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TEACHING THE ANALYTIC HIERARCHY PROCESS METHODOLOGY USING REALITY TELEVISION AS A BACKDROP FOR ENCOURAGING STUDENT GROWTH AND LEARNING

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Summary:

This paper looks to explore using a new innovative approach to teaching student's operations research and statistical methodologies by using examples from something that has become popular and well known among students, "reality television." Given the fact that reality shows like Survivor, which has been on for nine seasons, American idol, which has been on for five seasons, the Apprentice, which has been on for five seasons, and the Amazing Race, which has been on for nine seasons, shows their extreme popularity. Due to this popularity, it makes sense to use them as a data set for teaching quantitative methods to our students. What makes these shows so popular is the unknown about who is going to win and how are they going to succeed. Is it their strategy to play fair, nice, or ruthless? Is it their charm, good looks or wit that causes them to be successful? What exactly makes the winners of these shows, "winners?"

We examine these types of questions using operations research and statistical methods and techniques. The one specific method explored here is the analytic hierarchy process methodology. A fictitious data set was created to explore how a show would be used to teach this specific procedure. It is important to encourage student growth and learning using data that interests them. Once they see how the methodology is useful in fun exercises, they can then apply them in business scenarios.

1.1 Introduction-Teaching Today's Students

Data-driven decision making is increasingly important in today's business environment. Even as the numbers of students interested in mathematics decline (GAO 2006), so the need for these skills in business increase. Business students today may not need to know how to generate mathematical proofs, but they must be able to understand data analysis techniques, and be prepared to analyze vast amounts of data to support business decisions. Management science is often a difficult part of a student's business program.

In addition, the students in our undergraduate classes are very different from when we were students. These "digital natives" prefer games to reading business textbooks, they prefer graphics rather than text, and they like to parallel process and multi-task. (VanSlyke 2003). These young adults grew up spending time watching reality television shows such as American Idol, Survivor, Apprentice and Project Runway as well as playing fast-paced video games, alone and in groups. Our students have grown up in a media-saturated environment, spending an average of nearly 6.5 hours a day with media, television being the dominant media (Rideout, Roberts, Foehr 2005).

When asked how to improve their educational experience, many students expressed interest in making learning more fun to reduce boredom at school. Students feel a course should "engage" them and that there is a generation gap between professors and them.. Mathematics was often cited specifically as a subject that might benefit from the use of games (US Department of Commerce 2005).

As these students enter college, we must look at ways that this active learning paradigm can be continued to make mathematics and management science courses fun and engaging. (Hanson, Carlson 2004) As in secondary schools, college students often lack engagement and motivation, prerequisites for learning. They are engaged outside the classroom, with a multitude of activities. Inside the classroom, it is necessary to incorporate interest and activity into the lessons. (Prensky 2005-2006).

Our field is teaching quantitative skills to business students. Classes include "Applied Business Problem Solving" and "Business Statistics". As educators, we have worked to develop activities to encourage learning by the student's of today.

1.2 Introduction-The Analytic Hierarchy Process

The Analytic Hierarchy Process is a complex mathematical algorithm developed by Thomas Saaty. (Saaty 1994) And as such, not a user-friendly application as is. In terms of organizing and solving complex problems it lacked an interface for the average decision maker to benefit and use its power and strength. With the advances in computers and technology a group of people got together and developed a software package that allowed users to enter information and data in such a way that increased the

widespread use of AHP. The software package was developed in the 1980's and is titled Expert Choice. (Forman, Saaty, Selly, and Waldron 1983)

Areas of typical application include the following: Prioritizing, Resource allocation, Benefit/cost analysis, Benchmarking, Hiring, evaluating and promoting employees, Negotiating and conflict resolution, Evaluating mergers and acquisitions, Total quality management, Restructuring, Business process re-engineering, Evaluating investment / divestment plans, and Strategic planning.

AHP is being taught in University's everywhere including: Harvard University, Yale University, MIT, Johns Hopkins University, The University of Maryland, The University of California, The Naval War College, The George Washington University, Stanford University, Duke University, The Katz School of Business, and The Wharton School of Business.

