
The Best Alternative to Alleviate Anthrax Fears at Ernst & Young, LLP

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Abstract

The McLean office of Ernst & Young, LLP is assessing various alternatives to reduce employee fear of a possible biochemical attack through the mail. Each day, Ernst & Young receives a U.S. Postal delivery of approximately 500 pieces of mail, three FedEx deliveries of approximately 20-50 pieces of mail and two to three other deliveries from DHL, UPS or a local courier service. The recent attacks on the world trade center and the pentagon combined with the letters containing anthrax that were sent to NBC, CBS and a U.S. Senator have caused a feeling of anxiety not only within the mailroom, but the entire workforce. This review is an attempt to use a more modern analytic decision process, Analytic Hierarchy Process (AHP), to aid in determining the best course or courses of action to take in order to alleviate anxiety. Four different objectives, increased productivity, employee safety, employee satisfaction (general employees and mailroom employees) and timely distribution of the mail were objectives used in evaluating alternatives against the goal.

Introduction

It is the intent of this review to select the best course of action to be used by Ernst & Young management to alleviate fears of anthrax exposure within the local McLean office. This intent is defined as the goal within this review.

The decision of “best” alternative will be generated by use of Analytic Hierarchy Process.

Expert Choice is a decision making software package based on the Analytic Hierarchy Process.

Analytic Hierarchy Process (AHP)

AHP allows decision makers to model a complex problem in a structure showing relationships of the goal, objectives and alternatives. Uncertainties, pros and cons as well as other influencing factors can also be included. The goal is defined as a statement of the overall objectives. Therefore, our definition of best choice is that it is the choice that best meets the objectives. For the precise accountant that only wishes to deal in finite numbers, AHP allows decision makers to derive ratio scale priorities as opposed to randomly assigning them. By doing so, the decision maker is able to incorporate both subjective and objective matters in the decision process. This is done by assigning complexity as a hierarchy and ratios through comparison of alternatives relative to the objective (called pairwise comparisons).

Herbert Simon in 1960 developed the following three-phase process relative to decision-making: (1) Intelligence; (2) Design; and (3) Choice. The choice phase seems to be the one that receives the most attention and is generally what people consider the individual development of pros and cons for each alternative presented and then logically choosing the best alternative. AHP is designed so that alternatives are no longer mutually

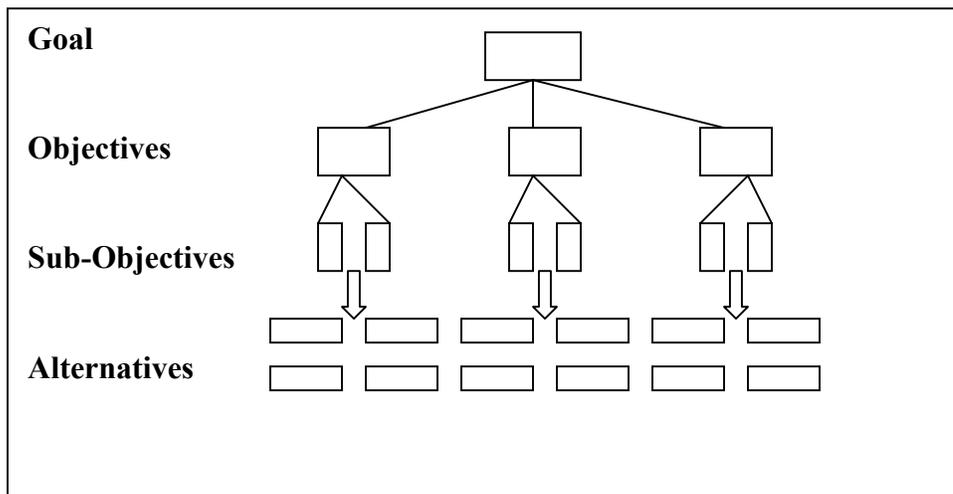
exclusive and can be considered as part of the entire decision-making process; therefore, it is possible to have a combination of alternatives that would become the “best choice.”

