IDENTIFYING SYSTEM-WIDE CONTACT CENTER COST REDUCTION OPPORTUNITIES THROUGH LEAN, CUSTOMER-FOCUSED IT METRICS

by

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Submitted to the MIT Sloan School of Management and the Civil and Environmental Engineering Division in Partial Fulfillment of the Requirements for the Degrees of

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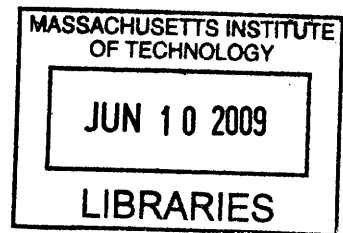
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ABSTRACT

Dell's long-term success depends on its customers' future buying patterns. These patterns are largely determined by customers' satisfaction with the after-sales service they receive. Previously, Dell has been able to deliver high customer satisfaction but has done so at a high expense, further reducing the low margins on their consumer product line. Dell's Global Consumer Services and Support organization (GCSS) is constantly innovating to lower its operating costs while maintaining customer satisfaction. Their task is difficult to achieve in part because of the broad scope of problems that Dell's customer service agents (CSAs) tackle and the grey areas of support boundaries. In order to identify and correct the root-causes of these contact-center costs, Dell needs the ability to measure the specific cost of supporting individual customers. Yet, no such customer-centric data framework exists at Dell, or indeed in the contact center industry. However, it is possible to create just such a customer focused data framework by applying an automated value stream mapping (VSM) analysis to a large sample of contact-center activity data from Dell's data warehouse. The resulting data set is a collection of digital value stream maps representing the end-to-end customer service experience of each contact-center customer. After performing the proposed data transformations, these customer-focused metrics (CustFM) are shown to yield significant insights into previously unidentifiable cost reduction opportunities available across Dell's global contact-center network.

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"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the stage of science."

Lord Kelvin [PLA, vol. 1, "Electrical Units of Measurement", 1883-05-03]

"... Lord Kelvin's famed quotation, that we do not really understand until we can measure, still stands. But before we measure, we should name the quantity, select a scale of measurement, and in the interests of efficiency we should have a reason for wanting to know."

Jay Forrester [Industrial Dynamics, 1961, p. 59]

GLOSSARY

Average Handle Time (AHT)
- Average number of minutes spent by a CSA interaction with a customer during a contact.
- Since AHT is often used as a proxy for cost, it is thought that if calls are kept short, the contact center's costs will go down, allowing staff levels to be reduced over time.

Call Avoidance Program
- A process engineering effort to reduce the number of calls to CSAs by directing customers to cheaper resolution channels such as web self-help on http://support.dell.com.

Contact
- A single interaction between a CSA and a customer in any of the resolution channels.

Customer Experience (CE)
- Customer Experience is measured at all the different stages of the customer's journey with a brand, e.g., brand awareness, product/service availability, ease of buying, ease of installation, welcome experience, usage quality, quality of service, awareness of future needs. Customer service is just *one* dimension of the customer experience.

Customer Service Agent (CSA)
- These contact center employees are most often referred to as "agents". They operate at the first level of support, answering phones, online chats, emails, and letters. Agents are differentiated from "technicians", a more highly trained group to whom the most difficult issues are "escalated".

Customer Satisfaction (CSAT) (as stated by Customers in surveys)
- After customer calls tech support, they receive a survey asking, "Are you satisfied with the experience?" The % CSAT is equal to Positive Responses / Total Responses
- A high value is good desirable since CSAT is known to correlate with customer repurchase behavior and future revenue.

OTB
- Abbreviation for "on-the-box" denoting the resolution channel created by installing custom Dell software on the computer (i.e., the "box"). OTB software can automatically diagnose hardware and software problems and sends such data back to the contact-center.

Resolve in One (Ri1)
- % of calls resolved in a single contact (as stated by the customer in surveys)
- If the customer states that the issue was resolved, and only one contact was made, it's an Ri1
- Ri1% = Total Ri1's / Total Customer Responses

Resolution channels (OTB, Web, Email, Letter, Chat, Phone)
- A channel is the medium through which agents interact with the client. When telephone interactions were the prevalent means of communicating with customers, "contact centers" were referred to as "call centers".

RR: % Resolution Rate
- RR = 1 – (Failures / Calls to tech support)
- Failure = customer contacts Dell again within 7 days

Service Level
- % of calls offered within acceptable (as defined by Dell) time in queue
- Service Level = Sum of Calls Offered within Acceptable Window / Total Calls Offered

Transfer Rate: % of calls transferred

- Total number of Transfers / Total Calls to Tech Support
- A high number is bad as this indicates inefficiency in call routing and added telecom expense.

1 Introduction

1.1 Business Context at Dell, 2007-onwards

When Michael Dell returned as company CEO in January 2007, Dell Inc. was still the leading PC manufacturer in the US and the second worldwide[1]. For many years, Dell's direct, make-to-order model and use of vendor-managed inventory had given it a competitive edge by shortening its supply chain relative to the competition[2]. But this advantage had been temporary; competitors were now achieving similar efficiencies and had taken market share. The personal computer industry had also become largely commoditized and Dell's ability to customize each order had become irrelevant to the marketplace. Dell no longer held the dominant industry strategy.

In March 2007, in a bid regain market leadership, Dell resolved to cut $3 billion in costs by 2010. The company would do so through a combination of belt-tightening measures including layoffs, factory closings, and outsourcing, all with immediate effect. As a result of these measures, in February 2008, Dell's Global Consumer Division posted an end-of-quarter profit[3]. The division hoped to build on this momentum with: (1) a renewed focus on product design, as well as (2) a radically transformed approach to customer service based on lower service levels coupled with better expectation setting[4].

Customer service itself is a lesser-known aspect of Dell's profitability model. In an industry known for razor-thin margins, the cost of answering a few technical support calls following a computer sale can rapidly exceed the profit made on that sale. The important responsibility of managing this, the "tail end of profitability," belongs to Dell's Global Consumer Support & Services group (GCSS).

1.2 Dell's Challenge

While layoffs and cutbacks can increase profits in the short-term, Dell's longer-term (and greater) challenge is to maintain market share and growth by ensuring sustained customer loyalty. To do this, the company must engage in practices that maximize each customer's satisfaction level (CSAT), a survey measure that itself is a strong predictor of another survey metric, Likelihood To Repurchase (LTR). LTR is very important. Specifically: LTR, multiplied by installed customer base, multiplied by the average price of a PC, divided by the average PC lifetime equals the revenue stream that can be expected as a result of customer loyalty and satisfaction. Thus, assuming a stable customer base, LTR has a linear effect on revenue, e.g., if LTR is 50%, and you are not acquiring more customers, your revenue will fall by 50% over the customer's purchase cycle (approximately 3 years in the PC industry).

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[1] Christy Pettey, *Gartner Newsroom*, Gartner, January 15, 2009, http://www.gartner.com/it/page.jsp?id=856712 (accessed February 19, 2009).

[2] Bill Breen, *Living in Dell Time*, December 19, 2007, http://www.fastcompany.com/magazine/88/dell.html?page=0%2C2 (accessed March 31, 2009).

[3] Dell, Inc., *Dell.com*, February 26, 2009, http://www.dell.com/content/topics/global.aspx/about_dell/investors/meet_conf/webcast_42?c=us&l=en&s=cor p (accessed March 14, 2009).

[4] Interview with Dell executive.

In the commoditized and saturated PC marketplace, the only remaining differentiator affecting customer loyalty and satisfaction (and therefore future revenue) is Customer Service. Michael Dell has known this for a long time; his 1999 book states:

> *"We've found that pricing is only one-third of our customers' decision-making process; the other two-thirds represent service and support."*[5]

Thus, for Dell's customers, customer service satisfaction is a strong determinant of repeat purchase behavior. Repeat purchase behavior is often measured as a percentage coined "Likelihood To Repurchase" (LTR). Indeed, this relationship's constancy has been confirmed over time both by customer surveys and actual empirical data of customer purchasing patterns. A recent empirical study conducted at Dell showed that service is actually a 35% determinant of LTR whereas the product experience is a 23% determinant. Put together, the customer experience (CE) is a 58% determinant of LTR[6].

Adding to the challenge of maintaining high customer satisfaction is Dell's goal of doing so in the face of extreme cost cutting. Customer satisfaction (CSAT) is a function of each customer's experience (CE). Additionally, certain aspects of CE—such as the customer's perceptions—are subjective and therefore difficult to measure. The qualitative dimensions of CE metrics are an uncomfortable fit for Dell's culture of empirical measurement.

To meet the CE/LTR challenge, what Dell needs is a means of measuring its contact-center performance, not in inward-facing service level terms, but in terms that mirror **each** customer's **specific experience** during the support process. It boils down to this premise: beyond a certain level of courtesy, empathy, and competence, what a customer desires from the customer service experience is a prompt "resolution" to the issue she called in about. A customer-centric approach is one that focuses uniquely on this resolution, and nothing else, eliminating all "other" activities from the contact-center system. Since these "other" activities do not contribute to the customer's expectation of resolution, they represent waste (extra cost to Dell, and wasted time for the customer) and must be eliminated.

The above approach and mindset is consistent with lean process improvement principles that have transformed automotive manufacturing and are now being applied across a broad range of industries. The contact-center industry has already begun to move toward such concepts as evidenced by the body of work authored by the Customer Contact Council, entitled "Executing the Shift from Company-Centric to Customer-Centric Resolution[7]. Dell itself was actively engaged in lean service delivery experiments at its El Salvador contact centers from 2006 through 2007. During that time, Dell's Business Process Improvement (BPI) group expended significant effort in lean education and employee empowerment. As a result, numerous Kaizen events were held and best practices were recorded and disseminated to other sites. Unfortunately, these efforts were interrupted by cost cutting measures in early 2008. For such efforts to survive, they must be immune to cost cutting and must be embedded into the contact-center's core performance measurement systems to drive lean behaviors throughout the contact-center network.

In this thesis, I offer a candidate set of lean, customer-focused metrics (named "CustFM") that meet these survivability requirements. I developed the CustFM framework with the help of

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[5] Michael Dell, *Direct from Dell: Strategies that Revolutionized an Industry* (Collins Business Essentials, 1999).

[6] These studies were conducted by Dell's now defunct CE group, the last data I saw was through July 2008.

[7] Customer Contact Council, *Acheiving Breakout Use of Self-Service: Overcoming the Conflict between Active Channel Management and Customer Satisfaction*, (Corporate Executive Board, 2006)..

several Dell employees during the Spring/Summer of 2008 and applied it to actual Dell contact center data.

1.2.1 Specific challenges of maintaining customer satisfaction in the service industry

The service sector represents over 79 percent of U.S. economic activities and jobs.[8] This proportion continues to increase as industrial activities such as manufacturing continue moving abroad. As important as the service sector is, companies have been dropping the ball on delivering high quality Customer Experience (CE) as measured by such metrics as CSAT (Customer Satisfaction). Indeed, the American Customer Satisfaction Index for service industries has fallen to 72.5 in 2008, down 4% from its 1995 value. The decline can be attributed to the service industry's high rate of growth and the relatively slow rate of process improvement applied to its practices (relative to manufacturing and logistics). Furthermore, the service industry is hamstrung by the instantaneous nature of its "product" delivery model[9]. Contact-centers are not able to stockpile "inventory" in order to avoid stock-outs as one can in manufacturing. Every customer call needs to be dealt with in real-time. Yet, contact centers struggle to staff ahead of demand because of the added operational expense this entails.

According to PRTM, a strategy consulting firm, "high quality post-sales support is critical for establishing a trusting relationship with your customers. If customers feel abandoned by your company, they are likely to reciprocate [...] In the world of high tech, personal computers, and consumer electronics, "power users are evangelists, much less tolerant of poor customer service [...] customer service operations are no longer a cost of doing business, they're a source of significant competitive advantage"[10]. As illustrated in Figure 1, the causal implications of these relationships are rather simple and illustrate how good service can lead to more sales, not only through repurchasing behavior but also by generating referrals to new customers due to a word-of-mouth effect. Note that that if Product Price and Product Quality are held constant, Service Quality can drive the entire purchase cycle.

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[8] United States Central Intelligence Agency, *Field Listing - GDP - composition by sector*, March 19, 2009, https://www.cia.gov/library/publications/the-world-factbook/fields/2012.html (accessed March 31, 2009).

[9] Rogelio Oliva, "Tradeoffs in Responses to Work Pressure in the Service Industry," *California Management Review*, 2001, Summer 2001 ed.: 26-43.

[10] Robert Rowello, "Customer Service that Helps Your Customers--And You Too," *PRTM Insight*, February 15, 2006..

Figure 1: Causal Dynamics of Customer Satisfaction (CSAT), Likelihood to Repurchase (LTR), and Referral Sales Through the Word-of-Mouth (WOM) Effect
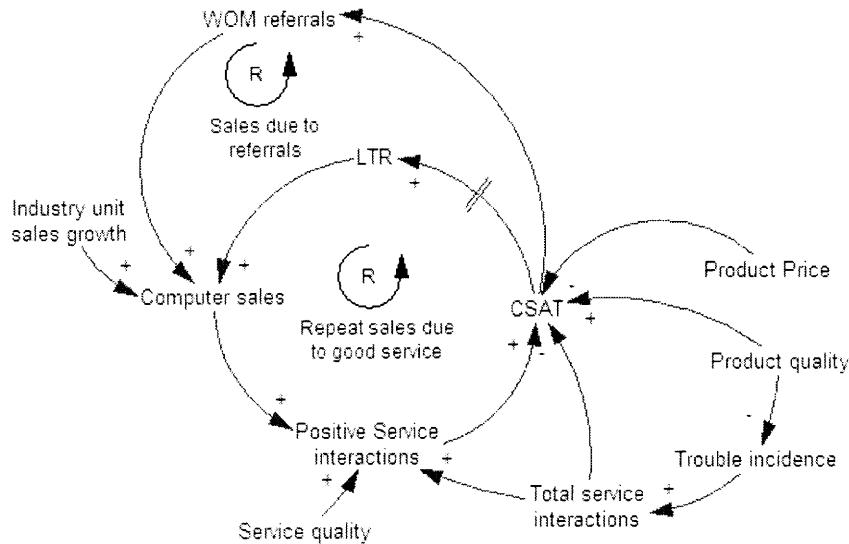
Notice also the reinforcing relationship between CSAT and LTR: the more customers are satisfied, the more likely they are to repurchase, albeit with a delay. The following chart illustrates customer satisfaction score movements for several PC makers between 1994 and 2008. **N.B.:** these data relate to <u>overall</u> CSAT based on a composite of CSAT due to Price, Product Quality, and <u>Customer Service</u> (which, as mentioned earlier, we know to be a 66% determinant of LTR for Dell's customers).

Customer Service (including Technical Support) is therefore a strategic area of performance for Dell and its competitors. Dell invests heavily in this area: it employs approximately 27,000 contact center agents in contact centers spread across North America, South America, India, and the Phillipines. But despite the CEO's knowledge of the relationship between CSAT and LTR, Dell has not always been able to deliver a consistently high customer experience and at times their CSAT has trailed behind major competitors. Public accounts of customers stuck in "Dell Hell" (an unfortunate customer-coined colloquialism describing a bad customer service experience with Dell) have wreaked havoc on consumer sales, as well as Dell's stock price. In an industry where margins are razor-thin, Dell spends three-fourths of its 18% operational expense on support and service[11]. These support expenditures have hurt Dell's bottom line. In 2008, their gross margin was only 5.4% compared to HP's 7.5% and Apple's 16%.[12]

Figure 2 shows how overall consumer satisfaction (CSAT) with Dell products has fared in relation to other major industry players in the University of Michigan's annually compiled American Consumer Satisfaction Index (ACSI). It is interesting to consider the fate of Packard Bell, which had the lowest satisfaction, in relation to the causal model depicted in Figure 1. After years at the

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[11] Employee interviews
[12] Linda Tucci, *HP beats Dell (again) at its Own Game*, February 22, 2007, http://searchcio.techtarget.com/news/article/0,289142,sid182_gci1244810,00.html (accessed March 16, 2009).

bottom of the ACSI ratings as well as PC World's customer satisfaction surveys[13], Packard Bell withdrew from the US in 1999 because its low sales could no longer support its operations.

Figure 2: ACSI Scores for the PC Industry 1995 through 2008[14]
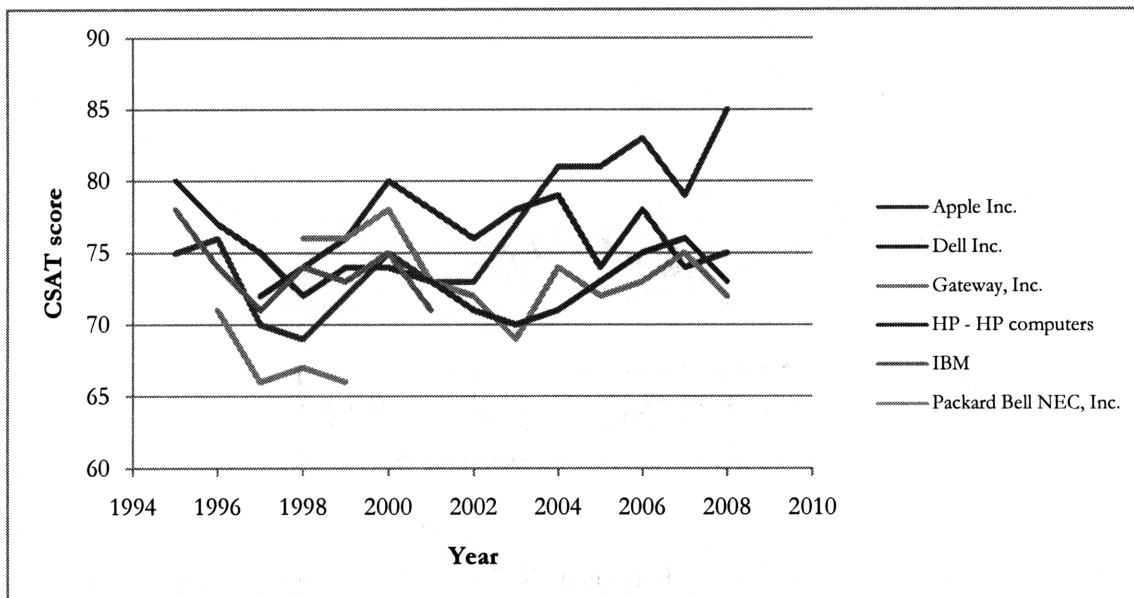
It is also interesting to compare CSAT between the high margin manufacturer (Apple) and the lower margin manufacturers (the rest of the PC industry; data for Sony, which carries higher margins, was not available).

1.3   Dell's recent recovery from the "Dell Hell" stigma

In 2005, Dell's customer satisfaction scores were plummeting[15], having fallen 5 points from 79% to 74% since 2004[16]. David Van Amburg, general manager of the ACSI, attributed this drop to dissatisfaction with customer service[17] rather than quality of the products[18]. Over the next year and a half, the company performed a formidable feat. It recovered from what can only be described as a thorough public relations thrashing at the hands of its own customers; a scenario that would not have been possible before the appearance of blogs and wikis.

While Dell customers may sometimes have had negative customer service experiences in the past, Internet blogs and forums suddenly gave *each* of them an opportunity to highlight their *specific*

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[13] Kirk Steers, *PC Reliability & Service: Who Can You Trust?*, September 29, 1998, http://www.pcworld.com/article/8258-20/pc_reliability_and_service_who_can_you_trust.html (accessed April 29, 2009).

[14] University of Michigan, Ross School of Business, "American Consumer Satisfaction Index," July 2008. Michael Dell, *Direct from Dell: Strategies that Revolutionized an Industry* (Collins Business Essentials, 1999).

[15] Dwight Silverman, *Updated: Dell drops in Customer Satisfaction Survey*, August 16, 2005, http://blogs.chron.com/techblog/archives/2005/08/dell_drops_in_c.html (accessed April 30, 2009).

[16] Tom Krazit, *Study: Dell customer rating plunges; Apple Leads Pack Customer Service, Not Products, were Source of Dissatisfaction for Dell*, August 16, 2005, http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,103959,00.html (accessed March 14, 2009).

[17] John G. Spooner, *Growing Pains Hit Dell's Customer Service*, 02 24, 2004, http://news.cnet.com/2100-1042_3-5162141.html?tag=nefd_lede (accessed 4 30, 2009).

[18] Tom Krazit, *Study: Dell customer rating plunges; Apple Leads Pack Customer Service, Not Products, were Source of Dissatisfaction for Dell*, August 16, 2005, http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,103959,00.html (accessed March 14, 2009).

tales of contact center woe. Suddenly, complaints voiced by individual Dell customers could be read by millions of people across the globe. Things came to a head when Jeff Jarvis, a CUNY Journalism professor who also happened to be a prolific blogger, joined in and began writing about his personal support "nightmare" following the purchase of an expensive Dell laptop he had just purchased. His first post follows:

> "June 21, 2005
>
> Dell lies. Dell sucks.
>
> I just got a new Dell laptop and paid a fortune for the four-year, in-home service.
>
> The machine is a lemon and the service is a lie.
>
> I'm having all kinds of trouble with the hardware: overheats, network doesn't work, maxes out on CPU usage. It's a lemon.
>
> But what really irks me is that they say if they sent someone to my home -- which I paid for -- he wouldn't have the parts, so I might as well just send the machine in and lose it for 7-10 days -- plus the time going through this crap. So I have this new machine and paid for them to F---- -- FIX IT IN MY HOUSE and they don't and I lose it for two weeks.
>
> DELL SUCKS. DELL LIES. Put that in your Google and smoke it, Dell."[19]

Such was the level of buzz that by October mainstream media outlets such as Business Week had picked up the story[20] and Dell was faced with a serious public relations challenge. To ignore the customers' complaints would have been unthinkable in the face of such negative press. The company reacted with speed by taking two critical steps:

- On the front end: It decided to begin communicating with its customers using the very same medium in which it was being criticized: blogs and forums. Thus was born "IdeaStorm"[21] and in conjunction with a revamped Dell Forums[22] site and numerous Twitter feeds, Dell began exploiting social networking technologies to get closer to its customers. Suddenly the very same frustrated customers who had felt ignored by Dell could speak directly with the company in public, worldwide forums. Dell was listening.
- On the back end: Dell decided to deploy its well-known Operations Management skills to improve its contact center performance. They appointed Dick Hunter, former VP of Manufacturing, to run the Consumer Customer Experience and Support (CCES)[23] organization and apply some of the process rigor that had worked in the factory to ameliorating contact center performance. The following comments from Dick Hunter,

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[19] Jeffrey Jarvis, *Dell Hell*, June 21, 2005, http://www.buzzmachine.com/archives/cat_dell.html (accessed March 14, 2009).