A few examples of organizations having success using AHP and Expert Choice are the following:

IBM used AHP and expert choice to benchmark industry competition and to allocate resources in the Silverlake Project. Jim Coraza, Director of Advanced System Management, IBM Rochester found that allocating resources with no structure was especially difficult because "everyone seemed to have a legitimate claim for funding ahead of someone else." Emilio Collar, who oversaw their market analysis, "found a model for helping us make our priority-setting decisions-a methodology to render the ranking process more objective and systematic. It also allowed us to take any number of criteria into consideration. In short, it enabled us to deal with our situation in all its complexity." The entire statement by Jim Coraza can be found at www.expertchoice.com/Silverlake.htm.

"The U.S. Department of Veterans Affairs set out to develop a completely integrated capital investment process in 1997. Their goal was to develop a decision process that would enable them to prioritize information technology projects with construction and operations projects in a single list. They implemented Expert Choice to model their project prioritization decision and were able to become the first organization in the federal government to successfully integrate their resource allocation process." http://www.expertchoice.com/css1.htm

"Mukesh Dalal and Rangsan Thammaneewong, of the University of Pittsburgh, used Expert Choice to rank business schools in the U.S. and presented their findings at the International Conference on Multiple Criteria Decision Making in Bangkok."

"They found that "Most results of business school rankings generally fail to mention the criteria used and often use subjective judgments in an unsystematic approach. This model provides a systematic and less subjective method for ranking business schools. It uses both quantitative and qualitative data for the criteria with the quantitative data being statistically normalized before the relative measurement approach is applied. The ratings approach of Expert Choice was used to rank the schools."

They also found that, “Every business school in the US (more than 700 schools) for which data was publicly available was ranked. This study shows how multi-criteria decision techniques can be used in the real world; and, how we go around the problems in data collection, in interpretation and in modifying the model can be got around without sacrificing the objective.” http://www.expertchoice.com/testimonials/app6.htm

The few examples above show that AHP is being used in both public and private organizations, in government agencies throughout the world and in the non-profit sector some others include following organizations: IBM, Goodyear, Ford Motor Co., Texaco, General Motors, Citibank, Westinghouse, Xerox, 3M, Boeing, NASA, Internal Revenue Service, The Federal Bureau of Investigation, The Department of Defense, U.S. Intelligence Agencies, Prudential Insurance, The World Bank, Inter-American bank, Amoco Production Co., and Anderson Consulting Company.

