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An Experiential and Integrative Approach to Problem Solving and Decision Making

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Abstract

This paper describes an integrative, experiential approach to teaching problem solving and decision making from two different perspectives: prescriptive theory using "quantitative" tools and models, and behavioral theory. Behavioral theory addresses both the cognitive and affective domains of information processing - what the decision maker does and how decisions are affected by habitual factors, personal values, psychological aspects, organizational context and external and internal pressures. The results of an online survey of the alumni of the first eight EMBA groups of a West Coast University using this approach are discussed. The survey provided data on three main areas concerning the respondents': (1) decision making practices; (2) the nature of their decision making environment and (3) thoughts and reflections on the impact of the course. It appears that integration of behavioral and quantitative approaches is effective since the participants considered themselves to be good or effective decision makers. The alumni said that an integrated behavioral and quantitative approach to decision making is valuable in assessing their internal decision making capabilities. They feel more in charge rather than allowing outside or environmental factors influence their decisions and have more than an intuitive grasp of a structured approach to decision making. This lends credence to the fact that executive education that considers human and quantitative factors, in combination, is desirable for reducing defects in decision making. The resultant action taken by decision makers, such as managers and CEOs, will become more streamlined and efficient. Nevertheless, to fully judge

the impact of this approach further systematic confirmatory research in other institutions and environments is recommended.

Introduction

Learning, motivation, decision-making, and executive intelligence involves problem solving in a variety of ways and on many levels (Senge, 1990; Herzberg, 1987). Senge (1990) states, "mental models are deeply ingrained assumptions, generalizations, or even pictures of images that influence how we understand the world and how we take action" (p. 8). A manager's work, including planning, scheduling, and coordinating, inevitably results in some kind of problem solving, whether it be solving a concrete and specific existing problem or anticipating the future and planning for the future. Ultimately, articulation of a decision has to be made. Therefore, decision-making and problem solving are core functions of management and the ability to articulate and assess decisions to be made requires a highly motivated state. Combined with experiential learning, and emotional and executive intelligence, an experiential approach we believe will provide greater management participation, and focused quantitative and qualitative problem solving and decision making.

Problem solving and decision-making are studied by many different disciplines, each of which seems to regard it as uniquely its own. Neuroscientists in Germany, Norway and the U.S. analyze the distinctive cerebral activity foreshadowing our choices. These researchers state we learn from perception and important experiences to plan ahead and act on incomplete information (Soon et al., 2008). Soon and colleagues now show that brain activity predicts up to seven seconds ahead of time how a person is going to decide. Economists construct axiomatic models that describe market forces and their effects, operations researchers model problems encountered in specific enterprises, applied statisticians analyze data in order to describe the underlying system or infer characteristics of the system, and cognitive and applied psychologists examine the information processing tendencies of managers. We believe that managers who draw from all these approaches can make better decisions.

The information in much of the decision making literature has been on describing the decision making process, rather than on providing prescriptive models. Simon et al., (1987) state, "Central to the body of prescriptive knowledge about decision making has been the theory of subjective expected utility (SEU), a sophisticated mathematical model of choice that lies at the foundation of most contemporary economics,

theoretical statistics, and operations research". The key, therefore, is to use both descriptive and prescriptive approaches.

This paper describes an integrative approach to teaching problem solving and decision making from two different perspectives: prescriptive theory using "quantitative" tools and models, and behavioral theory. Behavioral theory addresses both the cognitive and affective domains of information processing - what the decision maker does and how decisions are affected by habitual factors, personal values, psychological aspects, organizational context and external and internal pressures. Behavioral theory also addresses the content, process and reinforcement theories of motivation (i.e., reasons for and changes in behavior, and how to sustain a particular behavior). Whenever one learns intellectually, there is an inseparable accompanying emotional dimension. The relationship between intellect and affect is indestructibly symbiotic (Brown, 1971). While decisions can be made "ad hoc" based purely on intuition, judgment, and experience, decisions can also be made by creating a symbolic/abstract model, which is then "solved" analytically, and the results are inferred back to the original decision situation. This latter approach is known as the quantitative modeling, or management science, approach.

We describe a course where these two different approaches of the decision-making process are integrated – a quantitative approach, which is concerned primarily with learning how to use quantitative tools and models to improve the efficiency and effectiveness of decisions, and a behavioral approach, which is concerned primarily with gaining a better understanding of the subjective side of decisions. In other words, how a person's behavioral tendencies influence the choices they make ultimately shapes their decision making capabilities. This, in turn, affects one's ability to frame the quantitative-prescriptive model with *affect* and an *intuitive grasp* of making judgments and decisions. This distinction between the quantitative approach which is "rational," and the behavioral approach which is "intuitive" is the 'linking pin' of our approach. The synthesis of both the qualitative and quantitative aspect of decision making theory aligns rational thought into a queue with behavior/intuition thus creating mastery in the decision making process. We propose that developing creative and analytical skills for making decisions across a range of managerial settings, specifically on *problem solving in day-to-day operations of the enterprise* is essential. Focusing on the human dimension and developing a greater awareness of and appreciation for the non-rational aspects of decision-making will describe the evolution and experience we have had with eight groups (over 150 individuals) of

Executive MBA students at a West Coast university. The evolution of the course was not without challenges presented by attempting to blend the two approaches to problem solving and decision making. For example, behavioral factors are much more loosely defined whereas the quantitative modeling approach fundamentally depends upon the availability of precise, relevant and accurate data. We also recognize the inherent difficulty in measuring the quality, or indeed the effect, of a decision, i.e., was the decision a "good" decision. Even if data are available, the decision is only as good as the data that it is based upon. This however, may be a limitation of any decision regardless of how it was made. Integrating these two approaches in a meaningful and useful fashion, and thereby broadening the inputs to the decision making/ problem solving process was always a goal and addressing these challenges is the focus of this paper.

