirect Resources Used
Indirect Labor	$750	$1,000	33%
Supplies	$2,000	$1,950	-3%
Machining	$4,500	$4,500	0%
Maintenance	$1,800	$2,000	11%
Utilities	$1,500	$1,300	-13%
Other	$1,250	$1,800	44%

From this test data the management accountants believe that (Selected Cost Driver) do not relate to manufacturing overhead costs in the Painting activity and should not be used to allocate these costs to the two products. Thus, the estimated cost per unit for Green has not changed, providing no information as to whether a competitive reduction in price is possible, while still making a profit. In the accountants' opinion it appears that one cost driver will not sufficiently relate to all of these manufacturing overhead costs, and thus this activity would need to be split into separate activity cost pools with separate cost drivers. This, however, is not feasible in the immediate future, since this would entail a significant revision of Michigan's information systems.

Participants receive the feedback in either Panel A or B depending on feedback condition. If participants are in a condition with priming, then the feedback report they receive includes the slogan "*Better Accounting for Better Decisions*" as illustrated.

Table 2 Cell Means (Standard Deviations) of Future Effort on MAS Revision

Panel A: *Time*

		PriorSuccess	
		Success	Failure
Priming	Primed	161.49 (108.08) n = 30	130.33 (67.55) n = 28
	Not Primed	141.70 (90.55) n = 30	158.01 (81.70) n = 30

Panel B: *#TimesContinued*

		PriorSuccess	
		Success	Failure
Priming	Primed	1.30 (1.34) n = 30	1.14 (1.33) n = 28
	Not Primed	1.30 (1.32) n = 30	1.67 (1.22) n = 30

Table 3 Correlations and Descriptive Statistics of the Two Measures of the Dependent Variable, *Time* and *#TimesContinued*, and the Covariates

Panel A: Correlation Matrix

	Time	*#TimesContinued*	*TimeBefore*	*AcctgCourses*	*ABCNonClass*	*WorkExp*	*Interesting*
Time							
#TimesContinued	**0.546**						
TimeBefore	**0.295**	0.075					
AcctgCourses	0.093	0.111	**-0.189**				
ABCNonClass	-0.026	-0.127	0.136	0.073			
WorkExp	**-0.205**	-0.095	-0.092	**-0.231**	-0.046		
Interesting	**0.290**	**0.191**	0.145	-0.083	**0.228**	-0.002	
InterestRes	**0.293**	**0.203**	0.131	-0.049	**0.217**	0.013	**0.978**

All bolded correlations are significant at the 0.05 level (two-tailed).

Variables	Definition
Time	Time in seconds spent on future MAS Revision.
#TimesContinued	The number of times participants continue revising the MAS.
TimeBefore	Time spent on the experimental materials *before* feedback.
AcctgCourses	The number of accounting courses completed.
ABCNonClass	Self-rating of "How familiar are you with activity-based costing in a non-classroom setting?" (Likert scale, 1-10).
WorkExp	The number of months of professional experience.
Interesting	Self-rating of "How interesting did you find this exercise?" (Likert scale, 1-10).
InterestRes	Residual of *Interesting* regressed on *Priming* and *PriorSuccess*.

(This table is continued on the next page.)

Table 3 (cont'd)

Panel B: Descriptive Statistics

Variables	Mean	Median	SD	Min	Max
Time	148.18	142.35	88.27	13.98	469.78
#TimesContinued	1.36	1.00	1.30	0	3
TimeBefore	476.77	458.41	139.38	113.21	969.49
AcctgCourses	3.59	3.00	2.98	0	20
ABCNonClass	2.59	2.00	1.91	1	9
WorkExp	23.66	6.50	27.96	0	108
Interesting	5.95	6.00	2.15	1	10

Panel C: Cell Means (Standard Deviations) of Covariates

TimeBefore

	Success	Failure
Primed	472.54 (125.23)	463.99 (118.65)
Not Primed	498.63 (124.71)	471.06 (182.58)

AcctgCourses

	Success	Failure
Primed	2.83 (2.15)	4.07 (3.87)
Not Primed	3.23 (2.64)	4.27 (2.97)

ABCNonClass

	Success	Failure
Primed	3.03 (2.36)	1.75 (1.24)
Not Primed	2.53 (2.15)	3.00 (1.44)