2.0 The Model

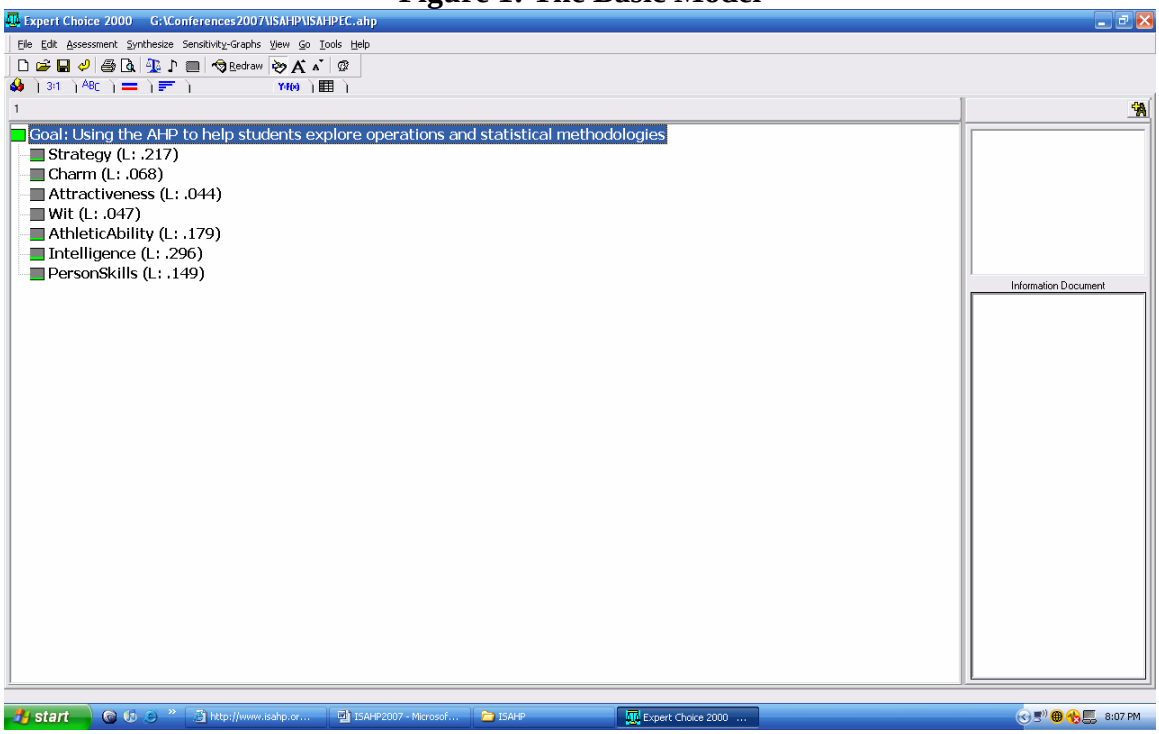
For the purpose of this research, the commonly known reality television show Survivor was chosen. It was chosen to explore the usefulness of the Analytic Hierarchy Process in the decision making process. The show is one of many new reality shows that use real people in a form of a competition. The premise of this show is that sixteen unfamiliar people are put into two tribes and then asked to compete with each other and eventually, each week, vote off one of the contestants. Ultimately, the sole Survivor wins a million dollars. The show is interesting and unique in the sense that after the Survivors are reduced to 10, the remaining people that get voted off become a member of a jury that in the end vote as to which of the final two Survivors deserve the million dollar prize and who will be the runner-up.

This leads to interesting “play” behavior. If you are too ruthless, in the end they won’t vote for you to win out of revenge. Or is this true? In the past juries have voted for a winner because they believed that by being ruthless meant they played the game the best. Other examples are, if you play under the radar, the jury may feel you didn’t really play the game and that you relied on others to do the dirty work and they won’t vote for you. If you are strong athletically, should they vote you off? It has been seen that early on athletic ability is seen as a favorable quality, but over time it becomes an increasing threat. When is the “right” time for a player with a particular strength to be voted off? Every game is different because every player is different and every player has a different core set of strengths and weaknesses. Sometimes they work to your advantage and sometimes they hurt you.

Due to the different variables that affect the outcome of the show make it a perfect data set for exploring operations techniques, specifically, AHP. The model can change week to week, and game to game.