The rest of the paper is organized as follows: first, we provide a quick overview of the quantitative modeling approach to problem solving and decision making, with a discussion of the advantages and limitations of this approach, followed by an overview of the behavioral approach to problem solving and decision making. Next, we describe the evolution and challenges of an Executive MBA course titled "The Manager as a Decision Maker" that integrates behavioral and quantitative modeling elements in problem solving and decision making. In the following section, the impact of the course is investigated by surveying the opinions of some 150 alumni of the course, and the paper concludes with a discussion of the merits of this approach.

Review of Related Literature - The Quantitative Modeling Approach to Decision Making

This section adapts and extends the discussions found in typical Operations Research / Management Science (OR/MS) textbooks, primarily Eppen and Gould (1998), but also including Anderson, Sweeney, Williams (2006), Ragsdale (2008) and Taylor (2007).

Numerous examples of successes, arranged by industry, function and benefit of using a modeling approach for decision support can be found on: http://www.scienceofbetter.org/ and http://www.bnet.com/2436-13241_23-188245.html. The modeling process can be summarized in Figure 1. Instead of decisions being made "ad hoc", based purely on intuition, judgment, experience etc., (i.e., directly in the real world – left

side of diagram) decisions are made by creating a symbolic/abstract model ("abstraction") which is then "solved," usually using some analytical techniques ("analysis") and the results are inferred back to the original decision situation ("interpretation"). This is the path from upper left to upper right, to lower right and back to lower left in Figure 1. Behavioral issues requiring managerial judgment, experience and intuition are essential to be considered in all aspects of the process – the better this judgment, experience and intuition is reflected (or incorporated into the model) the better the decision support provided by the model.

Figure 1: The Modeling Process

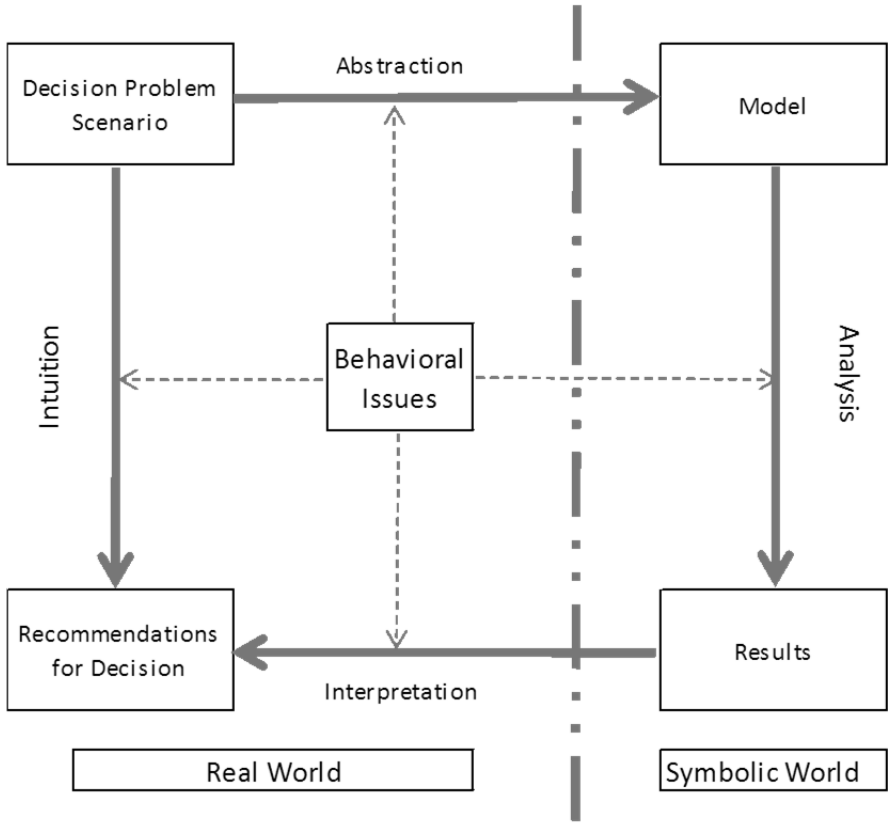

Figure 1 displays the quantitative modeling approach to decision making through the steps of Abstraction, Analysis and Interpretation.

Advantages of Using Models

1. They are less expensive and less disruptive than experimenting with the real world system. Decision alternatives can be evaluated in the "safe" environment of a symbolic model or Excel spreadsheet.
2. Often, *optimal* (as opposed to "good" or "satisfying") decisions can be obtained with appropriate analysis.
3. The modeling process forces a systematic approach to problem analysis. The methodology and rigor required for this systematic approach to problem solving and decision making forces managers to confront situations head on and in much greater precision and depth than in the ad-hoc approach. Managers must be specific and precise in statements of objectives, constraints, trade-offs etc., thereby improving the quality of the decision.
4. Once a model is built managers can ask "what if?" questions. If a computer implementation of the model is created almost unlimited "what-if" scenarios can be systematically investigated and evaluated. We can also do "sensitivity analysis," which can provide insights into the problem / situation under investigation with respect to any (future) changes. This is particularly easy to do if the model is implemented in an Excel spreadsheet environment.
5. Uncertainty can be incorporated (i.e., simulated) into the model and the results obtained and consequences of the uncertainty expressed in terms of probabilities.
6. In complex situations models can help reduce the time needed to evaluate decisions.
7. Models can save costs if good alternatives or solutions are chosen or evolved.
8. Behavioral issues can be integrated into the model if they can be identified and suitably coded.

Research has shown that the benefit and usefulness of decision making improves significantly when the modeler is also the decision maker (see, for example, Leon et al., (1996), Powell (1995), (1997), (2001) or Roy et al., (1989)). Today, managers have extremely powerful, ubiquitous and user friendly tools on their desktop to help with the modeling and decision making process, (most notably, Excel, which includes the Solver optimizer and various add-ins for automating simulations are available). Therefore, problem solving and decision making is no longer the purview of "white-coated technicians" with special skills.

Limitations of Using Models

Models should behave like the real world system they are representing. In other words, if the same set of inputs is entered into the model as in the real situation the model should return the same responses as experienced in the real situation. Problems with the modeling approach can occur at any of the three stages labeled Abstraction, Analysis and Interpretation in Figure 1.

