DuMond International Decision Analysis

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Abstract— DuMond international board of directors is about to make a very important decision which is either to introduce a new product or keep the current product. Nancy Milnor an analyst in the firm calculated the expected value for each alternative and came to a conclusion that introducing the new product is better than keeping the current one. The board of directors didn't agree entirely with Nancy's analysis. Therefore, they suggested some changes. Nancy kept track of the comments and suggested changes and after a few moments, she said. "In spite of your changes I believe I can persuade you that DuMond should go with the new product". We applied the changes that the board requested and we found out that the new product is better than the current as Ms. Milnor stated.

Index Terms— Decision tree, Sensitivity analysis, Pesticide product, Product development, Optimal decision, Health risk.

1 Introduction

Nancy Milnor, a business analyst had just completed her presentation to the board of directors of DuMond international, which manufactured agricultural fertilizers and pesticides. The decision the board faced was whether to go ahead with a new pesticide product to replace an old one or whether to continue to rely on the current product. Which had been around for years and was a good seller.

2 Problem Statement

The problem with the current product was the evidence was beginning to surface which showed that the chemical's use cloud creates substantial health risk, and there even was some talk of banning the product. The new product still required more development and the question was whether all of the development issues could be resolved in time to meet the scheduled introduction date. And once the product was introduced, there was always the question of how well it would be received. The decision tree Nancy had presented to the board captured these concerns as shows in Figure 1.

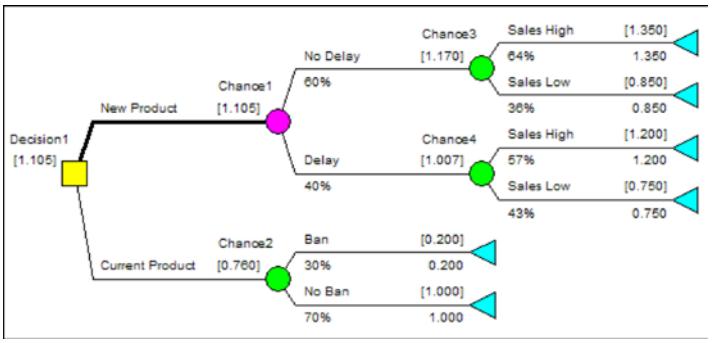

Figure 1: DuMond's new product decision

"Well, I'll start," said John Dilts a board member at the company. "I don't have much trouble with the numbers in the top half of the tree. But you have the chance of banning the current product pinned at 30 percent. That's high. personally, I don't think there are more then 10 to 30 percent. That's high personally, and I don't think there's more than 10 percent chance of an out-and-out ban."

"Yeah, and even if there were, the current product ought to be worth $300,000 At least," added Pete Lillovich." With a smaler chance of a ban and higher value. Surely, we're better off with the old product!"

"Well, I don't know about you two". Said Marla Jenkins. "I think we have a pretty good handle on what's going on with the current product. But I'd like to play the new product a little bit more conservatively. I know that the value at the end of the branches on the top half of the tree are accounting's best guesses based on a complete analysis, but maybe they should all be reduced by $100,000 just to play it safe. And maybe we should just set the probability of high sales equal to 50 percent regardless of the delay."

Steven Kellogg had been involved in the preliminary development of the new product more then anyone else. He piped up,"and the delay is actually more likely than no dalay. I'd just reverse those probabilities so that there's a 60 percent chance of a delay. I agree with Marla that we have a good idea about the performance of the current product and the prospects for a ban."

"I don't think it matters." countered Lillovich. "The chance John and I suggest make the current product look better than it does in Nancy's analysis. Marla's and Steven's chance make the new product look worse. Either way, the effect is the same." Nancy had kept track of the comment and suggested chance. She said, "I believe I can persuade you that DuMond should go with the new product.