2.1 The Basic Model

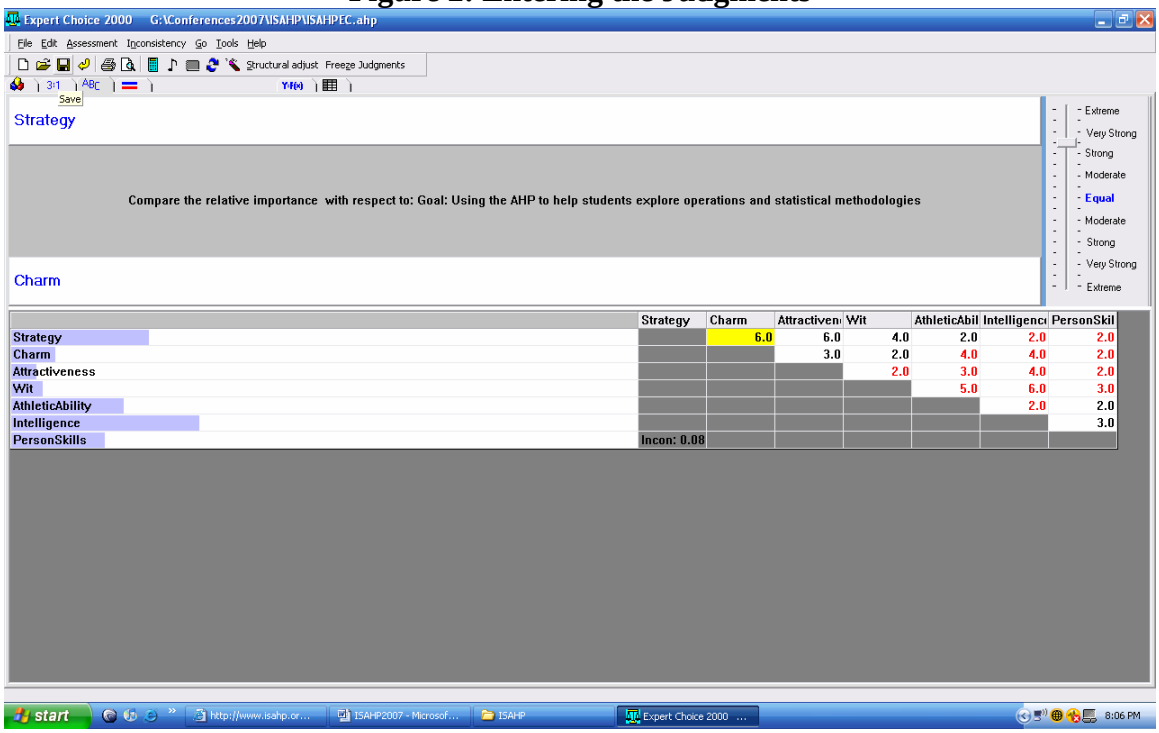
Figure 1: The Basic Model



As can be seen in Figure 1, the first step is to enter the different criteria into an AHP model. The criteria for this model are: strategy, charm, attractiveness, wit, athletic ability, intelligence and personal skills.

2.2 Entering the Judgments for Objectives

Figure 2: Entering the Judgments



Once the criteria were entered, the weights for each criterion were derived using the verbal pair-wise mode. This determined the relative importance of each of the criteria with respect to the others. What is so flexible about the model is that these weights may be changed from week to week. As mentioned, being strong at the beginning may be relatively important, but as time passes it may become less and less of a strength. Likewise, strategy may be less important at the beginning and become increasingly important as there are less and less people to vote off.