AHP allows for decision makers to pull information together for one alternative, assess pros and cons for that alternative, weigh that alternative against others using a variety of measurement techniques and finally communicate the decision through synthesis of the alternatives in relation to the goal.

One of AHP’s strong points is that it allows for inconsistency by the decision maker that may result from clerical error, lack of information (as in this particular review), and a lack of concentration¹.

The first step in using AHP (and Expert Choice) is to develop a hierarchy by breaking the issue into the following components: goal, objectives and alternatives. Figure 1 provides a typical layout of a hierarchal decision.

Figure 1. Decision Hierarchy



After the hierarchy has been established, the next step is to derive ratio priorities using pairwise comparisons. Each alternative is compared to its peers for each specific objective. Within Expert Choice, there are three modes of comparison: verbal, graphical or numerical. When comparing factors, a ratio of preference or likelihood is established. In this analysis, preference and verbal were utilized. Verbal comparisons are easier to make when the frame of reference is social or psychological implications and are easier to justify.

After the pairwise comparisons are complete, the information is synthesized to achieve an overall preference relative to the goal. This synthesis ranks each of the objectives relative to the goal and how each alternative ranked to each objective or sub-objective.

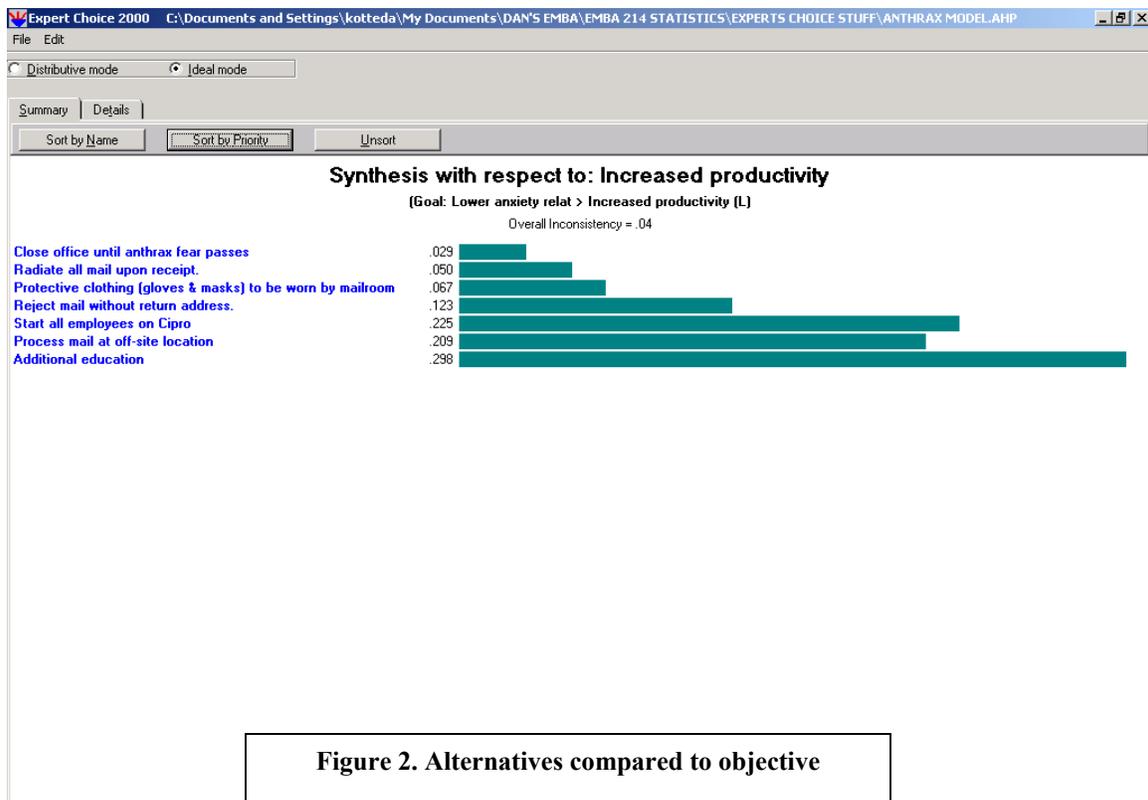
¹ Forman, Ernest H. and Selly, Mary Ann, *Decision By Objectives*, World Scientific Press, (2001), pp. 43-50.