WorkExp

	Success	Failure
Primed	24.60 (28.56)	24.91 (27.02)
Not Primed	19.60 (27.84)	25.60 (29.31)

Interesting

	Success	Failure
Primed	6.20 (2.02)	5.50 (2.05)
Not Primed	6.53 (2.29)	5.53 (2.15)

Table 4 Future Effort on MAS Revision Measured as the Natural Log of Time Spent on MAS Revision (*LNTime*)

Panel A: General Linear Model

Source	df	Mean Square	F	Sig.
Model	8	2.01	5.35	<.01
Intercept	1	103.01	274.31	<.01
Priming	1	0.00	0.01	.93
PriorSuccess	1	0.05	0.13	.72
Priming * PriorSuccess	1	2.23	5.94	.01
TimeBefore	1	4.62	12.31	<.01
AcctgCourses	1	1.74	4.64	.03
ABCNonClass	1	2.71	7.22	.01
WorkExp	1	1.00	2.66	.11
InterestRes	1	6.30	16.76	<.01
Error	109			

Panel B: Pairwise Contrasts within the General Linear Model

Predictions	**Time on Subsequent Revision**	**P-Value, One-Tailed**
Accounting Prime and Prior Success (1) > Accounting Prime and Prior Failure (3)	4.948 > 4.621	0.03
No Accounting Prime and Prior Failure (4) > No Accounting Prime and Prior Success (2)	4.916 > 4.674	0.07
Prior Success and Accounting Prime (1) > Prior Success and No Accounting Prime (2)	4.948 > 4.674	0.05
Prior Failure and No Accounting Prime (4) > Prior Failure and Accounting Prime (3)	4.916 > 4.621	0.04

P-values for all pairwise comparisons are Bonferroni-adjusted.

Table 5 Future Effort on MAS Revision Measured as the Number of Times Continued Revising MAS (*#TimesContinued*)

Panel A: General Linear Model

Source	df	Mean Square	F	Sig.
Corrected Model	8	3.50	2.26	.03
Intercept	1	8.91	5.74	.02
Priming	1	2.40	1.54	.22
PriorSuccess	1	0.00	0.00	.97
Priming * PriorSuccess	1	5.33	3.44	.03
TimeBefore	1	1.63	1.05	.31
AcctgCourses	1	3.30	2.13	.15
ABCNonClass	1	11.23	7.24	.01
WorkExp	1	0.97	0.62	.43
ZRE_IntNew	1	11.92	7.69	.01
Error	109	1.55		

Panel B: Pairwise Contrasts within the General Linear Model

Predictions	**Number of Times Continued**	**P-Value, One-Tailed**
Accounting Prime and Prior Success (1) > Accounting Prime and Prior Failure (3)	1.43 > 0.98	0.10
No Accounting Prime and Prior Failure (4) > No Accounting Prime and Prior Success (2)	1.71 > 1.28	0.10
Prior Success and Accounting Prime (1) > Prior Success and No Accounting Prime (2)	1.43 > 1.28	0.32
Prior Failure and No Accounting Prime (4) > Prior Failure and Accounting Prime (3)	1.71 > 0.98	0.02

P-values for all pairwise comparisons are Bonferroni-adjusted.

APPENDIX C

Experimental Task

Instructions

In this decision-making exercise, you will assume the role of a manager making decisions based on information for a manufacturing firm. Please perform this task carefully as you make your decisions.

Different participants in this exercise will be making different decisions than you will be, so do not be surprised to see others completing this exercise before or after you do.

Please follow instructions carefully and work independently. Please fully consider each page and decision before clicking Next as you will not be able to go back after clicking Next.

On the sheet of paper given to you, please write your chosen ID and keep the sheet of paper to remember your ID. You will use this ID later to collect your pay.

Enter your chosen ID: .

Background Information

You are a production manager at Michigan, Inc. (Michigan), an industrial firm based in the Midwest. As a production manager you are responsible for the production process, including personnel, inventory, equipment, and production output. You coordinate personnel needs for the production line and are required to make adjustments to personnel as needed. You track inventory levels, monitor production equipment, keeping it maintained and in proper operation, and ensure that products meet specifications throughout the production process. Further, much of your time is spent in discussions with customers concerning shipments, issues with products, special order requests, etc.