[20] Louise Lee and Emily Thornton, *Hanging Up On Dell?*, October 10, 2005, http://www.businessweek.com/magazine/content/05_41/b3954102.htm (accessed March 14, 2009).

[21] blueridge, *Wanted--- English Speaking Support with Working Headsets AND Decision Making Ability*, August 9, 2007, http://www.ideastorm.com/ideaSearchResults?s=%22dell+hell%22&x=0&y=0 (accessed March 14, 2009).

[22] http://en.community.dell.com/forums/

[23] The CCES organization changed names to GCSS after Dick Hunter retired and was replaced by new executives.

explain the causes for the drop in CSAT and yield insight into the leadership mindset during this period:

"The reason for the satisfaction to drop so significantly last year was because of a variety of what I might call stupid decisions. We did things like cutting the warranty period, cutback on our support boundaries (what we were going to support – basically we weren't going to support operating systems). We even went as far as taking our 800 number for tech support off the web site. All of those were done somewhat early last year and we've reversed all of those decisions by this year. Our reversing those decisions started to really go after turning around the bad customer experience we were causing as a result of those things. Those things that hurt us were various cost cutting moves; that was probably the cause.

[These decisions were] all done at the executive level. [...] The people running those areas at the time (I suppose I could talk about it, because I wasn't one of them) thought they could do these things and not affect the customer experience. [...] Well, the reverse ended up happening. That's when Michael and others came back and said we've invested $150 million to turn that around. Yeah, I spent that money and we have turned it around. The ongoing issues are how do we keep the progress going – what are the next steps and so on."[24]

CCES' efforts produced an initial rise in CSAT for 2006 followed by a decline in 2007 (see Figure 2). After spending the $150 million needed to restore CSAT in 2006, CCES began designing transformative improvement initiatives that would help Dell break through to the 90% CSAT target set by Michael Dell. The long-term investment required for this did not survive Dell's OpEx reduction goals and in early 2008, Dick Hunter retired and was replaced by new executives. CCES (Consumer Customer Experience and Support) was renamed to GCSS (Global Consumer Services and Support) indicating a shift away from the goal of maximizing CE.

1.4 A General Case Applicable to Dell's Customer Support Organization

In this thesis, I propose a generic performance measurement framework as a meaningful way to measure a customer service organization's performance throughout its contact center operations. This measurement framework, which I name "CustFM" is based on Lean principles and overcomes certain tensions that are inherent in the objectives of any customer service organization (CSO). These objectives and their areas of impact are summarized in the following table:

Table 1: CSO Objectives and Areas of Impact

Objective	Area of Impact
Resolve the customer's issue	Customer Experience (Quality)
Do so at the right price	Operational Expense (Cost/Time)
With high quality	Customer Experience (Quality)
In the optimal amount of time	Customer Experience and Operational Expense (Quality/Speed/Time)

A CSO's success is typically measured internally in terms of operational expense (OpEx) and externally as customer experience (CE). However, when taken to the extreme, the objectives of these two metrics become fundamentally opposed, and in pursuing one or the other to the extreme,

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[24] Service Untitled Blog, *Interview: Dick Hunter, VP of Customer Experience at Dell*, May 15, 2007, http://www.serviceuntitled.com/interview-dick-hunter-vp-of-customer-experience-at-dell/2007/05/15/ (accessed May 1, 2009).

it is possible for an organization to fall into a guardrail-to-guardrail cycle that I call the "Service-Level-Seesaw". Two scenarios, A and B, illustrate this behavior:

1.4.1 Service-Level-Seesaw

At the highest level, a typical CSO's objective is to:

- Reduce the operational expense of contact centers, while
- Maintaining or increasing customer satisfaction.[25]

Many organizations have not been able to reconcile these two goals, engaging in a guardrail-to-guardrail switch in policies whenever management decides that the organization is failing to meet its goals. These policies are summarized as Scenario A and Scenario B.

Scenario A: "Customer satisfaction at all costs" or "CSAT maximization"

In this scenario, maximum resources are dedicated to giving the customers everything they want in order to keep customer satisfaction high. Such a policy can get costly, when taken too far:

- Monetary concessions are liberally given out to buy goodwill following a shipping error or quality problem.
- Support agents are given leeway to extend beyond prescribed service or scope levels.
- Call time or handle time is not restricted.
- Despite these costs, measured CSAT is likely to be high, and this is good for long-term revenue given the proven link between high customer satisfaction (CSAT) and future likeliness to repurchase (LTR)[26].

Scenario B: "Fanatical cost reduction" or "Opex minimization"

In this scenario, every contact with a customer is seen as a financial loss; this viewpoint can become unpleasant for everyone when taken too far:

- Service levels are cut drastically and customers are not offered resolution even when the problem originates on the company's side, e.g., the sales agent enters the wrong address, but the customer is not allowed to request an address change from the carrier.
- Support agents are held to exceedingly short call times which leads to abrupt and unsatisfactory customer interactions in which customers do not feel like they are being listened to.
- Agents are not incentivized to resolve the customer's issue, but rather to keep the calls short and mark calls as resolved even if they aren't.
- Successful but costly queues are abruptly moved abroad in an order to further cut costs; but service quality drops because money isn't spent on transferring process and expertise.

1.4.2 Causal Dynamics of the Service-Level-Seesaw

The guardrail-to-guardrail (oscillatory) behavior described in the Service-Level Seesaw is typical of systems dominated by balancing loops and subject to significant time delays[27]. Figure 3

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[25] Interview with Dell GCSS executive.

[26] Bruce D. Temkin and Steven Geller William Chu, *Customer Experience Correlates To Loyalty*, February 17, 2009, http://www.forrester.com/Research/Document/Excerpt/0,7211,53794,00.html (accessed March 14, 2009).

[27] John Sterman, *Business Dynamics: Systems Thinking and Modeling for a Complex World* (Irwin McGraw-Hill, 2000): 114-116.

illustrates how a CSO fits the system structure this implies. In this example, a system state (actual CSAT) is compared to a desired level (desired CSAT) and a corrective action (CE improvement programs) is taken to lessen the gap (CSAT gap) between those two values. Note that CE improvement programs are launched with a delay due to decision-making and program design. As the CE improvement programs are implemented, the contact-center's Service level improves—but also with a delay, since the new CE efforts are not deployed across the entire contact-center network all at once. As the service level improves, CSAT will improve—again with a delay due to measurement and customers' changing expectations. (Note that this is the same CSAT that drives LTR, as shown in Figure 1.) The dynamic described forms the CE Investment loop. It is a balancing loop since an increase in the CSAT gap eventually leads to a decrease in the CSAT gap. The delays occurring in the CE investment loop will cause CSAT to exceed its desired level, at which point managers will slow expenditures on CE since they have met their targets. At that point CSAT may drop again but the CSO will be unaware of that until the next CSAT measurement is taken and the reported is distributed. The CSO would then increase CE improvement expenditures again, overshoot their goal again, and so on.

Figure 3: Causal Loop Diagram of the Structure Responsible for the Service-Level Seesaw
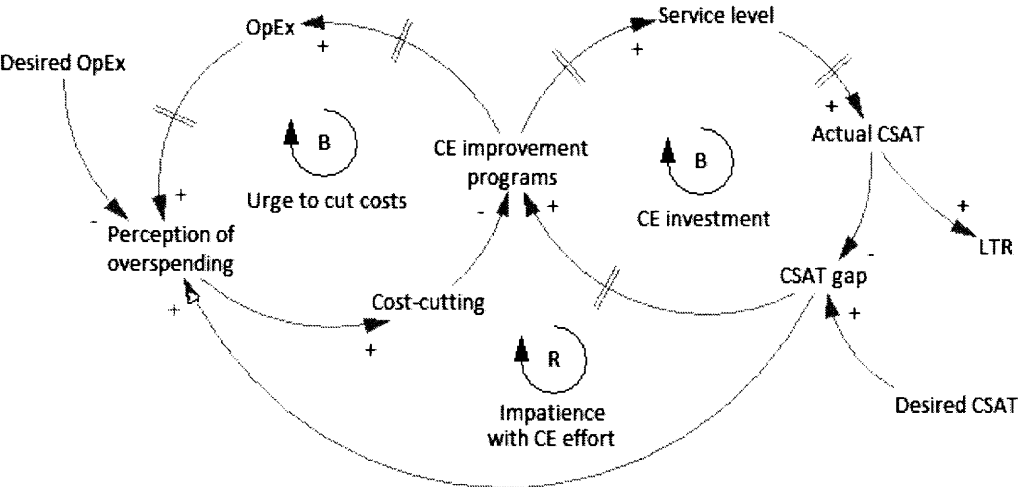
A second balancing loop further complicates the oscillatory dynamics of the structure shown in Figure 3. In "Urge to cut costs" executives compare a desired level of OpEx to quarterly reports of OpEx. The quarterly reporting timing creates a time delay. Executives use this information to update their judgment of whether or not the CSO is overspending. Beyond a certain threshold, they issue orders to cut costs, leading to the reduction of CE improvement programs; OpEx is consequently reduced. Additionally, the executives are simultaneously comparing the CSAT improvement promised by the CE improvement programs to actual CSAT (which is reported more frequently than OpEx). Seeing little improvement, or worse—seeing the drop caused by the oscillatory nature of the CE Investment Loop—the executives' perception that the CSO is overspending on CE is increased, causing them to cut costs before the CE improvement programs are given time to succeed.

The "Service-Level Seesaw" has serious repercussions beyond the organizational turmoil it causes. Customers don't like the inconsistency, CSAT scores suffer, and with a delay, so does LTR.

1.4.3 Solving the Seesaw with Lean thinking and metrics

Certain aspects of Dell's organizational dynamics (which are beyond the scope of this thesis) have made the Service-Level-Seesaw endemic to Dell's customer service. Over the past ten years, Dell has oscillated between scenarios A and B a total of three times, with well documented shifts in customer satisfaction[28] (see Figure 2).

Whether at Dell or elsewhere, the swing between Scenarios A and B is due to the inherent tensions described in Table 1 and the tendency of CSOs to simultaneously pursue industry-standard metrics objectives that are hard to reconcile, e.g., cost efficiency and high CSAT (quality). CSOs are not alone in this; traditionally, all business endeavor has been faced with the challenge of balancing cost, quality, and speed. Yet, compared to manufacturing, CSOs are more vulnerable to the seesaw effect because their service-levels and spending can instantaneously be adjusted by changing contact center policies, e.g., "We will no longer allow users to get order status over the phone". No capital expenditures are required for such adjustments; change can literally happen overnight. The resulting swings in service level and customer satisfaction neither benefit the customer relationship nor the organization's ability to sustain and continuously improve internal processes. Ironically, sustained process improvement is specifically what is needed in order to solve the "cost, quality, speed" challenge that leads to these policy swings.

The lean manufacturing perspective—derived from the Toyota Production System—is one that has been proven to reconcile the tension between cost, quality and speed. Instead of constantly changing policies to meet any of those three objectives, the Lean perspective focuses on activities that produce outcomes that the customer values. Work throughout lean organizations is then aligned to prioritize value-adding (VA) process steps while eliminating non-value adding (NVA) steps. The activity-based "value streams" thus created—and triggered only in response to customer requests—then become the organization's core process flows. These flows are then continuously improved to further reduce NVA steps and add more value as defined by the customer[29]. Lean thinking differentiates NVA activities into seven types of waste; these are laid out in Table 2.

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[28] University of Michigan, Ross School of Business, *Scores by Industry: Personal Computers*, http://www.theacsi.org/index.php?option=com_content&task=view&id=147&Itemid=155&i=Personal+Computers (accessed March 14, 2009).

[29] James P. Womack and Daniel T. Jones, *Lean Thinking* (Free Press, 2003).

Table 2: Types of Waste Identified by Lean Methodology for Manufacturing and their Equivalents in Service Delivery.

Manifestation in Manufacturing	Manifestation in the Service Industry
Defects (Rework)	Incorrect data entry
Over Production	Preparing extra reports, reports not acted upon, multiple copies in data storage
Transportation	Extra steps in the process, distance traveled
Movement	Extra steps, extra data entry
Waiting	Processing monthly, not as the work comes in (i.e. closings), queue time and hold time in call centers
Inventory	Transactions not processed
Over Processing	Sign-offs

Traditionally, companies have achieved this kind of enterprise-wide lean behavior by creating deep learning organizations in which the people closest to the work are empowered to experiment with process improvements and consciously engage in an ethos of continuous improvement in the pursuit of perfection. A broad educational goal of this kind would be difficult to achieve across Dell's entire, globally distributed network of 27,000 CSAs. But according to Deborah Nightingale, Co-Director of the Lean Advancement Initiative, research has shown that:

> *"Appropriate metrics appear to be an overarching driver of "lean" behavior. Putting in place these customer focused metrics that are aligned with cycle time reduction, for example, will necessarily drive lean behavior. Our enterprise research suggests that these are much larger determinants than the "bottoms up" learning organization constructs."*[30]

Thus, metrics that capture the lean perspective, through (1) systematic value/waste measurement and (2) appropriate goal setting, can (along with an empowered workforce) allow a CSO to focus on delivering what is of value to the customer and only that; thereby reconciling cost, quality and speed objectives simultaneously.

In contact center terms, the above statement translates to: "the less we frustrate the user by wasting his time, the happier he will be and the less it will cost us". The lean CustFM metrics framework described in the following sections is an attempt to measure the contact center on the basis of the preceding statement. CustFM reconciles the tension between achieving high customer satisfaction and lowering operational expense in the contact center by keeping track of the value-added and non-value added interactions experienced by each customer.

This customer-focused metrics framework was conceived of a result of:

- 48 semi-structured interviews with seasoned Dell employees from various job functions, both managers and individual contributors.
- My participation in several contact reduction programs within GCSS
- My exposure to Dell's massive Siebel ERP implementation efforts.
- My review and analysis of recorded customer service and technical support calls.
- Immersion into the Dell culture over 7 months of extraordinarily fast-paced organizational change.

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[30] Personal communication with author.

In the following Methodology chapter, I will describe the data sets and transformations used to construct a set of CustFM digital value stream maps for a subset of Dell customer support users. Then, in the Results chapter I will describe some findings made by mining those digital value stream maps. After that, in the Discussion chapter, I will discuss direct applications of the CustFM framework at Dell, implications for lean advancement, and will offer some insights into Dell's organizational dynamics. Finally, in the Conclusion, I will recapitulate my key project lessons and offer some closing remarks on the end-to-end customer experience.

2 Methodology

2.1 Approach

To avoid the Service Level Seesaw, a CSO organization can measure its Contact centers on metrics that reconcile the imperative for high CSAT with the operational need for low OpEx. The key is to create a Customer-Focused Metric (CustFM) that directly measures the customer's experience and allows the organization to focus on activities that directly benefit the customer while ridding itself of activities that detract from the customer's experience. As previously stated, this reconciliation is best done with an analysis of the user's value stream throughout the customer service interaction, as prescribed by the lean methodology derived from the Toyota Production System. Such an approach has the advantage of distinguishing between activities that:

- Add value to the user (Value Added, or "VA"), from activities that

- Do not add value but are necessary (Non-Value Added Necessary, or "NVAN")

- Do not add value but are not necessary (Non-Value Added, or "NVA")

NVA/NVAN activities frustrate users and lower their satisfaction levels whereas VA activities directly serve the customers' needs and therefore increase their satisfaction. When combined with prompt resolution delivered in a courteous manner, VA activities necessarily satisfy customer needs and therefore drive customer satisfaction. Table 3 shows examples of customer support activities and their VA/NVA/NVAN classification.

Table 3: Examples of User Activities and their Value Stream Classification

Value Stream Classification	Type of Activity (User's perspective)
Value Added	Diagnosing problem for first time
	Speaking with customer
Non Value Added but necessary	Identifying self to the CSA if caller ID could have done the job; this often happens after a phone transfer during which the customer already had to identify herself to the first CSA.
Non Value Added, unnecessary	Time spent in queue[31]
	Time spent explaining the same issue to 2nd, 3rd, 4th ... Nth CSA after failing to get resolution from the first[32].
	Time spent on hold while the CSA looks something up or seeks guidance from a manager.
	Time wasted asking for an escalation when the CSA clearly doesn't have the skills to solve the problem.

2.2 Metrics Design

2.2.1 Traditional Metrics

The contact center industry measures itself based on a series of inward-looking, queue-specific metrics such as: Agent utilization, Service Level, Answer Rate, Average Handle Time, Availability, Queue Time, Hold Time, Abandonment Rate, and numerous others. While these

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[31] From the contact-center perspective, this could be classified as NVAN based on an assumption of fixed contact center capacity under maximum utilization.

[32] See Appendix 6.1.1 for a customer's testimonial detailing the mix of value-added vs. non-value added steps in her customer support value stream.

common industry metrics are adequate for contact-center site management, they are insufficient with regard to identifying the specific workload and activities experienced <u>from the customer's side</u>. For instance, they ignore:

- The customer's end-to-end resolution experience, as measured by the total time elapsed between the computer failure and the resolution (however many days later that may be rather than minutes of resolution time delivered by the agent).
- The number of times the customer had to call in.
- The question of what percentage of time was spent on hold versus actually getting service?

Table 4: Common Contact-Center Metrics and their Shortcomings

Metric	Description	Shortcoming	Objective
AHT	Average Handle Time	Shorter calls cost less money. The agent is pressured to keep the call short rather than do whatever is necessary to resolve the user's issue. CSA "issue ownership" suffers as a result.	OpEx
AMPR	Average Minutes Per Resolution	Measures cumulative telecom time logged for the number of minutes elapsed before a call is marked resolved by the CSA. Measures agent time only, not time the user spends in queue, being transferred, repeat calling etc. Is averaged over the activities of a queue.	OpEx
CPC	Cost per call (computed as total operational costs /total # of calls)	Since this is a simple ratio it is easy to game. Lower values can be achieved by making each call shorter. If rewarded on CPC, CSAs are motivated to be more abrupt with users, transfer calls before they are resolved, and generally lower service level.	OpEx
CSAT	Customer Satisfaction	Score out of 10, averaged per queue but not examined or analyzed on a customer by customer basis	CE
RR	Resolution Rate	There are competing definitions for measuring RR: there is what the agent considers as resolved (within the context of his queue's scope), and then there is the customer's definition of resolution (which has to do with getting the problem solved), finally GCSS has its own definition which is that a call is considered resolved if the user has not called back in within a period of 7 days.	CE

It is possible to perform certain transformations on queue data that already exist in Dell's data warehouse to create what is essentially the reciprocal dataset: specific customer-perspective experience data. The transformed data can be thought of as a "digital value stream map," which specifically follows the customer's experience and is therefore likely to correspond to actual customer satisfaction. CustFM is very much intended to be the digital equivalent of the schematic value-stream mapping process that is common in Lean improvement methodology. The difference here is that this IT metrics platform allows one to create this value-stream map for each and every customer instead of just the generalized case. With those value streams comes the ability to identify the root causes for the myriad scenarios that cause some users to be very satisfied with their service experience and cause others to be extremely dissatisfied.

2.2.2 Customer-Focused Metrics Definition

Before any programming or data collection was started, it was helpful to produce a formalized definition of the customer-focused metric framework desired; this is shown in Table 4. For readers not familiar with SQL-based data-mining, this mathematical description of the CustFM metrics framework is an easy way to understand the level of aggregation and transformation

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performed by the SQL code listed in the Appendix. Following this formulation, it was possible to seek out the data sets required in order to construct a real-world data set containing these measures.

2.2.2.1 *Another Departure from Convention*

The reader will note that I am again making another departure from the industry norm in considering what exactly constitutes a computer "issue". Conventionally, contact-centers track users' problems as specific "incidents" whereby a certain aspect of the computer's functionality is out of order. The CSA's job is to diagnose the exact problem and instruct the user how to perform the fix or when to expect a shipment of replacement parts (such as a laptop battery). From the contact-center's perspective, that issue is "resolved" after the CSA delivers the information, hangs up the phone, and finishes logging the call. If by chance, some symptom persists or a new one appears some days or weeks later and the user calls in again, the interaction is logged as a brand new "issue". That new issue is then logged, worked on, resolved, and then closed again. To the contact-center, that series of events equates to their CSAs having rather efficiently closed two separate "issues". Dell's specific practice is to consider that any 7-day period of silence between interactions with a specific customer signifies that the previous "issue" has satisfactorily resolved and that the customer is calling in with a new "incident".

The customer's perspective is entirely different[33]. The series of emails, online chats, and phone calls that extended across the two "issues" actually represent one, continuous service experience. For example, most users do not consider a driver issue on their wireless card and a faulty 802.11 configuration in their network stack to be two separate "issues", whether each was "resolved" or not. The user's perspective is, "this computer is junk and I've had trouble connecting it to the Internet for weeks."[34] This attitude is particularly likely with users who just bought new computers and find themselves speaking regularly with Dell's customer support agents instead of enjoying the use of their new computer. Therefore, in the interest of customer-centricity, I designed the CustFM metrics to measure all support activities experience by the user in the four months following the purchase of their computer.

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[33] This is based on my interviews with angry customers waiting for Michael Dell in the lobby of the Round Rock 1 building, as well my audits of recorded calls heard over the "SuperView" application in use within GCSS.
[34] Conversation with an angry customer just outside the Round Rock 1 lobby.

Table 5: Mathematical Description of CustFM Metrics Framework

Description	Formulae	Notes	Objective	
			CE	OpEx
Customer Contacts Per Resolution across all possible channels (On-the-box, Online, email, chat, phone).	$$\frac{\sum_{CustID} Cases}{\sum_{CustID,CaseID} Contacts}$$ (Definition of Contacts should be expanded to include OTB, as well as online touches)	Fewer contacts generally give the customer a more value-added experience. Target the long tail of this distribution for contact deflection via outbound or kiosk diversion.	Yes	Yes
Customer Time Per Resolution, time between first contact and final resolution	$$\sum_{CustID,CaseID} (T_{max\,(JournalSeq)} - T_{min\,(JournalSeq)})$$	Similar to Commercial's Days-to-Resolve used in Gold SLA. Long values signal users who may be in "Dell Hell"[35]	Yes	Yes
Customer Value-Added Resolution Time	$$cTPR - \sum CTI_{CaseID}$$	CTI refers to telecom data, which is our only source of contact duration.	Yes	Yes
Customer Non-Value Added Resolution Time	$$cTPR - cVART$$		Yes	Yes
Customer Value-Added Ratio	$$\frac{cVar}{cTPR}$$	The closer to 1, higher likelihood of high CSAT	Yes	Yes
Ownership Ratio: Agents per Resolution	$$\frac{1}{distinct(Badge)_{CaseID}}$$	Badge is the agent's Dell Employee number	Yes	No
Channels Used Per Resolution	$$\sum distinct(ContactType)_{CaseID}$$		Yes	No
Customer Contact Cost.	$$\sum_{CustID,CaseID} \left(c_i * \sum K_{i,CaseID}\right)$$ where I is contact type, c is a vector of contact type costs, K is sum of a single contact type	How much a string of contacts with a particular customer has cost so far	No	Yes

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is not a Dell sanctioned term, it has been popularized in the media and is used internally as shorthand to denote a tenor of customer contact that the would like to prevent or redress at every opportunity.

