Exercise

BrainCell Internet Advertising • Solver

By Arnaud De Bruyn

The *BrainCell Internet Advertising* exercise is a standalone spreadsheet with preset formulas and result displays. To use it, simply open the file "*BrainCell Internet Advertising Data (Solver).xls"*. By default, the file installs in "*My Documents/My Marketing Engineering/*".

Overview

This exercise and the associated spreadsheet are intended to familiarize you with building formulas in Excel, teach you to use Excel's Solver function, and introduce the concept of response functions.

Introduction

BrainCell is positioned to sell cell phones, call plans, and mobile services to end-user customers using the Internet exclusively as its unique sales channel (though it also will employ call centers to some extent, mostly for technical support and billing questions). Partnering with one of the largest available communication networks in Europe, BrainCell follows the same business strategy for its cell phones that Internet banks use with their banking operations: reducing its operational costs through the absence of physical branches and local infrastructure and then using these saved costs to reduce prices and increase competitiveness.

As a relatively new offering, one of the challenges facing the company is identifying and targeting prospective customers. Market research shows that the customers who are most likely to go to the Internet to fulfill their mobile communication needs tend to be well educated, wealthier than the average population, heavy Internet users, and already technically familiar and equipped with cell phones. Given this target population, it seems natural (and cost effective) to use the Internet as a key communication channel to advertise the offerings and launch a promotional campaign.

Although BrainCell intends to enter all 25 countries of the European Union eventually, its offering will launch first in the 6 largest countries: Germany, France, the United Kingdom, Italy, Spain, and Poland, which contain approximately 350 million inhabitants. According to Internet usage, cell phone penetration, and national income market research, some of these countries appear much more attractive than others for BrainCell's offering.

Initial tests and extensive market research indicate several interesting findings. Although English remains the primary international language, it is

much more effective to advertise in the specific language of each target country. Advertising online in English is much more expensive than advertising in Polish or German, because online competition is fiercer in English (and, to some extent, Spanish), so Internet advertising costs rise exponentially (especially for services such as GoogleAds, for which advertisers must bid to get good ad placements). Proportional to its costs, Internet advertising is more effective in French or German than in English, and BrainCell must take this effect into account to measure the cost effectiveness of its Internet campaigns. In addition, the transformation rate for clicks is lower in English; for example, U.S. customers might see an online ad, follow the link (generating costs for BrainCell, which often pays by the click), then realize the offering is not intended for U.S. customers, and leave the site without purchasing.

BrainCell recently began to develop promotional response model tools to help it decide the appropriate level and allocation of Internet advertising across countries. It started with a prototype spreadsheet to encourage discussion about the appropriate level of Internet advertising for the six targeted European countries and to familiarize marketing managers with Marketing Engineering and the related software tools and ideas. In this case, the spreadsheet was developed to both socialize the ideas and help managers understand response modeling and optimization with Excel's Solver tool.

To get feedback about the value of the prototype, the developers purposely left the software incomplete. As a marketing manager, you must complete the missing cells in the spreadsheet (gross margins, acquisition costs, ROI, etc.) using Excel formulas.

In addition, the BrainCell marketing team, along with the advertising agency and Internet consultants, has conducted a judgmental calibration exercise to provide background for the promotional response modeling. In essence, the group considered the following questions: How many customers would BrainCell acquire within its first six months of operations if the company spent:

- Nothing?
- 50% less than current amounts?
- Current planned amounts?
- 50% more than current amounts?
- An unlimited amount?

Using the brand managers' answers to these questions, the software constructs a response model, which relates the amount of Internet advertising to the number of new customers acquired as a result of that spending.

The training session is designed to accomplish several goals:

- ✓ Familiarize you with building formulas in Excel.
- ✓ Introduce you to the functionality of Excel's Solver tool.
- ✓ Introduce the concepts of response functions and judgmental calibration.
- ✓ Produce a preliminary advertising budget (and some sensitivity analyses) for these six European countries.
- ✓ Provide design feedback for a more complete, operational decision support tool.

Note: The only cells you should change when running Solver are Cells C18–H18.

Questions

Question 1. Use Solver to make Internet advertising recommendations. In your analysis, consider several scenarios:

- **Scenario a**: Optimal budget and allocation with no constraints. How do recommendations differ from the initial budget, country per country? Explain these differences.
- **Scenario b**: Optimal allocation, but top management will not allow an increase in the total advertising budget.

