WHAT WILL YOU LEARN IN THIS CHAPTER?

This chapter is all about the dialogue between the business people who have a problem that they need to solve and the analytics folks who will give them the information required to solve the problem. This dialogue is mediated by the analytics professional (YOU) who is trusted by both sides because you are fluent in the language and culture of each side. As with any translation effort between two different groups, much of what follows are simple precepts to keep the sense of the business problem while decomposing it into actionable analytics pieces.

Learning Objectives

1. Reformulate a problem statement as an analytics problem
2. Develop a proposed set of drivers and relationships to inputs
3. State the set of assumptions related to the problem
4. Define key metrics of success
5. Obtain stakeholder agreement on the approach

Key Concepts/Fundamentals

OBJECTIVE 1. REFORMULATING THE BUSINESS PROBLEM STATEMENT AS AN ANALYTICS PROBLEM

There's an apocryphal story of a Black & Decker sales convention. The VP of sales gets up to the dais, and says, "Folks, I have some bad news for you. We've done some detailed customer surveys to find out what our customers care about. They couldn't care less about our carbide tips, or the voltage rating of our drills. In fact, they'd rather not think about drills at all! What our customers want is to hang a picture, or put up drywall, or do any number of other jobs. Our job is to help them do just that." Similarly, your business and operational stakeholders likely could not care less about **how** you and your team are going to solve their problem. They just want it to be solved reliably and deliver the results.

The first step is to decode the business problem statement to get to the analytics problem. There are many ways to do this, some more formal than others. In simple

terms, you are translating the "what" of the business problem into the "how" of the analytics problem.

1. What result do we want?
2. Who will act?
3. What will they do?
4. What will change in the organization as a result of the new information generated?

For example, a company wishes to increase market share, but what is the underlying problem they need to address? Are they, for instance, emphasizing carbide-tipped drills to someone who only wants to hang a picture?

One formal method of decomposition is quality function deployment (QFD) (http://www.ieee.li/tmc/quality_function_deployment.pdf). This is a rigorous process that maps the translation of requirements from one level to the next, e.g., from the business level to the first analytics level, from the first analytics level to the second level, etc.

Whether you are formally decomposing and parsing a complex business statement, or you are less formally brainstorming with a project sponsor, it is critically important to account for tacit as well as formal requirements. The best known model in this area is Kano's requirements model (Figure 2). It distinguishes between unexpected customer delights, known customer requirements, and customer must-haves that are not explicitly stated.

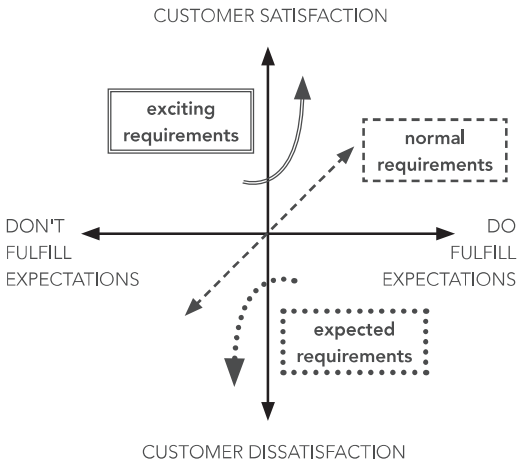

Figure 2: Kano's Requirements Model (used under Creative Commons, http://creativecommons.org/licenses/by-nc-nd/3.0/us/)

Often there are business or operational requirements that are taken for granted by those stakeholders that if not surfaced will result in customer dissatisfaction, particularly items that come under the heading of "that's the way we always do things." Now, there are times when those requirements or assumptions need to be challenged, but they can't be challenged until they are brought to light. When you ask your business stakeholders for a list of what requirements they have, they will tend to focus on the "normal

requirements," not the "expected requirements." As the analytics professional charged with translating business requirements into the problem statement, you really need to probe to make sure that you have the entire appropriate context as well, including the expected requirements.

OBJECTIVE 2. DEVELOP A PROPOSED SET OF DRIVERS & RELATIONSHIPS TO OUTPUTS

These next three items are related. Your input/output functions are strongly related to your assumptions about what is important about this problem as well as the key metrics by which you'll measure the organizational response to the problem.