Sensitivity analysis can then be used to show the relative importance of each objective.

Objectives

The goal is the statement of the overall objective. The objectives are what the office hopes to accomplish by meeting the goal. The objectives are listed as follows: increased productivity of office personnel, employee safety, employee satisfaction (mailroom and non mailroom), timely distribution of the mail, and timely resolution to employees' fears.

For each objective, the review considered how the alternatives weighted in meeting that objective. For example, the objective productivity of office personnel is presented in Figure 2 below.



Alternatives

The alternatives were developed through interviews with various Ernst & Young personnel ranging from mailroom staff to office managing partner. From the responses received, this analysis then focuses on seven alternatives: close office until threat subsides, radiate all mail, mailroom employees to wear protective clothing, reject all mail without a return address, process the mail at an off-site location, start all employees on

Cipro and provide additional education to the workforce relative to anthrax (e.g. what is it, how is it contracted, and how is it spread).

Decision Model

The decision model can be constructed using two approaches: a top-down approach and then a bottom-up approach. The top-down focuses on identifying and organizing objectives before evaluating alternatives, whereas, the bottom-up approach focuses on evaluating each of the alternatives relative to the objectives before evaluating the importance of each objective.

This review was a combination of the two. The review first identified objectives and then organized them according to the goal, but no weights were derived for each objective. Next, for the alternatives identified, pros and cons were developed and organized relative to each alternative.

Expert Choice Decision Hierarchy

Because pairwise comparisons have been made primarily in the psychological context, the verbal mode was chosen. This type of comparison involves the following scale: “equal,” “moderate,” “strong,” “very strong,” and “extreme.” The following figure (Figure 3) is a pairwise comparison that shows management’s judgments relative to two possible alternatives: close office until anthrax fear passes and process mail at off-site location. The comparison shows that management would prefer to process the mail at an off-site location rather than close the office by placing the indicator between very strong and extreme (high preference towards processing mail at off-site versus closing office).

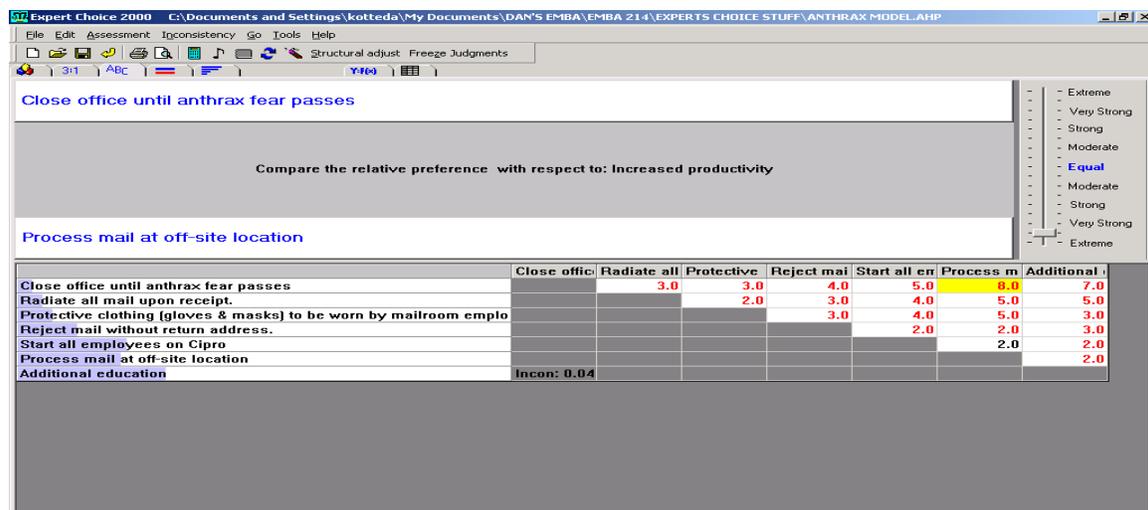


Figure 3. Pairwise comparison example

On the following page in Figure 4, the Expert Choice decision hierarchy is depicted that shows alternatives and objectives relative to the goal. You will notice in the upper right

hand box that “protective clothing (gloves and masks) to be worn by mailroom employees” has the best overall rating relative to the goal with a ratio scale measure of .222. The following alternatives and their ratio scale measure are as follows:

- Process mail at off-site location .195
- Radiate all mail upon receipt .159
- Additional education .151
- Reject mail without return address .124
- Start all employees on Cipro .112
- Close office until anthrax fear passes .038

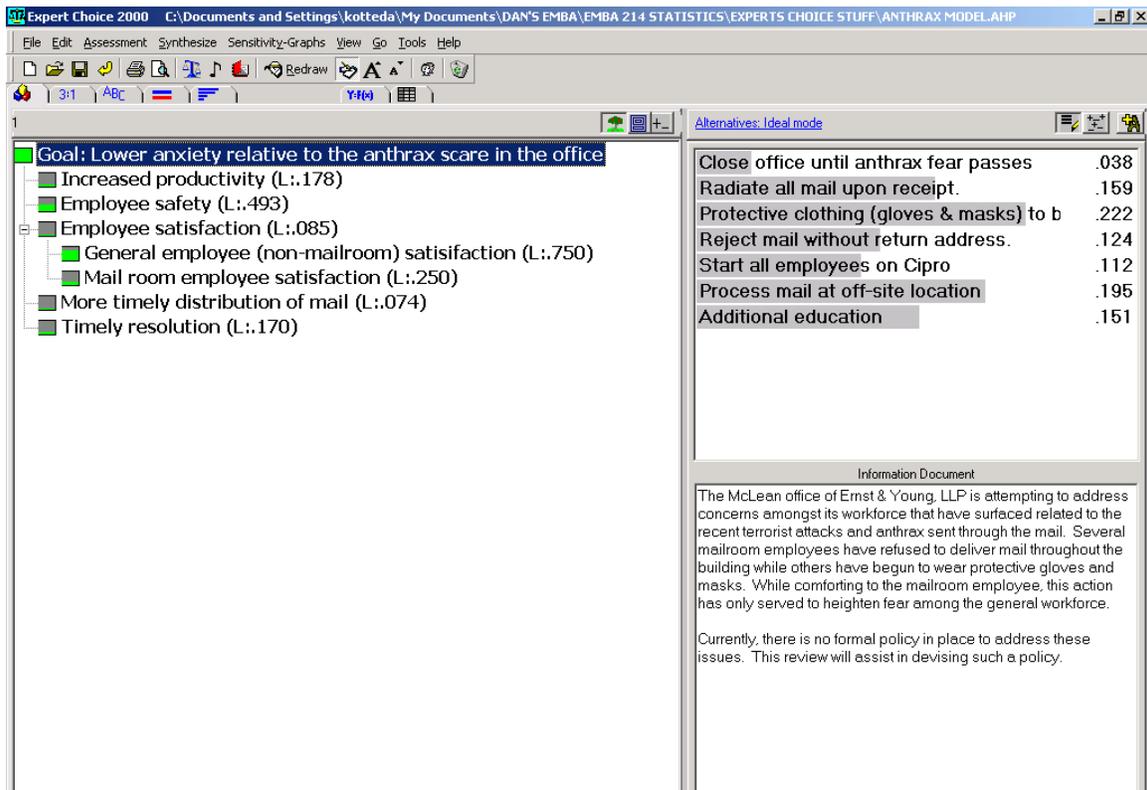
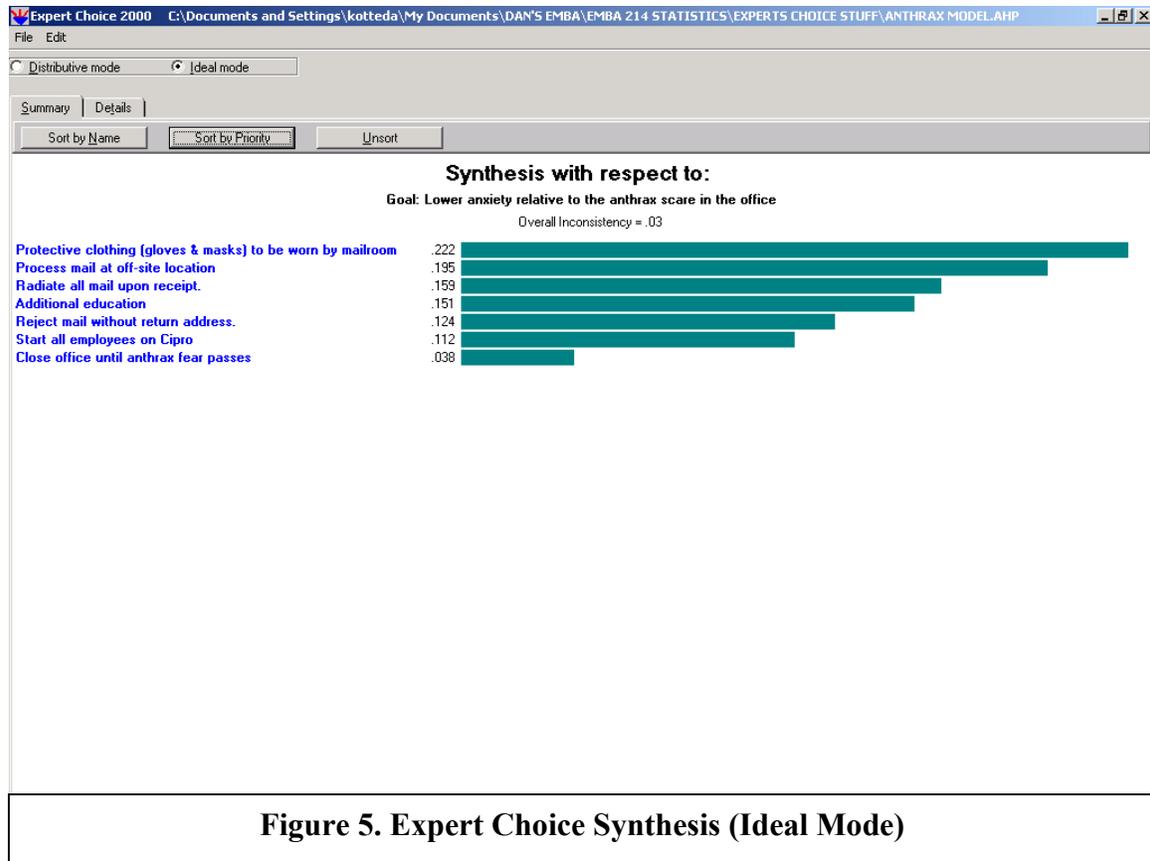