3 Decision Analysis

3.1 John Dilts Input Analysis

Assumeing the probability for ban (p) and no ban (1-p)

$$1.10 = 0.2p + 1(1-p)$$
$$1.10 = 0.2p + 1-p$$
$$0.10 = -0.8p$$
$$p = -0.125 \text{ (which is not possible)}$$

Therefore, for any ban probability, we choose to introduce the new product. To support our analysis, we will investigate the changes

that john suggested by changing the ban probability from (0.3 to 0.1) and no ban probability from (0.7 to 0.9) as shown in figure 2.

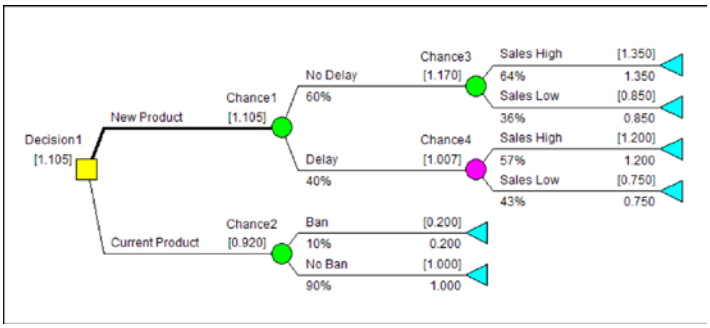

Figure 2: John Dilts Decision Tree

3.2 Pete Lillovich Input Analysis

We will assume the value for ban (v)

$$0.3v + 0.7 = 1.10$$
$$0.3v = 0.4$$
$$v = 1.33$$

If v > 1.33 chooseing the old product is optimal, else choose new product will be the board decision. To support our analysis, we will investigate the changes that Pete suggested by changing the value (0.2 to 0.3) as shown in the figure 3.

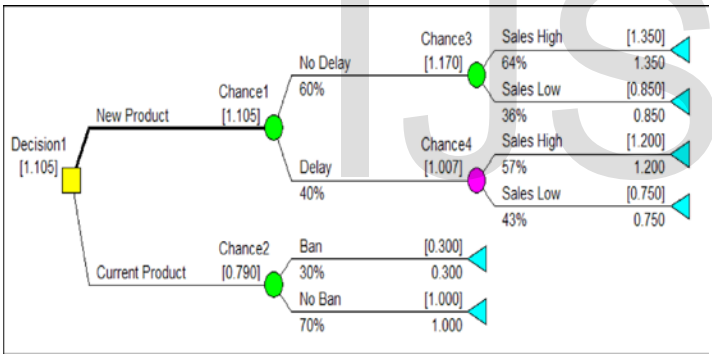

Figure 3: Pete Lillovich Decision Tree

Pete suggested model supports our claims (If v > 1.33 choose old product else choose the new product) therefore, Pete changes doesn't affect the optimal decision (new product).

3.3 Marla Jenkins Input Analysis

3.3.1 One-way Analysis

We will assume the reduced value is (t) and will perform a One-way analysis:

$$0.76 = 0.6\,[0.64(1.35-t) + 0.36(0.85-t)] + 0.4[0.57(1.2-t) + 0.43(0.75-t)]$$
$$0.76 = 0.6[0.864-0.69t + 0.306-0.36t] + 0.4[0.684 - 0.57t + 0.3225-0.43t]$$
$$0.76 = -0.6t + 0.702 - 0.4t + 0.4026$$
$$0.76 = -t + 1.1046$$
$$t = 0.3446$$

If reduction t > 0.3446 then the old product is the right decision otherwise, the new product. To support our analysis, we will apply the changes that Marla suggested by reducing the values of the new product by $100,000 as shown in the figure 4.

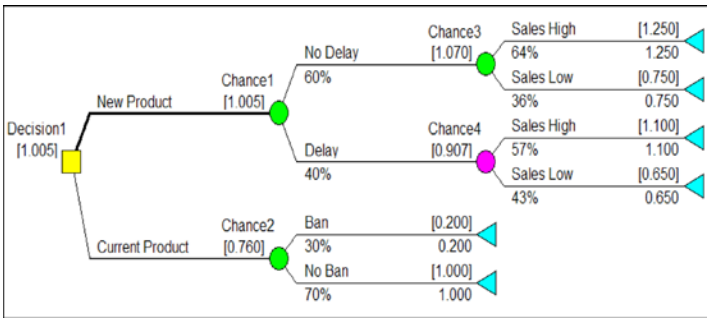

Figure 4: Marla Decision Tree (changing values)

After applying a $100,000 reduction to all sales in the new product we found that our decision remains the same because $100,000 is less than $344,600.