1. Probably the most serious limitation is during the abstraction phase. Since models are simplifications of reality, they will, by definition, include assumptions. Clearly, if these simplifications or assumptions are inappropriate, too broad, or too restricting the model will not be a meaningful representation of reality and any recommendations made based on the model will be invalid. It is therefore necessary for the modeler to work closely with the end-user/client to question all assumptions and verify that the model does indeed adequately and meaningfully reflect the real situation.
2. Quantitative models require data for the abstraction phase. If the data are unavailable, obsolete, or simply incorrect any recommendations made based on the model will be invalid. This is particularly true for modeling behavioral issues.
3. During the analysis phase if an inappropriate solution technique is used, or applied incorrectly, it may not be possible to obtain a solution or else, even if a solution is found it is likely to be invalid. Examples of this could be due to mundane issues, such as reversed inequalities in Solver constraints, or more serious logic or omission problems. As the complexity of the model increases greater modeling skills and experience are required of the modeler which may require additional training on the part of the modeler.
4. Finally, during the interpretation phase, assuming the model was a correct representation of the scenario under investigation, if the solution values generated are not interpreted correctly back to the original decision problem in a meaningful way (i.e., so that the end-users, understand the solution and its implications) any value-added to this modeling approach will be lost. The end users need to see that the solutions generated do not violate any of the conditions or rules stated and also include their preferences.

5. In particular, behavioral issues may be difficult to identify and suitably quantify and invariably some approximations will be required.

In a more general discussion of the limitations of models it should also be noted that (a) models may be expensive and time consuming to develop and test and (b) models are often misused/misunderstood/feared because of their quantitative nature and mathematical content. Also, not all decision problems can be meaningfully addressed using quantitative models. While quantification of subjective behavioral information can be made in some situations scenarios relying almost exclusively on subjective ideas and concepts may not be adequately captured by a quantitative (mathematical) model. Broadly speaking however, most operational type problems, that often have a behavioral component, can readily be modeled (and solved) using quantitative models, as long as relevant data are available.

The Behavioral Approach to Decision Making

On the behavioral side, decision making is investigated from the perspective of how the decision maker is influenced by non-quantitative information, such as individual information processing tendencies, personal values, organizational culture, emotional intelligence, intuition, personalities and other behavioral factors. In fact, the inclusion of such variables reduces and limits the possibility of a 'toxic decision making process' which could lead to negative emotions. Therefore, a more productive and positive emotion producing strategy would be to use both the cognitive and affective domains of decision making behavior. This can be very subtle and produce the dynamic properties of emotions and intuition. Ultimately, it is our intent to address the role of both prescriptive and descriptive approaches to decision making to reduce and eliminate counterproductive, negative emotions and decisions while accelerating qualitatively more efficient and effective problem solving and decision making strategies. There is great value in understanding the individual's values and decision making strategies.

In this course we have approximated a model of behavioral decision making strategies since there is no conclusive behavioral decision model that integrates both the behavioral and quantitative variables together. An advantage is that the present model is innovative and flexible which allows for the creative application and dissemination of ideas. An

inherent difficulty nevertheless remains in that linking the behavioral variables to the quantitative variables is usually dependent upon a wide array of factors and their interpretation.

Methodology

Integrative Design of the Course - Background

The course is taken in the second semester of the first year on a 2-year lock step Executive MBA program at an AACSB accredited West Coast university. The class meets for a 4-hour session every other weekend and is team taught by two instructors, one with a Ph.D., in organizational leadership and the other with a Ph.D., in operations research. Slightly more class time is devoted to the quantitative teaching simply because the skill building takes more time: each 4-hour session typically devotes about 1 – 1½ hours to the behavioral side and 2½ - 3 hours to the quantitative side, but both instructors are present during all classes and interrupt each other to make or emphasize points at appropriate times.

Learning Objectives

The learning objectives for student performance as stated on the syllabus are as follows. On completion of the course the student should be able to:

1. Diagnose and evaluate organizational decision-making issues, and separate symptoms from issues.
2. Understand both prescriptive and behavioral aspects of problem solving and decision-making.
3. Develop creative problem solving and decision-making skills, particularly since the demand for creative solutions goes up as the world becomes more complex.
4. Apply and use both quantitative and qualitative decision making tools in addressing a variety of organizational and managerial problems and issues.
5. Integrate the use of quantitative techniques and computer models into the decision-making process and be aware of the strengths and limitations of the quantitative techniques used.
6. Present cogent, well-supported solutions to decision problems.

The course integrates two different but related decision making theories: (1) prescriptive (normative) theory that views the decision maker as a maximizer of expected value; and (2) behavioral theory which makes prescriptive decision more descriptive of what the decision makers actually do.

The quantitative/modeling strategies implemented in the course are as follows:

Some typical decision making problems are investigated from problem statement through to solution analysis. Decisions are developed using a modeling approach for both deterministic (data are available and known with certainty) and probabilistic (uncertain) problem scenarios. The approach taken by this part of the course is very practical and applied. Problem solution concepts and techniques are introduced and illustrated using small examples and extended to larger problems which require the use of decision support software, specifically Microsoft Excel, Solver and Crystal Ball. The deterministic models are restricted to be linear, although integer and non-linear situations are mentioned in passing and focus on operational type problems encountered in organizations. The course title is The Manager as Decision Maker and the decisions are carried out by the students, in a modeling medium that is ubiquitous, namely Excel and using Solver (inside Excel) as the optimizing engine. For the probabilistic scenarios students develop their models in Excel and use Crystal Ball to identify uncertain data (and the distributions that they may come from). Crystal Ball then uses Monte Carlo simulation to provide results for whatever measures of performance were chosen.

The behavioral strategies and techniques implemented within the course are as follows:

1. Show the difference between problems and solutions by using an Organizational Iceberg Model. This facilitates the making of more critical individual and organizational decisions to process information related to solving the 'real' problems within organizations and design guidelines for future problem solving and decision making.
2. Introduce Ishikawa's Cause and Effect Diagram implementing a "Fishbone" diagram to have students problem solve and break down larger problems into solutions and recommendations. This examines the decision making paradigm thus showing the need for an information processing strategy to reduce inefficient time spent in the decision making process.