Figure 4. Expert Choice Decision Hierarchy

Expert Choice Synthesis

Once all judgments (pairwise comparisons of alternatives to peers relative to the objectives and the objectives relative to the goal) have been made, the information is synthesized to achieve an overall preference. The synthesis produces a report that includes a detailed ranking of each alternative. The synthesis cannot be completed if any of the pairwise comparisons have an inconsistency greater than ten percent. The overall synthesis in this review was three percent; therefore, the review has a high degree of validity.

The synthesis was conducted using the ideal mode. This mode distributes the full priority of an objective to the alternative that ranks highest under that objective. The other alternatives are given a priority in proportion to each alternative and the highest alternative². See Figure 5 for the full synthesis.



Expert Choice Sensitivity Analysis

Sensitivity Analysis is used to investigate the sensitivity of the alternatives to changes in the priorities of the objectives. There are five types of sensitivity analyses available within Expert Choice: Performance, Dynamic, Gradient, 2-D plot, and Head-to-Head. These analyses can be performed from the goal perspective or from the objective.

The performance sensitivity shows the relative importance of each of the objectives as bars, and the relative preference for each alternative with respect to each objective as the intersection of the alternatives' curves (lines) with the vertical line for each objective. See Figure 6.

² The other method is the distributive mode, which distributes the priorities of each covering objective among all the alternatives, thereby dividing its priorities proportionately to the priorities of the alternatives beneath it. This method is used when all alternatives matter.

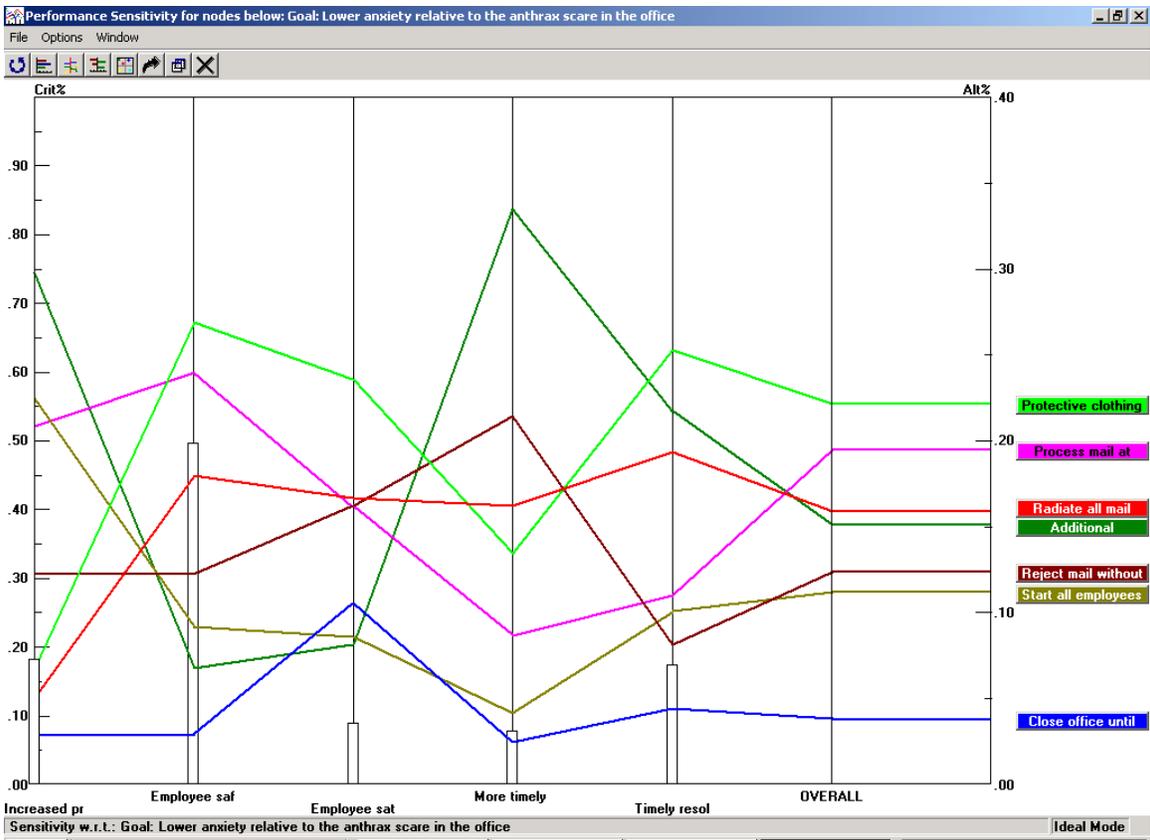


Figure 6. Expert Choice Sensitivity Analysis (Performance)

However, management could implement a variety of these options. Management may change its judgments toward one particular objective. Within Expert Choice, a gradient sensitivity analysis may be helpful to see what alternatives may change if management's judgments are likely to change. In Figure 6.1 on the following page, we can see our initial decision analysis indicated with the solid red line. Then assuming that management now wishes to place a greater emphasis on increased productivity, the decision line can be moved to another indication (identified as the blue dashed line). By doing so, we can now see that additional education would become our best available alternative. This is indicated as the highest alternative that intersects the sensitivity indicator.