We'll start by defining the input/output functions of the problem at hand. As with any of these areas, you can be as formal or informal as you like, but sketches and diagrams certainly help communicate with your stakeholders and help get everyone on the same page.

Here's a very simple example: An organization wants to predict the number of detected software defects over the next six months. That's the output. The inputs would be elicited from stakeholder interviews, using questions like, "What future activities will add to our rate from where we are today?", "What will decrease our rate from where we are today?", "Will we add interfaces or components to the testing?", "Will we materially change the size of the test team?", etc. Bear in mind that you aren't looking for causation at this stage, just ideas around which you'll form some hypotheses against which you'll test your model later.

Once you have these inputs and a general sense of their predicted effects, you have a choice of how to communicate them to the team at large. A simple table (Figure 3) is one approach. A black box sketch (Figure 4) is another approach. How you do it isn't nearly as important as doing it in a way that the people you're working with will understand.

INCREASING FACTORS		DECREASING FACTORS	
NAME	SCALE	NAME	SCALE
NEW INTERFACES	LESS THAN 1	TEST TEAM SIZE	LESS THAN 1
CUSTOMER SITE DEPLOYMENT	1-10	TIME SINCE LAST NEW FUNCTIONALITY	LESS THAN 1
…	…	…	…

Figure 3: Input Table

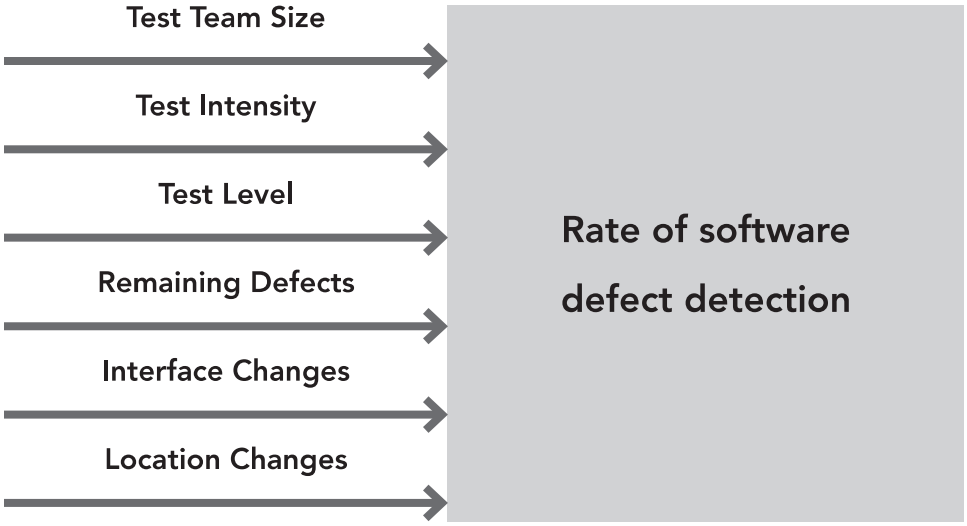

Figure 4: Black Box Sketch

Even these simple examples help illustrate the concept. The idea here is to make the inputs visible and start getting agreement among the team on the direction and scale of the relationships to bound the problem and to create the related hypotheses that you'll use later to attack the data. A point you'll want to emphasize to the team is that these are preliminary assumptions and while your best estimate is needed, it is still just an estimate and is subject to change depending on what reality turns out to be. The danger we're trying to avoid here is what Kahneman calls "anchoring." People have a tendency to hang on to views that they've seen and held before, even if they are incorrect. Reminding them that these are initial and preliminary, rather than finalized views, helps mitigate the anchoring effect.

OBJECTIVE 3. STATE THE SET OF ASSUMPTIONS RELATED TO THE PROBLEM

This is where you set the boundaries of the problem. As you look at your input drivers, each likely has one or more assumptions embedded in it that needs to be surfaced and listed. Additionally, some complexities can be trimmed away if their presumed effect on the answer is less than the effort required to handle them.