3. Integrate the concepts of “Groupthink” as detailed in the Challenger and Columbia shuttle disasters as a way to recognize both symptoms of “Groupthink” and ways to resolve complex decision making issues in organizational situations. Application and discussion to real case studies such as, Enron, WorldCom, Iraq War, Iran-Contra Affair, Abu Ghraib Prison, Kennedy's Bay of Pigs, the Cuban Missile crisis, and Hurricane Katrina, to mention a few, are integrated into individual assignments. The difference between 'self-interest' decisions and decisions which affect 'group behavior' and 'organizational policy' are investigated.
4. Alternative courses of action, and reframed decisions, are researched and recommendations made based upon the value of an outcome which is more favorable and entails less risk.
5. Discussion of prescriptive, descriptive and normative approaches to decision making are exemplified and applied to different organizational contexts.
6. Use of the Kiersey Temperament Sorter (MBTI) is incorporated to understand different managerial decision styles and ways managers make decisions in interpersonal and organizational contexts. Patterns of group communication and decision quality of decision making groups based on personality styles is investigated. Discussion and analysis of decisions and how situational pressures can influence managers in promoting appropriate decision styles and ways of communicating differences to colleagues is discussed and evaluated to improve group outcomes.
7. Differences between symptoms and problems related to stress are also discussed to show how internal and external stress factors influence both individual and group behavior. These differences include the degree in which individuals use innovation, flexibility, and responsiveness to improve communications within their department and organization.

The behavioral process and insights that we explore in the course provides a broader set of inputs for students in their problem solving and decision making and the synthesis of behavioral and quantitative information we conclude should lead to more productive outcomes.

Experiential Nature

Both the behavioral and quantitative instruction is highly experiential. On the behavioral side, for example, students in small groups choose a problem and analyze cause and effect by creating a suitable Ishikawa (or fishbone) diagram. Each group shares their problem and solutions with the class and discuss how this method can be applied and integrated into real world situations. Decision styles role playing with incorporation of the Kiersey Temperament Sorter is a significant component within the behavioral/human factors area.

Leadership/managerial/decision styles include: ST (sensing-thinking), NT (intuition-thinking, SF (sensing-feeling) and ST (sensing-thinking). A review of both the disadvantages and advantages of each style in relation to the other styles is analyzed. Students are divided into groups according to their decision styles and a comprehensive discussion ensues on how to interact with members of each of the other three groups. This results in an increased understanding of how to interact with colleagues and integrate qualitative material into the quantitative component of the modeling process.

On the quantitative side, prior to each class meeting students are provided with a small decision making problem (called a “mini-case”) for which they are required to submit their recommendations (via e-mail) to the instructor three days before the class meets. The quality of these recommendations provides the instructor with information on how to pitch the upcoming class, which usually starts by addressing the issues presented in the problem. The mini-cases increase in difficulty as the course progresses and are used to introduce most of the quantitative material on the course. Students are allowed to make as many resubmits of these mini-cases as they wish. They receive feedback after each submission. The first submission (3-days before each class) is "free" whereas each resubmission thereafter costs the student a point penalty. Each mini-case is graded out of 5 points and students are able to score all 5 points, as long as they do not incur any penalties. By addressing the decision making problem prior to class the students experience some of the difficulties firsthand. The idea being that class time will then be more productively utilized in that the students will be seeking solutions or explanations to the difficulties they encountered.

Course Deliverables

During the course, two take home assignments of decision problems of larger dimension and complexity than the mini-cases are set. Each decision problem starts with a prescriptive approach and solution. After a solution has been obtained, situations and/or additional information or data are presented to illustrate the impact of *behavioral elements* and how these might change the recommendations provided by the quantitative model.

For example, students investigate the problem of RN staffing in an ER based on the average number of cases passing through the ER on each day. Students build a model of the ER scheduling problem which includes various constraints (such as the RNs working a 5-day on, 2-day off schedule, the required number of RNs on each day and restrictions on the number of RNs available) and the associated costs (e.g., the RNs receive bonus pay for weekend shifts compared to Monday through Friday shifts). They use their model to determine optimal schedules under various objectives: (1) from the point of view of the hospital management, i.e., to minimize costs and (2) from the RN's point of view i.e., to maximize the RNs preferences since a survey found that the RNs prefer schedules that do not include a weekend day at work so that they can spend time with their families. Students are required to discuss the tradeoffs. After the 'base problem' is solved, further behavioral considerations are introduced for discussion of whether they could be captured by an amended model and how. For example, how a requirement such as religious preferences of the multiethnic RN team could be accommodated since some RNs would prefer not to work on Fridays, some on Saturdays and some on Sundays, based on their religious beliefs. From a modeling point of view this would require obtaining data on the RNs religious affiliation and creating a few more constraints in the model. From the management point of view the issues concerning fairness, possible favoritism or discrimination, as well as increased costs would be significant. The model could be used to carefully evaluate alternatives in the safe environment of a computer model and provide support and insights to any eventual decision. In some cases, depending upon the complexity of the problem under investigation, mainly to cut down on student modeling time they are allowed to discuss and explain in detail what they would do (as opposed to actually building the model) to address the behavioral issues. In this event a structured approach is taken where, for example, students have to name two behavioral issues that may affect the models and recommendations they

made previously. Then the discussion of each behavioral issue is required to address each of the following: (i) how each issue named could be included in the model; (ii) what data, if any, would be needed and how could it be obtained and used to enhance the model; (iii) if it is felt that an issue cannot be modeled, or it would be inappropriate, it must be explained why not; (iv) how could each of the issues named be incorporated into the eventual decision and recommendations; (v) what improvement, if any, would including the named behavioral issues provide to the quality of the decision and recommendations?