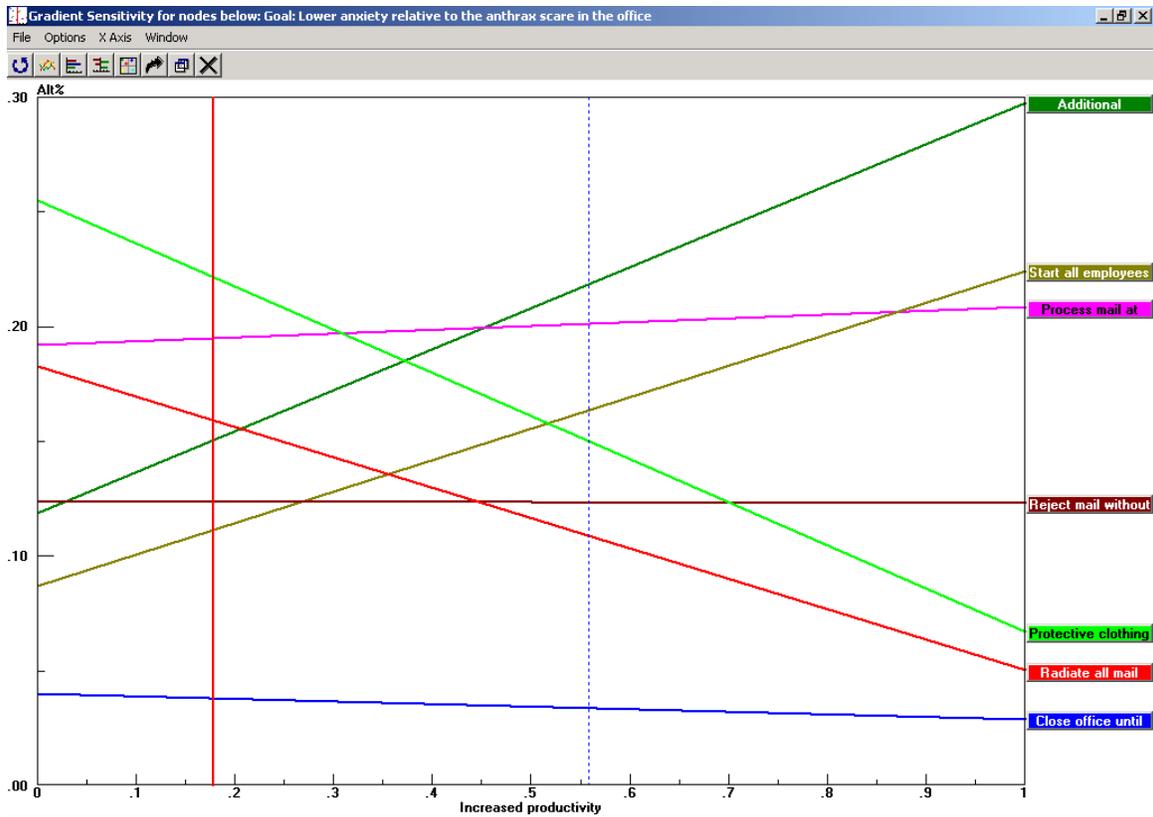


Figure 6.1. Gradient sensitivity analysis relative to increased productivity.

Additional analysis may provide an even clearer picture of actions available to management. For example, if management were to rely more heavily the timely resolution of anxiety within the office, then increased education in connection with protective clothing would be the likely course of action as outlined in Figure 7, which essentially moves additional education from the fourth best alternative to the second³.

³ Note that the dynamic sensitivity analysis allows the decision maker to change his or her bias toward a specific objective and notice the correlating change within the outcome.