2.3 Synthesis of Objectives

Figure 3: Synthesis of the Objectives

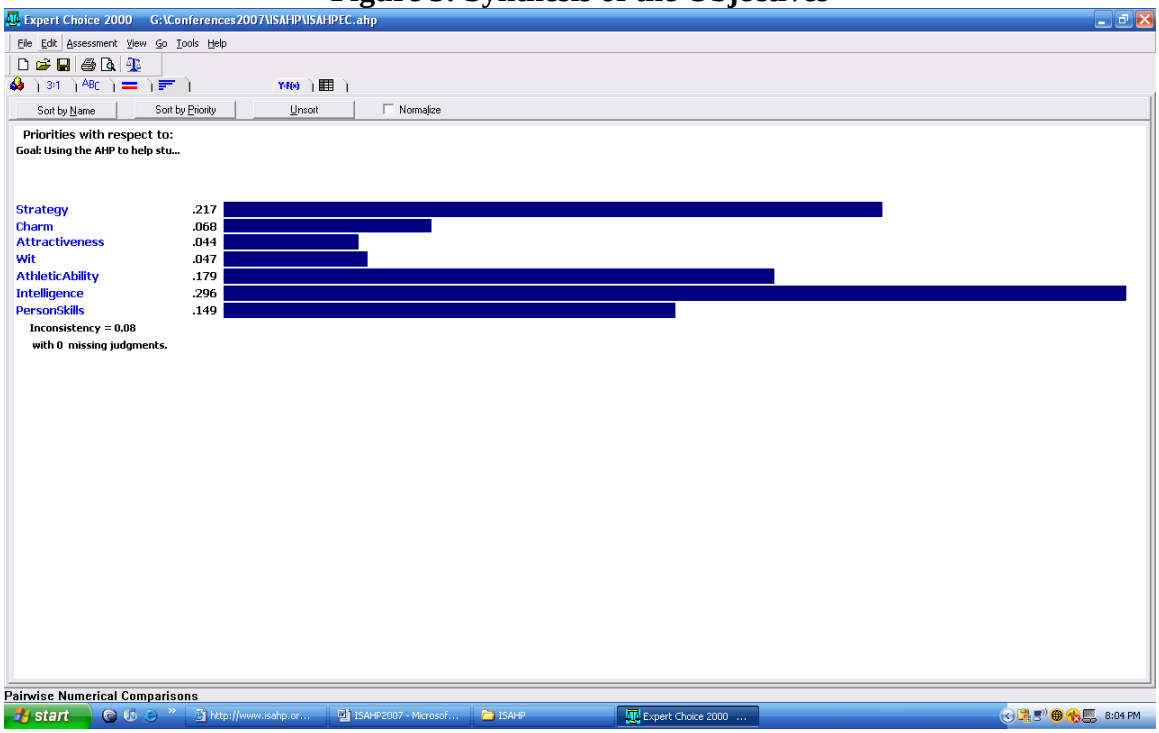
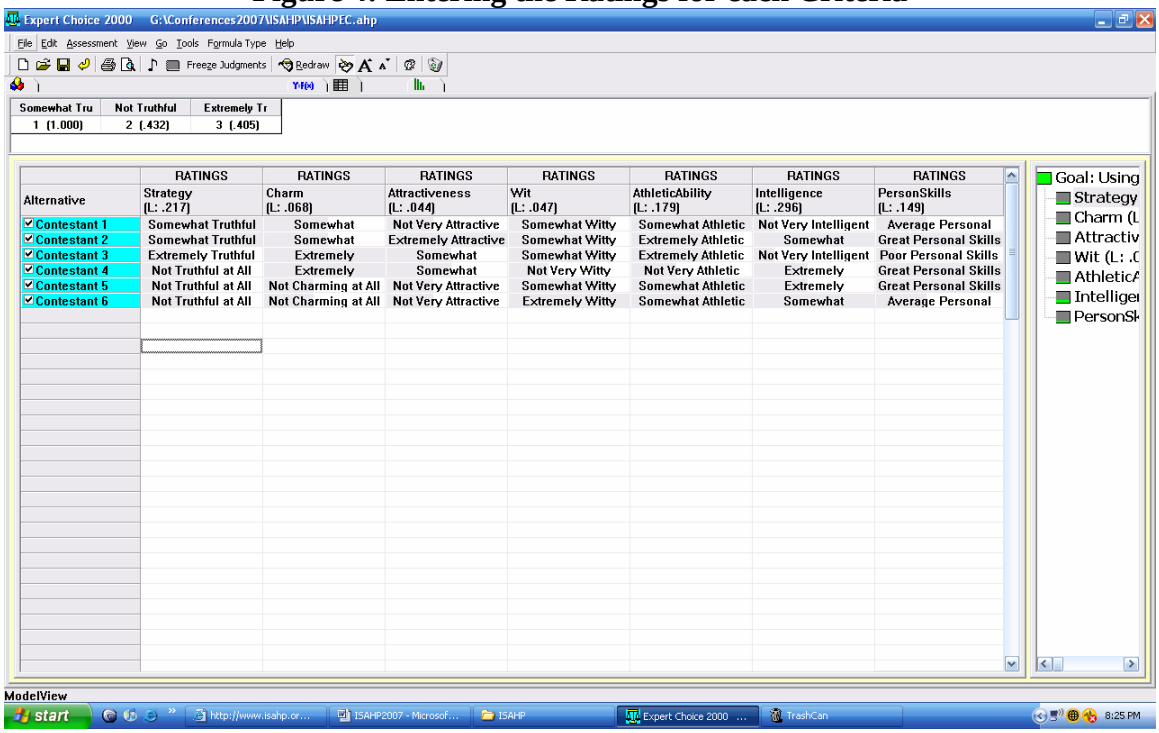