2.2.3 Data Set Description

Following the formulation presented in the previous section, it was possible to seek out the data sets required in order to construct a real-world data set containing these measures.

An investigation of individual customers' continuous service experience called for a data set with high resolution and a relatively long temporal span. I thus obtained both sales and all contact-center contact data for a subset of Dell's consumer laptop and desktop product line[36] computers sold in North America during the entirety of Dell's FY 2009 Q1 (February through May 2008). These 596,606 contact-center journal records include 178,366 individually indentified order numbers, 180,653 "service tags" associated with these orders, and five levels of technical support categories referred to as "issue reasons"[37]. The reader will note that "service tag" is a term used at Dell to denote the unique identifier assigned to each and every computer Dell manufactures. This is the master field used to weave together all the data sets used in this analysis in order to capture the users' full journey through Dell's customer service ecosystem. The following is a list of all data sets used.

- Sales force activity related to the sale of computers that appear in the customer support journal data.
- Web log activity from the Dell support website (http://support.dell.com) that relates to those computers.
- Specific self-help articles that the owners' of those computers may have consulted on support.dell.com (only captured if the user logged in with the computer's service tag— this is a common way to narrow the search results in Dell's expansive set of online self-help articles).
- The contact-center log journals recorded by the CSA for each agent-user interaction. Note: This data includes contact information across all contact-center channels: email, chat, and web. In Dell data warehouse parlance, the channel is identified as "ContactMethodDesc".
- Telecommunications activity data that matched to the corresponding contact-center journal. Data were matched based on machine service tag and a 5-minute window before and after the journal timestamp.
- A cost vector for each contact method/channel (email, chat, phone) that I constructed and matched to journal data.
- Finally, an attempt was made to match each of these customer support journeys with satisfaction survey data, internally known as iPerceptions data. The reader will note that the sample size of this data was too small to fully address in this analysis because satisfaction survey data collection was interrupted due to cost cutting measures.

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[36] Actual product line(s) are not revealed so as to protect Dell's confidentiality. Without knowing the product lines used and their volumes sold, it is impossible for a reader to draw inferences about Dell's total contact volume or defect rates.

[37] The source code shown in the appendix lists a much more detailed degree of issue categorization, but that analysis was left out of this phase of CustFM applications.

Figure 4: Data Sources Drawn up on Dell's Data Warehouse

eSupport	Sales	DSN	Contact Center	Survey
ServiceTag	ServiceTag	JournalID	Channel	iPerceptions
Guided Path	Customer	Resolution	Case	Cal Center
Clickstream	Number	Rate	Issue	Survey
Visit D	RepNumber		Total Contacts	DSN Survey
Paths-Articles	OrderNumber	VisitID	DSN Journal'	
Non-Guided Path	PromisedDate		Journal Details	
Applications	ShipDate	Clickstream	ANI RR AHT, CTI	
Articles				
Search				
Scent-based				

These data sets were extracted from the data warehouse, transformed, and loaded into an SQL analytics platform. The next section provides more detail about the transformations and aggregations used to convert contact-center journal data into a metric perspective that measures resolution time in days elapsed per issue and that highlights customer value-added time vs. non-value added time.

2.2.4 Transformation

The following operations and transformations were applied to the data set (Note: All join operations are done against the "service tag."):

a. Build the cost vector detailing average cost per minute for each contact channel
b. Merge the cost vector with journal data based on contact method
c. Sum and group the number of times each service tag was observed in each resolution channel, also sum and aggregate costs per channel
d. Pivot the data set on contact channel
e. Join in a pivot of high-level call profiling categories for each service tag (adds a count for the of types of issues experienced by each service tag)
f. Join in a pivot of the full detail of the lowest-level call profile categories (adds a count for the specific types of issues experienced by each service tag)
g. Join in the Telecom duration data and match it to service tag and timestamp window
h. Join in chat/email duration data
   o Note: This data was not readily available and was not included in this analysis.
i. Join in sales and warranty data
j. Match and join unique service tags from above steps with website self-help logs
k. Join in satisfaction survey measurements
   o Note: Collection of this data was interrupted early on in this work due to cost cutting measures implemented at Dell and therefore could not be used.

Once the disparate data sources are appropriately aggregated and joined, this resulting data set is essentially a <u>detailed digital value stream map of the customer's support experience</u> measured:

- Over the course a fiscal quarter
- Starting from the sales event
- Missing the moment when the user discovered that there was an issue, but capturing the exact moment Dell could have first become aware of their issue by seeing the service tag appear in:

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o The support website's logs, or

o In any of the contact-center channels

• Any subsequent repeat contact in any of the channels, including phone minutes spent in each channel

• Ending at:

o The moment of last contact (imperfectly considered the moment of final resolution),

o Abandonment (by the user), or

o The customer's last known contact before the final day of Dell's fiscal quarter (this sample dataset is right-censored)

After these steps, the original 596,606 contact-center journal records were summarized down to 180,653 specific computers owned by 178,366 individual customers, who collectively logged 320,202 separate issues. The resulting CustFM digital value stream records denote all activities that these 180,653 customers experienced during their experience with the contact-center network.

All 578 lines of source code for the data warehouse ETL (Extract, Transfer, Load) operation and the CustFM transformation described here is available in the Appendix. While the code applies specifically to an analysis of Dell's contact-center journal database fields, the logic of converting the contact-center data into its customer-focused reciprocal set can be applied to any company's contact center.

2.2.5 Profitability Analysis Capability

The ability to compute real-time, customer-specific support costs was deemed a desirable property of the CustFM framework. To this end, I obtained finance data detailing the average cost for a contact in each resolution channel:

• Inbound calls (calls from the customer to the contact-center)

• Outbound calls (calls from the contact-center to the customer, based on a promise)

• Customer Chat (on-line text-based support via instant messaging, initiated from the support website)

• Email (emails exchanged between users and the contact-center, initiated from the support website)

• Log with No Contact

• Dell Service Provider Call (calls from a Dell service provider)

• Letter (snail-mail letters sent to the contact-center and processed manually)

• Dell Community Forum (posts made on Dell's online forums where users help each other find solutions to their problems)

While accurate data were not available for each of these resolution channels, the CustFM cost vector was built to include each of these categories. A customer's total value stream cost is determined by multiplying his or her digital value stream by the cost vector across the appropriate channel fields. (See line 364 of CustFM source code in Appendix 5.4) Data elements for the cost vector were computed by Dell's finance organization; they incorporate fixed costs and variable costs. Further details of these cost calculations were not made available to me.

2.3 Implementation Milestones and Execution Strategy

This project was conducted during an extremely challenging time of change at Dell. Upon my arrival at GCSS, the organization was in a period of profound re-organization. Top management

had recently changed and previous process-improvement efforts had been de-prioritized in favor of a high profile IT implementation project. Labor force reductions were in effect and the group I joined had recently been cut in half. In the face of this organizational uncertainty, I kept MIT Sloan's distributed leadership model[38] in mind and proceeded in the following manner:

1) Kept in close contact with various managers who were forming new teams. (Relating)
2) Participated in kick-off meetings for initiatives under the new organization and asked where I could be useful. (Sensemaking, Visoning)
3) Became aware of the new imperative of OpEx reduction. (Sensemaking)
4) Helped out with data analysis and process mapping across the organization. (Sensemaking)
5) Shadowed various managers during their day-to-day activities and used their contacts to build a personal network of subject matter experts at Dell. (Relating)
6) Conducted 48 one-on-one interviews with personnel at all levels, recording: past experiences, programs attempted which failed or succeeded, organizational history, assessment of organizational culture, politics and strategy, on-ongoing pain points, and gained an understanding of GCSS' highest level objectives. (Relating, Sensemaking, Visoning)
7) Conducted brainstorming sessions to identify ways of minimizing cost without jeopardizing CSAT. (Visioning, Inventing)
8) Identified need for customer-centric metrics that capture the customer experience in terms of value-added contact time as opposed to current agent-facing industry metrics that obscure the customer experience and allow CSAs to game their metrics. (Sensemaking, Visoning)
9) Conducted literature review of lean concepts and service industry dynamics as could be applied to the challenges identified. (Sensemaking)
10) Obtained sample contact-center data sets and performed exploratory data analysis, became familiar with Dell's data warehouse architecture. (Sensemaking)
11) Constructed formal definitions for customer-centric metrics joining online, telecom, and contact center journal data in terms that highlight the customers' actual end-to-end resolution experience during technical support contacts. Reviewed these with subject matter experts and data analysts. (Inventing, Relating)
12) Worked closely with global analytics team to validate that the required data existed across accessible inventory of data marts. (Inventing, Relating)
13) Iteratively created the code and logic to create the CustFM framework. (Inventing)
14) Reviewed integrity of analysis with highest level of US-based data analysts. (Inventing)
15) Ran code against full quarter of data to produce a live CustFM sample and mined CustFM for answers to pressing business questions (Inventing):
    a) How can we be sure each and every customer is receiving prompt resolution of his or her problem?
    b) How many unique users are being served?
    c) What is the distribution of repeat customer contacts?
    d) How much do the most frequent support users cost?
    e) Is our system incubating future Jeff Jarvis-like detractors (see section 1.3)?
    f) Are certain low margin products still profitable when you factor in the support costs?

The following chapter describes findings resulting from the execution of the methodology described in this chapter.

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[38] Deborah Ancona, *Leadership in a Time of Uncertainty*, MIT Leadership Center (Cambridge, MA: MIT Sloan School of Management, 2005), 4.

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3 Results

An analysis of CustFM results for a full quarter of customer support activity sheds light on what the Dell customer service experience is really like and how cost is apportioned across the user population.

3.1 Walkthrough of Sample CustFM Summary Value Streams

Question: How can we be sure each and every customer is receiving prompt resolution of his or her problem?

Table 6 shows a sample of CustFM output detailing the experience of ten customers who contacted Dell between 3 and 24 times in Q1 (many values are disguised). Variables correspond to the formal definitions in Table 5 except for OwnR, which is not converted into a ratio here. Search and Usage respectively correspond to the number of online self-help document searches detected for the user and the number of seconds spent on that web page. Only 12% of such searches are individually flagged with the user's service tag, therefore this field is a sampling measure (unlike all the other variables which represent the universe of all contacts for Q1). A "log with no contact" is a work session that a CSA performed alone, perhaps in preparation for an outbound call, or to denote an internal activity in service of the customer but which did not require customer contact.

As seen here, the CustFM value stream record allows Dell to perform a quick assessment of the level of attention and activity that each individual customer is receiving.

Table 6: Sample CustFM Summary Value Streams for Ten Customers

ShipLag	WarrLen	cCPR	OwnR	cCUPR	numCases	EstExpense	Call - Inbound	Call - Outbound	Online Chat	Log w/ No Contact
6	364	3	3	3	1	17.3	1	1	-	-
3	366	4	4	3	2	26.8	2	1	-	1
4	1096	4	4	3	3	33.0	1	1	2	-
3	366	8	7	3	5	67.7	4	2	2	-
6	364	3	3	3	1	25.2	1	1	1	-
4	-	11	7	3	2	86.6	5	5	-	-
3	1096	7	5	3	2	44.9	2	3	-	2
1	1096	11	8	3	3	63.8	3	4	-	4
6	364	24	15	3	2	200.0	6	17	-	1
1	1096	5	4	3	1	35.4	2	2	-	1

tQueueTime	tTalkTime	tHoldTime	tWorkTime	Search	Usage	cDaysPR	CVART	CNVART	CNVANRT	CVARatio
-	-	-	-	-	-	1	-	-	-	-
-	-	-	-	-	-	4	-	-	-	-
-	-	-	-	-	-	42	-	-	-	-
-	-	-	-	3	546	33	-	-	-	-
-	-	-	-	-	-	5	-	-	-	-
184	4385	3	165	-	-	6	73	8320	3	0.0087
-	-	-	-	-	-	48	-	-	-	-
0	2242	552	91	-	-	21	37	30327	9	0.0012
257	3283	0	6	-	-	29	55	42008	4	0.0013
-	-	-	-	-	-	38	-	-	-	-

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3.2 Distribution of Contact Frequency

Questions: How many unique users are being served? What is the distribution of repeat customer contacts?

The CustFM dataset offers a holistic view of what the Dell customer service experience is really like. Contact frequency per user is a useful measure of resolution efficacy since the ideal customer service experience (and the least costly to Dell) is to resolve every customer issue in no more than one call. At Dell, the one-call resolution is known as Ri1, or "Resolve in 1". Figure 5 shows the frequency of contacts made by individual users over the course of the quarter following the purchase of their computer. The second graph shows the same data on a semi-log plot, and the third shows it on a log-log plot.

Figure 5: Frequency Distribution of Contacts per Customer (cCPR)
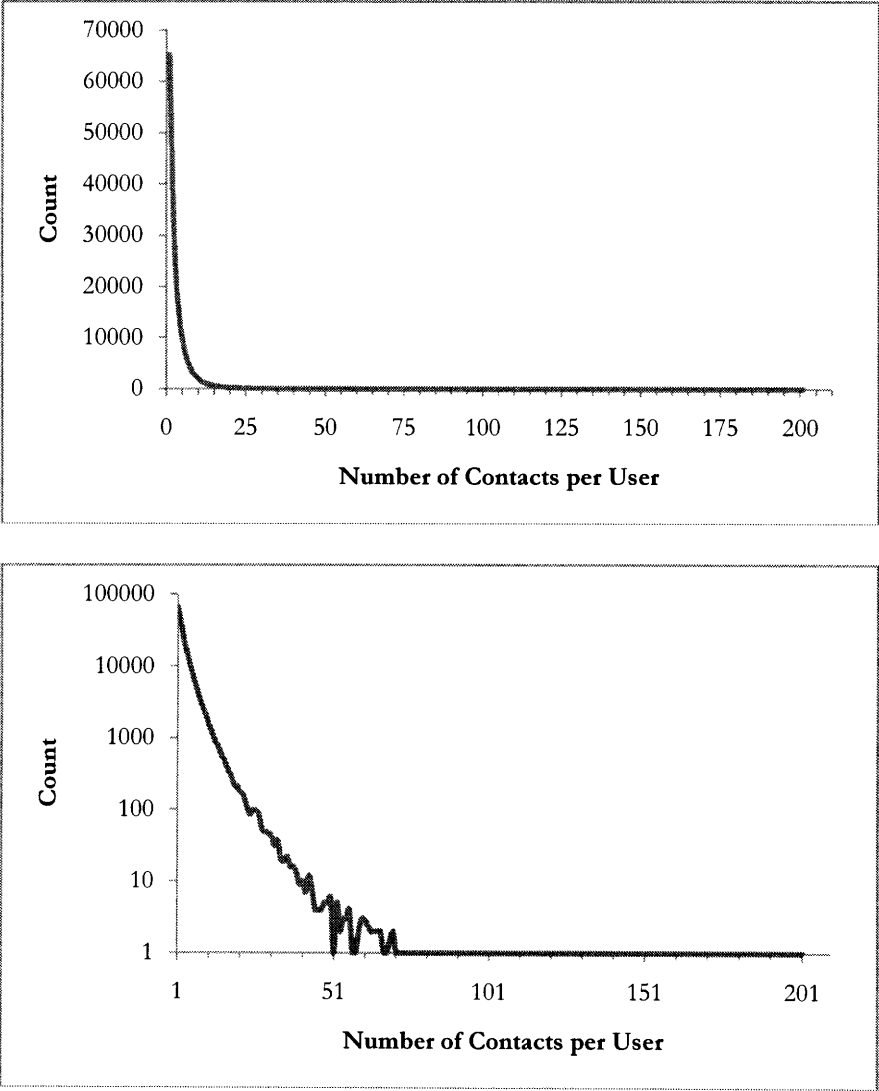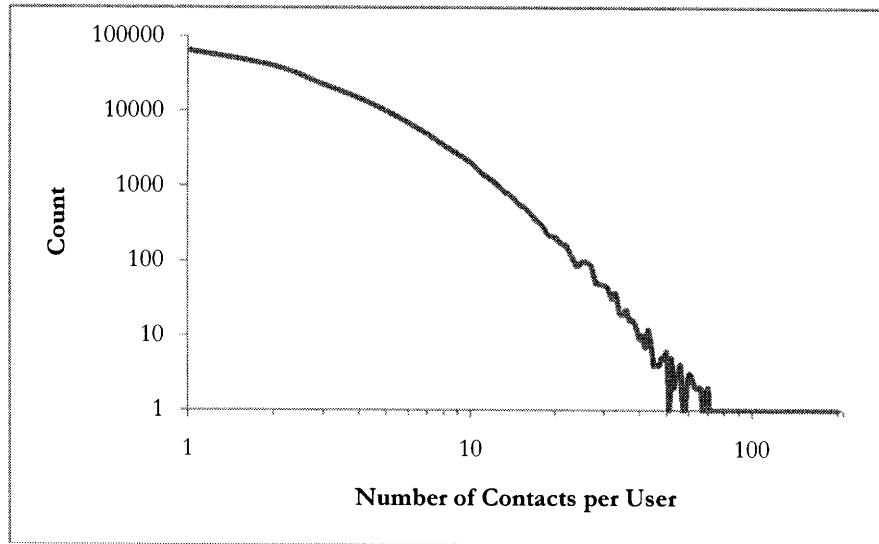
The distribution is skewed right, with 91% of customers experiencing no more than 7 contacts per quarter, and a full 36% getting resolution in a single contact (Ri1). This seems reasonable and in fact the average number of contacts per resolution is 3.3 across all channels. However, such summary statistics obscure exactly how the *cumulative* number of contacts is apportioned across segments of customers. The full breakout is shown in Table 7.

Table 7: Cumulative Statistics of Contact Frequency per Customer

Number of Contacts	# of unique customers	% of total population	% of users with at least this many contacts	# of contacts by users with at least this many contacts	% of contacts by users with at least this many contacts
1	65217	36%	100.00%	596637	100.00%
2	40173	22%	63.90%	531420	89.07%
3	22597	13%	41.66%	451074	75.60%
4	14889	8%	29.15%	383283	64.24%
5	10030	6%	20.91%	323727	54.26%
6	6898	4%	15.36%	273577	45.85%
7	**4949**	**3%**	**11.54%**	**232189**	**38.92%**
8	3513	2%	8.80%	197546	33.11%
9	2661	1%	6.86%	169442	28.40%
10	2050	1%	5.38%	145493	24.39%
11	1470	1%	4.25%	124993	20.95%
12	1172	1%	3.44%	108823	18.24%
13	878	0%	2.79%	94759	15.88%
14	736	0%	2.30%	83345	13.97%
15	569	0%	1.89%	73041	12.24%

Note the statistics for customers with 7 or more contacts; these are discussed in more detail in the following section.

3.3 Identification of an Expensive Sub-Population

Question: How much do the most frequent support users cost?

Looking only at customers who had more than 7 contacts over Q1, the cCPR metric shows that these customers are responsible <u>for a full 39% of total contacts</u> (and an equivalent proportion of costs). Figure 6 offers a graphically intuitive sense of this breakout by offering a spatially normalized

comparison of the total number of unique users next to their share of the total number of contacts (and costs).

Figure 6: Identifying High Cost Support Customers

Unique Users   **Proportion of Contacts**

20,851 12%

159,801 88%

232,158; 39%

364,448; 61%

■ 1-6
■ 7+
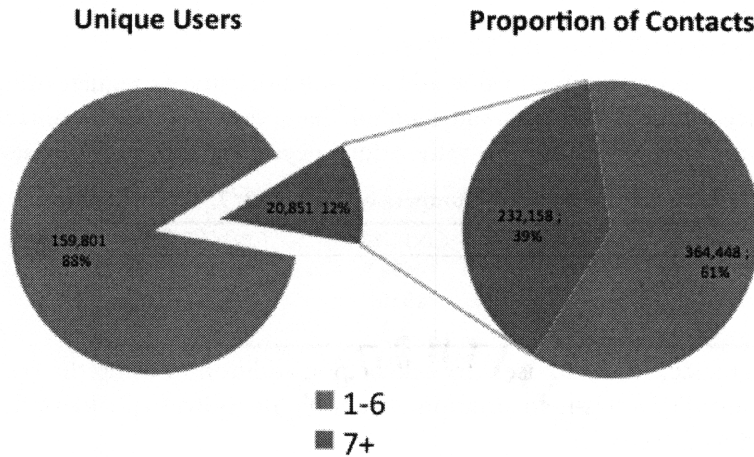
This unintuitive result is impossible to extract using traditional metrics, but it is easily arrived at using the following concise CustFM query:

```
select count(*) as [All users] from CustFM;
select sum(cCPR) as [Sum of all contacts] from CustFM;
select count(*) as [7+ Users] from CustFM where cCPR > 6;
select sum(cCPR) as [Sum of 7+ contacts] from CustFM where cCPR > 6;
```

Furthermore, the long, flat tail of this (cCPR) distribution represents users who have been exposed to system dysfunctions and are at a high risk of dissatisfaction. It is important for any company to be able to identify these users early and resolve their issue before the customers:

(1) Become unprofitable.

(2) Become dissatisfied and decide to never buy the same brand again, or worse…

(3) Influence other customers not to buy from the brand.

Thus, CustFM provides quick access to identifying system dysfunctions and can allow the organization to reach out to customers who are at a high risk of dissatisfaction. I refer to this subpopulation as the "12/7/40" customers, i.e., the 12% of users who have 7+ contacts per quarter and represent 40% of operating costs.

3.4   Characteristics of the 12/7/40 Customers

The CustFM dataset can be further mined to gather more descriptors relating to the 12/7/40 customers. Without access to an automated multifactor regression engine, I was able to determine the following about this sub-population.

- They are 5% more likely to be XPS[39] users (both laptop and desktop)
- On average, they speak with 9 different agents vs. 2 for the general population
- On average they are logged into 4 case numbers vs. 1 for the general population
- Their ratio of inbound calls to outbound call is 3 to 1 as opposed to 1:1 for the general population

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[39] XPS is Dell's premium consumer brand; XPS users were 22% of the Q1 sample, but 27% of the 12/7/40 segment.

