OR Process Skills Transform an Out-of-Control Call Center into a Strategic Asset

Vijay Mehrotra, Thomas A. Grossman
Department of Finance and Quantitative Analytics, School of Business and Management, University of San Francisco, San Francisco, California 94117
{drvijay@sbcglobal.net, tagrossman@usfca.edu}

A large consumer-software company was struggling to manage a seemingly unmanageable, high-cost technical-support call center. The company used “OR process skills” to transform the call center into a strategic asset. By focusing on executive priorities, personally observing business processes, engaging with frontline workers, and directly examining the sources of important data, we discovered the central problem amidst a contentious, disorganized situation. We used a pilot program to test simple analytical tools, such as Pareto charts and sampling, to bring actionable information to the right parts of the organization. Following the processes we developed, the company analyzed customer feedback to improve the product and customer self-support mechanisms, thereby reducing both current and future call volumes. By empowering client staff and leading process change across functional boundaries, the company reduced its call-center costs and achieved higher product quality. In addition, we demonstrate that OR process skills can be an essential element in sustaining long-term consultant-client relationships.

Key words: OR/MS implementation; data analysis; philosophy of modeling; quality management applications.

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This paper describes an engagement from a long consultant-client relationship. This project utilized only a few basic analytic techniques, such as statistical sampling and Pareto charts, adapted to the services context. Despite its modest mathematical content, this project is noteworthy because it highlights OR process skills that are often essential in satisfying client needs and uncovering opportunities to apply traditional OR. We describe in context the OR process skills that we applied and place them into a larger framework of OR practice.

The client organization is a large consumer-software company with three product lines. The company had achieved rapid growth by adding new features to its products and marketing aggressively; it released new product versions annually. However, technical-support call-center expenses were excessive. Senior management lacked confidence in the call-center managers and felt that the call center was not being managed well.

We used OR process skills to change how the call center did business and to reestablish senior management confidence in its operations. The main benefits to the client were (1) conversion of the call center into a strategic asset that enabled improved product quality and customer service, (2) elimination of a source of aggravation and distraction, and (3) reduction of call volumes. The benefits to us were credibility and goodwill, which led directly to extensive follow-on work performing traditional OR, including the project described in Saltzman and Mehrotra (2001).

OR Process Skills

OR process skills address the real-world factors that are “assumed away” in mathematical models. These skills, which are essential for enabling organizations to effectively use analytic models, are part of every consultant-client engagement. This engagement relied heavily on seven OR process skills (Table 1).

None of these skills is new, and research literature exists on many of them. The contribution of this paper is to describe their role in the context of an engagement that cemented an important long-term client relationship.
1. Understand and address executive priorities.
2. Personally observe existing business processes.
3. Engage with frontline workers and earn their trust.
4. Examine the source of the data and do not trust data that are given.
5. Use a pilot program before attempting a large-scale rollout.
6. Take the lead in changing business processes, especially across functions.
7. Empower people in the client organization.

Table 1: This table shows the OR process skills we used in this engagement.

Literature Survey: Call Centers and OR Technology

Call centers have been fertile ground for OR. Research includes call-forecasting models (Andrews and Cunningham 1995, Avramidis et al. 2004), staffing models based on queueing theory (Andrews and Parsons 1993; Koole and Mandelbaum 2002; Green et al. 2003, 2007), agent-scheduling algorithms (Andrews and Parsons 1989; Aykin 1996, 2000; Caprera et al. 2003; Atlason et al. 2004), and simulation models (Brigandi et al. 1994, Saltzman and Mehrotra 2001, Mehrotra and Fama 2003). Several surveys, including Aksin et al. (2007), Gans et al. (2003), and Grossman et al. (2001), provide additional references.

The Starting Point

Our client at the software company was the vice president of operations (VPO). We had just concluded our first engagement by delivering a call-center forecasting tool, and we felt strongly that the company had a need for significant additional work applying the traditional OR tools of queueing theory, simulation, and optimization.

However, the company and the VPO had other priorities. The technical-support call centers were in a crisis state. Customer waiting times were excessive, with a mean of over five minutes. Call abandonment was high, at times in excess of 20 percent. Call-center expenses were 16 percent of revenue, almost triple the 6 percent that competitors were spending.

The VPO, who had executive responsibility for the call-center operations, felt heavy pressure to resolve the crisis. Upon learning that this was his top priority, we proposed to help sort out the problems at the call center (we used OR process skill 1).