Figure 3 shows the relative importance of each of the criterion. At this stage of the game, intelligence is the most important criteria with a weight of .296, while attractiveness is the least important with a weight of .044. Wit doesn't have much importance here with a weight of .047 nor does charm with a weight of .068. While strategy with a weight of .217, athletic ability with a weight of .179 and personal skills with a weight of .149, are still relatively important. At this stage in the game, there are eight competitors left, therefore, as the weeks go on, these weights will undoubtedly change. In a classroom setting, this can be used to show how the model can be updated as new information is gathered and as the dynamics of the show change.

2.4 The Ratings

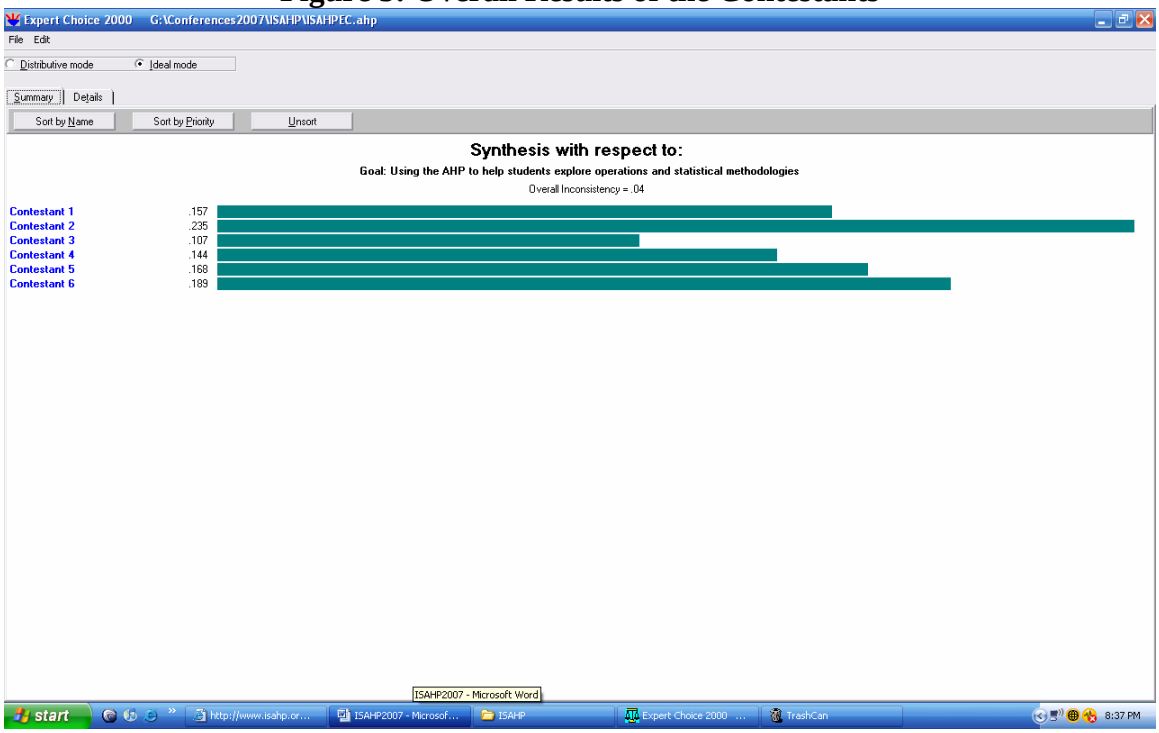
Figure 4: Entering the Ratings for each Criteria



As can be seen in figure 4, ratings scales were developed to show the how each contestant measured up on each of the criteria. Contestants may do well on some criteria and not so well on others, it is these tradeoffs that lead to how well each contestant does overall in the model. The next section will give the overall results of the model for each of the candidates.