35

- On average, they cost $115 to support vs. $24 for the general population, which makes them 4.8 times more costly for Dell.
- They are more than twice as likely to use more than one resolution channel during their service experience.
- In terms of Lean service delivery, the 12/7/40 users:
  - o Consume 2.3 times as much value-added resolution time as regular users
  - o Experience 3 times more non-value added "hang time" between contacts
  - o Experience 2.3 times more non-value added necessary time as the general population.

Table 8: Lean Service Delivery Comparison for the 12/7/40 Customers

	CVART	CNVART	CNVANRT
7+	95	46942	14
1-6	41	15561	6
Factor	2.3	3.0	2.3

- When given the chance, 12/7/40 users try self-help in addition to using the contact centers.
  - o 1776[40] out of 8022 self-help attempts that could be individually identified are attributed to these users.
  - o This means that compared to the general population, 12/7/40 users are 2.2 times more likely to use self-help resources available online. (See table 8.)

Table 9: 12/7/40 Customers Likelihood to Use Self-Help Resources

Customer Segment	Unique Customers	Identifiable Self-Help Article Usage	Proportion
Others	159801	6246	3.9%
12/7/40	20851	1776	8.5%
	180652	8022	2.18

- 12/7/40 users are <u>not</u> differentiated on:
  - o Product, e.g., a specific computer model like the XPS M1330 laptop
  - o Sales experience (the lag between order and shipment date), or
  - o Warranty duration purchased.

3.5 Detractor Detection

Question: Is our system incubating future Jeff Jarvis-like[41] detractors?

Users who are having a less than stellar experience within the contact center system are likely to become detractors of Dell's brand. Without a framework like CustFM, it is impossible for Dell to proactively detect such users and reach out to them before they go public with their gripes. Again, by drawing upon the cCPR variable, one can pull a list of such customers and escalate their resolution priority and end their stream of calls. cCPR summary statistics show:

```
Min.   1st Quartile.  Median  Mean   3rd Quartile  Max.
1.000  1.000          2.000   3.303  4.000         201.000
```

While the 3rd quartile shows only 4 contacts per resolution, the maximum number of contacts is a staggering 201. Looking at this customer's individual CustFM data, we see his contact experience spread out over 81 days and 158 different CSAs. Based on 6 inbound calls and 29 outbound calls, the customer spent a total of 12 hours in queue waiting for a CSA to pick up, 95.5 hours speaking

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[40] Again, this sort of insight is easily available through CustFM: `select count(*) from CustFMDSN where cCPR > 6`
[41] Recall the CUNY journalism professor introduced in section 1.3 of the Introduction chapter.

with CSAs, and 17.3 hours on hold while the CSA researched a fix or spoke with a manager. This customer further initiated 138 online chats with CSAs, and sent them 25 emails. CSAs categorized his concerns as "software related" a total of 30 times, "other" 80 times, and "hardware related" 71 times; 19 of his calls were regarding customer service rather than technical support. The CustFM cost estimate for supporting this customer is 1.2 times[42] greater than the original list price of this customer's laptop. Since the data set is right-censored, we do not know if this customer has reached resolution; but, given the pattern of "Reason" codes assigned, it is likely that this customer's contacts extended into Q2. (This user's CustFM record and abbreviated journal listings can be found in the Appendix.)

While this particular customer is an extreme case, the CustFM dataset includes other users with comparably extended and costly contacts. A stem and leaf plot of cCPR offers an insight into how many potential brand detractors may have to be proactively assisted or sold a higher level of support (to offset their costs). Figure 7 shows that there are 5 customers who had 70 or more contacts in the quarter: two had 70 contacts each, one had 71, another had 72, and the last had 77 contacts.

Figure 7: Stem and Leaf Plot of Contact Frequency per Customer

```
The decimal point is 1 digit(s) to the right of the |

 0 | 11111111111111111111111111111111111111111111111111111111111111111111+170852
 1 | 0000000000000000000000000000000000000000000000000000000000000000000+8145
 2 | 0000000000000000000000000000000000000000000000000000000000000000000+1033
 3 | 000000000000000000000000000000000000000000000011111111111111111111+185
 4 | 000000000011111111112222222233333333333344444444555566667777888889999
 5 | 000000122222334445556666678
 6 | 0003344556678
 7 | 00127
 8 | 12
 9 | 25
10 |
11 | 7
12 | 8
13 |
14 |
15 | 8
16 |
17 |
18 |
19 |
20 | 1
```

3.6 "Tail End" of Product Profitability

Question: Are certain low margin products still profitable when you factor in the support costs?

The CustFM framework can be applied to any category of product whose customers are entitled to after sales service via a contact center. As previously mentioned, the support costs represent the tail end of a product's profitability. One important question is to determine the appropriate warranty length for low price (non-computer) products. Once this warranty entitlement is determined, it is then useful to know how much actual customer service loads affect the profitability of the product. To this end, the CustFM code was run against data for another fiscal quarter for a separate subset of Dell's non-computer products[43]. The ETL showed 531,029 sales to

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[42] Actual numerical value and laptop model disguised in order to protect Dell confidentiality.

[43] Again, to protect Dell's confidentiality, the exact product line is not revealed. No inferences can be made about what specific product line or set of items these calculations correspond to.

unique customers during the quarter, accompanied by 205,226 contacts served by CSAs in that product category during the quarter. The results are shown in Table 10.

Out of the 205,226 contacts for the product category, the union with the sales cohort data narrowed down the relevant set of contacts to 61,142 unique customers, meaning that the early post-sales contact rate is 11.5%. Using supply chain cost and pricing data from the Sales dataset, we compute revenue at $25.3M and profit at $3.8M. Using CustFM data, support costs are estimated at approximately $1.5M. Adding these support costs to supply chain costs, we see that the original 15% profit margin for these products has been cut down to 9.7%. *(Please note that further details of the calculation were removed for reasons of confidentiality.)*

Table 10: Tail-End Profitability Analysis for a Low Priced Product Category

Sales Journal	61,142	-
Contact rate	11.5%	-
Cost of support	$1,358,599	-
Revenue	$25,321,589	-
Margin before support	**$3,813,957**	**15.1%**
Margin after support	**$2,455,358**	**9.7%**

Looking at the entire sales cohort for the quarter, the effects of the 11.5% call-in rate are much diluted. The product category's carries an overall profit margin of 23%, which was only reduced to 21% following all customer contacts incurred during the first quarter of product ownership.

Table 11: Profitability Analysis for the Entire Sales Cohort

Revenue	$76,016,574	-
Margin before support	**$17,240,156**	**23%**
Margin after support	**$15,881,556**	**21%**

While this analysis shows that the product category tested is still profitable in the quarter during which the same occurred, it is important to note that:

- The data are right-censored, since the data warehouse ETL cuts the data off at the end of the quarter. It is likely that several customers in that quarter's sales cohort used the contact center following that date, resulting in higher lifetime costs.
- The journal extract for the entire product category shows 205,226 contacts of which the 61,142 recent purchasers are only responsible for a fraction[44]. The implication is that actual margins are even lower that the cohort analysis shows.

3.7   CSA Issue Ownership

The problem of issue ownership was a recurring theme in my interviews of customers as well as my audits of recorded phone calls. You will recall my earlier example of a customer calling in, several days apart, to get help with some recurring wireless networking issues that prevented him from connecting to the Internet (see section 2.2.2.1). Given Dell's globally distributed network of 27,000 CSAs, there is a good chance that this customer will not get to speak with the same agent twice. Users stressed that it was a burden to repeatedly explain their symptoms to the next CSA

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[44] Exact fraction is not revealed in order to protect Dell confidentiality.

upon every follow-on contact. They consider it a very frustrating experience that adds no value to their support experience and that lowers their overall satisfaction with Dell.

Given this fact, we can use the CustFM dataset to see what the odds are that a customer will speak to a different CSA upon each successive contact (see Figure 8). Looking at a linear model fit of cCPR (customer contacts per resolution) vs. OwnR (ownership ratio) over 180,655 observations, we see a coefficient of 1.17 on OwnR and a R^2 of 0.91 (p= $2.2e^{-16}$). Users are extremely likely to speak to a different CSA almost every time they call in.

Figure 8: Plot of cCPR vs. OwnR
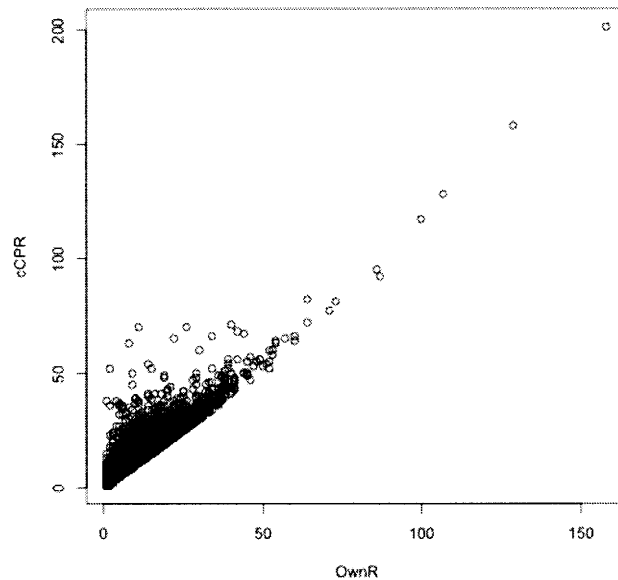

```
lm(formula = cCPR ~ OwnR, data = custfm)

Residuals:
     Min       1Q   Median       3Q      Max
-9.77888 -0.27437 -0.07776 -0.07776 57.21281

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -0.0931804  0.0036102  -25.81   <2e-16 ***
OwnR         1.1709432  0.0008538 1371.46   <2e-16 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 1.117 on 180653 degrees of freedom
Multiple R-squared: 0.9124,                    Adjusted R-squared: 0.9124
F-statistic: 1.881e+06 on 1 and 180653 DF,  p-value: < 2.2e-16
```

This Results chapter has revealed some previously unknown facts about the true end-to-end customer support experience of Dell consumer customers. Most notably, a small minority of customers (about 12%), consume approximately 40% of the contact center's activities. The CustFM analysis also shows a way to measure the true profitabilty impact of warranty service for various product lines. Another finding is that customers are very unlikely to speak with the same CSA from one contact-center interaction to the next. Such visibility into individual customers' customer support value streams was not possible before CustFM. Such findings can help Dell's GCSS

organization drive improvement initiatives within its global contact-center network and can help it target large cost reduction opportunities.

The following Discussion section addresses such applications of the CustFM framework as well as implications for lean advancement at Dell and it concludes with an analysis of organizational dynamics relevant to the themes of this theses.

4 Discussion

The CustFM metrics framework described here is in essence a <u>real-time digital value-stream-mapping tool</u> offering high-resolution visibility into Dell customers' actual service experiences. Results obtained so far from the framework point to several applications that can aid GCSS in targeting system-wide cost and risk reduction opportunities throughout Dell's global contact-center network. This discussion section examines these opportunities via the following three angles:

1. Direct applications for the lean CustFM metric.
2. Lean advancement implications.
3. Insights into organizational dynamics.

4.1 Direct applications for the lean CustFM Metric

4.1.1 Early detection of unprofitable customers and potential detractors

Given CustFM's insight into the existence of the 12/7/40 customers and the difficulty in statistically isolating them using traditional metrics, it is clear that a right-time review of the CustFM framework could aid Dell in identifying high cost, high risk customers as their service experience begins to approach the 7 contact mark. In the past, Dell has experimented with a similar concept, wherein users who called in more than 3 times over a period of time were sent directly to a "tail busters" queue where they were given a higher level of service by more experienced "L3" technicians in order to speed resolution. However, since there was no system-wide metric against which to measure success, as there is with CustFM, the effort was difficult to justify and eventually ended inconclusively[45]. Since Dell usually ends projects that do not show a clear financial benefit within a quarter of activity[46], the effort was not resumed. As the CustFM analysis has conclusively shown, there is indeed great potential for large cost savings by targeting the 12/7/40 group. For example, by ending the flow of calls at 7, Dell could save approximately 60% of operating costs.

4.1.2 What to do with the high-risk customers found by CustFM?

4.1.2.1 Premium support

Customer service operations have traditionally operated as pure cost-centers[47]. But in meeting modern customers' higher expectations, Dell and others have begun offering premium support services that customers are willing to pay for. Such offerings can change customer support operations from cost center to P&L status. If this model succeeds, a portion of profits could be spent on service enhancements that would further boost customer satisfaction and therefore, future purchases. Such models have been known to work. Apple has historically charged customers for technical support and warranty beyond the 90-day post-purchase period; yet, has managed industry-leading customer satisfaction. Dell consistently managed 90% customer satisfaction scores with a premium service experiment run in 2007-2008. In this experiment, 30,000 households in the New York City area were matched with dedicated service teams that offered support for all Dell-branded devices in the household. Since the technicians fielded all the calls for specific households, they became more familiar with the users' issues and were able to offer better service. Users were no longer bounced around between different agents and no longer had to repeat their usage scenarios

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[45] Interview with Dell manager.
[46] Interview with Dell executive.
[47] Robert Rowello, "Customer Service that Helps Your Customers--And You Too," *PRTM Insight*, February 15, 2006.

and symptoms to each one (see non-value added activities in Table 2). With this level of customer knowledge, Dell effectively solved the issue ownership issue exposed in Section 3.7. In summer 2008, Dell formally launched this service as "Your Tech Team" for $179 a year plus *à la carte* pricing for out of scope issues, e.g., configuring non-Dell wireless networking equipment.

Cynics would say that premium warranty support services have gained in popularity because of the poor performance demonstrated by traditional contact-center based support. In truth, premium services probably only make sense for the heaviest support customers, those who cost Dell the most, but who are also most likely to be dissatisfied. Interestingly, this is specifically the sub-population of customers highlighted in the 12/7/40 CustFM analysis presented here. While reaching out to these high-contact customers, Dell could use the customer's CustFM value stream history to offer specific premium service packages that would best suit such users' needs. Since CustFM specifically highlights users who are heavy consumers of the company's support offerings, it makes sense to use the framework to support cross-selling of premium support services.

4.1.2.2 Customer loyalty programs

When run over time, CustFM can also help manage customer loyalty. Since the metric incorporates users' sales data and lifetime support costs, it is trivial to calculate actual lifetime customer value for each individual customer. Given that the consumer market for PCs is now dominated by notebook computer sales and that these notebooks have a shorter useful lifespan of about 3 years, it makes sense to engage in customer loyalty programs that create incentives to repurchase from the same brand. Casinos such as Harrah's and retail clubs like Costco maintain similar loyalty programs. Sales representatives (or better yet, Dell's online direct-ordering system) would have instant access to each customer's purchase history, service experience, satisfaction levels and overall profitability, allowing them to cross-sell a relevant bundle of products and premium support that the customer is more likely to purchase and enjoy.

By combining premium customer service offerings with customer loyalty programs, Dell could offset customers' lifetime support costs with their recurring membership fee and increase profitability per customer through cross-selling.

4.1.3 Feedback on profitability and product design

The CustFM framework allows for product-specific profitability analysis, taking into account everything from the sales event through the final technical support calls covered under the warranty. These profitability analyses are typically done at a LOB or product category level versus the individually identified level at which CustFM operates. A rule of thumb at Dell is that customers make the bulk of their calls during their first 4 weeks of product ownership. A new product's projected profitability is therefore affected by support cost estimates for that time period. However, our findings show that this rule of thumb is not necessarily true and that users can continue generating significant support costs well beyond the 4-week mark. With our high-resolution metric, such assumptions can be tested and the information can be used to make more accurate lifetime profitability predictions.

Furthermore, since CustFM records each user's support value stream, these data can shed light on actual product field performance and can become a useful source of information for use cases and failure modes. The metrics captured can serve as a proxy for product quality. Information feedback from this source would be valuable to product design teams working on successive generations of the products that CustFM users have called in about.

4.1.4 Managing the complexity and costs of multiple resolution channels

Earlier I justified the use of lean metrics as the basis for reconciling the objective of high customer satisfaction with cost saving objectives on the basis that "the less we frustrate the user by wasting his time, the happier he will be and the less it will cost us." The CustFM analysis can be taken even further than that and applied toward strategic management of the contact-center network.

4.1.4.1 Channel optimization

By measuring the resolution performance against the ratio of value-added vs. non-value-added activities, a CSO can measure how much room there is for process improvement within the entire contact-center system, certain channels, or specific queues. For instance, this would allow one to determine what the most effective resolution channel is for each issue type based on the resolution endpoint captured in CustFM value streams, e.g., the data shows that the phone channel is the most effective resolution channel of wireless networking issues. This particular case is intuitive since users with no Internet access would not be able to engage in website, email, or chat interactions. However, the data framework allows all categories to be matched to their most effective resolution channel, thereby increasing the odds of delivering a prompt resolution and achieving high customer satisfaction. Based on this information the contact center could attempt to shape resolution traffic toward the channel in which it is most efficiently resolved. Thus, what GCSS currently refers to as "call avoidance" programs could be re-launched as "optimized call routing programs," wherein calls are routed toward the resolution channel that is most likely to lead to a prompt resolution outcome. A channel-optimized deflection would be more likely to result in high CSAT (and therefore, high LTR) than simply sending customers to the cheapest channel possible.

4.1.4.2 Finding the root-causes of CSAT

Finally, since the framework captures every step in a customer's string of contacts, the reason for the duration of each resolution and the root cause for a low satisfaction score can be identified. Of course, this is only possible if satisfaction scores are routinely collected. Certain business functions represented in our sample data set had stopped measuring customer satisfaction as a cost-cutting measure. The decision not to measure CSAT is highly questionable for an organization whose main role is to ensure customer satisfaction through customer service delivery. The cancellation of CSAT measurement program made already sparse sample data even more difficult to obtain and add to the data set discussed here. However, if each CustFM record out of the sample data set (N= 180,653) could be matched to a customer-stated CSAT score, it would be possible to fit a multivariate model to the CustFM data set and produce an empirical measurement of CSAT. This could lessen the need to frequently measuring CSAT through subcontracted surveys, or—if the model fit is good enough and is proven to endure over time—eliminate sample based CSAT measurements altogether. In this case, it would, of course, be important to recalibrate the model regularly to be sure the CSAT-CustFM relationship has not changed.

4.1.5 Prioritizing resolution channels investment

CustFM allows the organization to get an idea of what preference level various user types have for each resolution channel; this could also result in considerable savings[48]. Given the 12/7/40 users' higher propensity to engage in self-help via the support website, investment in this resolution channel could potentially result in great cost savings. Based on our observation, it would make sense

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[48] Customer Contact Council, *Acheiving Breakout Use of Self-Service: Overcoming the Conflict between Active Channel Management and Customer Satisfaction*, (Corporate Executive Board, 2006).

to invest more heavily in improving the quality and findability of self-help resolution articles on the support.dell.com website. Findability is an area of high priority that certain Dell content-authoring teams have been addressing over time; but, that has sometimes been reprioritized during times of organizational change.

4.1.6 Addressing perverse effects caused by traditional metrics

The customer-focused metrics suggested here are in contrast to the industry's internal, agent-facing metrics, which obscure the customer experience and create significant incentives for CSAs to engage in gaming behaviors. For example, when agents are measured solely on number of tickets closed per day, some are tempted to transfer a certain type of call to another queue, then mark those tickets as "resolved". In this case, the CSA makes his numbers for the day but the ticket is still open—just assigned to another agent. From the customer's perspective, the problem is still not resolved and he may have to wait in queue for the next agent to service him. Sometimes the customer has to hold for a significant period of time and eventually abandons the queue. In this case, the customer has not gotten resolution, but the contact center metrics assess this as a successful interaction in that it was marked "resolved". If the customer eventually finds resolution via an Internet search and does not end up calling back into the system within 7 days, the traditional metrics would record this as a success.

In this simplest of examples, it is easy to say that the CSAs should be measured on customer-stated resolution status instead. Resolution could easily be determined with binary answer post-call question, e.g., "press 1 if your issue was resolved, 2 if it was not". This example supports Dell's effort toward meeting the Ri1, or "resolve in one (contact)" goal and would foster better issue ownership than we saw in Results section 3.7. While there is some danger in giving full control of resolution status to all customers (based on some calls I listened in on, some customers can be unreasonable), this would also be a good way to measure how well the organization is doing on setting expectations.

4.1.7 Reconciling motivations with outsourced contact centers

Like many of its competitors, Dell employs its own contact-centers as well as contact-centers owned by outside providers (OSP). Both kinds of contact centers are measured according to the same traditional industry metrics. A more accurate, customer-focused measurement system can help eliminate the motivational differences that separate Dell-owned and OSP contact centers. These operate with different financial models, have different margin structures, and therefore are differently motivated. While the Dell sites have been run as cost centers and have an incentive to reduce their costs through "call avoidance" programs, OSPs depend on call activity to justify their contracts and drive revenue. This is a fundamental conflict of interest.

Furthermore, OSP contracts sometimes stipulate additional fees payable to the OSP if it manages to reduce its CPC (cost per call); this is questionable. Paying OSPs by the call while rewarding them for reducing CPC creates a conflict of interest that pits the agents against the customers. Agents will want to take more, shorter calls; while customers still want their issue to be resolved correctly the first time, typically by having the agent spend a little extra time with them rather than being rushed off the phone. (See the previous section on perverse effects as well as the "shortcomings" column of Table 4.)

Finally, traditional OSP contracts usually promise the outsource organization a steady stream of business, which exacerbates the conflict of interest. It is difficult to think how one could convince OSPs to help Dell with its "call avoidance" programs so that both Dell and OSP contact

centers can work together toward reducing the total cost of support. Customer-focused metrics can help here as well. By measuring OSPs on customer-focused metrics, instead of queue-based metrics, their CSAs will automatically be doing the right thing instead of trying to game their AHT and CPC. Thus Dell could think about authoring new OSP contracts that would:

- Specify un-gameable, customer-focused metrics that OSP sites will be measured on.
- Impose contact avoidance goals to OSPs and share those savings with the OSPs, thus benefiting Dell's call avoidance programs as well as the OSP's bottom line.
- Make OSPs share the burden of authoring self-help content that Dell can use in its non-phone resolution channels but reward them for usage of that content associated with his traffic or satisfaction measures.

4.2 Lean advancement implications

The contact center environment is rife with opportunities for waste reduction and other objectives of lean organizations. As always in lean improvement efforts, one of the basic premises is to understand the current state of operations, identify wasteful activities, and find ways to eliminate them, enabling one to map out the desired future state. The CustFM metrics framework represents the basic tool required for applying this methodology across a distributed contact-center system because it completes the first step of digitally mapping out each customer's value stream.