  Hint: In Solver, add the following constraint: C26 ≤ [current budget].
- **Scenario c**: Although the spreadsheet provides estimated gross margins per customer for the first six months of the relationship, these figures might be too short-viewed. If customer acquisition represents a long-term investment, its benefits should be measured beyond the first few months. Multiply all gross margins by 3, and rerun the optimization (with no constraints). Interpret the differences.

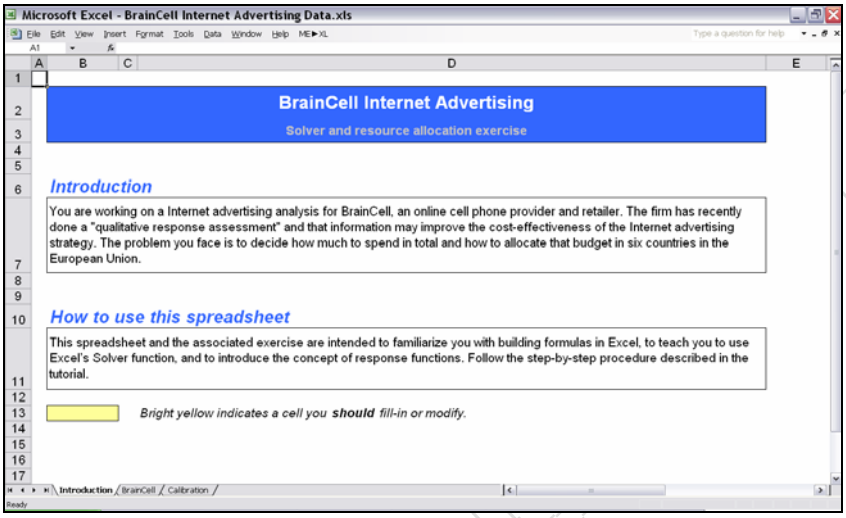
Question 2. According to additional market research, it appears that the total market potential in France might have been grossly overestimated.

- Go the Calibration sheet.
- In Cell D10, replace the value 30,000 by 20,000, the newly estimated market potential in France.
- Recalibrate the response functions using this newly estimated market potential (see *Step 4* on page 8 for instructions about how).
- Rerun Question 1, scenarios *a* and *b*. How sensitive are the recommendations to this change on the response function?

Question 3. After running these scenarios, make some suggestions to the marketing engineering software designers about the uses and limitations of the tool (including enhanced versions) for BrainCell. The following issues have come up in previous discussions: dynamics and time horizon of market response, the validity of the response functions, competition, other (missing) marketing-mix elements, and model validation, among others. What are the most critical characteristics to include in such a tool to ensure its broad use?

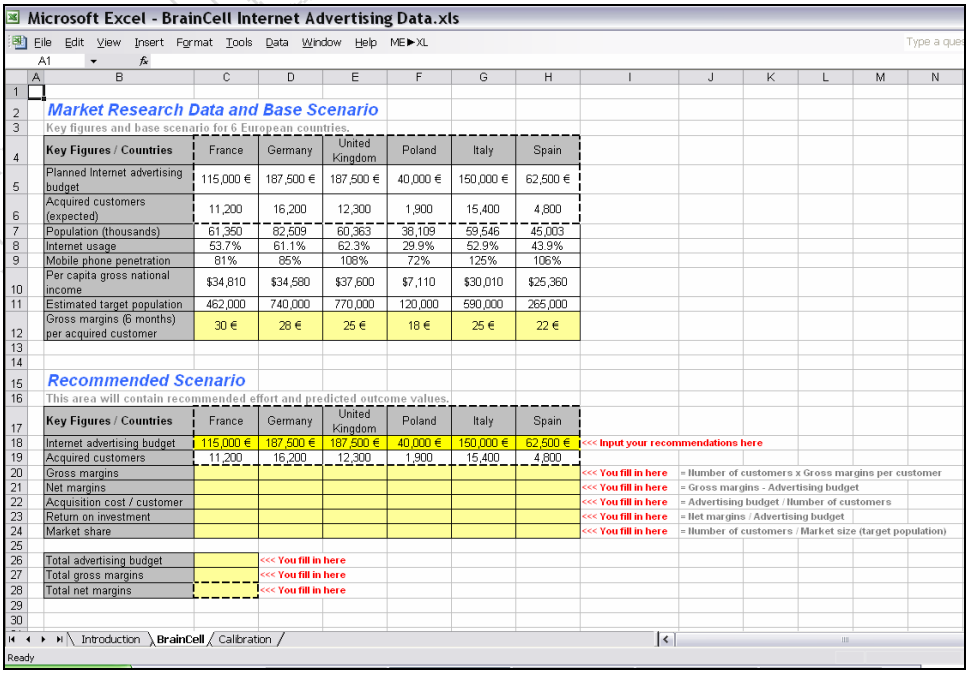
Getting Started

Open the file "*BrainCell Internet Advertising Data (Solver).xls*" in "*My Documents/My Marketing Engineering/.*"