As a further illustration of the experiential nature of the course, in addition to the written report for these take home projects, an "interactive model verification" is carried out at the start of class on the due date. This is an important aspect of the assessment process, which tests if the models the students have created are robust enough to cope with minor changes and tests whether they understand the implications and meaning of the results obtained. Students are asked a few (4 to 7) questions that involve running or interpreting their models on their laptop computers. The questions are time constrained: typically one minute per question is allowed. None of the changes for the interactive verification requires rebuilding the model or making substantial structural modifications to the model – just relatively simple changes to the various input data. Students who develop good robust models generally have no difficulty evaluating the consequences of these changes. Questions are phrased so that students can write in a simple answer on the sheet and submit it with their report.

The Project

Much of the earlier part of the course is preparation for the Problem Solving/Decision Making Project. The purpose of the project is to provide students with experience in problem identification, problem definition, and problem solution in order to make an appropriate decision which includes both quantitative and behavioral issues. Students work in dyads to integrate and solidify the behavioral and modeling components of the course by analyzing an *operational type problem area or decision-making scenario*. Students are required to choose a decision scenario related to their work environment for which they will have access to relevant data.

Experience has shown that problem identification and articulation is probably the most difficult, yet crucial, components of the entire decision making process. Integrating dimensions of personal meaning and

relevance is essential when analyzing personal and interpersonal affective experiences into the subject matter. To help with developing the project proposal, students are required to engage in some role playing within their two-person groups. One person's role is to be the "client" (who poses the decision problem) and the second person's role is to be the "consultant" (who is brought in by the client to address the decision problem). The client's role is to articulate exactly and precisely what the decision problem is and what are the specific decisions to be made. The consultant's role is to understand the decision problem and separate the symptoms from issues, in order to identify the underlying essential decision making issues. During this process coaching sessions are incorporated for each client-consultant group to assist in formalizing and processing the definition of the problem and resultant strategies needed to implement and execute the study. A one-page project proposal is written by the consultant (only) of the specific decision problem to be investigated. The idea is that, based on the problem description by the client, the consultant should understand the decision scenario sufficiently to be able to succinctly explain it to a third party (the instructors). The project proposal is either approved, or returned for resubmission (for further role playing), based on the clarity of the problem description, the identification of the underlying essential decision making issues and the richness of the integration of the course concepts and techniques into the problem scenario. Students cannot start work on the project until they have their proposal approved by both instructors and on occasion it is necessary to have as many as two or three iterations until the project is approved.

Once the project proposal is approved students work, in dyads, to solve the decision problem. Their observations and analysis are expected to encompass the concepts and ideas studied during the course and the eventual deliverable, the project report, must address prescriptive and behavioral concepts. Students are encouraged to continue with the "client" and "consultant" roles for clarification-type purposes, while working on solving the decision problem but the actual workload is intended to be equally shared. The project report is assessed on the richness of the integration of the course concepts and techniques (prescriptive and behavioral) into the problem scenario chosen; the appropriateness and correctness of the problem analysis including the usability (i.e., user-friendliness) and documentation of any models developed. A crucial section of the report is a critical analysis of the process, content and the impact of the recommendations.

The various stages of the project, from problem articulation through to model implementation and submission of recommendations and the report provide a direct mapping over to each of the course objectives stated above. So in terms of achieving the course objectives we conclude that, subject to the natural variability in performance across students, the project accomplishes this without any doubt. Some titles of past projects that clearly integrated the quantitative and behavioral aspects of decision making are:

- Optimal land use plan for Desert Estates.
- Skilled caregiver schedule in a home healthcare setting.
- The best mix of fulltime and contract recruiters during Baxgen's 5-year growth plan.
- Annual employee review: merit adjustment planning.
- Minimizing the number of guest complaints at the Marriott hotel.
- The best staffing schedule for the After Thanksgiving Holiday Sale.
- Improving access and service for Kaiser's same day appointment service.
- Development of a profitable mixed-use project in downtown LA.

Experience with Teaching the Course

On the quantitative side probably the single most challenging difficulty with teaching the course is the wide spectrum of students' quantitative and computer experience and abilities. While none of the groups were large, ranging from 14 to 27 students, every single group had a wide distribution of these skills with notable long tails particularly at the lower end. Various methods were used over the years to bring those in the lower tail up to par, most usually with workshops and with tutors. Nevertheless those in the lower tail were typically often struggling with their quantitative skills and that pressure perhaps detracted from their ability to see the big picture integration that the course was focusing on. On the other hand while many of those in the upper tail usually produced excellent work that on occasion dramatically demonstrated the integration of quantitative and behavioral issues in some cases there may have been scope for even more spectacular results if the entire class had their abilities.

Somewhat related to the previous point: the first few times the course ran the project groups were of 3 to 5 persons. The groups were self-selected and invariably each group had a "quant expert" to handle the quantitative modeling load. In practice, this often meant that this person ended up doing the majority of the heavy lifting in terms of the entire modeling process with the others often simply taking on a minor, passive assistant's role. So, at the extra cost of having more projects for the instructors to manage, the last five or six years the projects were carried out in dyads with the role playing as described above. Again these groups were self-selected where usually one person was stronger on the quantitative skills. This is not entirely surprising but again speaks to the fear that many students have of anything requiring quantitative skills. The course requires extensive instructor support outside of class, and not only on the quantitative side. Especially once the students are working on their projects both instructors typically are inundated with requests for advice and opinions at both micro and macro level. It is largely a coaching and mentoring role on the part of the instructors but is very time consuming.

The challenge in integrating the behavioral component (e.g., stress) into the quantitative model creates additional questions. For example, would changing a sidewalk traversing through an office park/housing project decrease or increase the amount of real stress an individual might experience? Would this increase and/or decrease efficiency or productivity in the work/home environment possibly affect work-life balance? Ergonomic issues such as these could play a major role in the redevelopment of an architect's blueprint within a personal or business environment. Reengineering in a business environment and in the corporation has been addressed by Hammer and Champy (2003). However, they did not take the behavioral and human elements into consideration. Our approach to decision making takes into consideration both the mechanistic and structural aspects of reorganizing a business as well as integrating behavioral variables for maximizing changes.