3.1 Overall Results of Contestants

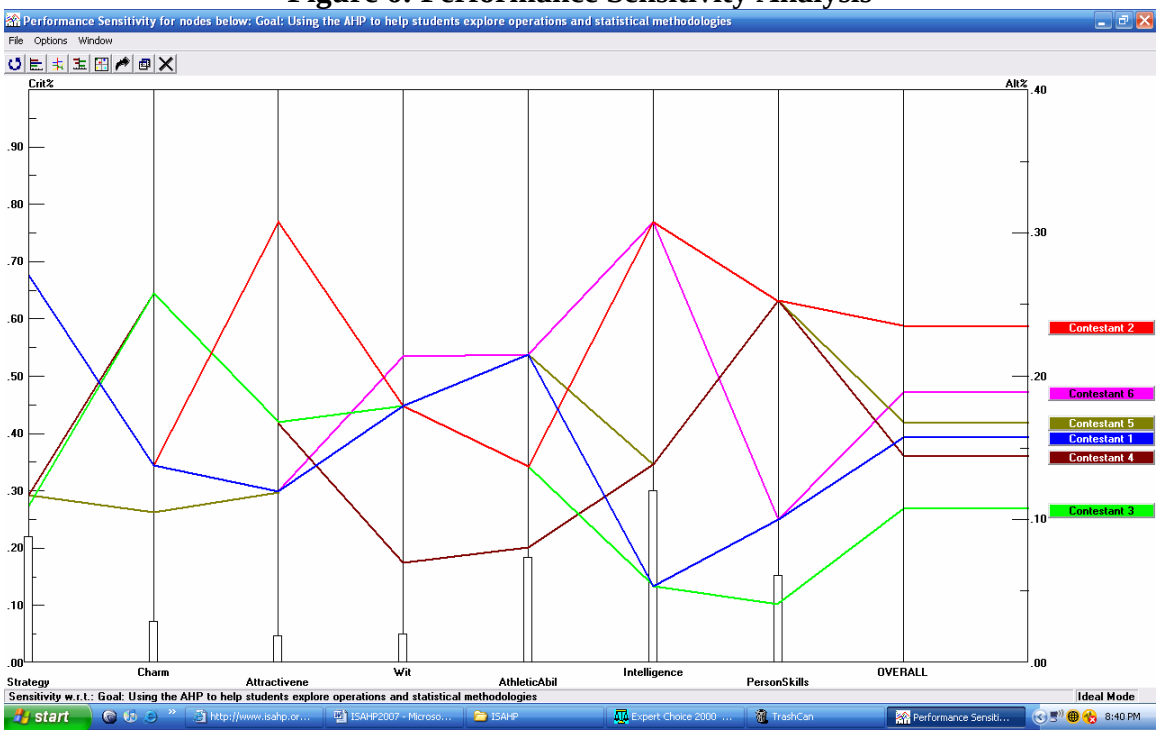
Figure 5: Overall Results of the Contestants



The model shows that overall contestant two is the best candidate to win, with contestant's six and one coming in second and third respectively. Contestant three did the worst overall. This model was set up within the framework that the best was the winner, it could have also been set up to show that the overall highest weighted person is the weakest and should be voted off. Results depend on how the model is set-up.

3.2 Performance Sensitivity Analysis

Figure 6: Performance Sensitivity Analysis



When looking at the performance sensitivity, we can see that contestant two won overall because they were strong on attractiveness and intelligence. Although attractiveness did not weight high in the overall model, it made a difference in the final outcome. Likewise, we can see that contestant three weighted the lowest due to their performance on intelligence and personal skills, which were both weighted as important criteria.

4.0 Conclusions and Future Research

This model shows how students can be engaged in operations methodologies and quantitative methods using topics that are of interest to them. This model shows how a reality television show like Survivor can be used to showcase the strengths of the powerful tool the Analytic Hierarchy Process. It showcases deriving weights, entering ratings scales, and analyzing synthesis and sensitivity reports. Students can also see the power of being able to update and change the dynamic model as information changes and situations change.

In the future, we will explore the different criterion that lead to success or failure in the overall outcome of the show. Other methodologies will be considered in conjunction with AHP to further enhance the students learning experiences.

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