Gathering Information and Defining the Problem

The problem was ill-defined. We began by gathering information about the call-center operations from several sources, starting with the VPO. Customers contacted technical-service representatives (TSRs) in one of two locations by calling a toll-free number. Each of the 300 TSRs cost the company over $50,000 per year, a total of more than $15 million to the company. The call center received 45,000 calls per week, with higher volumes near product release dates, and in December, January, and February because of customer usage patterns immediately before and after the end of each calendar year. Call volumes were perceived to be rising, in part because of a growing customer base.

We talked with call-center line managers. They believed that they understood their operations well and provided 50-page reports full of charts, graphs, and tables that they prepared weekly as evidence. They claimed that high technical-support costs were because of error-prone, complex products used by unsophisticated customers. They argued for increased funding to hire new TSRs to respond to the increasing call volumes, and felt that the engineering team should be doing more to fix bugs and improve the software’s usability.

The call center reported to the VPO but was funded by a business unit (BU) that was responsible for sales, marketing, engineering, and product development. We talked with several BU managers. They were frustrated by the call-center performance and lacked confidence in its management. They were also unwilling to throw more money at the call center when technical support costs were already much higher than those of competitors.

We paid frequent visits to the call centers to personally observe existing business processes, engage with frontline workers, and examine the source of the data (we used OR process skills 2–4). In particular, we spent substantial time sitting with TSRs while they were talking to customers. Between calls and during breaks, we listened carefully to their insights and worked hard to earn their trust. During a call, a TSR
listened to a customer’s description of symptoms, took notes, experimented on his or her own computer, speculated on the cause, searched collections of Post-it notes and e-mail printouts, consulted online resources, asked the customer to take certain actions, and eventually proffered a solution. The variety in call content was so high that TSRs saw few repeat problems. (This seemed surprising; however, we verified that it was true.) We found that supervisors used each TSR’s average handling time (AHT) in evaluating performance; therefore, TSRs were under pressure to keep calls as short as possible.

We observed how they captured raw data on customer issues by using a list of over 100 “wrap-up codes.” At the end of each call, the TSR was supposed to find the appropriate code number from a three-page list and enter it into his telephone handset. Because we were physically present and trusted by the TSRs, we were able to diagnose three significant problems associated with using the wrap-up codes.

**TSRs selected incorrect codes.** TSRs had an incentive to choose a code quickly to ensure short AHTs. Several TSRs told us that it was common to simply select a code arbitrarily rather than search for the correct one. Not surprisingly, they frequently selected codes near the top of the list.

**The codes were not actionable.** The codes were mostly symptoms (e.g., “General Protection Fault 000254”), or fixes provided by the TSRs (e.g., “Reinstall the WPR.EXE file”). They provided no insight into the root causes of customer problems.

**Customer problems did not match codes.** The codes were defined prior to product release. Thus, many customer problems were not associated with a code because they were unanticipated. New problems were not added to the code list, and several TSRs told us that they typically coded such problems arbitrarily.

We reached several conclusions from this problem-definition process. First, the wrap-up code data were fatally flawed; hence, the lengthy reports that the call-center management generated were neither accurate nor meaningful. Second, the call center was unable to provide information to the groups within the BU (engineering, marketing, and documentation) that could drive bug fixes and product changes; therefore, despite tens of thousands of telephone conversations each week, the company was unable to “hear” its customers. Finally, without systematic improvements in the software product, growth in the customer base would only exacerbate the call-center crisis in the months and years to follow.

**Rethinking the Role of the Call Center**

In the short term, the call center continued to fight for more financial resources to hire additional TSRs to increase its service capacity. In the long run, however, we understood that the company had to reduce the customers’ need to call technical support. To help achieve this, it needed to expand beyond helping customers with their problems; specifically, it needed to influence the BU to fix product bugs, improve product usability, and enhance customer self-support materials, all of which would reduce demand for call center resources. To make this work, the call center needed to take three actions.

**Obtain the correct data.** The TSRs had a great deal of knowledge about underlying causes that the wrap-up codes did not capture. This knowledge needed to be captured and utilized.

**Analyze data to create actionable information.** Based on feedback from the BU, we knew that it was essential to provide detailed information about recurrent problems, their relative frequency, and the context in which they occurred. The call center needed to develop a method for analyzing raw data to identify specific customer problems.

**Establish communication and trust across departments.** The call center could not eliminate any customer issues by making changes to the software, documentation, or Web support resources without the cooperation of the BU.