Michigan manufactures two products, Green and White, for finished-goods suppliers. Green has been Michigan's primary product for many years. White is a more complex product that Michigan has been producing for only a few years. Michigan contracts with its customers to supply these products, setting prices based on a percentage above the full production cost of each product. These products pass through three main activities during the production process. First, in the Painting activity direct materials purchased from suppliers are painted with a primer, then in the Fabrication activity these materials are combined to form the final product, and finally in the Finishing activity they receive finishing coats of paint and final inspections before being shipped to customers.

Figure 6 Michigan's Cost Accounting Policy

Better Accounting for Better Decisions

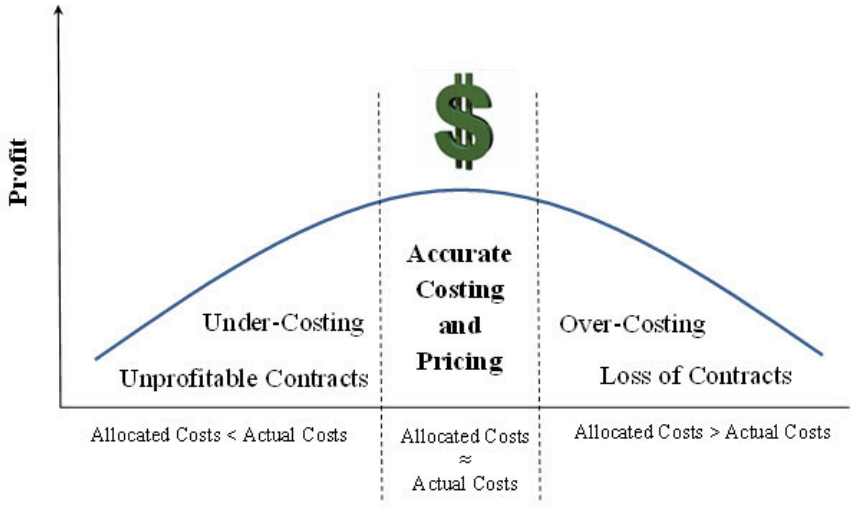
Michigan's Cost Accounting Policy

Michigan strives for accurate cost accounting to provide high-quality cost and profit measures for decision-making throughout the firm including: inventory valuation, product pricing, budgeting, performance measurement, and performance evaluation. To be accurate, product costs should be based on resource consumption by products, with more overhead costs allocated to products that consume higher amounts of overhead resources. Accurate cost accounting measures are important as they can affect firm performance, as shown below.

Currently, manufacturing overhead costs incurred during the manufacturing process are allocated to products based on direct labor costs. That is, total manufacturing overhead costs (such as supervision, supplies used, machining, etc.) are divided by total direct labor costs to determine the allocation rate. This rate is multiplied by the direct labor costs used by a specific product to determine the amount of manufacturing overhead to be allocated to that product. The full product cost is the sum of direct material costs, direct labor costs, and the allocated manufacturing overhead costs.

Example

An example of cost accounting affecting firm performance is that product costs estimated too low could encourage managers to set product prices lower, potentially resulting in winning unprofitable contracts, or product costs estimated too high could make managers believe they need to set product prices higher, potentially resulting in the loss of profitable contracts.



For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this dissertation.

Background Information

Michigan has had a strong market presence for many years, which has allowed it to maintain its policy of basing products' selling prices on full production cost plus a standard markup. Recently, Michigan has become aware that a competitor, Ohio, Inc. (Ohio), will be bidding to supply one of Michigan's large customers with a product similar to Green when Michigan's contract ends at the end of the current year. Available market information indicates that Ohio will be offering a price lower than Michigan's current price. Because this contract is important to Michigan, top management has decided to reduce the price of Green for this customer in order to keep the contract for next year.

Ohio offers comparable prices in other markets and makes a profit, so it can likely sustain its low price. Therefore top management at Michigan is considering: how can we compete profitably in the longer term? Can we still make a profit while aggressively meeting Ohio's prices, or should we move quickly into the less competitive markets for more complex products like White?

One important factor in answering these questions is a better understanding of product costs at Michigan. It is possible that because Ohio focuses on a single product, it is significantly more efficient at making this product than Michigan is. It is also possible, however, that Michigan is equally efficient but is misestimating its own cost of producing Green, because it has not devoted much attention to how it allocates manufacturing overhead costs between Green and White. If Green is actually as costly, or even more costly, to produce than current cost estimates indicate, then Michigan must re-examine its strategy in terms of manufacturing practices, product mix, and product prices. If Green is actually less costly to produce than current cost estimates indicate, then Michigan can profitably pursue an aggressive pricing policy on Green, and can consider the possibility of increasing prices in the less competitive White market.