The CustFM metric also offers a blueprint for designing a lean support organization that has the potential to both ensure high customer satisfaction but also do so while reducing Dell's overall support costs. Yet, it is difficult to imagine a traditional lean transformation effort succeeding across all of Dell's geographically disparate contact-centers, which operate under different management, some Dell-owned and some outsourced. Indeed, the best practices for traditional lean transformations apply to highly collaborative workforces that are geographically localized, empowered by management to experiment with process improvement, and which possess a strong learning culture. Contact centers are nearly the opposite of this. With their load balancing call-routing systems, outsourced nature, and their high employee attrition rates, call centers do not fit this mold at all. How then would one motivate lean behaviors across Dell's distributed workforce of 27,000 CSAs and cause them to systematically reduce waste in their daily actions? The answer is already well known at Dell: measure them on it.

Figure 9: Poster in Lobby of Dell's Round Rock 2 Building.
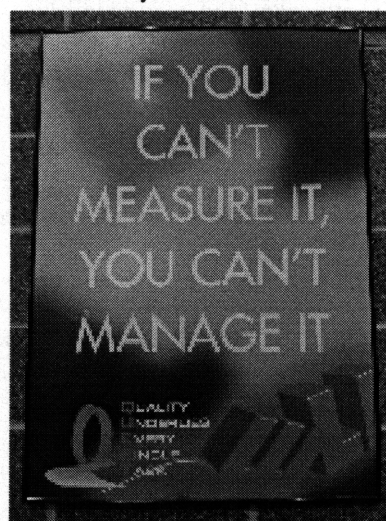
The lean IT metric presented here could serve as a tool for fostering Lean behaviors across a large, distributed population of workers without necessarily having to give them a deep education in lean. By measuring queues and CSAs on the proportion of value-added activities they deliver to each customer, lean performance may no longer be predicated exclusively on the goal of creating a true "learning organization". Rather, it could motivate teams to self-organize in order to deliver more value to the customer.

Current contact center IT systems already dictate some of the standard workflow that agents perform but the agents still control whether they transfer a call, what promises they make, and how aggressively they try to solve the user's issue right then and there. The "Resolve in one", or Ri1 metric in use at Dell was a step toward encouraging this kind of agent issue ownership. It measured agents on their ability to take sufficient ownership of the issue that the user did not have to call back again for the same reason. However, Ri1 did neither allow for a root-cause analysis of what was causing NVA steps to occur, nor even how much NVA activity was occurring.

In order to eliminate these NVA events, one needs to differentiate which of the NVA activities are caused by the agent and which are caused by the system that she is subject to. Appendix 6.1.5 sheds some light on how to approach this task. Looking at the sequence of calls detailed for the unfortunate customer who experienced 201 contacts over the first 4 months of ownership, one notices a significant number of discordant reason codes, several transfers, and service inquiries. Based on patterns in this user's CustFM record, one can quickly identify the following issues:

1. Routing: the contact centers' load balancing systems are sending the customer to new agents almost every single time, requiring him to waste time frequently re-stating his symptoms.

2. There may be a triage issue: on numerous occasions, the user ended up in the wrong queue and had to be transferred.

3. There is a potential communication or expectation setting problem: the user is not being kept informed of service status and therefore hits the contact-center with requests for status.

Of these three observations, 1 and 2 are due to the contact center's system design and 3 is due to a failure of individual CSAs to meet the customer's expectations. The expectation setting (issue 3) is a failure that CSAs can be trained to address. The system design issues (1 and 2) need to be addressed by GCSS' Process Engineering team. By systematically addressing NVA occurrence, Dell will be able to drive Ri1 performance, which is the leanest, most value-adding form of interaction for the customer, but also the cheapest for the company and the most likely to produce high CSAT and LTR. To give an idea of the size of this opportunity, the reader can look at Table 7 and see that Dell would save 90% of its contact-center costs if all customer issues were handled in a single contact. There is room for improvement.

Finally, this metrics-based approach to lean advancement at Dell would also have the benefit of being able to survive the pace of rapid organizational change and management discontinuities that can occur in fast-paced workplaces such as Dell. By embedding these metrics in Dell's IT measurement infrastructure, it should be possible to drive Lean behavior across Dell's expansive contact center network by directly measuring CSAs on lean delivery regardless of management or site ownership changes. This approach sidesteps the traditional challenges of implementing large-scale lean transformations even though it contradicts some well-known lean transformation best practices

such as reliance on a high degree of leadership involvement and the nurturing of a learning culture across the workforce.

4.2.1 Justifying process improvement expenditures in a culture of quarterly results

Research has shown that when companies introduce new policies or process improvement initiatives, there is a "worse before better" effect that causes performance metrics to drop in the short term while the initiative gains acceptance and workers familiarize themselves with new practices[49]. When the organization is up to speed with the new policies, performance typically improves. It is possible for managers to interpret the initial dip in performance as a sign that things are not going well and react by withdrawing the new processes[50]. Ironically, Dell has been especially susceptible to this fate because of its strongly metrics-driven culture, which enables it to evaluate its performance in real-time and react to those measurements much faster than most companies.

Even at Dell, pure cost cutting often gains faster acceptance than process improvement programs that require significant expense and ramp-up time. This is doubly true when new executives are put in charge and want to show immediate impact by way of OpEx reductions. Headcount is a typical target. Yet, across-the-board cost cutting can be detrimental to long-term process capability because of its potential for the loss of institutional knowledge and interruption of improvement initiatives. An example of this is the manner in which Lean transformation in Dell's El Salvador site was suspended. Lean efforts in the contact center are particularly vulnerable to cost-cutting because they have the double disadvantage of: (1) being characterized by the "worse before better" effect, and (2) taking place in a cost-center where financial benefits are always indirect and difficult to prove. Such outcomes are not uncommon to those who understand Dell's cultural pressure to perform financially on a quarterly basis.

But the tide may be turning. The relationship between CSAT and LRT has been empirically proven at Dell with strong statistical model fits. Thus, CSAT scores achieved by Dell's contact centers can be correlated to LTR and used to calculate dollar figures. The resulting climates is on in which the CSO could begin to be measured on its long-term ability to deliver high CSAT and become recognized as a significant driver of future sales.

Since lean metrics don't call for large investments in lean education and since they have the potential to promote lean behavior organically, their use in measuring the CSO would mark a transformation in the nature of change management at Dell. There are strong reasons to believe that organically lean transformation can happen at Dell since the company is strongly defined by its history of organic growth and its culture of measurement. Dell culture is nothing if not adaptable, process-oriented, and open to change.

This implicit lean transformation may have already started in North America, where Dell is approaching market saturation. In such a climate, methods that allow Dell to continue thriving are, by nature, lean. It is interesting to note that the premium support teams operated by Dell as "Your Tech Team," are structured in a manner identical to traditional lean manufacturing production cells. Because of this property, Your Tech Teams can provide higher customer satisfaction with less

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[49] Elizabeth Keating, Rogelio Oliva, Nelson Repenning, Scott Rockart and John Sterman, "Overcoming the Improvement Paradox," *European Management Journal,* April 1999: 120-134.
[50] Nelson P. Repenning and John D. Sterman, "Nobody Ever Gets Credit for Fixing Problems that Never Happened: Creating and Sustaining Process Improvement," *California Management Review* 43, no. 4 (Summer 2001): 64-88.

infrastructure use than a typical phone queue, while also allowing Dell to scale these teams to match the growing demand for premium support.

4.3 Organizational Dynamics

4.3.1 Operating in a complex, ever-changing organization

During my seven months at Dell, the only thing that remained the same was the high pace of change. As one set of executives left and others came in, old teams were dissolved and new ones were formed then given new strategic imperatives. The new strategic direction made some staff redundant, with much consolidation happening at the management level and even more attrition happening at the frontline worker level. As individuals changed departments or left the company, a considerable amount of operational knowledge was dispersed and essentially lost to the new organization. At the manager level, this was perhaps by design; but, the loss of operational knowledge at the worker level was unintentional and irreversible.

Throughout these transitions, I noticed that it was easier for me, as a graduate intern, to recapture some of the worker knowledge through my informal connections with former staff than it was for the new management. That said, it was only by conducting 48 hour-long one-on-one interviews, was I able to gain insight into the recurring pain-points experienced by the individuals who managed workflow and customer interaction on a daily basis. By extension, I surmise that higher-placed executives may not be getting the full composite picture of reality that their direct reports (and their reports) carry around in their heads. In fact, managers rarely have the visibility that one can achieve at the ground level. But without this visibility, it is impossible for a management team to work meaningfully toward the kind of continuous process improvement that makes lean organizations successful. Toyota is successful in this area because it has ingrained an ethos of continuous improvement and the pursuit of perfection into its corporate culture and operational vocabulary. Toyota's circumstances—initially born out of a scarcity of resources—forced it to maintain a stable organization, promote from within, and nurture a culture of learning at all levels thereby ensuring continuity of knowledge and long tenures at each job function. These conditions are almost the opposite of the bounteous period Dell experienced as it grew tenfold in ten years, all the while amassing operational complexity at a geometric rate. During those years, Dell employees enjoyed far more opportunities for advancement and responsibility than is the norm in almost any industry. Employees became accustomed to taking on new roles and responsibilities every few quarters, specializing in one thing, gaining new responsibilities, reinventing themselves, then moving on again as mandated by Dell's superlative growth. The resulting organizational culture is one that is built to grow continuously rather than to sustain. And when the organization is asked to shrink, it does so against its nature and with intense pain and loss.

This aspect of Dell's organizational DNA[51] highlights the need for building knowledge retention and process management into the company's systems. Such an integrative goal calls for end-to-end process measurements and the development of metrics dashboards that accurately mirrors the organization's true service delivery performance. The measurements must display what is meaningful to all levels of staff, from CSAs to executive leadership. Executives and managers need accurate, real-time tools that allow them to see, with their own eyes, what areas are performing well and which require improvement. With such tools, even new senior executives can have a chance at retaining the ability to understand operations at a fundamental level. And if such tools are

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[51] Blaine Paxton, "The Dell Operating Model," Thesis, MIT Sloan School of Management and Department of Civil and Environmental Engineering, Massachusetts Institute of Technology (Cambridge, MA, 2004), 87.

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implemented correctly, that ability will be able to subsist, no matter what the pace or direction of organizational change may be.

This may become a reality as Dell implements one of the largest ERP/CRM implementation projects in the world in order to replace the multiple legacy applications that have supported their operations for the past two decades. The metrics and reasoning described in this thesis have been shared with subject matter experts working on this project and all source code and documentation has been archived in an internal knowledge repository site.

5 Conclusion

5.1 Key Project Lessons

The type of customer-focused metrics framework articulated in this thesis reveal sizeable blind spots created by reliance on traditional contact center metrics. The presence of the 7/12/40 customers is just one of these. The CustFM metrics created here also support numerous strategic areas that Dell has already prioritized:

- Exploration of customer support data to target call avoidance programs.
- Generation of revenue through premium support offerings.
- Driving process improvement and formalization into IT tools.

CustFM also opens the door for much greater enterprise visibility in the areas of:

- Resolution per channel and channel optimization in general.
- Waste identification by pinpointing non-value-adding activities and other forms of agent-created and system-caused waste.
- Calculating end-to-end profitability of products.

Finally, the CustFM framework is a critical measurement needed in order to "lean out" a large-scale customer support operation and reconcile the imperative of cost cutting with the need to delight customers in order to ensure their future purchasing behavior. A major benefit is that the required lean behaviors could be organically motivated by simply measuring agents based on their ability to deliver a high ratio of value-added resolution activities. Applications of the lean perspective are boundless and have already been proven in numerous industries by companies that are intensely customer-focused: Toyota, Amazon, and Dell itself (in its direct model and manufacturing practices).

5.2 Closing Remarks

The customer experience begins at the sales event and extends through stages of fulfillment, usage, service, disposal, and hopefully repurchase. As one of the later steps in this cycle, quality of service is one of the freshest memories that customers have when considering their next purchase (see Figure 10). The cyclical nature of the Customer Experience dictates what needs to be done in order to create a financially sustainable business: deliver to customers exactly what they value. As obvious as it may be, customer-focus is a core strategy that is easier to articulate than to execute. I hope to have made a small contribution to this end by providing an immediately implementable metric that allows contact-centers to align their activities with the customer's mindset

Figure 10: The Full Cycle of Customer Experience.

Brand awareness

Awareness of
future needs

Product and service
availability

Quality of
service

Complete
Customer
Experience

Ease of
buying

Usage quality

Ease of
installation

Welcome experience
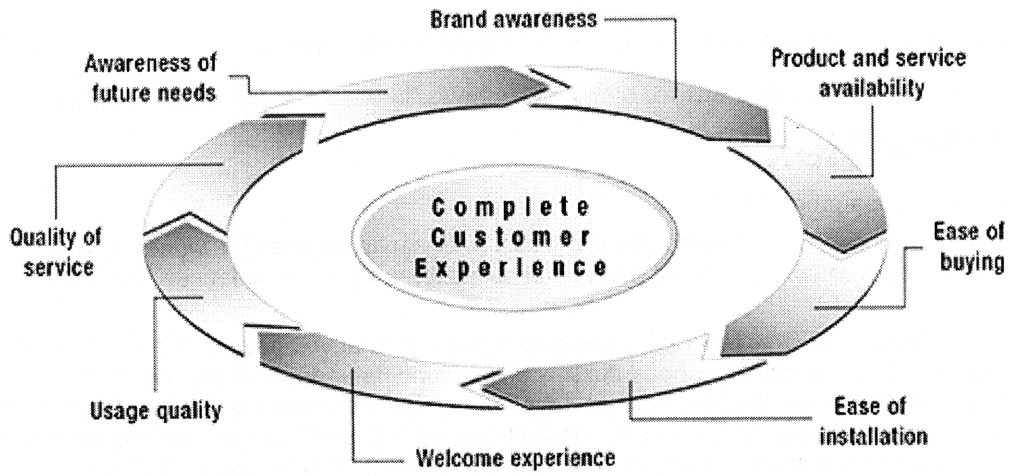
6 Appendix

6.1 Reader comments to BusinessWeek's "Dell Hell" story

http://www.businessweek.com/the_thread/techbeat/archives/2005/09/inside_dell_hel.html

Inside "Dell Hell"

Posted by: Rob Hof on September 29

My colleague Louise Lee's new story digging into Dell's customer-service challenges won't come as a surprise to the many folks who commented on a post that asked for people's experiences with the PC giant. (Thanks!)

The story points up a lesson to PC buyers that, increasingly, you get what you pay for: Inexpensive PCs mean minimal support. But while cutting support costs is entirely understandable in this cutthroat business, I question whether this is the best place to save money. Even someone who paid $500 for a PC darn well expects the thing to work, period. And if it doesn't, you can't blame them for wanting good, fast fixes. Whether it's providing adequate support or building better products that just work, technology providers need to step up to the plate. Sell stuff that people are delighted with, instead of stuff that they merely endure, and maybe they might be willing to pay a few bucks more.

TrackBack URL for this entry: http://blogs.businessweek.com/mt/mt-tb.cgi/1781.1438913619

READER COMMENTS

Robert Fitzgerald

September 29, 2005 09:14 PM

For what it's worth here's one more Dell problem. They shipped me a Dell Inspiron 6000 which either has an intermittent hardware error, or a bad driver. I carelessly let the 21 days pass. Their support people are in mostly incompetent, when you ask for a supervisor they lie and dump you back in the phone queue. Emailing Michael Dell used to be effective, but apparently not any more.

Maybe I should recover my money by selling short on Dell stock. There are at least 8 people who have Dells because of me. There will likely be many more now who don't because I will start spreading the word.

Richiez

September 30, 2005 10:07 AM

I had a similar problem with Dell's support. A mouse-problem was not resolved after a month of phone calls and speaking with as many as 7 different techs and supervisors. I just gave up and bought myself a new mouse. I'm a computer science mayor, Dell used to be my first choice for friends that were not computer savvy, with this type of tech-support, I'll be turning my people some where else.

Ajit

September 30, 2005 02:53 PM

I agree with you,,, Rob hof

Jimmy

September 30, 2005 10:16 PM

When my son's Dell laptop began unexpectedly "powering down", I called Dell tech support for help. I quickly realized I was speaking to Dell's infamous overseas contact center in India. The rep was barely understandable, and what I could decipher from her was to do something to the laptop, then call back another day. When I called back, I could not understand that Indian rep, and with many requests to be transferred to someone I could understand, I was cut off. I decided enough was enough...I had paid for a service contract, and Dell's refusal to provide me with an understandable point-of-contact for support was, to me, tantamount to breach of contract. So I filed online complaint forms with both my state attorney general's consumer complaint division and the Texas Better Business Bureau. In a few short days, I received a call from Dell, clearly an American voice, fervently asking what Dell could do for me to get my problem fixed. It became clear to me that while Dell is corporately giving the American consumer a "take it or leave it" middle-finger, the one outcome they do not want is to have to respond to a governmental

agency complaint. I think Dell is a predatory company interested only in aggrandizing Dell executives with great wealth, and they care not one wit for the country which enabled them to become wealthy.

6.2 Customer testimonial detailing "Non-Value-Added" activity

Donna
14 Jul 2008 05:28 PM

GETTING THE RUN AROUND! I have talked to Tech's in India now 23 times (since the 3rd week of May) about the same issue (I have 4 case numbers). The tech's keep stating that a SENIOR Manager will call in 3 hours (this is after they take the computer over and wipe it clean and cannot solve the problem). Then, I call the following day, they will not listen to what I am saying... I have to repeat the same info I gave them the day before and the case number. The "new" Rep does the same thing, they take the computer over, wipe it clean and say that a SENIOR Manager will call in 3 hours, which never happens. I was told today that my case was turned over to "our Escalation Team", I asked what an Escalation Team was and never got an answer.

The Laptop was sent to Dell in Tennessee for repairs 2 weeks ago and returned to us with the same problem.

I have called every phone number listed for Dell and continue to get Rep's in India. On one occasion I did reach Daniel in El Salvador who also promised that his Supervisor would call immediately. Well, that was last Wednesday (5 days ago). It is strange that when I *purchased* the computer I got a Sales Rep. in Oklahoma City, OK., where is this guy now when I need help? Does anyone out there know of a U.S. phone number for Dell? Or someone that can help?

Source: http://en.community.dell.com/blogs/direct2dell/archive/2008/07/01/new-premium-service-for-u-s-consumers-your-tech-team.aspx

6.3 Data hierarchy

1) Customer
   a) ServiceTag
      i) Journal Header CaseID
         (1) Journal Sequence Number
            (a) Phone journal
               (i) Handle time (from CTI, telecom call duration)
            (b) Phone journal
               (i) Handle time
            (c) Chat journal
               (i) Handle time
            (d) Email journal
               (i) Handle time
      ii) Online journal
         (1) Clickstream
            (a) eSupport
            (b) GuidedPath
            (c) DSN
      iii) On the Box (OTB)
            (a) SupportSoft DSC stream
            (b) GTeko DSC (legacy) latent pipe
2) Site (e.g., Chandigarh, India)
   a) Department Name (e.g., Core Tech Support Chat)
      i) Queue Name (e.g., Portable)

(1) Agent name
    (a) Journal Header Case ID
        (i) Journal Sequence Number
            1. Phone journal
                a. Handle time
            2. Chat journal
                a. Handle time
            3. Email journal
                a. Handle time