Results - Impact of the Course

One-hundred and fifty-three (153) requests to complete an online survey were sent out to all alumni on record of the first eight EMBA groups. Seventy-one (71) responses to the survey were obtained and 67 were useable resulting in a response rate of 44%. The survey provided data on three main areas concerning the respondents': (1) decision making practices; (2) the nature of their decision making environment and (3)

thoughts and reflections on the impact of the course and these are displayed in Tables 1, 2 and 3 respectively. In the following we consider the "strongly agree/disagree" (=1 point) and "somewhat agree/disagree" (=5 points) responses together to make some general observations.

Table 1
Decision Making Practices

When I make decisions I usually:-	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Average	Standard Deviation
Outsource the decision from a consultant	0	8	7	20	32	4.1	1.0
Solicit input from stakeholders	53	10	2	1	1	1.3	0.7
Gather data/information relating to the decision	59	8	0	0	0	1.1	0.3
Gather as much data/information as possible relating to the decision	40	24	2	1	0	1.5	0.6
Review/analyze the available data to help me better understand the problem	52	15	0	0	0	1.2	0.4
Review/analyze past procedures to help me better understand the problem	37	26	3	1	0	1.5	0.7
Test out / work through / discuss with colleagues various alternatives prior to making the decision	27	35	4	1	0	1.7	0.7
Test out / work through / discuss with subordinates various alternatives prior to making the decision	17	44	3	2	1	1.9	0.7
Test out / work through / discuss with superiors various alternatives prior to making the decision	25	29	11	2	0	1.9	0.8
Bear in mind (try to accommodate) company or department policies and priorities	40	20	5	2	0	1.5	0.8
Bear in mind (try to accommodate) the personalities of the individuals affected by my decision	18	32	14	3	0	2.0	0.8
Bear in mind (try to accommodate) my boss's or superior's anticipated feeling's regarding the decision	26	27	13	1	0	1.8	0.8

Table 1 displays the responses concerning the respondents' decision making practices.
1 = Strongly Agree; 5 = Strongly Disagree.

Table 2
Decision Making Environment

In my usual job function I regularly have to make decisions where:-	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Average	Standard Deviation
Substantial data are available (e.g., personnel/job/transportation scheduling, production planning, pricing)	18	34	4	7	3	2.1	1.1
Little or no data are available (e.g., behavioral, ethical, artistic/design/creative decisions)	14	23	11	13	5	2.6	1.2
There is a crisis requiring immediate implementation (e.g., triage,"fire fighting" decisions)	24	27	9	2	4	2.0	1.1

Table 2 displays the responses concerning the nature of the respondents' decision making environment
1 = Strongly Agree; 5 = Strongly Disagree.

On decision making practices, it appears that the majority of respondents actively participate in decision making since some 77% of respondents (52/67) disagreed with the statement that "when I make

decisions I usually outsource the decision to a consultant". Most of the respondents claim to follow good practices when making decisions. Specifically, 94% (63/67) solicit input from stakeholders; 95% (64/67) claimed to "gather as much data/information as possible relating to the decision" and significantly all (67/67) respondents claimed to "gather data/information relating to the decision" as well as "review/analyze the available data to help them better understand the problem."

The majority do not appear to make their decisions in isolation since they claimed to "test out /work through various alternatives with colleagues (92%)(62/67), subordinates (91%)(61/67) and superiors (81%)(54/67).

Similarly, the majority appears to be cognizant of their environment in their decisions since they "bear in mind and try to accommodate" company or department policies and priorities (90%) (60/67), the personalities of individuals affected by their decision (75%) (50/67) and their bosses' or superiors' anticipated feelings regarding the decision (79%) (53/67).

Regarding the nature of their decision making environment it appears that data availability in the respondents' decision environment covers the entire spectrum from substantial hard data available for 79% (50/66) respondents to little or no data available as for behavioral, ethical and artistic/design/creative decisions for 56% (37/66) of the respondents.

In terms of achieving the course objectives we feel that the course has been a success, or at the very least had an impact the alumni have to problem solving and decision making. The vast majority believe that it is important to include both behavioral considerations (97%) (63/65) and quantitative considerations (98%)(64/65) in decision making. 78% (51/65) believe that the MBAP 624, The Manager as a Decision Maker, course has had an impact on their decision making (79%)(51/65) and 72% (47/65) consider themselves "good/effective" decision makers.

Since the course has slowly evolved and adjustments were made over the years, the data was also looked at chronologically, by year of graduation, to see if there were any trends in the responses. However, as far as their decision making practices, the decision making environment and thoughts on the course were concerned there were no significant differences between the years.

Table 3
Perceptions Resulting from the Course

I think that:-	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree	Average	Standard Deviation
It is important to include behavioral considerations in decision making	38	25	1	0	1	1.5	0.7
It is important to include quantitative considerations in decision making	46	18	1	0	0	1.3	0.5
The MBAP624 course (The Manager as a Decision Maker) has had an impact on my decision making	24	27	12	2	0	1.9	0.8
Based on the information in the MBAP 624 (The Manager as a Decision Maker) course I consider myself to be a "good/effective" decision maker	22	25	16	2	0	2.0	0.8

Table 3 displays the responses concerning the nature of the respondents' thoughts and reflections on the impact of the course
1 = Strongly Agree; 5 = Strongly Disagree

Finally, we solicited some open ended feedback to the question "what have you done differently with respect to decision making as a result of the course?" Forty eight responses were obtained and a selection of these by year of graduation is displayed in Table 4. The vast majority of comments were positive with respect to the impact the course had and/or continues to have on their decision making. Looking at these comments may provide insights to managers who may be intrigued by the approach presented in this paper of combining behavioral and quantitative approaches to problem solving and decision making. The comments can be loosely put into three groups: (1) those stating that the course made them more aware of the need of considering either more data/ hard numbers or more behavioral dynamics than they would have previously; (2) those stating that they actually have used either the tools or concepts in their decision making, either improving their analytical skills or including consideration of personality types, views of other individuals and stakeholders; and (3) having a broader or more comprehensive approach to decision making. While the sixth learning objective may not be fully assessed by the survey, at least the first five objectives have, over time, been successfully achieved. Alumni of the course have indeed "applied and used both quantitative and qualitative decision making tools in addressing a variety of organizational and managerial problems and issues" [learning objective 4] and are "able to integrate the use of quantitative techniques and computer models into the decision-making process and be aware of the strengths and limitations of the quantitative techniques used" [learning objective 5]. We submit, therefore, that although currently there is no universally accepted decision making model that combines both approaches, based on our exploratory experiences with

this course this has potential benefit and impact for managers and would be a noteworthy endeavor for future research.