Background Information

Currently, all manufacturing overhead costs are allocated using direct labor costs. It is uncertain, however, whether the use of manufacturing overhead resources really changes as direct labor costs change. It is also uncertain what other cost drivers–if any–would do a better job of predicting products' use of these overhead resources.

Creating a new costing system would be a long and costly process and would not produce the information top management needs as soon as they would like to have it. It may be possible, however, to get more accurate product cost estimates in the near term by choosing a different cost driver on which information is already collected and using it to allocate overhead costs.

Background Information

Due to your familiarity with the production process as the production manager, top management has asked you to choose a better cost driver for one of the manufacturing activities, the Painting activity. This activity has been selected since it uses significantly more manufacturing overhead resources compared to the other activities, and there appears to be a lot of diversity in the overhead resources used by Green and White in this activity. Top management thus believes that changes in how overhead costs are allocated in this activity could significantly improve cost estimation for Michigan's two products.

Once you recommend a cost driver, a team from the accounting department will then test the usefulness of this driver by observing production closely and determining whether actual overhead resource use (indirect labor, supplies, maintenance, machining, etc.) changes as this cost driver changes. It is possible that this test will show that the new cost driver will more accurately allocate costs, and thus provide a better estimate of product costs. It is also possible, however, that it will not. An accurate cost driver for this activity might require information that the manufacturing information system does not currently capture. Or it might be that the overhead costs incurred in this activity are diverse and do not increase or decrease together with any one cost driver. Dividing this activity cost pool into more activity cost pools and tracking these activity cost pools and cost drivers is not feasible in the immediate future, because this would require significant revision of Michigan's information systems.

You have been presented with the budgeted costs of direct materials, direct labor, and manufacturing overhead for the Painting activity in the coming year.

Please open envelope #1, then click Next.

Table 6 Production Process and Overhead Cost Information for the Painting Activity

Painting Activity

Each product is composed of several pieces that are molded by suppliers. In the Painting activity molded pieces receive priming coats that are machine-applied to each piece. This activity is not labor intensive. Similar pieces can be painted in sequence without adjustments to the machines. Molds differ in the type and number of prime coats that must be applied, however, and machines must be stopped and set up more often for molds requiring special prime coats. Further, molds requiring more priming coats require more machine time for painting to ensure that the coats are evenly applied to the entire piece. Finally, the pieces are inspected for any blemishes.

	Green	White	Total
Number of Molds (per unit)	6	9	15
Priming Coats (per unit)	18	30	48
Painting Machine Hours (per 100 units)	2.50	5	7.50
Painting Direct Labor Hours (per 100 units)	1.50	1.50	3
Painting Setups (Green – Batch of 750 units White – Batch of 250 units)	14	12	26
Painting Inspection Hours (per unit)	0.75	1.25	2

(This table is continued on the next page.)

Table 6 (cont'd)

	DM		DL	
	Green	**White**	**Green**	**White**
Painting	$236,500	$145,850	$51,750	$14,250

Manufacturing Overhead:

	Indirect Labor	Supplies	Machining	Maintenance	Utilities	Other Overhead	Total
Painting	$13,400	$45,000	$84,000	$32,500	$25,000	$31,750	$231,650

These budgeted costs are based on an estimated production of 10,000 units of Green and 3,200 units of White, which is the current production volume and is approximately the total capacity usage desired by top management.

Please select the ONE indirect cost driver that you believe will best allocate Painting overhead costs to products.

POSSIBLE COST DRIVERS

- ☐ Number of Molds
- ☐ Number of Priming Coats
- ☐ Painting Machine Hours
- ☐ Painting Direct Labor Hours
- ☐ Number of Painting Setups
- ☐ Painting Inspection Hours

Table 7 Accounting Feedback Reports with Priming and Prior Success Manipulations

"Better Accounting for Better Decisions"

Management accountants have collected sample observations of the Painting activity to test whether your chosen cost driver of (Selected Cost Driver) is related to the use of manufacturing overhead resources in this activity. The quantity of (Selected Cost Driver) has been documented over the last several weeks while monitoring the quantity of manufacturing overhead resources used. Actual resource usage was recorded and calculated in dollars for ease of comparison. During these observations it was noted that the cost driver increased by 10%, and thus the corresponding observations for overhead resource use were compared to determine whether the overhead costs changed as the cost driver changed.