6.4 Source code for ETL and CustFM transformation

```
use DellSupport;

/******************************** BEGIN DATA SOURCE DOCUMENTATION ********************************
Avijit Sen                  MIT Graduate Fellow (Leaders for Manufacturing Program)
617-642-3233        DELL, Inc. Process Engineering and Services Readiness
Dual candidate              MBA Sloan School of Management - SM Civil & Env Engin, 2009


AS20080811: This analysis is nothing without the datasets that it is built upon.

These were originally pulled by Victor Hansard into to the following table structures.
The original pull included only desktop and laptop data but the analysis could just as
easily be done to include S&P data.

Telecom data was furnished by Aroon Jham according to the SQL queries documented herein.

DSN data was furnished by Nildip Ghosh as a by-product of his own work on DSN content
effectiveness.

-- This is the D3 pull for the Journal dataset
SQL: SELECT cjhr_489."BUSINESS_UNIT_ID" AS "Business Unit ID"
    ,cjhr_489."ORIGINAL_LOCAL_CHANNEL" AS "Local Channel"
    ,cjdr_580."CASE_DB_ID" AS "Case DB ID-Detail"
    ,cjhr_489."CASE_ID" AS "Journal Header Case ID"
    ,cjdr_580."JOURNAL_SEQ_NUM" AS "Journal Seq Num"
    ,cjdr_580."DETAIL_SEQ_NUM" AS "Detail Seq Num"
    ,cjhr_489."DPS_NUM" AS "DPS Num"
    ,cjhr_489."JOURNAL_CREATED_BY" AS "Call Rep Employee ID"
    ,stj_403."TECH_NAME" AS "Call Rep Employee Name"
    ,cjhr_489."CUSTOMER_NUM" AS "Customer Num"
    ,st_270."CUSTOMER_NUM" AS "Customer Num of Svc Tag"
    ,spa_213."STATE_PROV_CODE" AS "State Abbrev Shipping"
    ,cjhr_489."SERVICE_TAG_NUM" AS "Call Svc Tag ID"
    ,ph_72."PRODUCT_DESC" AS "Product Desc"
    ,ph_72."PRODUCT_LINE_DESC" AS "Product Line Desc"
    ,scm_284."CONTACT_METHOD_DESC" AS "Contact Method Desc"
    ,cjhr_489."CUSTOMER_CONTACT_TYPE" AS "Customer Contact Type"
    ,sjcc_252."COMPONENT_ISSUE_TYPE" AS "Call Profile Issue Type"
    ,sjcc_252."COMPONENT_CATEGORY_DESC" AS "Call Profile Category"
    ,sjc_251."COMPONENT_DESC" AS "Call Profile Component"
    ,sjcc_249."CAUSE_CATEGORY_DESC" AS "Call Profile Cause"
    ,sc_245."CAUSE_DESC" AS "Call Profile Reason"
    ,sc_245."CAUSE_ID" AS "Call Profile Reason ID"
    ,sr_260."REASON_CODE_DESC" AS "Reason Code Desc"
    ,cjhr_489."CASE_SUBSTATUS" AS "Case Substatus"
    ,cjhr_489."CASE_STATUS_DESC" AS "Case Status Desc"
    ,cjhr_489."JOURNAL_START_TIME" AS "Journal Create Time"
    ,cjhr_489."JOURNAL_START_DATE" AS "Journal Create Date"
    ,jcd_TT_3164_1."FORMAT_FISCAL_WEEK_ID" AS "Journal Create Date Week"
    ,jcd_TT_3164_1."FORMAT_FISCAL_MONTH_ID" AS "Journal Create Date Month"
    ,jcd_TT_3164_1."FORMAT_FISCAL_QUARTER_ID" AS "Journal Create Date Quarter"
    ,jcd_TT_3164_1."FORMAT_FISCAL_YEAR_ID" AS "Journal Create Date Year"
FROM SVC_MART..CALL_JOURNAL_HEADER_REPORT cjhr_489
LEFT OUTER JOIN SERVICE..SVC_TECHNICIAN stj_403 ON
    (
    cjhr_489."TECH_ID"=stj_403."TECH_ID" AND cjhr_489."BUSINESS_UNIT_ID"=stj_403."SVC_BUSINESS_UNIT_ID")
    LEFT OUTER JOIN SVC_MART..CALL_JNL_DTL_REPORT cjdr_580 ON
    (
    cjhr_489."BUSINESS_UNIT_ID"=cjdr_580."BUSINESS_UNIT_ID" AND cjhr_489."CASE_DB_ID"=cjdr_580."CASE_DB_ID"
AND cjhr_489."CASE_ID"=cjdr_580."CASE_ID" AND cjhr_489."JOURNAL_SEQ_NUM"=cjdr_580."JOURNAL_SEQ_NUM")
    LEFT OUTER JOIN SERVICE..SVC_CAUSE sc_245 ON
    (
    cjhr_489."BUSINESS_UNIT_ID"=sc_245."SVC_BUSINESS_UNIT_ID" AND cjhr_489."CAUSE_ID"=sc_245."CAUSE_ID")
    LEFT OUTER JOIN SERVICE..SVC_JOURNAL_CAUSE_CATEGORY sjcc_249 ON
    (
    sc_245."SVC_BUSINESS_UNIT_ID"=sjcc_249."SVC_BUSINESS_UNIT_ID" AND
sc_245."CAUSE_CATEGORY_ID"=sjcc_249."CAUSE_CATEGORY_ID")
    INNER JOIN GPNL_FINANCE..ORDER_HEADER oh_12 ON
    (
    cjhr_489."ORDER_BUSINESS_UNIT_ID"=oh_12."BUSINESS_UNIT_ID" AND
cjhr_489."ORIGINAL_ORDER_NUM"=oh_12."ORDER_NUM")
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```
        INNER JOIN FINANCE..SHIP_ADDRESS_INFO spa_213 ON
        (
        oh_12."SHIP_TO_SEQ_NUM"=spa_213."ADDRESS_SEQ_NUM" AND oh_12."BUSINESS_UNIT_ID"=spa_213."BUSINESS_UNIT_ID"
AND oh_12."CUSTOMER_NUM"=spa_213."CUSTOMER_NUM")
        LEFT OUTER JOIN SERVICE..SVC_REASON sr_260 ON
        (
        cjhr_489."BUSINESS_UNIT_ID"=sr_260."SVC_BUSINESS_UNIT_ID" AND
cjhr_489."JOURNAL_REASON"=sr_260."REASON_CODE")
        INNER JOIN CORP_WW..FORMAT_FISCAL_DAY_INFO jcd_TT_3164_1 ON
        (
        cjhr_489."JOURNAL_START_DATE"=jcd_TT_3164_1."FORMAT_ACTUAL_DATE")
        INNER JOIN CORP_WW..SVC_CONTACT_METHOD scm_284 ON
        (
        cjhr_489."BUSINESS_UNIT_ID"=scm_284."SVC_BUSINESS_UNIT_ID" AND
cjhr_489."CUSTOMER_CONTACT_TYPE"=scm_284."CONTACT_METHOD_CODE")
        INNER JOIN CORP_WW..PRODUCT_HIERARCHIES ph_72 ON
        (
        cjhr_489."SKU_CLASS"=ph_72."SKU_CLASS")
        LEFT OUTER JOIN SERVICE..SVC_JOURNAL_COMPONENT sjc_251 ON
        (
        cjhr_489."BUSINESS_UNIT_ID"=sjc_251."SVC_BUSINESS_UNIT_ID" AND
cjhr_489."COMPONENT_TYPE"=sjc_251."COMPONENT_CODE")
        LEFT OUTER JOIN SERVICE..SVC_JOURNAL_COMPONENT_CATEGORY sjcc_252 ON
        (
        sjc_251."SVC_BUSINESS_UNIT_ID"=sjcc_252."SVC_BUSINESS_UNIT_ID" AND
sjc_251."COMPONENT_CATEGORY_ID"=sjcc_252."COMPONENT_CATEGORY_ID")
        LEFT OUTER JOIN SERVICE..SVC_TAG st_270 ON
        (
        cjhr_489."BUSINESS_UNIT_ID"=st_270."SVC_BUSINESS_UNIT_ID" AND
cjhr_489."SERVICE_TAG_NUM"=st_270."SVC_TAG_ID")

        WHERE ((cjhr_489."BUSINESS_UNIT_ID" = 11
          AND
        cjhr_489."ORIGINAL_LOCAL_CHANNEL" IN ('09', '13', '14', '17', '19', '21', '22', '23', '24', '29', '80')
          AND
        spa_213."STATE_PROV_CODE" = 'NY'
          AND
        cjhr_489."JOURNAL_START_DATE" BETWEEN '2004-05-14' AND '2008-06-18'
        ) AND
        ((cjhr_489."BUSINESS_UNIT_ID" IN (11, 20, 105, 175, 707, 999, 1415, 1435, 2020, 2062, 3232, 3636, 3696,
3737, 4747, 5858, 7777, 7878, 8585, 9595, 9990, 9991, 9992, 9993, 9994, 9995, 9996, 9997, 9998, 45161, 47163)
        ) OR
        (cjhr_489."ORIGINAL_LOCAL_CHANNEL" IN ('**', '01', '0101', '0103', '0104', '0105', '0106', '0107', '0108',
'0109', '0110', '0111', '0112', '0113', '0114', '0115', '0116', '0117', '0118', '0119', '0120', '0121', '0122',
'0123', '0124', '0125', '0126', '0127', '0128', '0129', '0130', '0131', '0132', '0133', '0134', '0135', '0136',
'0137', '0138', '0139', '0140', '0141', '0142', '0143', '0144', '0145', '0146', '0147', '0150', '0151', '0152',
'0153', '0154', '0155', '0156', '0157', '0158', '0159', '0160', '0161', '0162', '0163', '0164', '0165', '0174',
'0175', '0176', '0177', '0179', '0180', '0181', '0184', '0185', '0186', '0187', '0188', '0193', '0195', '0197',
'0199', '10', '11', '2001', '2003', '2020', '2021', '2022', '2023', '2024', '2025', '2026', '30', '3005', 'CI',
'EXT', 'FA', 'top1', 'ZZ')
        )) AND
        (ph_72."PRODUCT_LINE" IN ('5MD4', '5BN', '5DRAD', '5MS', '5MS2', '5LZ', '5MN1', '5DN', '5CC2', '5ND',
'5LU', '5SL', '5DK3B2', '5DO', '5MN3', '5J1', '5PL', '5AJ', '5DI', '5NA', '5DLT', '5SS', '5NBLA', '5DQA',
'5JL', '5DC1', '5GL', '5J6', '5MD3', '5NCC', '5DH', '5NDB', '5RE2', '5B', '5SPB', '5SN', '5RD2', '5FL',
'5DRU2', '5MN5', '5QH', '5DM', '5MK', '5JSA', '5J3', '5DF', '5CC3', '5NDA', '5NC', '5KI', '5DRA1', '5DG', '5A',
'5MC', '5SPFM', '5NCA', '5DRAC', '5MS3', '5NDD', '5LY', '5DI1', '5D', '5N9', '5RI', '5DC1A', '5DS', '5MD2',
'5SL1', '5DRAB', '5DCC1', '5N6', '5DK3A', '5MD1', '5NI', '5DD', '5DC1D', '5N1B1', '5DQAP', '5SZ2', '5LR',
'5LS', '5NF', '5N3', '5LN1', '5IA2', '5DLS', '5CC', '5TH1', '5SPF', '5SZ', '5DQ', '5DC', '5LQ', '5MZ', '5FM',
'5LV', '5NK', '5NX1A', '5DK2', '5DB', '5N3A', '5DK3C', '5N1A', '5DPP', '5LP', '5N5', '5RE', '5NH', '5LS',
'5J5', '5MI', '5WB', '5KC', '5NDC', '5DZ', '5N2', '5WL', '5MN2', '5DP', '5MI2', '5LW', '5DL', '5NB', '5DRA',
'5DK2C', '5SB', '5IA', '5DC1C', '5NEFA', '5KL', '5DC1E', '5SPC', '5ZI', '5CO1', '5NX1', '5DX', '5N4', '5DK3',
'5DK', '5HU', '5NG', '5SG', '5SY', '5DC1B', '5MN4', '5J4', '5YM', '5HW', '5LT', '5KB', '5DJ', '5ZB', '5NI1',
'5SD', '5N1B', '5DA', '5LO', '5CC1', '5NCB', '5DK1', '5J6A', '5SPA', '5NEA', '5DE', '5RB', '5RD1', '5DS2',
'5TV', '5NBA', '5AS', '5TH', '5J2', '5DF1', '5DI3', '5GG', '5N7', '5N3')
        ))
        GROUP BY cjhr_489."BUSINESS_UNIT_ID"
        ,cjhr_489."ORIGINAL_LOCAL_CHANNEL"
        ,cjdr_580."CASE_DB_ID"
        ,cjhr_489."CASE_ID"
        ,cjdr_580."JOURNAL_SEQ_NUM"
        ,cjdr_580."DETAIL_SEQ_NUM"
        ,cjhr_489."DPS_NUM"
        ,cjhr_489."JOURNAL_CREATED_BY"
        ,stj_403."TECH_NAME"
        ,cjhr_489."CUSTOMER_NUM"
        ,st_270."CUSTOMER_NUM"
        ,spa_213."STATE_PROV_CODE"
        ,cjhr_489."SERVICE_TAG_NUM"
        ,ph_72."PRODUCT_DESC"
        ,ph_72."PRODUCT_LINE_DESC"
        ,scm_284."CONTACT_METHOD_DESC"
        ,cjhr_489."CUSTOMER_CONTACT_TYPE"
        ,sjcc_252."COMPONENT_ISSUE_TYPE"
        ,sjcc_252."COMPONENT_CATEGORY_DESC"
        ,sjc_251."COMPONENT_DESC"
        ,sjcc_249."CAUSE_CATEGORY_DESC"
        ,sc_245."CAUSE_DESC"
        ,sc_245."CAUSE_ID"
        ,sr_260."REASON_CODE_DESC"
        ,cjhr_489."CASE_SUBSTATUS"
        ,cjhr_489."CASE_STATUS_DESC"
        ,cjhr_489."JOURNAL_START_TIME"
```

```
        ,cjhr_489."JOURNAL_START_DATE"
        ,jcd_TT_3164_1."FORMAT_FISCAL_WEEK_ID"
        ,jcd_TT_3164_1."FORMAT_FISCAL_MONTH_ID"
        ,jcd_TT_3164_1."FORMAT_FISCAL_QUARTER_ID"
        ,jcd_TT_3164_1."FORMAT_FISCAL_YEAR_ID"


-- This is the D3 pull for the Sales dataset
SQL: SELECT st_270."SVC_BUSINESS_UNIT_ID" AS "Business Unit ID"
        ,st_270."LOCAL_CHANNEL" AS "Local Channel"
        ,s_45."SALESREP_NUM" AS "Salesrep Num"
        ,s_45."SALESREP_NAME" AS "Salesrep Name"
        ,ohsoo_230."CUSTOMER_NUM" AS "Customer Num"
        ,st_270."CUSTOMER_NUM" AS "Customer Num of Svc Tag"
        ,st_270."ORDER_NUM" AS "Order Num"
        ,ohsoo_230."ORDER_DATE" AS "Order Date"
        ,st_270."SVC_TAG_ID" AS "Svc Tag ID"
        ,ph_72."PRODUCT_DESC" AS "Product Desc"
        ,ph_72."PRODUCT_LINE_DESC" AS "Product Line Desc"
        ,sd_TT_2973_1."FORMAT_FISCAL_YEAR_ID" AS "Shipped Date Year"
        ,sd_TT_2973_1."FORMAT_FISCAL_QUARTER_ID" AS "Shipped Date Quarter"
        ,sd_TT_2973_1."FORMAT_FISCAL_MONTH_ID" AS "Shipped Date Month"
        ,sd_TT_2973_1."FORMAT_FISCAL_WEEK_ID" AS "Shipped Date Week"
        ,ohsoo_230."SHIPPED_DATE" AS "Shipped Date"
        ,id_TT_2929_1."FORMAT_FISCAL_YEAR_ID" AS "Inv Date Year"
        ,id_TT_2929_1."FORMAT_FISCAL_QUARTER_ID" AS "Inv Date Quarter"
        ,id_TT_2929_1."FORMAT_FISCAL_MONTH_ID" AS "Inv Date Month"
        ,id_TT_2929_1."FORMAT_FISCAL_WEEK_ID" AS "Inv Date Week"
        ,ohsoo_230."INV_DATE" AS "Inv Date"
        ,MAX(sc_246."SVC_CONTRACT_END_DATE") AS "Max Svc Contract End Date"
        FROM SERVICE..SVC_TAG st_270
        INNER JOIN GPNL_FINANCE..ORDER_HEADER ohsoo_230 ON
        (
        st_270."ORDER_BUSINESS_UNIT_ID"=ohsoo_230."BUSINESS_UNIT_ID" AND st_270."ORDER_NUM"=ohsoo_230."ORDER_NUM")
        INNER JOIN FINANCE..SHIP_ADDRESS_INFO spa_213 ON
        (
        ohsoo_230."BUSINESS_UNIT_ID"=spa_213."BUSINESS_UNIT_ID" AND
ohsoo_230."SHIP_TO_SEQ_NUM"=spa_213."ADDRESS_SEQ_NUM" AND ohsoo_230."CUSTOMER_NUM"=spa_213."CUSTOMER_NUM")
        INNER JOIN SERVICE..SVC_CONTRACT sc_246 ON
        (
        st_270."SVC_TAG_ID"=sc_246."SVC_TAG_ID" AND st_270."CUSTOMER_NUM"=sc_246."SVC_CONTRACT_CUSTOMER_NUM" AND
st_270."SVC_BUSINESS_UNIT_ID"=sc_246."SVC_BUSINESS_UNIT_ID")
        INNER JOIN CORP_WW..FORMAT_FISCAL_DAY_INFO sd_TT_2973_1 ON
        (
        ohsoo_230."SHIPPED_DATE"=sd_TT_2973_1."FORMAT_ACTUAL_DATE")
        INNER JOIN CORP_WW..FORMAT_FISCAL_DAY_INFO id_TT_2929_1 ON
        (
        ohsoo_230."INV_DATE"=id_TT_2929_1."FORMAT_ACTUAL_DATE")
        INNER JOIN CORP_WW..PRODUCT_HIERARCHIES ph_72 ON
        (
        st_270."SYSTEM_CLASS"=ph_72."SKU_CLASS")
        INNER JOIN FINANCE..ORDER_SALESREP_PRIMARY_INFO os_17 ON
        (
        ohsoo_230."ORDER_NUM"=os_17."ORDER_NUM" AND ohsoo_230."BUSINESS_UNIT_ID"=os_17."BUSINESS_UNIT_ID")
        LEFT OUTER JOIN FINANCE..SALESREP s_45 ON
        (
        os_17."BUSINESS_UNIT_ID"=s_45."BUSINESS_UNIT_ID" AND os_17."PRIMARY_SALESREP_NUM"=s_45."SALESREP_NUM")

        WHERE ((st_270."SVC_BUSINESS_UNIT_ID" = 11
         AND
        st_270."LOCAL_CHANNEL" IN ('09', '14', '17', '19', '21', '22', '23', '24', '29', '80')
         AND
        spa_213."STATE_PROV_CODE" = 'NY'
        ) AND
        ((st_270."ORDER_BUSINESS_UNIT_ID" IN (11, 20, 105, 175, 707, 999, 1415, 1435, 2020, 2062, 3232, 3636,
3696, 3737, 4747, 5858, 7777, 7878, 8585, 9595, 9990, 9991, 9992, 9993, 9994, 9995, 9996, 9997, 9998, 45161,
47163)
        ) OR
        (st_270."LOCAL_CHANNEL" IN ('**', '01', '0101', '0103', '0104', '0105', '0106', '0107', '0108', '0109',
'0110', '0111', '0112', '0113', '0114', '0115', '0116', '0117', '0118', '0119', '0120', '0121', '0122', '0123',
'0124', '0125', '0126', '0127', '0128', '0129', '0130', '0131', '0132', '0133', '0134', '0135', '0136', '0137',
'0138', '0139', '0140', '0141', '0142', '0143', '0144', '0145', '0146', '0147', '0150', '0151', '0152', '0153',
'0154', '0155', '0156', '0157', '0158', '0159', '0160', '0161', '0162', '0163', '0164', '0165', '0174', '0175',
'0176', '0177', '0179', '0180', '0181', '0184', '0185', '0186', '0187', '0188', '0193', '0195', '0197', '0199',
'10', '11', '2001', '2003', '2020', '2021', '2022', '2023', '2024', '2025', '2026', '30', '3005', 'CI', 'EXT',
'FA', 'top1', 'ZZ')
        )) AND
        (ph_72."PRODUCT_LINE" IN ('5MD4', '5BN', '5DRAD', '5MS', '5MS2', '5LZ', '5MN1', '5DN', '5CC2', '5ND',
'5LU', '5SL', '5DK3B2', '5DO', '5MN3', '5J1', '5PL', '5AJ', '5DI', '5NA', '5DLT', '5SS', '5NBLA', '5DQA',
'5JL', '5DC1', '5GL', '5J6', '5MD3', '5NCC', '5DH', '5RE2', '5B', '5SPB', '5SN', '5RD2', '5FL',
'5DRU2', '5MN5', '5QH', '5DM', '5MK', '5J5A', '5J3', '5DF', '5CC3', '5NDA', '5NC', '5KI', '5DRA1', '5DG', '5A',
'5MC', '5SPFM', '5NCA', '5DRAC', '5MS3', '5NDD', '5LY', '5DI1', '5D', '5N9', '5RI', '5DC1A', '5DS', '5MD2',
'5SL1', '5DRAB', '5DCC1', '5N6', '5DK3A', '5MD1', '5NI', '5DD', '5DC1D', '5N1B1', '5DQAP', '5SZ2', '5LR',
'5LS', '5NF', '5N3', '5LN1', '5IA2', '5DLS', '5CC', '5TH1', '5SPF', '5SZ', '5DQ', '5DC', '5LQ', '5MZ', '5FM',
'5LV', '5NK', '5NX1A', '5DK2', '5DB', '5N3A', '5N1A', '5DPP', '5LP', '5N5', '5RE', '5NH', '5LS',
'5J5', '5MI', '5WB', '5KC', '5NDC', '5DZ', '5N2', '5WL', '5MN2', '5DP', '5MI2', '5LW', '5DL', '5NB', '5DRA',
'5DK2C', '5SB', '5IA', '5DC1C', '5NEFA', '5KL', '5DC1E', '5SPC', '5ZI', '5CO1', '5NX1', '5DX', '5N4', '5DK3',
'5DK', '5HU', '5NG', '5SG', '5SY', '5DC1B', '5MN4', '5J4', '5YM', '5HW', '5LT', '5KB', '5DJ', '5ZB', '5NI1',
'5SD', '5N1B', '5DA', '5LO', '5CC1', '5NCB', '5DK1', '5J6A', '5SPA', '5NEA', '5DE', '5RB', '5RD1', '5DS2',
'5TV', '5NBA', '5AS', '5TH', '5J2', '5DF1', '5DI3', '5GG', '5N7', '5NJ')
        ))
        GROUP BY st_270."SVC_BUSINESS_UNIT_ID"
```

```
        ,st_270."LOCAL_CHANNEL"
        ,s_45."SALESREP_NUM"
        ,s_45."SALESREP_NAME"
        ,ohsoo_230."CUSTOMER_NUM"
        ,st_270."CUSTOMER_NUM"
        ,st_270."ORDER_NUM"
        ,ohsoo_230."ORDER_DATE"
        ,st_270."SVC_TAG_ID"
        ,ph_72."PRODUCT_DESC"
        ,ph_72."PRODUCT_LINE_DESC"
        ,sd_TT_2973_1."FORMAT_FISCAL_YEAR_ID"
        ,sd_TT_2973_1."FORMAT_FISCAL_QUARTER_ID"
        ,sd_TT_2973_1."FORMAT_FISCAL_MONTH_ID"
        ,sd_TT_2973_1."FORMAT_FISCAL_WEEK_ID"
        ,ohsoo_230."SHIPPED_DATE"
        ,id_TT_2929_1."FORMAT_FISCAL_YEAR_ID"
        ,id_TT_2929_1."FORMAT_FISCAL_QUARTER_ID"
        ,id_TT_2929_1."FORMAT_FISCAL_MONTH_ID"
        ,id_TT_2929_1."FORMAT_FISCAL_WEEK_ID"
        ,ohsoo_230."INV_DATE"

        HAVING ((MAX(sc_246."SVC_CONTRACT_END_DATE") >='2004-05-14'
        ))


-- This is the pull for the Telecome data (Aroon Jham's code)
declare @st_date varchar(255)
declare @end_date varchar(255)
set @st_date = '2/2/08'
set @end_date = '2/9/08' -- AS20080811: run this one week at a time if you are doing one-time analytics, longer
pulls require IT approval

select       distinct (r.RouterCallKey), r.RouterCallKeyDay , substring (r.variable5, 14, 26) as ST

into #AJTmp1

from dell_hds.dbo.Route_Call_Detail r
where  r.Variable5 like '%TAG%' and
       r.datetime >= @st_date
       and r.datetime < @end_date
       and Len(substring (r.variable5, 14, 26)) >=5

group by r.RouterCallKeyDay , r.routercallkey  , substring (r.variable5, 14, 26)

SELECT  call.peripheralID , call.agentperipheralnumber , call.digitsdialed ,
