

The George Washington University

The American Association  
for the Advancement of Science  
(AAAS)  
Decision Analysis for Circulation Modeling

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## **Introduction**

The American Association for the Advancement of Science publishes the weekly journal Science, a general-interest scientific research magazine. Science has a circulation base of approximately 150,000, and is the most oft-cited research journal in the world. Through its 145,000 individual subscribers and 2,000 institutional subscribers, it is estimated that upwards of 500,000 scientists read Science each week.

## **Background:**

The Office of Membership and Meetings manages the circulation and fulfillment of the journal, as most memberships include a subscription to Science. As Business Manager, I handle the revenue and circulation forecasts for the Association. These forecasts provide the information that determines approximately 90% of AAAS' \$120 million budget each year. It is critical that the forecasts provided to the association be accurate and detailed.

For years, the Business Manager has used a circulation model that has provided eerily accurate revenue and circulation forecasting. When I started in this position 18 months ago, I discovered the model had been created in Lotus many years ago, and had been updated in Excel as needs (such as new membership categories or additional marketing campaigns) were added. This now enormous model was in one spreadsheet, with no instructions, nothing to indicate where annual changes needed to be made, and no one in the company who completely understood how it worked.

The first project I gave myself was to figure this beast out. I printed out the model, which was 27 pages at full size, taped it together and started tracking the formulae. After a week, I was able to break it into several manageable chunks, and determine the inputs. During the past 18 months, I have focused on learning our marketing strategies, fulfillment needs, dues structuring, and reporting analysis, all of which need to be reflected as inputs for the model. Until I fully understood everything that is used to generate the assumptions we build into the current model, I didn't want to try to replace it.

I've now had two cycles of budgeting at AAAS. This year, I updated all the assumptions in the model to reflect changes that have occurred since they were last updated (as long as five years or more ago). I tested the actuals by using them for the 2000 model, and assuming everything went well, I planned to update the 2001 model as part of the budget preparation. However, when I entered actuals for our marketing campaigns, direct mail responses, earned amounts, file fluctuation, etc., the numbers for both circulation and revenue were way off the 2000 actuals.

I knew then that we had to replace the model. If we can't use accurate assumptions, at some point this model will give way and our budget will be way off. For two years I have been within four percent of my budget numbers, and I didn't want to let something I can control mess that up. Worse, I didn't want to try and explain to other department heads how we came to rely on a model with knowingly inaccurate assumptions.

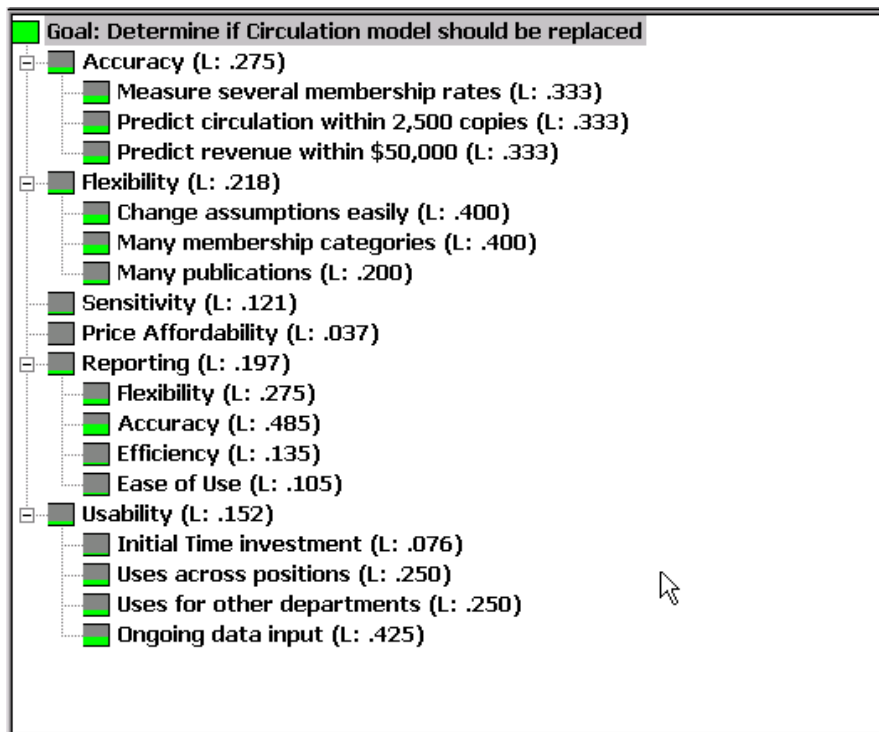
### **Using Expert Choice to Prove a Need:**