Indirect Cost Category	Resource Use at Initial Level of Cost Driver	Resource Use at 10% Higher Level of Cost Driver	Percent Change in Cost of Indirect Resources Used
Indirect Labor	$750	$800	7%
Supplies	$2,000	$2,200	10%
Machining	$4,500	$5,000	11%
Maintenance	$1,800	$2,075	15%
Utilities	$1,500	$1,650	10%
Other	$1,250	$1,350	8%

From this test data the management accountants believe that (Selected Cost Driver) do relate to manufacturing overhead costs in the Painting activity and should be used to allocate these costs to the two products. Using this cost driver to allocate manufacturing overhead costs does reduce the estimated cost per unit for Green, and suggests that a competitive reduction in price is possible, while still making a profit.

Participants in the Prior Success/Primed condition receive this feedback report which includes the slogan "*Better Accounting for Better Decisions*" as illustrated.

Table 7 (cont'd)

"Better Accounting for Better Decisions"

Management accountants have collected sample observations of the Painting activity to determine whether your chosen cost driver of (Selected Cost Driver) is related to the use of manufacturing overhead resources in this activity. The amount of (Selected Cost Driver) has been documented over the last several weeks while monitoring the amount of manufacturing overhead resource used. Actual resource usage was recorded and the corresponding costs were calculated in dollars for ease of comparison and relative significance. During these observations it was noted that the cost driver increased by 10%, and thus the corresponding observations for overhead resource use were compared to determine whether the overhead costs changed as the cost driver changed.

Indirect Cost Category	Resource Use at Initial Level of Cost Driver	Resource Use at 10% Higher Level of Cost Driver	Percent Change in Cost of Indirect Resources Used
Indirect Labor	$750	$1,000	33%
Supplies	$2,000	$1,950	-3%
Machining	$4,500	$4,500	0%
Maintenance	$1,800	$2,000	11%
Utilities	$1,500	$1,300	-13%
Other	$1,250	$1,800	44%

From this test data the management accountants believe that (Selected Cost Driver) do not relate to manufacturing overhead costs in the Painting activity and should not be used to allocate these costs to the two products. Thus, the estimated cost per unit for Green has not changed, providing no information as to whether a competitive reduction in price is possible, while still making a profit. In the accountants' opinion it appears that one cost driver will not sufficiently relate to all of these manufacturing overhead costs, and thus this activity would need to be split into separate activity cost pools with separate cost drivers. This, however, is not feasible in the immediate future, since this would entail a significant revision of Michigan's information systems.

Participants in the Prior Failure/Primed condition receive this feedback report which includes the slogan "*Better Accounting for Better Decisions*" as illustrated.

Table 7 (cont'd)

Management accountants have collected sample observations of the Painting activity to test whether your chosen cost driver of (Selected Cost Driver) is related to the use of manufacturing overhead resources in this activity. The quantity of (Selected Cost Driver) has been documented over the last several weeks while monitoring the quantity of manufacturing overhead resources used. Actual resource usage was recorded and calculated in dollars for ease of comparison. During these observations it was noted that the cost driver increased by 10%, and thus the corresponding observations for overhead resource use were compared to determine whether the overhead costs changed as the cost driver changed.

Indirect Cost Category	Resource Use at Initial Level of Cost Driver	Resource Use at 10% Higher Level of Cost Driver	Percent Change in Cost of Indirect Resources Used
Indirect Labor	$750	$800	7%
Supplies	$2,000	$2,200	10%
Machining	$4,500	$5,000	11%
Maintenance	$1,800	$2,075	15%
Utilities	$1,500	$1,650	10%
Other	$1,250	$1,350	8%

From this test data the management accountants believe that (Selected Cost Driver) do relate to manufacturing overhead costs in the Painting activity and should be used to allocate these costs to the two products. Using this cost driver to allocate manufacturing overhead costs does reduce the estimated cost per unit for Green, and suggests that a competitive reduction in price is possible, while still making a profit.

Participants in the Prior Success/Not Primed condition receive this feedback report which does not include the slogan "*Better Accounting for Better Decisions*".