       call.LocalQTime, call.talktime, call.holdtime, call.worktime
       , call.TimeToAband, t1.ST, call.datetime, call.ANI


FROM dell_awdb.dbo.Skill_Group S , dell_awdb.dbo.Service V
       , dell_hds.dbo.Termination_Call_Detail Call
       inner join #AJTmp1 t1
       on call.routercallkey = t1.routercallkey
       and call.RouterCallKeyDay = t1.RouterCallKeyDay


WHERE  Call.SkillGroupSkillTargetID = S.SkillTargetID
       and Call.ServiceSkillTargetID = V.SkillTargetID
       and Call.DateTime >= @st_date
       And Call.DateTime < @end_date


AND ((Call.PeripheralID In (5028) And S.PeripheralNumber in (30, 123 , 211))
or (Call.PeripheralID In (5039) And S.PeripheralNumber in (80, 81, 82, 83, 218))
or (Call.PeripheralID In (5044) And S.PeripheralNumber in (103, 210, 102, 204))
or (Call.PeripheralID In (5050) And S.PeripheralNumber in (241, 242, 244,916))
or (Call.PeripheralID In (5051) And S.PeripheralNumber in (604))
or (Call.PeripheralID In (5057) And S.PeripheralNumber in (192))
or (Call.PeripheralID In (5060) And S.PeripheralNumber in (48 ,34))
or (Call.PeripheralID In (5062) And S.PeripheralNumber in (87, 95, 129))
or (Call.PeripheralID In (5062) And S.PeripheralNumber in (93,94))
or (Call.PeripheralID In (5064) And S.PeripheralNumber in (83,94))
or (Call.PeripheralID In (5065) And S.PeripheralNumber in (15))
or (Call.PeripheralID In (5067) And S.PeripheralNumber in (18, 22))
or (Call.PeripheralID In (5068) And S.PeripheralNumber in (9, 21))
or (Call.PeripheralID In (5086) And S.PeripheralNumber in (146))
or (Call.PeripheralID In (5088) And S.PeripheralNumber in (6, 100, 204))
or (Call.PeripheralID In (5108) And S.PeripheralNumber in (204, 202, 203, 14))
or (Call.PeripheralID In (5109) And S.PeripheralNumber in (203, 40,  206, 204))
or (Call.PeripheralID In (5113) And S.PeripheralNumber in (900)))

drop table #AJtmp1


/****************************** END DATA SOURCE DOCUMENTATION ******************************/


/*****************************************************************************/
/*   Build Customer Focused Metrics for an entire quarter of data     */
/*****************************************************************************/
/*
```

```
The steps are:
1. Build the cost vector
2. Pivot the Journal Data onto Service Tag (1 line per entity)
  a.) Apply the cost vector at the same time
3. Join in the Telecom duration data
4. Join in chat/email duration data (not available at this time)
5. Join in Sales data
5. Join in CE measures data (CSAT)

*****************************************************************/


/***************************************************************/
/*** Set up Support cost vector  and append to Journal data  */
/***************************************************************/
-- create costs vector
drop table CostVector;
create table CostVector
(
 ContactType varchar(30),
 Cost numeric(5,2),
 CostperUnitTime numeric(5,2)
);

insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Call - Inbound', XXXX, 0);
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Call - Outbound', xxxx, 0);
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Customer Chat', xxxx, 0);
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Email', XXXX, 0);
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Log with No Contact', XXXX, 0);  -- my
assumption
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Dell Service Provider Call', XXXX, 0);
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Letter', XXXX, 0); -- no data
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Dell Community Forum', XXXX, 0);
insert into CostVector (ContactType, Cost, CostperUnitTime) values ('Dell In-Line Stores', XXXX, 0);
-- in the next step we will perform a cartesian product of cost vector against CustFM, a table of unique
service tags.

/***************************************************************/
/*** Pivot the Journal data into 1 line per Customer (including costs)  ***/
/***************************************************************/
-- let's build a dataset with users' various experiences (customer-centric metrics).  Later we'll try to fit a
model.

drop table CustFM;
drop table temp;
-- Bring the data into one line per service tag and add in cost estimates
select [Call Svc Tag ID], count(*) as CCPR,
customer contacts per rapport/resolution
                       count(distinct [Call Rep Employee ID]) as OwnR,          -- agents ownership ratio
(agents per resolution)
                       count(distinct [CustomerContactType]) as cCUPR,          -- channels used per
rapport/resolution
                            count(distinct [Journal Header Case ID]) as numCases, -- number of cases
per user (but this may not be valid for consumer)
                       sum(Cost) as EstExpense
estimated expense of supporting this customer
into CustFM
from (   -- putting the costs in on the fly here saves disk IO but increases CPU load
        -- TODO: do a better job accounting for hang-up/disco, and transfers
       select a.*, b.Cost
       from q1j as a
       left join CostVector as b
       on a.[ContactMethodDesc] = b.[ContactType]
    ) as c
group by c.[Call Svc Tag ID];

-- the following should be zero, if it's not, there was a problem matching costs
select count(*) as CostMatchErrorCount from custfm where EstExpense is null

-- join in some info about their equipment and add in what channels they used and how many times,
-- e.g., how many contacts where outbond vs inbound, etc.
select distinct a.cCPR, a.OwnR, a.cCUPR, a.numCases, a.EstExpense, b.[Product Desc], b.[Product Line Desc],
c.*, d.*, e.*
into temp
from CustFM as a
left join q1j as b on a.[Call Svc Tag ID] = b.[Call Svc Tag ID]
left join (  select * from (select [Call Svc Tag ID], [ContactMethodDesc], count(*) as cCPR
                       from q1j group by [Call Svc Tag ID],[ContactMethodDesc]) as SourceTable
           pivot (sum(cCPR) for ContactMethodDesc in ([Call - Inbound], [Call - Outbound], [Customer Chat],
                                                                                            [Dell Community
Forum], [Dell In-Line Stores], [Dell Service Provider Call],
                                                                                            [Email],
[Letter], [Log with No Contact])) as PivotTable
        ) as c on a.[Call Svc Tag ID] = c.[Call Svc Tag ID]
-- add in a pivot of the profiling categories for all these users, Issue type
left join (
        select * from (select [Call Svc Tag ID] as Tag, [Call Profile Issue Type], count(*) as NumIssues
                       from q1j group by [Call Svc Tag ID], [Call Profile Issue Type]) as
SourceTable
        pivot (sum(NumIssues) for [Call Profile Issue Type] in ([SOFTWARE], [OTHER], [HARDWARE], [CUST
SERVICE], [USCONSUMERCUSTO], [WEB REQUEST], [SAFETYHAZARD], [ESF TECH],
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```
        [POWERCONNECT], [Dell PDA HW], [SERVER SOFTWARE], [Dell PDA SW])) as PivotTable
            ) as d on a.[Call Svc Tag ID] = d.[Tag]
left join (
-- also profile on a totally insane range of Categories (could be very noisy due to profiling quality, might
want to leave this out)
            select * from (select [Call Svc Tag ID] as CatTag, [Call Profile Category], count(*) as
NumCategories
                            from q1j group by [Call Svc Tag ID], [Call Profile Category]) as
SourceTable
                pivot (sum(NumCategories) for [Call Profile Category] in ([Operating System], [Wrong
Queue/Extension], [Dell On Call], [Comm/Fax/Internet], [Wireless Networking Device],
                                            [Portable-Components], [Customer Contact],
[Desktop-Components], [Peripheral and/or 3rd Party], [Escalation], [Customer Service Phone],
                                            [AntiVirus/Utility/Backup/Recovery], [Desktop-
Storage], [Microsoft], [Portable-Storage], [Display], [Desktop-Systemboard], [Portable-Systemboard],
                                        [Other Generic Apps], [Imaging], [Tech Service],
[Dell Utilities], [Missing, Wrong, Damaged], [Post delivery support], [Game], [Non-DHS CC Issue],
                                        [Sales/Order Processing], [Returns], [DVDRW
Application], --[Other],
                                            [CDRW Application], [Multiple Dell App Install],
[Order Delivery/Receive], [Multimedia], [Mailbox Tracking], [Tracking],
                                    [Call], [Graphic / Presentation], [Application
Suite], [Policy], [Web Support Request], [Online], [Credit Return Reasons], [Order Assembly], [Database],
[Dialed Number/Extension], [Server-Components],
                                    [Credit/Billing Issue],
[Recognition/Compliment], [TECH SUPPORT], [Dead On Arrival (DOA)], [Save the Sale], [Marketing/Advertising],
[Dell OpenManage Printer Manager], [Server-Storage], [Vista OS],
                                    [Chat Queue], [Fire/Smoke], [Coupons],
[Spreadsheet/Accounting], [Consumer Bundle], [Server-Systemboard], [Manual Dispatch], [Post Sales Queue],
[Console/web Interface], [Shock/Sparks], [3rd Party Software],
                                    [Word Processor], [OpenManage Network Manager],
[DOC Refund - Full Refund], [Network Operating System], [Too hot to touch], [Burning Odor], [Manufacturer
Recall], [Accessories], [LCD/Screen], [Chemical],
                                    [Other Apps], [Feedback], [Hardware (including
Firmware)], [DOC Refund - Price Adjustment], [Music / Video and Communication], [Cables], [Radiation Hazard],
[Non-BSD/EPP CC Issue], [Dell Bundles],
                                    [Productivity/Organization], [3rd Party SW], [MS
Apps], [Exposed Wire/Component], [System Unit], [Sharp Edges], [Misc Issue], [PARTS], [Power], [Server
Applications], [Explosion])) as PivotTable
            ) as e on a.[Call Svc Tag ID] = e.[CatTag];

-- cleanup
drop table CustFM; EXEC sp_rename 'temp', 'CustFM';
alter table CustFM drop column Tag;
alter table CustFM drop column CatTag;
drop table temp

/*****************************/
/*** Join in Telecom data ***/
/*****************************/
-- merge in telecom data that matches service tag and contact timeline and
-- summarize it by service tag since we're not grouping down to caseID (after Jasper told me that cases are
meaningless in consumer.)

select * into temp from CustFM as a
left join (    select [Call Svc Tag ID] as Tag, sum(LocalQTime) as tQueueTime, -- in seconds
                                            sum(talktime) as tTalkTime, -- in seconds
                                            sum(holdtime) as tHoldTime, -- in seconds
                                            sum(worktime) as tWorkTime, -- in seconds
                                            sum(TimeToAband) as tTimeToAband -- in
seconds
            from (select  a.*, b.[LocalQTime], b.[StartTime], b.[talktime], b.[holdtime], b.[worktime],
b.[TimeToAband]
                    from (-- create contact db to match on (this could be called 'tempTimeTable')
                        select [Call Svc Tag ID], [Journal Header Case ID],
                                min(JournalSeqNum) as firstcon, max(JournalSeqNum) as lastcon

                        from q1j group by [Call Svc Tag ID], [Journal Header Case ID]
                        ) as a
                    left join (-- create matching data set with calculated starttime (which better matches
journalseqnumber datestamp)
                                select LocalQTime, TalkTime, HoldTime, WorkTime, TimetoAband, ST,
                                (datetime - (talktime + holdtime + worktime)/86400) as StartTime,
DateTime as EndTime, ANI
                                from q1telecom) as b
                    on (a.[Call Svc Tag ID] = b.ST) and (b.StartTime between (a.firstcon - 0.003473) and
(a.lastcon + 0.003473)) -- 0.003473 is 5 minutes measured in days.
                    ) as a
            group by [Call Svc Tag ID]
            ) as b
on a.[Call Svc Tag ID] = b.[Tag];

-- cleanup
drop table CustFM; EXEC sp_rename 'temp', 'CustFM';
alter table CustFM drop column Tag;

/*
-- what is the match rate?
select convert(float,(select count(*) from CustFM where ttalktime is not null))/
        convert(float,(select count(*) from CustFM where ([Call - Inbound] > 0) or ([Call - Outbound] > 0) )) as
TelecomMatchRate
-- about 18%
```

```
*/

/*************************************/
/*** Join in Chat/Email Duration  */
/*************************************/

-- AS20090731: Jasper Horton tells me that this data is maintained by IT, that it is available for ad-hoc
analysis
-- but that it would require significant consolidation for an AHT-like measure because more than 1 person can
be
-- involved in a chat.  I think this would be OK if it was a many to one interaction between customers and
agents ...
-- but not the opposite (since CustFM is customer focused.)

/***************************************/
/*** Join in Sales data for these users ***/
/***************************************/

-- let's join in the sales data with the larger regression data set, it will help with the regressions
select a.[Salesrep Name], a.[Sales Location], a.[Customer Num],
        -- a.[OrderDate], a.[Inv Date], a.[Shipped Date], a.[Max Svc Contract End Date],
        -- a.[Shipped Date] - a.[OrderDate] as convert(float(ShipLag)),
        convert(float, a.[Shipped Date] - a.[OrderDate]) as ShipLag,
        convert(float, a.[Max Svc Contract End Date] - a.[Inv Date]) as WarrLength,
        --a.[Max Svc Contract End Date] - a.[Inv Date] as WarrLength,
        b.*
into temp
from Sales as a
right join CustFM as b
on a.[Svc Tag ID] = b.[Call Svc Tag ID];

drop table CustFM; EXEC sp_rename 'temp', 'CustFM';

/***************************************/
/*** Find contact center users in DSN ***/
/***************************************/

/* there are dupes in Web because users are spread out over their fiscal weeks of usage; need to fix this
before doing a regression on entire quarter
select count(distinct(service_tag)) from Web;   -- that's 147263 obs
select count(*) from Web; -- 176164 obs
select top 1000 * from Web;
*/

-- join count of contacts and counts in {DSN KNOWING THAT NOT ALL ARE GOING TO BE FOUND}
select a.*, b.searches_performed, b.usage_seconds, b.Warr
into temp
from CustFM as a
left join (select service_tag, sum(searches_performed) as searches_performed, sum(usage_seconds) as
usage_seconds, avg(Warranty) as Warr
                from Web
                group by service_tag
                ) as b
on a.[Call Svc Tag ID] = b.service_tag;
-- 8022 obs ... we see that only 4.4% of users were found in DSN previously (Nildip says tagging rate is only
12% anyway)
-- How many of these guys are the high contact users?
-- select count(*) from custfmdsn where cCPR > 6
-- 1776 of 8022!

-- cleanup
drop table CustFM; EXEC sp_rename 'temp', 'CustFM';

/***************************************/
/*** Join in iPerceptions or other CE data */
/***************************************/

-- this data was not available at the time of this analysis, but is prime for comparison to the Lean metrics
-- work done under Laura Bosworth's team.  It was proven that customer-centric metrics (such as those created
-- by Eric Feller: CRF) correlate strongly with CE data.  The significance of this is that once these metrics
are
-- in place, one can run the business off the customer-centric metrics and pay less attention to survey-based
-- and inherently subjective CE measures.

/**************************/
/*** Create VSM Metrics  */
/**************************/

-- 20080811 data set was backed up as CustFMBackup
-- Add in total time for resolution (grouping total by total length of involvement, not individual cases)
select * into temp from CustFM as a
left join (select [Call Svc Tag ID] as Tag, --[Journal Header Case ID],
                        convert(float,(max(JournalSeqNum) - min(JournalSeqNum)))*24*60 as cMinPR,-- time per
rapport in minutes
                        datediff(day, min(JournalSeqNum), max(JournalSeqNum)) as cDaysPR -- same variable in
days
                        from q1j group by [Call Svc Tag ID]--, [Journal Header Case ID]
                        ) as b
on a.[Call Svc Tag ID] = b.[Tag]

-- cleanup
drop table CustFM; EXEC sp_rename 'temp', 'CustFM';
```