**Learning from a Pilot Program**

To test our ideas about data collection and data analysis, we ran a pilot program (we used OR process skill 5) involving 16 particularly diligent TSRs at a call center close to our office. We provided the TSRs with a simple paper form on which they would document the customer’s activity when the problem occurred, the TSR’s assessment of the cause and the proffered solution(s), and the problem-handling time. We coached the TSRs to provide plenty of detail and visited them often to maintain a strong relationship.
Within two weeks they had created 4,000 paper forms. We organized the forms into binders under approximately 100 themes, such as “printer problems.” This enabled us to distinguish multiple issues that had previously been incorporated under a single code. For example, the code “Unable to Print” became “cannot print a Summary Report,” “when printing my font is very small,” or “HP Deskjet prints transactions with different margins than I see on my screen.”

Unlike textbook examples, the Pareto chart of the issues was flat. Fewer than 10 issues had a frequency of even 1 percent of total calls; approximately 20–30 issues had a frequency 0.5 to 1 percent; and 50–75 issues had a frequency of 0.25 to 0.5 percent. About half the calls appeared to be unique issues.

**Getting Buy-in from the BU (and Funding from the VPO)**

Armed with these results, we still needed to change business processes so that call-center insights could be used to improve the product; we also needed the help of the BU staff to change the processes (we used OR process skill 6). The BU staff was outside the VPO’s direct authority and not friendly with the call center. With difficulty, we were able to set up meetings with representatives from marketing, engineering, and documentation. In these meetings, we discovered that both our Pareto charts and the binders containing the sorted call-content forms were effective in motivating the BU to take action to address specific customer issues.

With this level of buy-in from the BU, the VPO agreed to fund a full-scale “call-stopping” program that would improve upon the pilot, implement it across both call centers, and transfer it to client staff.

**Developing and Rolling Out the Full-Scale Call-Stopping Program**

Significant changes were needed to develop and implement the full-scale program based on the pilot. To enable hundreds of TSRs to collect call-content data, we replaced the paper forms with an Access database with a Visual Basic interface. Given the large volume of data, it would be infeasible to examine all call records; therefore, we used sampling to choose records for classification.

Most importantly, to sustain the program over the long run, we needed to empower client personnel to take ownership of analysis and reporting (we used OR process skill 7). Two new “call-content analyst” (CCA) positions were created to analyze call-content data, organize findings within a database, and communicate them across the organization. Two highly regarded TSRs were hired into these positions. Ultimately, we transferred responsibility for all analysis, reporting, and communication with other groups to the CCAs until they owned the entire data collection, data analysis, and reporting process.

We worked with the CCAs to develop a Visual Basic platform to randomly sample call records, assign them to specific customer issues based on the raw data entered by the TSRs, compute frequency statistics, and generate specific reports.

Given their credibility as former TSRs and knowledge of the products and the organization, the CCAs were able to take actions that we could not. For example, one challenge was to persuade the TSRs to capture the requisite detailed data. The CCAs were passionate advocates for high-quality data collection. Once their analysis began to produce insights about customer behavior, the CCAs regularly presented their results to teams of TSRs to motivate them.

We worked to establish new business processes for communicating results from the call center to the BU (we used OR process skill 6). We began by changing the reports that were provided to the BU, focusing on information quality rather than quantity. We developed reports of frequently asked questions (FAQs); they included actionable information on the most common customer issues. The Excel-based FAQ lists (e.g., Figure 1) could be sorted on AHT, frequency, or workload (AHT weighted by frequency).

We produced three primary reports each week. The “Flash Report” listed all issues that had emerged for the first time that week. The “Rolling Four-Week FAQ” provided insight into the cyclical nature of customer issues. The BU staff eagerly read the “Year-to-Date FAQ” to estimate the costs associated with each of the top issues.

We assembled a cross-functional team comprising the CCAs, marketing, engineering, documentation, Web development, and technical-support training. The
team met weekly to solve problems on the FAQ lists by acting in three areas:

Product quality. The team eliminated bugs and improved the user interface by providing immediate patches and then making permanent changes to the next major release;

Customer self-support facilities. It modified manuals, the help facility, and the technical-support website; and

First-call resolution. It prevented callbacks by revising the TSR training materials and online knowledge base, thus ensuring that TSRs would solve problems correctly.

Understanding the Call-Stopping Program’s Benefits

This program led directly to thousands of changes to the client’s products that enhanced both the customer experience and product reputation. It resulted in changes to documentation and websites that allowed customers to self-support without needing to contact the call center for help. The VPO spent much less time on the “call-center crisis.” Senior management no longer felt the call center was mismanaged. To the BU, the call center became a strategic asset that bridged customer needs and product capabilities (Chase and Garvin 1989).