Table 7 (cont'd)

Management accountants have collected sample observations of the Painting activity to determine whether your chosen cost driver of (Selected Cost Driver) is related to the use of manufacturing overhead resources in this activity. The amount of (Selected Cost Driver) has been documented over the last several weeks while monitoring the amount of manufacturing overhead resource used. Actual resource usage was recorded and the corresponding costs were calculated in dollars for ease of comparison and relative significance. During these observations it was noted that the cost driver increased by 10%, and thus the corresponding observations for overhead resource use were compared to determine whether the overhead costs changed as the cost driver changed.

Indirect Cost Category	Resource Use at Initial Level of Cost Driver	Resource Use at 10% Higher Level of Cost Driver	Percent Change in Cost of Indirect Resources Used
Indirect Labor	$750	$1,000	33%
Supplies	$2,000	$1,950	-3%
Machining	$4,500	$4,500	0%
Maintenance	$1,800	$2,000	11%
Utilities	$1,500	$1,300	-13%
Other	$1,250	$1,800	44%

From this test data the management accountants believe that (Selected Cost Driver) do not relate to manufacturing overhead costs in the Painting activity and should not be used to allocate these costs to the two products. Thus, the estimated cost per unit for Green has not changed, providing no information as to whether a competitive reduction in price is possible, while still making a profit. In the accountants' opinion it appears that one cost driver will not sufficiently relate to all of these manufacturing overhead costs, and thus this activity would need to be split into separate activity cost pools with separate cost drivers. This, however, is not feasible in the immediate future, since this would entail a significant revision of Michigan's information systems.

Participants in the Prior Failure/Not Primed condition receive this feedback report which does not include the slogan "*Better Accounting for Better Decisions*".

Current Responsibilities

It has been weeks since the test of the cost driver for the Painting activity and you have returned to your regular responsibilities of managing and monitoring production. You are currently revising and finalizing production schedules, determining personnel needs, working on a project to increase production quality, and evaluating equipment maintenance requirements. You are also dealing with delivery issues and other questions from customers. These duties continue to fill your entire work week.

Top management would like to consider whether it would now be valuable to make revisions to how manufacturing overhead costs are allocated in the other two activities in the production process, Fabrication and Finishing. Even though the manufacturing overhead costs in the Painting activity did not relate to the one chosen cost driver, this does not mean it will be true in these other two activities. Selecting new cost drivers for these activities may or may not be beneficial. New cost drivers for these activities could improve cost estimation for Michigan's products. Cost driver selection, however, takes time which would take you away from your numerous production management responsibilities, and new drivers must be tested, requiring time that could be used elsewhere in the firm. Further, the revision process may not lead to better cost allocations. More accurate cost drivers for these activities might not be available due to data limitations or it might be that the costs incurred in these activities are diverse and cannot be captured with only one cost driver for each activity. Dividing these activity cost pools into more activity cost pools and tracking these activity cost pools and cost drivers is not feasible in the immediate future, since this would require a significant revision to Michigan's information systems.

You have been presented with the budgeted costs of direct materials, direct labor, and manufacturing overhead for these activities in the coming year.

Please open envelope #2, then click Next.

Table 8 Production Process and Overhead Cost Information for the Fabrication Activity

Fabrication Activity

Painted molds are received into the Fabrication process. These molds are assembled in this activity in multiple steps. As molds are combined, workers transfer them through different stations until the molds are assembled into a completed product. The more molds that are required for a product, the more stations are used to combine them. Workers combine many of these molds by hand, but some have to be combined using machinery. Setup for these machines is relatively straightforward and does not require much time to complete. Once all of the molds are combined, products are inspected for any defects. Following these inspections, products are transferred to Finishing.

	Green	White	Total
Number of Molds (per unit)	6	9	15
Fabrication Machine Hours (per 100 units)	1.50	2.50	4
Fabrication Direct Labor Hours (per 100 units)	3	8	11
Fabrication Setups (Green – Batch of 1,750 units White – Batch of 300 units)	6	10	16
Fabrication Inspection Hours (per unit)	1.25	1.75	3

(This table is continued on the next page.)

Table 8 (cont'd)

	DM		DL	
	Green	**White**	**Green**	**White**
Fabrication	$60,500	$48,650	$128,250	$51,750

Manufacturing Overhead:

	Indirect Labor	Supplies	Machining	Maintenance	Utilities	Other Overhead	Total
Fabrication	$29,250	$18,500	$51,850	$15,750	$18,500	$12,500	$146,350

These budgeted costs are based on an estimated production of 10,000 units of Green and 3,200 units of White, which is the current production volume and is approximately the total capacity usage desired by top management.