3.3.2 Two-way Analysis

$$0.6[1.35p+0.85(1-p)] + 0.4[1.20q+0.75(1-q)] = 0.76$$
$$0.3p + 0.51 + 0.18q + 0.3 = 0.76$$
$$0.3p + 0.18q = -0.05$$

q=0 => p= - 0.1666 (which is not possible)
p=0 => q= - 0.2777 (which is not possible)

Therefore, for any sales probability we choose to introduce the new product. To support our analysis, we will investigate the changes that Marla suggested by changing the probabilities (no delay => sales high from 0.64 to 0.5), (no delay => sales low from 0.36 to 0.50), (delay => sales high from 57 to 0.50) and (delay => sales low from 43 to 0.50) as shown in the figure 5.

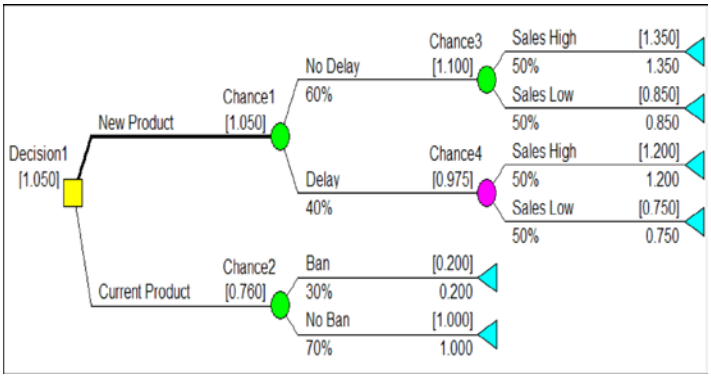

Figure 5: Marla Jenkins Decision Tree (changing probabilities)

In this model Marla suggested that we set high sales probabilities to 50% regardless of the delay. We applied those suggestions and we found that the new product is still better.

For curiosity, we applied all the changes together as shown in figure 6 and we found out that introducing the new product is still better than keeping the current.

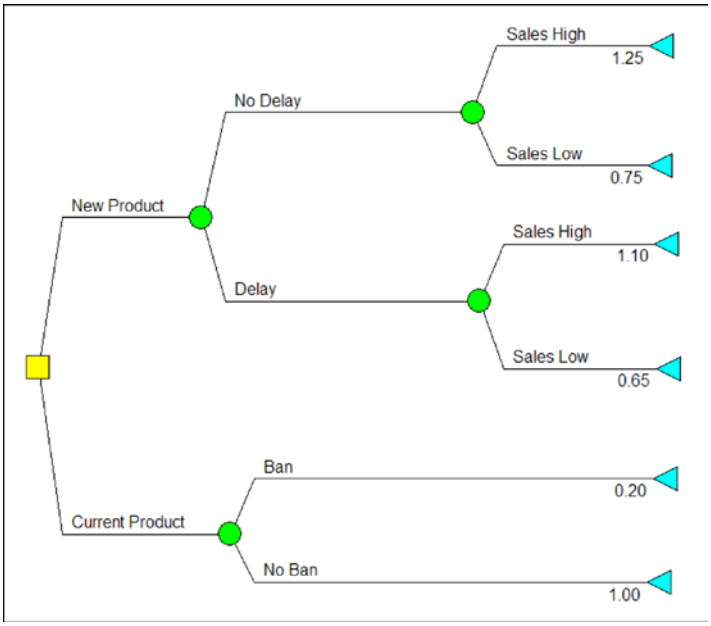

Figure 6: Marla Decision Tree (all changes)

3.4 Steven Kellogg Input Analysis

0.76 = (1-D) [0.64(1.35) + 0.36(0.85) + D [0.57(1.2) +0.43(0.75)]
0.76 = (1-D) (1.17)
0.76 = 1.17 – 1.17D + 1.0065D
D = 2.508 (Not possible because 0<D<1)

As we have found out in the analysis, the delay probability has no effect on our decision (new product) what so ever. To support our analysis, we will apply the changes that Steven suggested by reversing the delay and no delay probabilities as shown in the figure 7.