Although I am convinced of the need to replace our model, I am having a hard time convincing my department managers that replacing the model needs to be a priority. They are afraid to leave

behind what still seems to be working. They are comfortable with the old model, and sure that the new software out there cannot compete with what we use. To convince them, I'm using a complete analysis in Expert Choice, and supplementing that by having demonstrations of possible circulation models in-office.

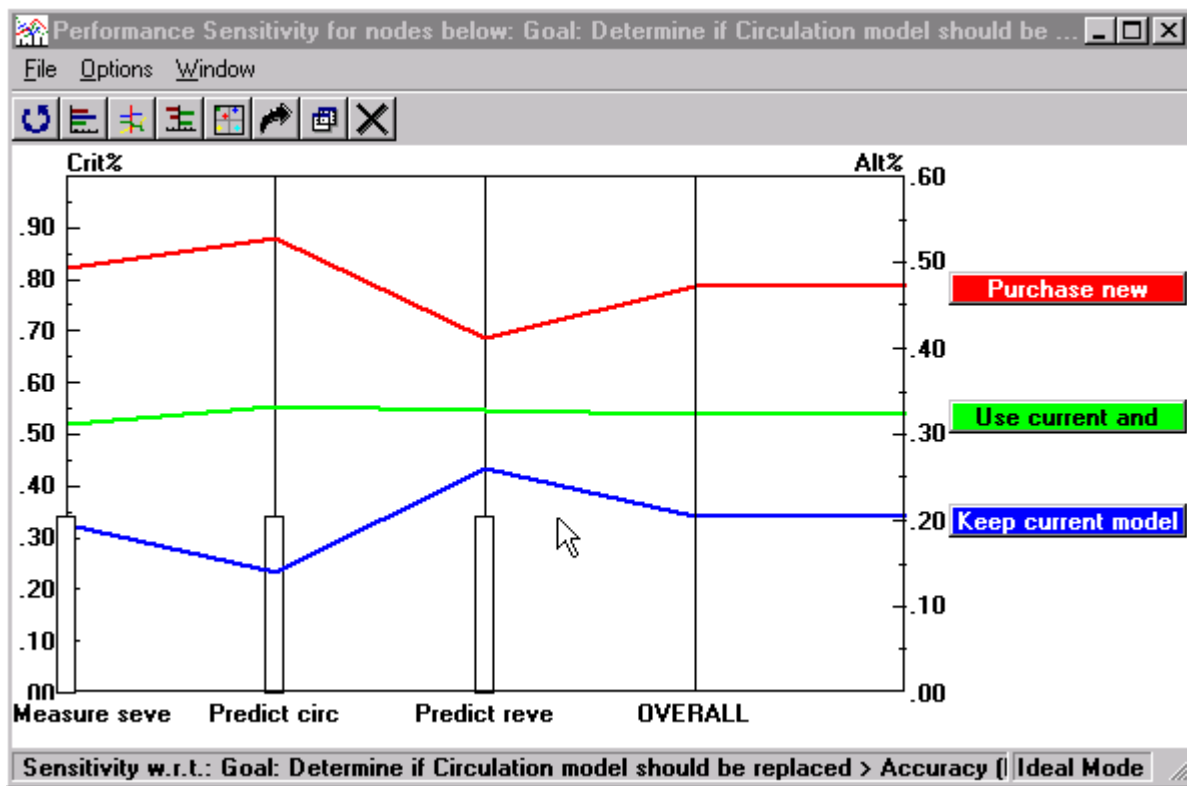
To develop the model, I listed all the objectives I would want in an ideal model. By using pairwise comparisons, I was able to determine which of the objectives were most important for each alternative. The decision to purchase a new model did not surprise me. As I was answering the pairwise comparisons, it became more and more clear to me that the current model simply could not provide the high level of accuracy, flexibility and reporting needs that a new model would give AAAS.