Table 4
What have you done differently with respect to decision making as a result of the course?

Graduated	Response
2002	Maintaining good, strong communications with both superiors and subordinates has resulted in making the decision process more tolerable in that a "buy-in" is almost always assured if folks are involved. Whether there is a positive or negative affinity to the decision, it's more acceptable to all if they were part of the process.
2003	Looked at a problem from more than one point of view.
2003	I thoroughly review all options available first!
2004	Looked and reviewed data more closely
2005	Balance hard data (numbers) and soft data (behavior) as inputs to decision making in order to make decisions that will create sustainable performance improvement.
2005	Better balance of data/analytics/priorities/needs of business vs. people/behaviors/communications
2005	I consciously take statical factors and emotional/personal/personel factor in to consideration where previously I probably would not of given it much thought. It was a unique class to put those two considerably different approaches in making decisions and more or less force using them together.
2005	Become more cognizant of stakeholder's and their ability to make or break a decision.
2006	Relied more on creating and presenting data as part of the decision-making process and to support my recommendations. It has helped me become a valuable member of the dept I work for particulary since the some of the managers and executives lack business and managerial experience. On the other hand, because they lacked those skills, they are not able to appreciate the importance of data and how to use it when communicating with senior executives.
2006	It's has been several years since I have taken that course. The current business environment that I am currently in is leading up to the specific quantitative and qualitive data that will be readily available to make decisions. Mostly we have been making decisons from past experiences coupled with some behavioral considerations (example, deciding to cut inventory expenses and labor cost during a cash flow crunch. That decision is making positive strides for us and we seeing the light of day)
2007	I most often try to consider how the decision will affect others directly and indirectly. I try to communicate our (the executive team's) progress in the decision making to those effected so no one is suprised of the outcome and they understand how the outcome is being decided.
2007	I don't make quick decision before gathering data and information
2007	Anticipate ultimate decision maker's behavior/individual decision making skills into my proposed plan.
2007	Tried to implement a consistent, systematic approach to decision making. Take into consideration factors outside the immediate decision (i.e. personalities etc).
2007	As a manager, I have paid more attention to dissenting views and become much more aware of the behavioral dynamics that negatively affect the decision-making process of management teams. While awareness of group think and other behavioral influences is important, the greater challenge lies in influencing those who are really not interested in considering any input that does not support their views.
2008	Every time I come up with an effective decision made via calculations and numbers, I try to then think what could go wrong or not be as efficient or effective because there will be people with different goals, personalities and emotions involved. / /I try to avoid group thinking. / /Try to use as many concepts as possible learned from Wharton Decision making, such as split personality and cascade effect, I was not aware that some of these concepts existed or that they were well documented in academic texts. / /Consider emotions of others on any decision made upon the existance of different world views. "Consider", does not mean "roll over" to other people feelings every time and simply change a decison because another person has a different position. "consider", involves, at least listening to their perspective and reasons to disagree or contribuitions and include the new data or information on the final decision
2008	I have taken greater consideration in understanding personality types and their impact to the decision making process.
2008	I tend to include more individuals in the decision making process and consider their suggestions and opinions before making a decision
2008	I incorporate decision tree methods to most if not all decisions that are needed within the scope of my job function.
2008	Solicited data before making decisions
2008	I evaluate all the data now and am not impulsive in making a decision. Plus I consider all the consequences of every possible decision before making it.
2008	Prior to the course, I would tend to make a business case based on my supervisor's desire/enthusiasm for the project with sensitivity analysis as the most sophisticated quantitative approach utilized. The course taught me to inform my decisions with quantitative data, especially in building models to support research and gut feelings. Now, I'm able to present a vastly superior and informed analysis to my boss that either supports what he wants to do, or serves to temper that desire. Facts and review of various outcomes are powerful. I had many informative and demanding courses at LMU, this one was one of the handful of gems that I consider transformative for me. I'm a very different manager and leader due to the course. Recently, I was able to build a model that supported corporate wide adoption of near- to mid- term capital budget sources based on various investment outcomes. It was a breakthrough arguement that I would have been unable to formualte prior to the Manager as the Decision Maker Class. Wharton on Decision Making sits on my desk and Crystal Ball resides on my laptop. Many thanks and bravo to Ish and Fred.
2009	I have used analytical tools more effectively in my decision-making.
2009	Since taking the course I have thought about certain decisions with more structure. Sometimes, I have found, the discipline of structuring the available data and clearly stating the variables involved has brought us to a decision without significantly more analysis. / /I have also used an understanding of variability and the "flaw of averages" to improve our thinking about certain forecasts. / /Thinking about the behavioral aspects of decision making was interesting but I have not explicitly incorporated anything new from this part of the course.
2009	Incorporate the "behavioral" considerations when making decisions and implementing changes in the workplace.
2009	I have paid closer consideration to behavioral factors when making tough decisions. People react to changes in different/varied ways. Thus, having a better understanding of people makes the job of decision making lighter in that you can try to anticipate, consider different approaches to gain "buy in" or deal with resistance.
2009	I take a global view of the problem and/or process which includes both behavioral biases and quantitative undertones to arrive at the most logical decision based on information available at any given time.
2009	Consistently evaluate the behavioral impact of my and my clients decisions to stakeholders. Focus on the overall impact of decisions using the quantitative tools learned and the non-quantitative factors discussed in this course.
2009	I have developed a more analytical approach to diagnose the problem and weigh the options available to mitigate or solve the problem. Also I have developed a question base approach to back up and check data available before taking action.