Step 1 Understanding the model

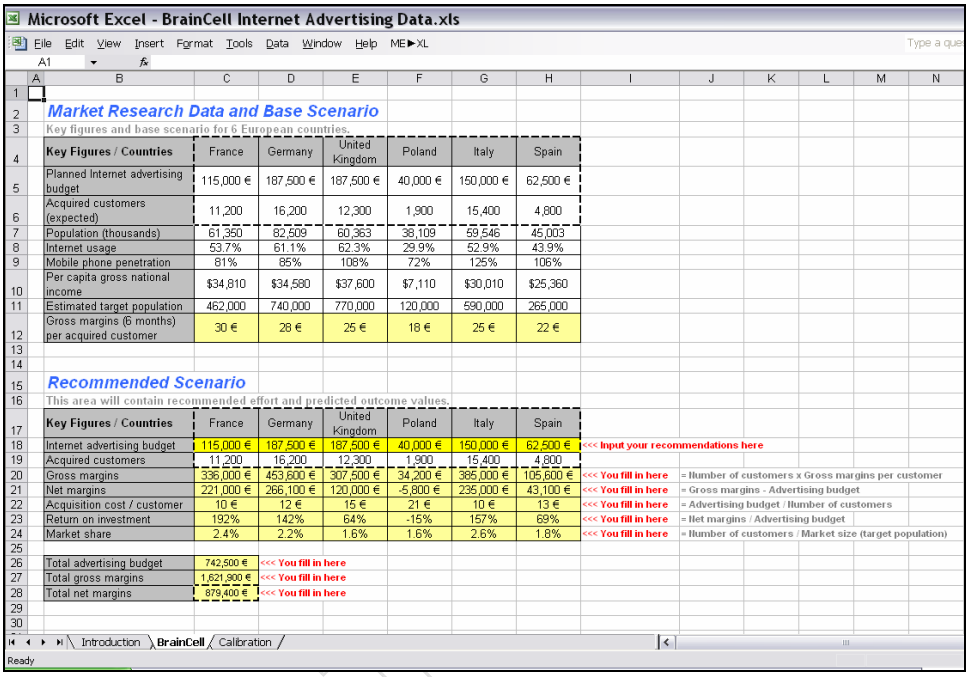
In Excel, click on the *BrainCell* sheet. This sheet contains a simple business model spreadsheet that leads to estimates of net profits for six different European countries.



- **Base scenario** (rows 5 and 6) contains information about the initially planned budget and expected results. For instance, the company plans to spend 750,000€ in the United Kingdom and acquire about 24,000 new customers within the first six months. These cells do not need to be changed. Use them as a reference point only.
- **Market research data** (rows 7–10) contain key figures about the target markets. This information comes from various sources and has no direct impact on the model. Note that mobile phone penetration can go higher than 100%, because some customers have more than one cell phone. This phenomenon is not taken into account.
- **Estimated target population** (row 11) represents how many potential BrainCell customers there are in each country. These figures are based on market research data and should be used later to estimate the true size of the market (e.g., compute market shares).
- **Estimated gross margins** (row 12) per acquired customer represent average revenues minus the costs of serving a new customer during the first six months of its relationship with the firm. This figure does not take into account acquisition costs (i.e., advertising).
- **Recommended scenario** (rows 18 and 19) contains the recommended planned advertising budget and number of customers acquired as a result of that campaign. Cells C18–H18 should become the target cells of Solver. Cells C19–H19 contain the response functions.
- **Gross margins**, **Net margins**, **Acquisition cost per customer**, **Return on investment**, and **Market share** (rows 20–24) must be filled in manually using Excel formulas. *Note: Return on investment is defined as (gross margins / costs) – 1, or (net margins / costs).*

Step 2 Filling in the blank cells

If you fill in the blank cells correctly, your screen should look like this:



Microsoft Excel - BrainCell Internet Advertising Data.xls

File Edit View Insert Format Tools Data Window Help ME►XL

Market Research Data and Base Scenario

Key figures and base scenario for 6 European countries.