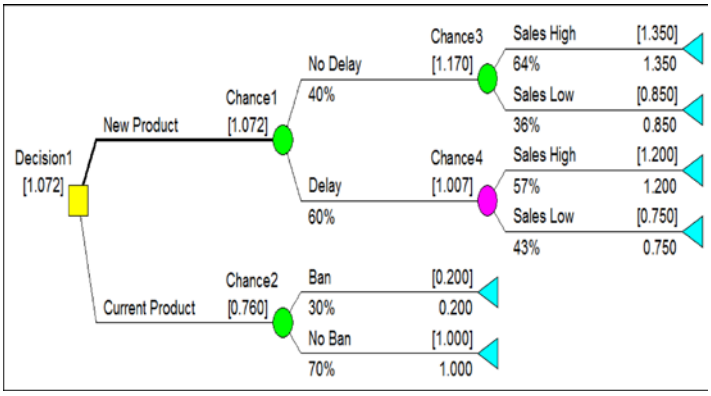

Figure 7: Steven Kellogg Decision Tree

Steven suggested model supports our claims therefore, Steven changes doesn't affect the optimal decision (new product).

3.5 John Dilts & Pete Lillovich Input Analysis

After applying the changes suggested by Pete and John together, we found that the new product remains to be the best alternative.

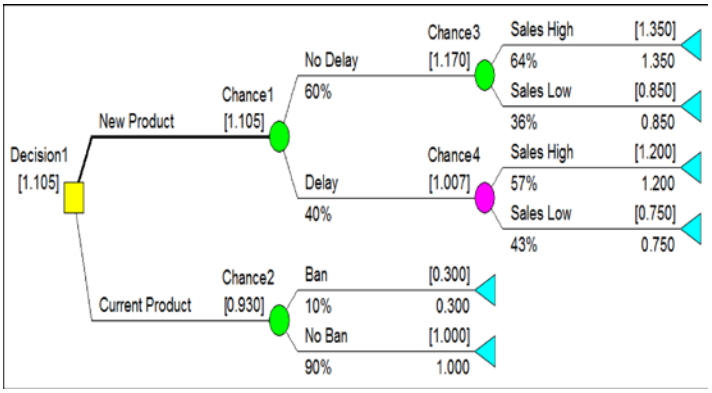

Figure 8: Pete Lilovich & John Decision Tree

3.6 Marla Jenkins & Steven Kellogg Input Analysis

Applying the changes suggested by Marla and Steven together, we found that the new product remains to be the better for the company.

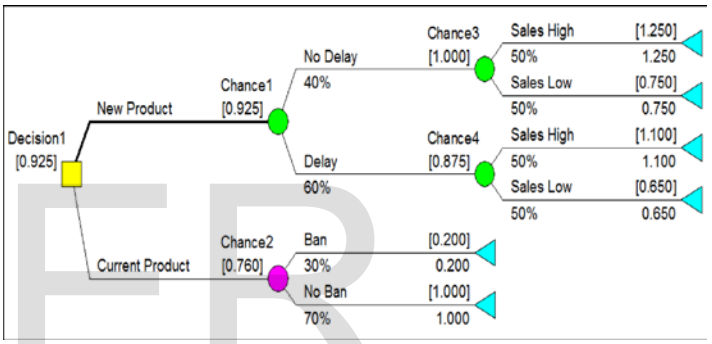

Figure 9: Marla & Steven Decision Tree

er, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

4 CONCLUSIONS

A sensitivity analysis can be performed to get a better understanding of the risks associated with introducing the new product. Nonenthless, the company is better off going with the new pesticide product to replace an old one.

5 REFERENCES

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