As Stephen R. Covey (2004, p. 24) said, "We simply assume that the way we see things is the way they really are or the way they should be. And our attitudes and behaviors grow out of these assumptions." Common practice assumptions in your organization also need to be listed and questioned regularly to ensure that they are either still valid or that the problem statement needs to change to incorporate changes to them.

OBJECTIVE 4. DEFINE THE KEY METRICS OF SUCCESS

There is a truism quoted by many people that "what is measured, improves" (cf. Drucker, Pearson's Law, Hawthorne effect). This ties directly to the business problem statement, but goes down one level further to the items that comprise the key success metric. For example, if the business problem is that the organization wants to increase return on sales from 10% to 12%, you might decompose that a few different ways. One way is to give each business group that goal, or even to give each group the objective of reaching 13%, figuring that some won't make it and on average we'll be okay. Another way is to look at your value chain and give each group a target: cost of goods reduction of five percentage points, general and administrative reduction of three percentage points, etc. These metrics need to be negotiated, published, committed to, and tracked so that your team knows where you are and what to do next. As is the case throughout this chapter, you have to make sure that all facets of the business problem are incorporated in the metrics. After all, if you don't say how something will be measured, you don't know how you're doing, and you can't succeed.

OBJECTIVE 5. OBTAIN STAKEHOLDER AGREEMENT

Although you've been in touch with your business stakeholders at some level all along, this is when you come back to them to walk them through your assumptions and approach and what the final answer will look like to be sure that you really are answering the business problem. Whether in the form of a formal presentation, you want your assumptions acknowledged along with the reframing you did from the business problem, and the key metrics you will be using to mark progress toward the solution.

Many people tend to think of stakeholders as people in positions "above" the analytics team. It is true that there is a group of stakeholders that are the ones with the business need and who are paying for the effort. But just as importantly, you must also have an agreement with the people executing the analytics work that your methods and hypotheses are workable in the time and budget allotted to get the work done.

The output of this stakeholder agreement will vary by organization, but should include the budget, timeline, interim milestones (if any), goals, and any known effort that is excluded as out of scope. The key is to get all the pieces we've noted in this chapter verbally discussed, documented, and visibly agreed to by all parties. It can be tempting to settle for e-mails or written documents only and desk-side reviews. For all but the simplest problems, this is a mistake. Translation of problems from the business domain to the analytics domain, or truly from any

given domain to another domain, requires that all parties agree to definitions and terms, which really does require full and frank discussion. Otherwise, errors will creep in and what was delivered will miss critical unstated requirements. If you allow your project to rely on written communication only, you've missed the opportunity to correct misapprehensions when it is still cheap to do so.

SUMMARY OF KEY TERMS

Decomposition: the act of breaking down a higher-level requirement to multiple lower-level requirements (http://www.hq.nasa.gov/office/codeq/software/ComplexElectronics/l_requirements2.htm).

Requirements: a requirement should be unitary (no conjunctions such as and, but, or or), positive, and testable.

SUMMARY

Faithful translation of the business problem statement into an analytics problem statement requires the following:

- Understanding the business case for solving this particular problem

Framing the business case as an actionable analytics problem by:

- Defining the key input and output drivers
- Surfacing and understanding individual and organizational assumptions
- Assigning goals to each sub-group affected by the problem

Full and frank review of the approach with the business stakeholders and the analysts to ensure that the problem can be attacked as planned and that a successful attack will yield the desired business result.

FURTHER READING

Albright SC, Winston W, Zappe C (2011) *Data Analysis and Decision Making*, 4th ed. (South-Western Cengage Learning, Mason, OH).

Covey S (2004) *The 7 Habits of Highly Effective People* (Simon & Schuster, New York).

Crow KA (1992) Quality Function Deployment, http://www.ieee.li/tmc/quality_function_deployment.pdf.

National Aeronautics and Space Administration (2009), Assurance Process for Complex Electronics, http://www.hq.nasa.gov/office/codeq/software/ComplexElectronics/l_requirements2.htm.

Tversky A, Kahneman D (1974) Judgment under uncertainty: Heuristics and biases. *Science* 185(4157):1124–1131.