### Goals and Objectives for Circulation Modeling with Respect to Goal:



The most important option for any circulation model is accuracy. The main reason I considered switching to a new model is because the inputs of my current model are not accurate. If I enter accurate assumptions, the output is inaccurate! This is clearly a problem for inspiring confidence to the company that our annual predictions are reliable. I need to be assured that a new model will provide an accurate output based on my assumptions. If the data isn't accurate, none of the other objectives are usable.

### Sensitivity level with respect to accuracy:



Accuracy is the most important of the objectives, though not by much. Within the objective, the sub-objectives pretty evenly came out in favor of the alternative to purchase a new model. The sub-objective “Predict Circulation” was slightly more important than the other two as it has a larger impact on the organization as a whole. If the revenue is off somewhat, it mainly affects our department. I use the model to send circulation predictions for the year to other

departments; if those numbers are off, the impact will be felt in our department, the Finance Department, and the Science Business office.

For my specific use, however, circulation predictions are about as important as revenue forecasts. Too, the ability to use the model for more than just our main publication will be of more importance during the next year. Our current model handles only one publication, but a new model will be able to handle all four of our revenue-producing publications. Since one of the publications is now regularly earning over a million dollars a year, the ability to forecast and analyze is becoming more urgent.

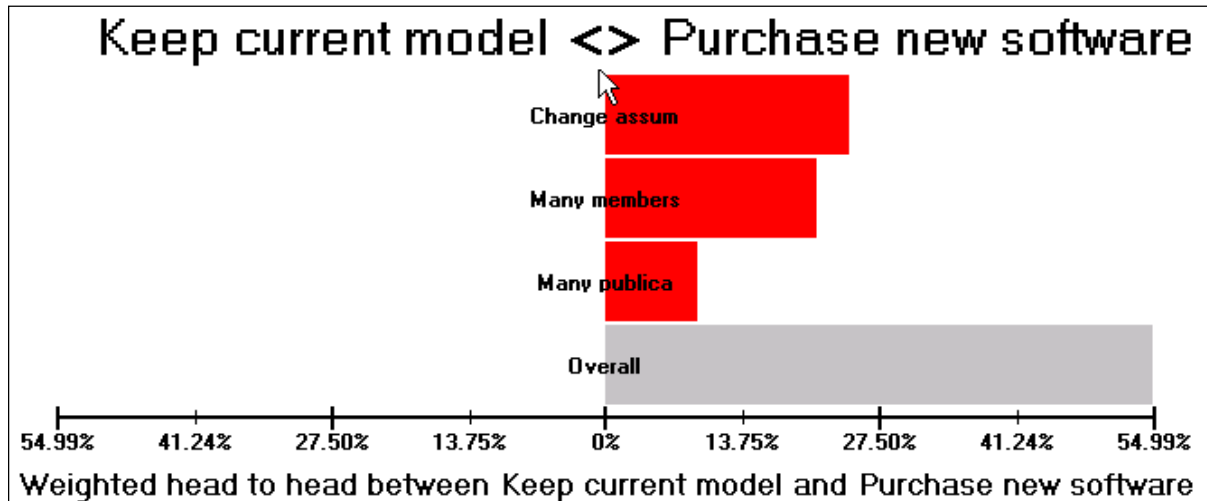
As I stated earlier, accuracy is the first objective that has to be met before any other objectives are considered. However, once that objective is met, other objectives rank closely behind it.

**Flexibility** is another option needed in our circulation model and the second most important objective. Synthesis with respect to the goal shows pretty clearly that a new model would be preferable over the current model. This is because AAAS has several membership categories, each with differing prices. The current model can handle this in a limited fashion, but it cannot track marketing tests or discounts, which we use in a regular fashion. Because of this, we can only estimate the revenue differences caused by these special tests or deals. A new model would enable these changes to be input into the system.

While the current model has been able to keep up with the minimum of our forecasting needs, we are limited to including only our print journal. AAAS produces three online products that generate revenue, but forecasting is simply a guessing game. The model was created before the advent of our online products. Since we have not had flexibility in our model previously, it

doesn't rank as high as accuracy and reporting, but it will greatly improve our long-range forecasting abilities.