Table 4 displays a sample of the responses received, by year of graduation, to the open ended question "what have you done differently with respect to decision making as a result of the course?"

Conclusion

We described an experiential EMBA course that exposes students to an integrated behavioral and quantitative model building approach to problem solving and decision making. Combined with experiential learning, and emotional and executive intelligence, an experiential approach provides greater management participation, and focused quantitative and qualitative problem solving and decision making. This is a novel approach and to our knowledge has not been tried in other schools. Based on a survey of the alumni of the program it appears that integration of behavioral and quantitative approaches is effective since the participants considered themselves to be good or effective decision makers. It would be interesting to try to confirm this in a controlled study where the students are compared to a group with similar backgrounds and abilities that were not exposed to this integrated approach. However, the logistics of such a study would be quite complex to find suitable control subjects.

The alumni said that an integrated behavioral and quantitative approach to decision making is valuable in assessing their internal decision making capabilities. They feel more in charge than allowing outside or environmental factors influence their decisions and have more than an intuitive grasp of a structured approach to decision making. Thus, developing creative and analytical skills for making strategic decisions across a range of managerial settings, specifically on *problem solving in day-to-day operations of the enterprise* is essential. Focusing on the human dimension and developing a greater awareness of and appreciation for the non-rational aspects of decision-making described that evolution and experience we have had with EMBA students.

This lends credence to the fact that executive education that considers human and quantitative factors in combination is essential for reducing defects in decision making and thus the resultant action taken by managers, CEOs, etc., is more streamlined and efficient. We conclude that the benefit of this approach is the synthesis, or combination, of the quantitative and behavioral approaches which provides broader input into the decision making/problem solving process. In the worst case this broader input should not detract from the quality of the eventual outcome, but may in fact improve it. If a manager can match their decision making modality to the people they work with this should lower stress and conflict in decision making and help to create a more productive and efficient environment.

This study has impact for business schools in that it provides a multidisciplinary approach to decision making. The qualitative approach is usually taught in behavioral sciences classes, whereas, the quantitative approach is taught in management science and statistical classes. Our approach is integrated, combining both qualitative and quantitative factors. In the real world decisions are not made in silos - they contain both the qualitative and quantitative sides. Therefore, curriculum could benefit from an approach that more closely reflects how decisions are made in business.

The study has impact for the EMBA industry in that it is one example of how disciplines are being bridged to promote tools that business managers can actually use. Managers need to be equipped to make decisions in this fast paced world. We would argue that the EMBA industry needs more courses similar to what is being discussed in this paper. A process-oriented, problem solving and decision making approach is more likely to assist individual decision makers to make more precise, informed and consolidated decisions. Our course assists an individual to adapt to the accuracy of decision making and current real world challenges that are both interdisciplinary and multicultural.

Future research should look at how decision making can evolve by using an integrative approach, creating a synergy of both the qualitative and quantitative factors. Additionally, future research can provide a broader cultural and multidisciplinary approach to decision making. This can include a larger population for generating a more in-depth controlled statistical analysis. As the world becomes more complex, other aspects such as communicating across time zones, governmental rules and regulations including practices and procedures, and the global dimensions to decision making and problem solving must be discussed. We therefore urge future research to provide a more comprehensive statistical and behavioral analysis to analyze how computer generated models and behavioral science will foster a more productive, collaborative and participative work environment. Additionally, we hope future research could provide a more in-depth perspective at how quantitative and behavioral methodology can be incorporated into the business and work environment.

References

Anderson, D.R., Sweeney, D.J., & Williams, T.A. (2006). Quantitative Methods for Business, (10th ed.). Mason, Ohio: South-Western.

Brown, G. I. (1971). Human Teaching for Human Learning.Penguin Books.

Eppen, G. D., Gould, F. J., Schmidt, C. P., Moore, J. H., & Weatherford L. R. (1998). Introductory Management Science, (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Hammer, M. & Champy, J. (2003). Reengineering the Corporation: A Manifesto for Business Revolution; New York, NY: Harper Collins.

Herzberg, F. (1987). One more time: How do you motivate employees? Harvard Business Review, 65 (5), 109-120.

Leon, L., Przasnyski, Z. H., & Seal, K. C. (1996). Spreadsheets and OR/MS models: An end-user perspective. Interfaces, 26 (2), 92-104.

Powell, S.G. (1995). The Teachers' Forum: Teaching the art of modeling to MBA Students. Interfaces, 25 (3), 88-94.

Powell, S.G. (1997). The teacher's forum: From intelligent consumer to active modeler, two MBA success stories. Interfaces, 27 (3), 88-99.

Powell, S.G. (2001). Teaching modeling in management science, INFORMS Transactions on Education. 1 (2), http://ite.informs.org/Vol1No2/Powell/

Ragsdale, C. T. (2008). Spreadsheet Modeling and Decision Analysis: A Practical Introduction to Management Science (5th ed.). Mason, Ohio: South-Western.

Roy, A., Lasdon, L., & Plane D. (1989).End-user optimization with spreadsheet models.

European Journal of Operational Research, 13, 131-137.

Senge, P. (1990). The Fifth Discipline: The art and practice of the learning organization. New York, NY: Doubleday/Currency.

Simon, H. A., Dantzig, G. B., Hogarth, R., Plott, C. R., Raiffa, H., Schelling, T. C., Shepsle, K. A., Thaler, R., Tversky, A., &Winter, S. (1987). Decision making and problem Solving. Interfaces, 17 (5), 11-31. DOI: 10.1287/inte.17.5.11

Soon, S. S., Brass, M., Heinze, H-J & Haynes J. D. (2008). Unconscious determinants of free decisions in the human brain. Nature Neuroscience. 11, 543 – 545.

Taylor, B.W. III. (2007). Introduction to Management Science (9th ed.). Upper Saddle River, NJ: Prentice Hall.