Table 9 Production Process and Overhead Cost Information for the Finishing Activity

Finishing Activity

Products transferred from Fabrication receive finishing coats of paint. Workers clean these products to prepare them for finishing, and finishing coats are then machine applied to the cleaned products. Machine attachments are used to apply product-specific finishes. These are easily switched and adjusted so that little setup time is required. Different products require different numbers of finishes, resulting in varying requirements for run time on the finishing machines. After the finishes are applied, the products are set to dry. Once dry, products pass through final inspections and are machine tested to see if the finish coats are smooth and the final products are within specifications. Inspection requires more time for products with more finishes. Once the products clear inspection they are shipped by common carrier to customers.

	Green	White	Total
Number of Finishes (per unit)	4	7	11
Finishing Machine Hours (per 100 units)	2	3	5
Finishing Direct Labor Hours (per 100 units)	1.50	2	3.50
Finishing Setups (Green – Batch of 2,500 units White – Batch of 500 units)	4	6	10
Finishing Inspection Hours (per unit)	2	3	5

(This table is continued on the next page.)

Table 9 (cont'd)

	DM		DL	
	Green	**White**	**Green**	**White**
Finishing	$58,000	$40,500	$45,000	$9,000

Manufacturing Overhead:

	Indirect Labor	Supplies	Machining	Maintenance	Utilities	Other Overhead	Total
Finishing	$12,750	$14,750	$49,500	$11,750	$13,250	$10,700	$112,700

These budgeted costs are based on an estimated production of 10,000 units of Green and 3,200 units of White, which is the current production volume and is approximately the total capacity usage desired by top management.

Direct labor costs are being used to allocate manufacturing overhead costs in Fabrication and Finishing to products. If you recommend keeping this cost driver, then you will not be involved with additional revisions to the costing system, and you will return to your responsibilities as the production manager. If you do not recommend keeping this cost driver, then you will continue to be involved in revising the costing system.

- Recommend using direct labor costs to allocate manufacturing overhead costs for Fabrication and Finishing, and return to your production responsibilities.
- Do not recommend using direct labor costs to allocate manufacturing overhead for these activities, and continue to be involved in revising the costing system.

One manager, who is new to Michigan, has suggested using machine hours to allocate the manufacturing overhead costs for Fabrication and Finishing, based on her knowledge of the production process. She believes that machine hours would provide for a more accurate allocation of manufacturing overhead costs than direct labor costs. If you choose to recommend machine hours as the basis for allocating manufacturing overhead costs for both of these activities, then you will not be involved with additional revisions to the costing system, and you will return to your responsibilities as the production manager. If you choose not to recommend this cost driver, then you will continue to be involved in revising the costing system.

- Recommend using machine hours to allocate manufacturing overhead for these activities, and return to your production responsibilities.
- Do not recommend using machine hours to allocate manufacturing overhead for these activities, and continue to be involved in revising the costing system.

To select a cost driver for Fabrication, please refer to the activity information you have been provided in envelope #2 for Fabrication.

Please select the ONE indirect cost driver that you believe will best allocate Fabrication overhead costs to products.

POSSIBLE COST DRIVERS

- ☐ Number of Molds
- ☐ Fabrication Machine Hours
- ☐ Fabrication Direct Labor Hours
- ☐ Number of Fabrication Setups
- ☐ Fabrication Inspection Hours

If you choose to not be involved with additional revisions to the costing system, you will return to your responsibilities as the production manager. If you choose to proceed, then you will continue to be involved in revising the costing system.

☐ Complete your involvement in the revision of the costing system, and return to your production responsibilities.

☐ Continue your involvement in revising the costing system by recommending a cost driver for the Finishing activity.

To select a cost driver for Finishing, please refer to the activity information you have been provided in envelope #2 for Finishing.

Please select the ONE indirect cost driver that you believe will best allocate Finishing overhead costs to products.

POSSIBLE COST DRIVERS

- ☐ Number of Finishes
- ☐ Finishing Machine Hours
- ☐ Finishing Direct Labor Hours
- ☐ Number of Finishing Setups
- ☐ Finishing Inspection Hours

APPENDIX D

Post-Experiment Questionnaire

1. Why did you decide to continue revising the costing system?

Allocate 100 points among the reasons below based on how important each reason was to why you decided to continue revising the costing system, where 0 = Extremely Unimportant and 100 = Extremely Important.