Key Figures / Countries	France	Germany	United Kingdom	Poland	Italy	Spain
Planned Internet advertising budget	115,000 €	187,500 €	187,500 €	40,000 €	150,000 €	62,500 €
Acquired customers (expected)	11,200	16,200	12,300	1,900	15,400	4,800
Population (thousands)	61,350	82,509	60,363	38,109	59,546	45,003
Internet usage	53.7%	61.1%	62.3%	29.9%	52.9%	43.9%
Mobile phone penetration	81%	85%	108%	72%	125%	106%
Per capita gross national income	$34,810	$34,580	$37,600	$7,110	$30,010	$25,360
Estimated target population	462,000	740,000	770,000	120,000	590,000	265,000
Gross margins (6 months) per acquired customer	30 €	28 €	25 €	18 €	25 €	22 €

Recommended Scenario

This area will contain recommended effort and predicted outcome values.

Key Figures / Countries	France	Germany	United Kingdom	Poland	Italy	Spain		
Internet advertising budget	115,000 €	187,500 €	187,500 €	40,000 €	150,000 €	62,500 €	<<< Input your recommendations here	
Acquired customers	11,200	16,200	12,300	1,900	15,400	4,800		
Gross margins	336,000 €	453,600 €	307,500 €	34,200 €	385,000 €	105,600 €	<<< You fill in here	= Number of customers x Gross margins per customer
Net margins	221,000 €	266,100 €	120,000 €	-5,800 €	235,000 €	43,100 €	<<< You fill in here	= Gross margins - Advertising budget
Acquisition cost / customer	10 €	12 €	15 €	21 €	10 €	13 €	<<< You fill in here	= Advertising budget / Number of customers
Return on investment	192%	142%	64%	-15%	157%	69%	<<< You fill in here	= Net margins / Advertising budget
Market share	2.4%	2.2%	1.6%	1.6%	2.6%	1.8%	<<< You fill in here	= Number of customers / Market size (target population)

Total advertising budget	742,500 €	<<< You fill in here
Total gross margins	1,621,900 €	<<< You fill in here
Total net margins	879,400 €	<<< You fill in here

Introduction | BrainCell | Calibration

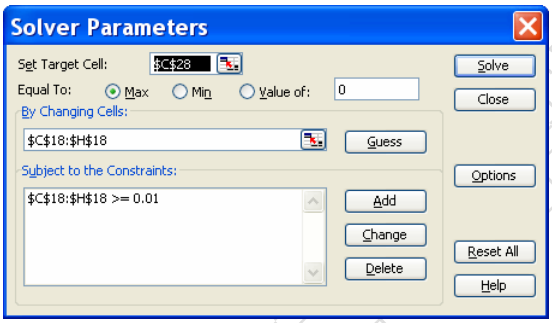
Ready

Note: You must fill in the blank cells using Excel formulas that you develop.

Step 3 Using solver

You must determine the "optimal" spending level that maximizes Total Net Margins (cell C28). (Your spending level for each of the six countries must be greater than or equal to zero.)

Use Solver to perform this task. In the Excel menu, select TOOLS → SOLVER and select the cells as follows (if the SOLVER option does not appear under the TOOLS menu, read the last section of this document to install it):



Solver should have these cells selected:

- **Target Cell** is the cell that you want to maximize, in this case Total Net Margins, in cell C28.
- **Changing Cells** are those cells that contain decision variables; in this exercise, the decision variables are in cells C18–H18 and represent the levels of Internet advertising in each country.
- **Constraints** must be added to the decision variables because you cannot spend less than zero.

Click Solve.

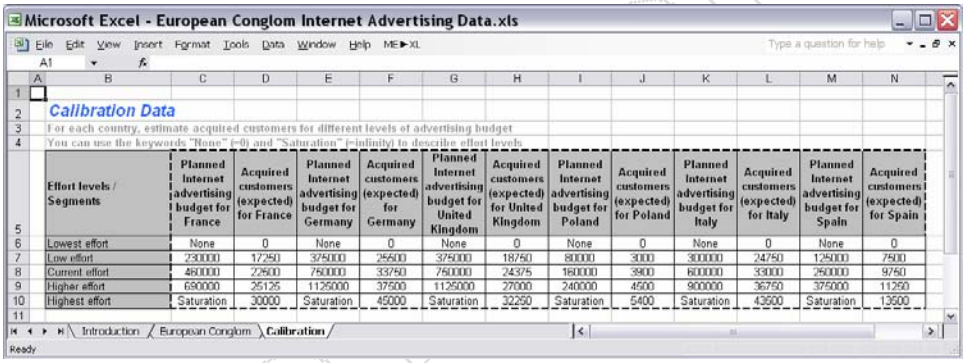
In some cases, the Solver run in Excel will not converge or will converge to a solution that is not optimal. You then may have to provide Solver with new starting values. It is usually a good idea to restart any new optimization from the base scenario.