It is notable that cost savings were not an explicit driver in this project. We were not asked to provide a financial justification to sell either the pilot program or the full-scale call-stopping program. As part of a budgeting process to extend our approach to the client’s other business units (an engagement not discussed in this paper), we were asked to provide a rough savings estimate. We used a “quick-and-dirty” model to estimate that savings would be in the range of $0.75–$3.3 million for the largest of three product lines. A financial analyst in the client organization devised a simplistic model that had great credence in the organization. A referee proposed an enhanced model. We conclude that the estimation of cost savings is an interesting research question; in the electronic companion, we provide more detail and a call for further research. The electronic companion to this paper is available as part of the online version that can be found at http://interfaces.pubs.informs.org/ecompanion.html.

Conclusions

The technical-support call center, although expensive, was delivering poor customer service with no prospects for improvement other than throwing more money at the problem. In partnership with many people in the client organization, we transformed the
call center into a strategic asset that used customer feedback to enhance product quality; it also reduced call volumes. This engagement was essential to the long-term success of our young OR firm because it was the springboard for extensive follow-on work doing traditional model-and-algorithm OR.

The Importance of OR Process Skills
Before entering academia, the authors spent a combined 16 years working full time in OR consulting firms. We learned that much of the art of practice involves managing the process whereby a client organization can benefit from data and models. We learned that to grow an OR consulting business over the long run, it is important to sell follow-on engagements to current clients. A long-term consultant-client relationship depends heavily on OR process skills.

Despite its importance to the practice of OR, we knew little of OR process skills when we left school, similar to many young OR professionals we speak to today. In this section, we discuss OR process skills (Table 1), place them into a larger framework of practice, and argue that they deserve explicit attention in our research literature.

Some might argue that these OR process skills are not OR at all, or that they are the same as process and quality management. However, our goal as practitioners is neither quality nor process improvement per se; it is to convince clients that our OR work, whether in the form of mathematical insights or softer process improvements, is worthy of their time and money. OR process skills are central to that conversation. We believe that the OR profession must value OR process skills and nurture them in its practitioners.

OR Process Skills in a Larger Framework of Practice
Fortuin et al. (1996) performed structured interviews with OR practitioners. They provide a powerful framework for understanding different types of OR practice. This paper fits their category of “facilitator OR” whereby the “support from OR is more on issues of cooperation and integration (cross-functional, multi-plant) and it resides less in the tools or interactive computer systems than in the person of the OR worker and his or her process skills” (Fortuin et al. 1996, p. 9). This category of OR practice has a strong pedigree relevant to this paper. Ackoff (1973) discusses the importance of managing “messes” that are complex systems of changing problems that interact with each other; Pidd (1996) discusses situations with extreme ambiguity and possibly disagreement.

Practitioners Must Do More Than Sell Tools
The impetus to focus narrowly on tools is a part of OR’s historical evolution. Ackoff (1987) traces a evolution of OR/MS from its roots as a “market-oriented profession” that defined itself by the class of users it addressed, through a stage of being an “output-oriented profession” that defined itself by the class of problems it solved, to becoming an “input-oriented profession” that defines itself by the class of tools it uses.

For OR practitioners, we see strong benefits to a market orientation that focuses on the needs of customers to solve operational problems using any techniques that work. There is a far larger market for consultants who can fix ambiguous, messy operational problems than there is for people who are limited to analyzing and optimizing stable business processes in the presence of accurate data. It is desirable for the OR practitioner to be effective working across functional boundaries because clients often find it difficult to do so. The practice of working through ill-defined problems to improve business operations can lead to opportunities to implement traditional OR solutions; for example, Saltzman and Mehrotra (2001) describe a subsequent project involving this client’s call centers. We note that as academics we can more easily define ourselves based on deep, narrow expertise, in part because we no longer need a stream of paying clients to make a living.

Need for Research on OR Process Skills
We learned OR process skills via apprenticeship from senior OR consultants, and by learning from our own mistakes. Although these are expensive ways to learn, they may be common; Corbett and van Wassenhove (1993, p. 632) indicate that “Most knowledge about the process of applying OR is implicit, and generally seems to be learned by trial and error.” We see a need to make explicit this implicit knowledge by performing research into the process of creating client value using OR. We would also like to see the role of these OR process skills receive more attention in the presentation of traditional OR success stories.
Electronic Companion

An electronic companion to this paper is available as part of the online version that can be found at http://interfaces.pubs.informs.org/ecompanion.html.

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References


Fortuin, L., P. van Beek, L. van Wassenhove. 1996. OR at Work: Practical Experiences of Operational Research. Taylor & Francis, Bristol, PA.


The editor in chief has received a verification letter attesting to the impact of this work on the firm. The firm has requested to remain anonymous.