Points Reason

☐ Revising the costing system was important to me

☐ Product cost information was not sufficiently improved to support better decisions

☐ My strong cost accounting knowledge

☐ I was required to continue revising the costing system

☐ I was interested in revising the costing system

☐ It was not important for me to return to my production management responsibilities

☐ My extensive knowledge of how to revise the costing system

☐ I had no other uses of my time

☐ I valued what I learned from revising the costing system

☐ Other: ☐

Total Points

2. After choosing a cost driver for Painting, how successful did you believe that this revision to Michigan's costing system was at improving the costing system?

Extremely Unsuccessful									Extremely Successful
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. Did you believe that additional revision of the costing system after selecting a cost driver for Painting would lead to costing system improvement?

No Improvement									Extreme Improvement
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

4. After you put effort into choosing a cost driver for Painting, did you believe you had made progress towards increasing the accuracy of allocating overhead costs to products?

No Progress									Extreme Progress
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

5. How enjoyable was the task of revising the costing system?

Extremely Unenjoyable									Extremely Enjoyable
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

6. After you put effort into choosing a cost driver for Painting, were you committed to increasing the accuracy of allocating overhead costs to products?

Not Committed									Extremely Committed
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

7. How easy or difficult did you find the task of revising the costing system?

Extremely Easy									Extremely Difficult
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

8. After you put effort into choosing a cost driver for Painting, did you believe you had improved the accuracy of allocating overhead costs to products?

No Improvement									Extreme Improvement
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

9. How important is cost allocation to the success of Michigan's short-term product decisions, such as decisions concerning current contracts?

Extremely Unimportant									Extremely Important
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

10. How important is cost allocation to the success of Michigan's long-term product decisions, such as decisions concerning strategy?

Extremely Unimportant									Extremely Important
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

11. After you put effort into choosing a cost driver for Painting, did you care about increasing the accuracy of allocating overhead costs to products.

Did Not Care									Cared Extremely
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

12. How important do you believe revising costing systems is for firms' success in general?

Extremely Unimportant									Extremely Important
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

1. What is your age? ☐

2. What is your gender?
   - ☐ Male
   - ☐ Female

3. Is English your native language?
   - ☐ Yes
   - ☐ No

4. What is your GPA in the MBA program at Michigan State University? ☐

5. What is your GMAT score? ☐

6. What is your concentration in the MBA program? ☐

7. How many university-level accounting courses have you completed in current or previous degree programs? ☐

8. When you received test data concerning the cost driver you recommended for Painting, did the management accountants recommend using your selected cost driver?
   - ☐ Yes
   - ☐ No

9. How many months of post-baccalaureate work experience do you have? ☐

10. How many months of work experience do you have doing accounting? ☐

11. How many months of management experience do you have? ☐

12. How often have you made (or been part of a group that made) product pricing decisions?

Never									Extremely Often
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

13. How often have you made (or been a part of a group that made) decisions about product mix or volume?

Never									Extremely Often
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

14. How familiar are you with activity-based costing in a classroom setting?

Extremely Unfamiliar									Extremely Familiar
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

15. How familiar are you with activity-based costing in a non-classroom setting (e.g., in a firm)?

Extremely Unfamiliar									Extremely Familiar
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

16. How familiar are you with product costing systems in a non-classroom setting (e.g. in a firm)?

Extremely Unrealistic									Extremely Realistic
1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

17. How much effort did you put into completing this exercise?

No Effort 1	2	3	4	5	6	7	8	9	Extreme Effort 10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

18. How interesting did you find this exercise?

Extremely Uninteresting 1	2	3	4	5	6	7	8	9	Extremely Interesting 10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

19. How relevant did you find this exercise?

Extremely Irrelevant 1	2	3	4	5	6	7	8	9	Extremely Relevant 10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

20. How satisfied are you with your participation in this exercise?

Extremely Unsatisfied 1	2	3	4	5	6	7	8	9	Extremely Satisfied 10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

21. How realistic did you find this exercise?

Extremely Unrealistic 1	2	3	4	5	6	7	8	9	Extremely Realistic 10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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Thank you for your participation.

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