Note: If you set up the Return on Investment *formulas correctly, setting a budget to zero will create a* Divide by Zero *error in the spreadsheet. To avoid this problem, create a constraint in Solver that the advertising budget in each country must be greater than 0.01 or another very small number.*

Step 4 Recalibrating the response functions

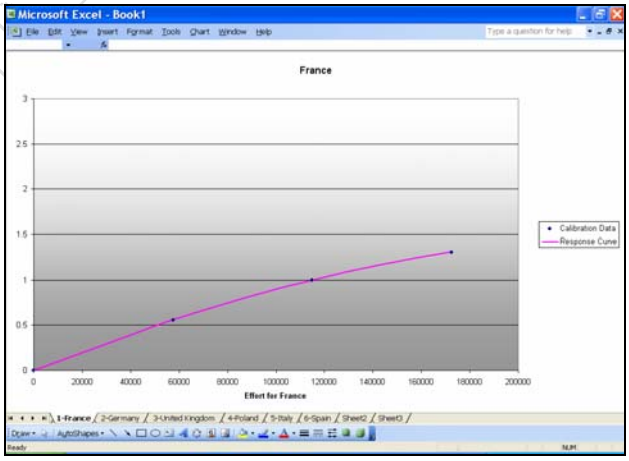
Recalibrate the response curve for various countries and see how it affects the recommendations. Changing the values in the Calibration spreadsheet is not sufficient. Instead, you must also run a calibration analysis of the newly entered data using the Marketing Engineering for Excel resource allocation software. To recalibrate a response function, follow these steps:

- Open the *Calibration* spreadsheet.
- Update the data.
- After you enter consensus estimates for different "what-if" scenarios for each country, click on ME ▸ XL → RESOURCE ALLOCATION → CALIBRATE RESPONSE CURVES, and follow the instructions. Refer to the resource allocation tutorial for details.



Effort levels / Segments	Planned Internet advertising budget for France	Acquired customers (expected) for France	Planned Internet advertising budget for Germany	Acquired customers (expected) for Germany	Planned Internet advertising budget for United Kingdom	Acquired customers (expected) for United Kingdom	Planned Internet advertising budget for Poland	Acquired customers (expected) for Poland	Planned Internet advertising budget for Italy	Acquired customers (expected) for Italy	Planned Internet advertising budget for Spain	Acquired customers (expected) for Spain
Lowest effort	None	0	None	0	None	0	None	0	None	0	None	0
Low effort	230000	17250	375000	26600	375000	18750	80000	3000	300000	24750	125000	7500
Current effort	460000	22600	750000	33750	750000	24375	160000	3900	600000	33000	250000	9750
Higher effort	690000	25125	1125000	37500	1125000	27000	240000	4500	900000	36750	375000	11250
Highest effort	Saturation	30000	Saturation	45000	Saturation	32250	Saturation	5400	Saturation	43600	Saturation	13500

Note: The software will create a worksheet called "Book1.xls" that includes graphs of the response functions, such as:



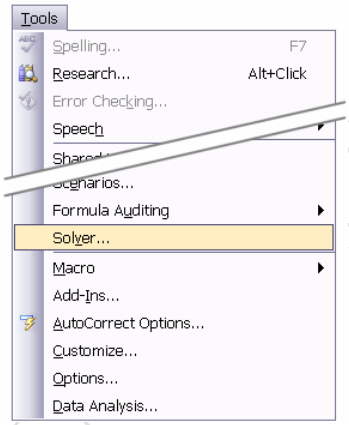
You must return to the sheet called "BrainCell Internet Advertising Data (Solver).xls" to complete the exercise.

Installing Excel's Solver

Microsoft Excel provides *Solver*, a tool that allows users to automatically find the best values to plug into certain cells to optimize (e.g., maximize or minimize) the content of a target cell in a spreadsheet.

Checking that Solver Is Installed

Solver is shipped with all versions of Excel but might not be installed by default. Verify that Solver is installed by opening the *Tools* menu in Excel. If Solver appears as one of the options, it is installed and ready to use.



Installing Solver

In Excel, select the menu option TOOLS → ADD-INS. A dialog box appears. Check the Solver option, and click OK. Solver will install automatically.