### Head-to-Head Flexibility Sensitivity with Respect to Goal:



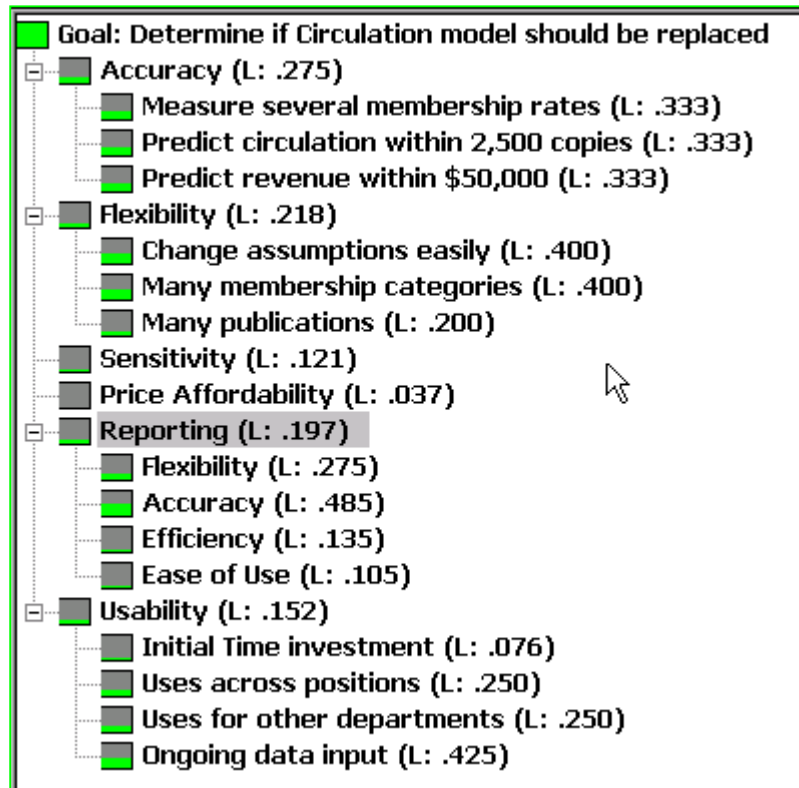
The last major objective is **Reporting**. As our current model is an Excel spreadsheet, we can derive no reports from it: it is for forecasting purposes only. We currently receive all our data from our fulfillment vendor. The data comes in hard copy and has to be manually entered into Excel for spreadsheet reporting.

A new model would automatically access data through our fulfillment vendor and filter it through the system into pre-set reporting links. Once a new model is up and running, reporting and analysis will improve radically. The ability to generate reports will have an impact on several of our other departments. For instance, the Finance office cannot close the month until we receive month-end documents from the fulfillment house. We sometimes have to wait until almost mid-month for these reports. Being able to generate them in-house will save us an enormous amount of time and effort.



Another bonus to a new model is that reports can be balanced in the system, automatically alerting me to data entry errors on the fulfillment side. This ties in perfectly with the sub-objective given the most weight: Accuracy. For reporting needs, the easy choice is to get a new model.

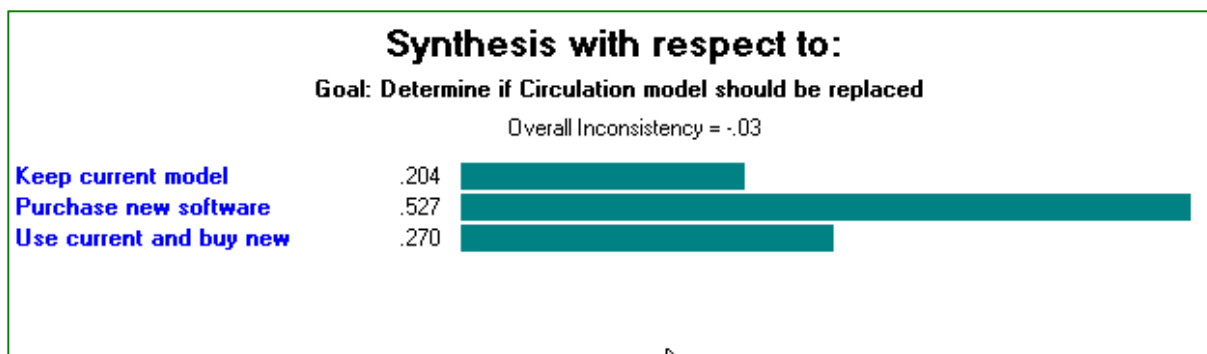
## Level of Importance Derived for Reporting:



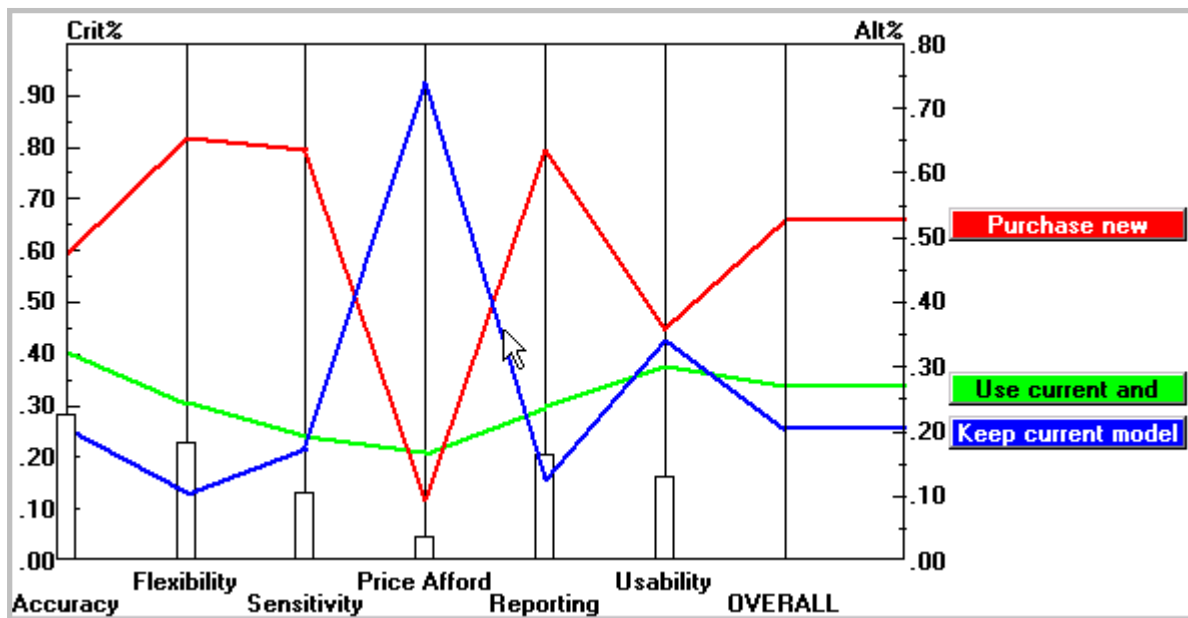
Price and sensitivity rank rather low but are important nonetheless. Since our current model was built in-house, it costs nothing to maintain. A decision based solely on price would immediately disqualify any option. Still, it needs to be considered, since a new model is not budgeted for, and can run from \$500 a month for leasing to up to \$25,000 for a buy-out option (plus consulting costs). This differential makes it especially important to use this objective in comparison to other objectives.

Sensitivity relates to fluctuations in the model if we change the amount of gracing, for instance. Gracing is what we call the number of issues we continue to provide out subscribers after their subscription has expired. Generally we keep the gracing to eight issues, but it will fluctuate during the year. A large amount of gracing can dramatically change our overall circulation rate (by as much 100,000 during the year). Our current inability to factor that into the model does affect the outcome. As with so many other items, we are forced to estimate those differences.

### Overall performance sensitivity as relates to the goals:



### Sensitivity Chart with Respect to the Overall Goal:



## **Conclusion:**

Although I was certain I wanted to replace our current model before starting this project, Expert Choice has allowed me to fully map out the priorities I have with respect to the goal. I have seen two demonstrations for new circulation modeling software in the past week. Prior to the demonstrations, I asked my boss to read over the latest draft of this paper; I felt it was important for him to see the needs that were not being address by our current model. For the first time he could see that there was software out there that would outperform the spreadsheet we have been relying on for so long.

Because of Expert Choice, I was able to refine my search before it began. The pairwise comparisons forced me to determine my level of needs as compared to other possible outcomes before I was bombarded with information. When the demonstrations took place, I was able to see past the sales pitch to determine if the objectives I had outlined could be met.

My boss was able to see the level of consideration I put into this decision. Reading the draft of my paper put the needs of a model into perspective for him as well. He has agreed to help me reallocate a portion of our budget in order to fund this purchase.