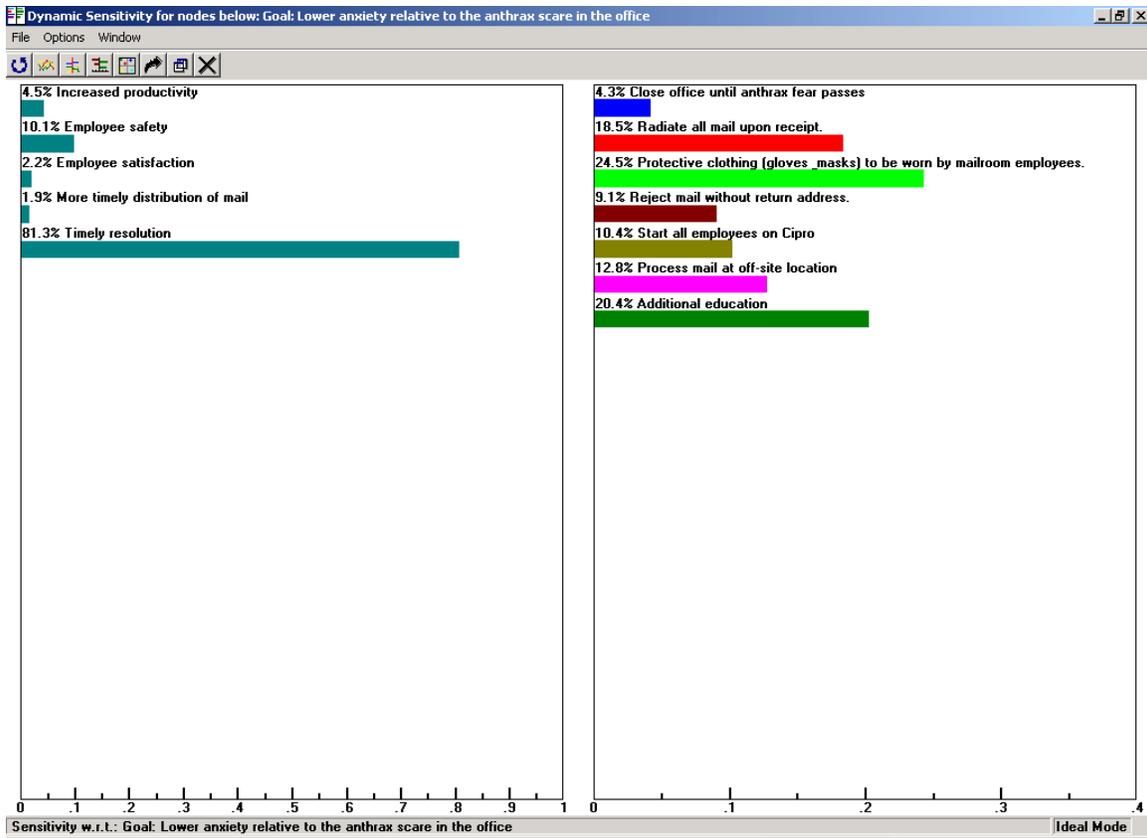


Figure 7. Expert Choice Sensitivity Analysis (Dynamic)

Conclusions

Based on the pairwise comparisons with derived scale measurements, this analysis indicates that the best alternative in meeting our goal and objectives is to issue protective clothing (gloves and masks) to mailroom employees.

The action that was actually taken was a combination of the available alternatives. Office management first began by issuing protective surgical gloves and masks to all employees that came in contact with mail (mailroom employees and administrative assistants). Next, based on the recommendations from this analysis, management provided all office personnel with a 'fact sheet' related to the anthrax disease in an effort to provide employees with a better understanding of the disease. The fact sheet contained the following: its origin, how it is contracted, spread, treatment, as well as the number of pieces of mail delivered a day and the sources of delivery (postal facility names). This served to further educate all office personnel about the disease and the likelihood of the office receiving a contaminated letter. The analysis performed in this review assisted management in recognizing that there was not just one solution, but a combination of acceptable alternatives . . . just as Expert Choice is intended to do!