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```
alter table CustFM drop column Tag;

select * into temp
from CustFM as a
left join (
          select [Call Svc Tag ID] as Tag, tTalkTime/60 as CVART, -- Customer Value Added Resolution Time in
minutes
                 cMinPR - (tTalkTime/60) as CNVART, -- Customer non-value added resolution time
                 (tQueueTime + tHoldTime + tTimeToAband)/60 as CNVANRT, -- Customer Non-value added
necessary resolution time in minutes
                 (tTalkTime/60)/cMinPR as CVARatio -- Customer Value-Added Ratio in minutes/minutes which
is dimensionless
          from CustFM where cMinPR > 0
          ) as b
on a.[Call Svc Tag ID] = b.Tag;

-- cleanup
drop table CustFM; EXEC sp_rename 'temp', 'CustFM';
alter table CustFM drop column Tag;
```

6.5 Full version of Table 7

Table 12: Cumulative statistics of contact frequency per customer (full table)

Number of Contacts	# of unique customers	% of total population	Cumulative %	# of contacts by users beyond this frequency rank	% of contacts by users beyond this frequency rank
1	65217	36%	100.00%	596637	100.00%
2	40173	22%	63.90%	531420	89.07%
3	22597	13%	41.66%	451074	75.60%
4	14889	8%	29.15%	383283	64.24%
5	10030	6%	20.91%	323727	54.26%
6	6898	4%	15.36%	273577	45.85%
7	**4949**	**3%**	**11.54%**	**232189**	**38.92%**
8	3513	2%	8.80%	197546	33.11%
9	2661	1%	6.86%	169442	28.40%
10	2050	1%	5.38%	145493	24.39%
11	1470	1%	4.25%	124993	20.95%
12	1172	1%	3.44%	108823	18.24%
13	878	0%	2.79%	94759	15.88%
14	736	0%	2.30%	83345	13.97%
15	569	0%	1.89%	73041	12.24%
16	473	0%	1.58%	64506	10.81%
17	361	0%	1.32%	56938	9.54%
18	297	0%	1.12%	50801	8.51%
19	223	0%	0.95%	45455	7.62%
20	207	0%	0.83%	41218	6.91%
21	173	0%	0.71%	37078	6.21%
22	158	0%	0.62%	33445	5.61%
23	113	0%	0.53%	29969	5.02%
24	86	0%	0.47%	27370	4.59%
25	97	0%	0.42%	25306	4.24%
26	95	0%	0.37%	22881	3.83%
27	84	0%	0.31%	20411	3.42%
28	52	0%	0.27%	18143	3.04%
29	49	0%	0.24%	16687	2.80%
30	47	0%	0.21%	15266	2.56%
31	42	0%	0.19%	13856	2.32%
32	31	0%	0.16%	12554	2.10%
33	37	0%	0.15%	11562	1.94%
34	20	0%	0.13%	10341	1.73%
35	19	0%	0.11%	9661	1.62%
36	22	0%	0.10%	8996	1.51%
37	16	0%	0.09%	8204	1.38%

38	16	0%	0.08%	7612	1.28%
39	13	0%	0.07%	7004	1.17%
40	9	0%	0.07%	6497	1.09%
41	10	0%	0.06%	6137	1.03%
42	7	0%	0.06%	5727	0.96%
43	12	0%	0.05%	5433	0.91%
44	8	0%	0.05%	4917	0.82%
45	4	0%	0.04%	4565	0.77%
46	4	0%	0.04%	4385	0.73%
47	4	0%	0.04%	4201	0.70%
48	5	0%	0.03%	4013	0.67%
49	5	0%	0.03%	3773	0.63%
50	6	0%	0.03%	3528	0.59%
51	1	0%	0.03%	3228	0.54%
52	5	0%	0.02%	3177	0.53%
53	2	0%	0.02%	2917	0.49%
54	3	0%	0.02%	2811	0.47%
55	3	0%	0.02%	2649	0.44%
56	4	0%	0.02%	2484	0.42%
57	1	0%	0.02%	2260	0.38%
58	1	0%	0.01%	2203	0.37%
60	3	0%	0.01%	2145	0.36%
63	2	0%	0.01%	1965	0.33%
64	2	0%	0.01%	1839	0.31%
65	2	0%	0.01%	1711	0.29%
66	2	0%	0.01%	1581	0.26%
67	1	0%	0.01%	1449	0.24%
68	1	0%	0.01%	1382	0.23%
70	2	0%	0.01%	1314	0.22%
71	1	0%	0.01%	1174	0.20%
72	1	0%	0.01%	1103	0.18%
77	1	0%	0.00%	1031	0.17%
81	1	0%	0.00%	954	0.16%
82	1	0%	0.00%	873	0.15%
92	1	0%	0.00%	791	0.13%
95	1	0%	0.00%	699	0.12%
117	1	0%	0.00%	604	0.10%
128	1	0%	0.00%	487	0.08%
158	1	0%	0.00%	359	0.06%
201	1	0%	0.00%	201	0.03%

6.6 CustFM record for customer with 201 contacts in Q1

ShipLag	WarrLength	cCPR	OwnR	cCUPR	numCases	EstExpense	Product	Product Line Desc
3	702	201	158	6	51	XXXX.XX[52]	Personal Notebook	Inspiron 1720

Call - Inbound	Call - Outbound	Customer Chat	Dell Forum	Dell In-Line Stores	DSP Call	Email	Letter	Log with No Contact	Searches performed	Usage seconds
6	29	138	NULL	NULL	1	25	NULL	2	4	228

SOFTWARE	OTHER	HARDWARE	CUST SERVICE
30	80	71	19

tQueueTime	tTalkTime	tHoldTime	tWorkTime	tTimeToAband	cMinPR	cDaysPR	CVART	CNVART	CNVANRT	CVARatio
728	5733	1038	355	0	117066.567	81	95.55	116971.0167	29.4	0.000816

6.7 Abbreviated Journal for customer with 201 contacts in Q1

Date	Agent Name[53]	Contact Type	Issue Type	Category	Reason Code	Substatus
29/Feb/08	Wnlnagv Enav	Chat	Other	Tech Service	Service request status	Resolved
29/Feb/08	Enav Onanlng	Chat	Other	Tech Service	Service request status	Resolved
1/Mar/08	Fuvonav Angu	Chat	Other	Tech Service	Service request status	Working
3/Mar/08	Avquv Fnatun	E-mail	Hardware	Portable-Storage	Can't access drive	Resolved
3/Mar/08	Avquv Fnatun	E-mail	Hardware	Portable-Storage	Can't access drive	Resolved
3/Mar/08	Cenouyrra Ounfva	Chat	Hardware	Portable-Storage	Can't access drive	Resolved
3/Mar/08	Wnfcerrg Fvatu	Chat	Hardware	Portable-Storage	Can't access drive	Resolved
3/Mar/08	Wnfcerrg Fvatu	Outbound call	Hardware	Portable-Storage	Can't access drive	Resolved

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[52] Exact amount is censored so as to protect Dell confidentiality.
[53] Names have been disguised.

Date	Name	Channel	Category	Subcategory	Issue	Status
4/Mar/08	Ineha Fnvav	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
4/Mar/08	Nanaganenlna Qrb	Inbound call	Hardware	Portable-Components	Nonfunctional	Resolved
4/Mar/08	Najne Xuna	Inbound call	Other	Escalation	Escalation: customer	Resolved
4/Mar/08	Zbuna T	Chat	Hardware	Wireless Networking Device	Configuration error	Pending Assignm
4/Mar/08	Wnvirre Fvatu	Outbound call	Other	Customer Contact	Hang-up(nobody on line)	Pending Assignm
4/Mar/08	Nabbc Funezn	Outbound call	Other	Customer Contact	Hang-up(nobody on line)	Pending Assignm
4/Mar/08	Nqnefu C	Chat	Software	Operating System	Windows vista	Pending Assignm
4/Mar/08	Onyenw Enan	Chat	Software	Operating System	Windows vista	Working
4/Mar/08	Vdony Fvatu	Outbound call	Other	Escalation	Escalation: customer	Working
5/Mar/08	Fnheni Qubyr	Chat	Other	Escalation	Escalation: customer	Working
5/Mar/08	Fhquve Wlbgv	Chat	Software	Operating System	Windows vista	Resolved
5/Mar/08	Unewbg Fvatu	E-mail	Cust service	Sales/Order Processing	Software	Resolved
5/Mar/08	Unewbg Fvatu	E-mail	Hardware	Portable-Storage	Can't access drive	Resolved
5/Mar/08	Ebpxl Ynzon	Chat	Hardware	Portable-Components	Other chassis part	Resolved
6/Mar/08	Unewbg Fvatu	E-mail	Hardware	Portable-Storage	Can't access drive	Working
6/Mar/08	Enuhy Fnuv	Chat	Hardware	Portable-Components	Nonfunctional	Working
6/Mar/08	Ivwnl Thunenw	Chat	Hardware	Portable-Components	Nonfunctional	Working
6/Mar/08	Ineha Wubenq	Chat	Hardware	Portable-Components	Nonfunctional	Working
6/Mar/08	Funyvav Funezn	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
6/Mar/08	Cevlnaxn Neben	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
7/Mar/08	Ebpxl Ynzon	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
7/Mar/08	Ynyvg32 Funezn	E-mail	Hardware	Portable-Components	Nonfunctional	Resolved
7/Mar/08	Ynyvg32 Funezn	E-mail	Hardware	Portable-Components	Nonfunctional	Resolved
7/Mar/08	Charrg Funezn	E-mail	Hardware	Portable-Components	Nonfunctional	Resolved
7/Mar/08	Anzengn Xunapuv	Chat	Other	Wrong Queue/Extension	Wrong queue	Resolved
8/Mar/08	Unewbg Fvatu	E-mail	Hardware	Portable-Storage	Can't access drive	Resolved
8/Mar/08	Ynyvg32 Funezn	E-mail	Hardware	Portable-Components	Nonfunctional	Resolved
10/Mar/08	Cnenzcevln Qnfthcgn	Chat	Hardware	Portable-Components	Nonfunctional	Working
10/Mar/08	Fhqunxne Chggnvnu	Outbound call	Hardware	Portable-Components	Nonfunctional	Resolved
11/Mar/08	Tnngunn Fvaquv	Chat	Other	Customer Contact	Hang-up(nobody on line)	Resolved
11/Mar/08	Avgva Fnyjna	Outbound call	Other	Customer Contact	Hang-up(nobody on line)	Resolved
11/Mar/08	Avgva Fnyjna	Outbound call	Other	Customer Contact	Hang-up(nobody on line)	Resolved
11/Mar/08	Avgva Fnyjna	Outbound call	Other	Customer Contact	Hang-up(nobody on line)	Resolved

Date	Name	Channel	Type	Category	Issue	Status
11/Mar/08	Fherfu N	Chat	Hardware	Portable-Storage	Can't insert/eject disks	Resolved
11/Mar/08	Nafuhy Ounaqnev	Chat	Hardware	Portable-Storage	Can't insert/eject disks	Resolved
11/Mar/08	Oreyrl Trbetr	Chat	Other	Tech Service	Service request status	Resolved
11/Mar/08	Ivxenz Znejnun	Chat	Other	Tech Service	Service request status	Resolved
12/Mar/08	Nzevaqre Unawna	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
12/Mar/08	Enzvaqre Tvyy	E-mail	Software	Antivirus/Utility/Backup /Recovery	Requires usage support	Resolved
12/Mar/08	Enzvaqre Tvyy	E-mail	Software	Antivirus/Utility/Backup /Recovery	Requires usage support	Resolved
12/Mar/08	Cnjna Fvatu	Chat	Other	Tech Service	Service request status	Resolved
13/Mar/08	Thecengnc 4 Fvquh	Chat	Other	Tech Service	Service request status	Working
13/Mar/08	Avfunag Zrugn	Chat	Other	Tech Service	Service request status	Working
13/Mar/08	Enwrfujner Enb	Chat	Hardware	Portable-Components	Misalighned part	Resolved
13/Mar/08	Ebpxl Ynzon	Chat	Other	Tech Service	Service request status	Working
13/Mar/08	Nqnefu C	Chat	Other	Tech Service	Service request status	Working
13/Mar/08	Ghyfv Thehat	Chat	Other	Tech Service	Service request status	Resolved
13/Mar/08	Ghyfv Thehat	Outbound call	Other	Tech Service	Service request status	Resolved
13/Mar/08	Neivaq Erqql	Chat	Other	Mailbox Tracking	Document	Resolved
14/Mar/08	Enjny Qnggn	Chat	Other	Customer Contact	Hang-up(nobody on line)	Resolved
14/Mar/08	Zhxrfu Xnzng	Chat	Hardware	Portable-Storage	Can't access drive	Resolved
14/Mar/08	Grffvgu Gubznf	Outbound call	Hardware	Portable-Storage	Can't access drive	Resolved
16/Mar/08	Ivfuny Cnaqvgn	Chat	Other	Wrong Queue/Extension	Wrong queue	Working
17/Mar/08	Qrrcvxn Enjny	Chat	Other	Wrong Queue/Extension	Wrong queue	Working
17/Mar/08	Fronfgvna Snol	Chat	Other	Wrong Queue/Extension	Wrong queue	Working
19/Mar/08	Qrivaqre F	Chat	Software	Operating System	Windows vista	Resolved
19/Mar/08	Nzvg Xx	Outbound call	Other	Escalation	Escalation: internal caller	Resolved
19/Mar/08	Nznaqrrc Thweny	E-mail	Cust service	Sales/Order Processing	Software	Resolved
19/Mar/08	Nznaqrrc Thweny	E-mail	Cust service	Sales/Order Processing	Software	Resolved
19/Mar/08	Znaqrrc Fvatu	E-mail	Cust service	Sales/Order Processing	Software	Resolved
19/Mar/08	Znaqrrc Fvatu	E-mail	Cust service	Sales/Order Processing	Software	Resolved
19/Mar/08	Purgna Pungengu	Chat	Other	Tracking	Dispatch call	Resolved
19/Mar/08	Znaqrrc Fvatu	E-mail	Cust service	Sales/Order Processing	Software	Resolved
22/Mar/08	Nzvg Ohquvenwn	Chat	Cust service	Customer Service Phone	Wrong queue	Working
22/Mar/08	Fvzenawvg Oubtny	Chat	Hardware	Portable-Components	Nonfunctional	Pending Assignm

Date	Name	Channel	Category	Subcategory	Detail	Status
22/Mar/08	Nouvanaqna Xhzne	Outbound call	Other	Escalation	Escalation: internal caller	Resolved
22/Mar/08	Nznacerrg Znqnune	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
23/Mar/08	Cenfnaan Fevqune	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
23/Mar/08	Enaquve Fvatu	Inbound call	Usconsumercusto	Sales/Order Processing	Other	Resolved
23/Mar/08	Newha Fnynevn	Chat	Hardware	Wireless Networking Device	Technical question	Working
24/Mar/08	Fevunefun Enatnenwna	Chat	Other	Wrong Queue/Extension	Wrong queue	Pending Assignm
24/Mar/08	Furuanm Wbua	Chat	Hardware	Portable-Components	Nonfunctional	Pending Assignm
24/Mar/08	Evpun Funezn	Chat	Hardware	Portable-Components	Nonfunctional	Pending Assignm
24/Mar/08	Znacerrg Fnaquh	Chat	Other	Wrong Queue/Extension	Wrong queue	Pending Assignm
24/Mar/08	Nzvg Cneirm	E-mail	Other	Wrong Queue/Extension	Wrong queue	Working
24/Mar/08	Avxuvy Zrugn	Chat	Other	Wrong Queue/Extension	Wrong queue	Working
24/Mar/08	Qrrcnx Cnv	Chat	Other	Wrong Queue/Extension	Wrong queue	Working
24/Mar/08	Nzvg Xnqnz	Chat	Other	Escalation	Escalation: customer	Working
24/Mar/08	Neben Xnena	Chat	Cust service	Other	Stolen/theft	Working
24/Mar/08	Thecerrg Fvatu	E-mail	Other	Escalation	Escalation: customer	Working
24/Mar/08	Cenqrrc Oungg	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
25/Mar/08	Tnheni Wrengu	Chat	Hardware	Portable-Components	Nonfunctional	Resolved
25/Mar/08	Theqvc Fvatu	Chat	Hardware	Wireless Networking Device	Technical question	Resolved
25/Mar/08	Thecnearrg Frxuba	Chat	Hardware	Wireless Networking Device	Technical question	Working
25/Mar/08	Fhaqrrc Fhaal	Outbound call	Hardware	Wireless Networking Device	Technical question	Resolved
25/Mar/08	Tnngunn Fvaquv	Chat	Hardware	Wireless Networking Device	Nonfunctional	Resolved
26/Mar/08	Zbuna T	Chat	Software	Microsoft	Factory install general help	Resolved
27/Mar/08	Unevfu Iraxngrfjnena	Chat	Other	Tracking	Dispatch call	Working
27/Mar/08	Fbzn Onfnx	Chat	Cust service	Customer Service Phone	Service request status	Working
28/Mar/08	Nzevaqre Unawna	Chat	Other	Customer Contact	Hang-up(nobody on line)	Pending Assignm
28/Mar/08	Avgva Znabunena	Chat	Hardware	Wireless Networking Device	Nonfunctional	Resolved
28/Mar/08	Fnzrran Nuznq	Inbound call	Other	Wrong Queue/Extension	Wrong queue	Resolved
29/Mar/08	Fnzvg Xncbbe	E-mail	Hardware	Wireless Networking Device	Nonfunctional	Resolved

Date	Name	Method	Category	Subcategory	Issue	Status
30/Mar/08	Thecerrg Fvatu	E-mail	Hardware	Wireless Networking Device	Nonfunctional	Resolved
31/Mar/08	Wnfzva Funezn	Chat	Hardware	Wireless Networking Device	Nonfunctional	Resolved
5/Apr/08	Nxnfuqrrc Tvyy	Customer chat	Hardware	Peripheral And/Or 3rd Party	Nonresponsive keyboard	Working
8/Apr/08	Funezn Ehpuvxn	Customer chat	Hardware	Portable-Components	Other chassis part	Working
8/Apr/08	Arqmnq Vznzbivp	Customer chat	Other	Wrong Queue/Extension	Wrong queue	Resolved
8/Apr/08	Oebbxf Eboregf	Email	Hardware	Portable-Components	Other chassis part	Working
8/Apr/08	Nfuyvr Jvfr	Customer chat	Other	Customer Contact	Hang-up(nobody on line)	Working
8/Apr/08	Nqnz Gnathzn	Customer chat	Hardware	Portable-Components	Misalighned part	Working
9/Apr/08	Fcrapre Yrjvf	Customer chat	Hardware	Portable-Components	Other chassis part	Working
9/Apr/08	Funezn Nfuvfu	Customer chat	Hardware	Portable-Components	Other chassis part	Working
9/Apr/08	Oebbxf Eboregf	Email	Other	Missing, Wrong, Damaged	Dell damaged part	Working
9/Apr/08	Oebbxf Eboregf	Email	Other	Missing, Wrong, Damaged	Dell damaged part	Working
9/Apr/08	Ghyfv Thehat	Customer chat	Hardware	Portable-Components	Other chassis part	Working
9/Apr/08	Nxfunl Fnvav	Customer chat	Cust service	Other	Wrong queue	Resolved
10/Apr/08	Enxrfu Xnaangu Z	Customer chat	Other	Escalation	Escalation: internal caller	Working
10/Apr/08	Nouvfurx Ounggnpuneln	Customer chat	Cust service	Other	Stolen/theft	Resolved
11/Apr/08	Nouvfurx Xunaan	Customer chat	Other	Missing, Wrong, Damaged	Dell damaged part	Working
11/Apr/08	Ivxnf19 Qnuvln	Customer chat	Other	Missing, Wrong, Damaged	Dell damaged part	Working
11/Apr/08	Funezn Ehpuv	Customer chat	Other	Escalation	Escalation: customer	Working
11/Apr/08	Ivxenag Fnaquh	Call - outbound	Other	Escalation	Escalation: customer	Working
12/Apr/08	Fhxunzevg Fvatu	Customer chat	Software	Operating System	Windows vista	Resolved
13/Apr/08	Anaqvav Uverzngu	Customer chat	Other	Escalation	Escalation: customer	Working
13/Apr/08	Enxrfu Xnaangu Z	Customer chat	Other	Escalation	Escalation: customer	Working
14/Apr/08	Fujrgn Qhggn	Customer chat	Other	Escalation	Escalation: customer	Resolved
14/Apr/08	Tbqjva Tc	Call - outbound	Other	Escalation	Escalation: internal caller	Resolved
14/Apr/08	Xhore Wbfuv	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Working
14/Apr/08	Fevunefun Enatnenwna	Customer chat	Other	Customer Contact	Hang-up(nobody on line)	Working
14/Apr/08	Tbcnyxevfuana I	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Resolved

14/Apr/08	Tbcnyxevfuana I	Call - outbound	Hardware	Portable-Systemboard	Other motherboard failure	Resolved
15/Apr/08	Cevlnaxn Neben	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Resolved
15/Apr/08	Bz Xnabhwvn	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Resolved
15/Apr/08	Fhxucerrg Ibuen	Customer chat	Hardware	Portable-Systemboard	Nonfunctional	Resolved
15/Apr/08	Nfnqhyyn Xunqev	Customer chat	Other	Tech Service	Service request status	Resolved
16/Apr/08	Fhzvg Ibuen	Customer chat	Cust service	Customer Service Phone	Service request status	Resolved
16/Apr/08	Ouhiarfu Xhyfuerfugun	Call - outbound	Other	Escalation	Escalation: customer	Resolved
16/Apr/08	Ubzv Funezn	Customer chat	Hardware	Portable-Systemboard	Port problem	Resolved
16/Apr/08	Nouvfurx Xunaan	Customer chat	Hardware	Portable-Systemboard	Technical question	Resolved
16/Apr/08	Hqrfu Tbry	Customer chat	Cust service	Order Delivery/Receive	Other	Resolved
16/Apr/08	Ehqenwvg Fnun	Customer chat	Other	Tech Service	Service request status	Resolved
17/Apr/08	Fuhjro Fnvg	Call - outbound	Other	Tech Service	Service request status	Resolved
17/Apr/08	Xvena Ybxnangun	Customer chat	Other	Tech Service	Service request status	Resolved
17/Apr/08	Ouhina Znapunaqn	Customer chat	Cust service	Order Delivery/Receive	Other	Working
17/Apr/08	Cnenf Ghyyv	Call - outbound	Other	Escalation	Escalation: customer	Working
18/Apr/08	Puvenawrri Fnvav	Customer chat	Cust service	Other	Wrong queue	Resolved
18/Apr/08	Tnheni Fvatu	Customer chat	Hardware	Portable-Components	Other chassis part	Resolved
18/Apr/08	Zbunzzrq Onvt	Dell service provider call	Other	Tech Service	Document	Resolved
18/Apr/08	Punaqne Ony	Customer chat	Other	Escalation	Escalation: customer	Working
18/Apr/08	Fherfu N	Customer chat	Other	Escalation	Escalation: customer	Resolved
18/Apr/08	Funagnah Fnexne	Log with no contact	Other	Escalation	Escalation: customer	Resolved
18/Apr/08	Wnorm Fbeanenw	Customer chat	Other	Escalation	Escalation: customer	Resolved
18/Apr/08	Nqvgln Ounabg	Customer chat	Other	Escalation	Escalation: customer	Working
18/Apr/08	Fhxuenw Fvatu	Call - outbound	Other	Customer Contact	Hang-up(nobody on line)	Working
19/Apr/08	Xvena Frguv	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Pending Assignm
19/Apr/08	Cerrgl Wbyyl	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Pending Assignm
19/Apr/08	Tnheniqrrc Gbbe	Call - outbound	Hardware	Portable-Systemboard	Other motherboard failure	Resolved
20/Apr/08	Avunevxn Fvatu	Customer chat	Hardware	Portable-Systemboard	Other motherboard failure	Resolved

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20/Apr/08	Fhxuenw Fvatu	Call - outbound	Other	Customer Contact	Hang-up(nobody on line)	Resolved
20/Apr/08	Nabbc Xi	Call - inbound	Other	Customer Contact	Hang-up(nobody on line)	Resolved
20/Apr/08	Nznaqrrc Quvaten	Call - outbound	Cust service	Order Delivery/Receive	Other	Working
21/Apr/08	Arryznav Env	Log with no contact	Other	Customer Contact	Dialed wrong number/extension	Resolved
21/Apr/08	Avunevxn Fvatu	Customer chat	Other	Customer Contact	Hang-up(nobody on line)	Working
21/Apr/08	Fhxuenw Fvatu	Call - outbound	Other	Customer Contact	Hang-up(nobody on line)	Working
21/Apr/08	Nfnqhyyn Xunqev	Customer chat	Cust service	Customer Service Phone	Document	Working
21/Apr/08	Funagnah Fnexne	Customer chat	Other	Escalation	Escalation: customer	Working
21/Apr/08	Ineha Fvatu	Customer chat	Other	Escalation	Escalation: customer	Working
23/Apr/08	Nzvfun Zhawny	Customer chat	Cust service	Online	Service request status	Resolved
24/Apr/08	Nzvfun Zhawny	Call - outbound	Hardware	Portable-Components	Other chassis part	Resolved
24/Apr/08	Lbhavf Unzqnav	Customer chat	Other	Customer Contact	Hang-up(nobody on line)	Resolved
24/Apr/08	Nghy51 Jnyvn	Customer chat	Hardware	Peripheral And/Or 3rd Party	Technical question	Resolved
24/Apr/08	Thawna Xhzne	Customer chat	Cust service	Online	Onsite service representative	Working
27/Apr/08	Fuviwvg Fvatu	Customer chat	Hardware	Portable-Systemboard	Nonfunctional	Working
30/Apr/08	Funezn Ehpuv	Customer chat	Hardware	Portable-Storage	Technical question	Resolved
30/Apr/08	Enwng Punaqry	Customer chat	Software	Operating System	Needs to reinstall op/sys	Resolved
30/Apr/08	Xhyjvaqre Fvatu	Customer chat	Software	Operating System	Windows vista	Resolved
3/May/08	Znabw Xungev	Call - outbound	Other	Escalation	Escalation: internal caller	Working
3/May/08	Fvsgv Quvyyba	Customer chat	Hardware	Portable-Systemboard	Nonfunctional	Resolved
3/May/08	Xvena Ee	Customer chat	Software	Operating System	Windows vista	Working
3/May/08	Funezn Nfuvfu	Customer chat	Software	Operating System	Windows vista	Working
4/May/08	Puvenawrri Fvatu	Customer chat	Software	Operating System	Windows vista	Working
4/May/08	Avxuvy Xncbbe	Customer chat	Software	Operating System	Windows vista	Resolved
4/May/08	Tnheni Wrengu	Customer chat	Software	Operating System	Windows vista	Resolved
4/May/08	Zbunzzrq Nynz	Customer chat	Software	Microsoft	Locks up system	Resolved
4/May/08	Avunevxn Fvatu	Customer chat	Software	Operating System	Windows vista	Working
4/May/08	Funyvav Fbbq	Customer chat	Software	Operating System	Windows vista	Resolved
4/May/08	Funyvav Fbbq	Call - outbound	Software	Operating System	Windows vista	Resolved
5/May/08	Nahent Zhxurewrr	Customer chat	Software	Operating System	Windows vista	Resolved
6/May/08	Fhoenznavna Iraxngnenzna	Customer chat	Software	Operating System	Windows vista	Working

6/May/08	Fvatu Fngove	Email	Software	Operating System	Windows vista	Working
6/May/08	Fnaqrrc Onybhevn	Customer chat	Software	Operating System	Windows vista	Working
7/May/08	Nzvgrfujne Fvatu	Customer chat	Software	Operating System	Windows vista	Working
7/May/08	Hazhxg Funezn	Call - inbound	Other	Wrong Queue/Extension	Wrong queue	Resolved
7/May/08	Arun Qbten	Call - outbound	Software	Operating System	Windows vista	Resolved
7/May/08	Nzvgrfujne Fvatu	Call - outbound	Software	Operating System	Windows vista	Working
7/May/08	Nafuhy Fbbq	Customer chat	Other	Wrong Queue/Extension	Wrong queue	Working
8/May/08	Unecerrg Znguneh	Customer chat	Software	Operating System	Windows vista	Resolved
9/May/08	Ineha Xunggne	Customer chat	Software	Operating System	Windows xp	Resolved
13/May/08	Ivchy Qnlny	Customer chat	Other	Wrong Queue/Extension	Wrong queue	Working
14/May/08	Fvatu Unecerrg	Customer chat	Software	Operating System	Windows vista	Resolved
20/May/08	Xvena Ybxnangun	Customer chat	Software	Operating System	Windows vista	Resolved
20/May/08	Ouhfuna Nfvwn	Customer chat	Other	Tech Service	Service request status	Resolved

7 Bibliography

Ancona, Deborah. *Leadership in a Time of Uncertainty.* MIT Leadership Center, Cambridge, MA: MIT Sloan School of Management, 2005, 4.

blueridge. *Wanted--- English Speaking support with working headsets AND decision making ability.* August 9, 2007. http://www.ideastorm.com/ideaSearchResults?s=%22dell+hell%22&x=0&y=0 (accessed March 14, 2009).

Breen, Bill. *Living in Dell Time.* December 19, 2007. http://www.fastcompany.com/magazine/88/dell.html?page=0%2C2 (accessed March 31, 2009).

Customer Contact Council. *Acheiving Breakout Use of Self-Service: Overcoming the conflict between active Channel Management and Customer Satisfaction.* Corporate Executive Board, 2006.

Customer Contact Council. *Redefining Issue Resolution: Executing the Shift from Company-Centric to Customer-Centric Resolution.* Corporate Executive Board, 2007.

Davenport, Thomas H. "Competing on Analytics." (Harvard Business Review) January 2006.

Dell, Inc. *Dell.com.* February 26, 2009. http://www.dell.com/content/topics/global.aspx/about_dell/investors/meet_conf/webcast_42?c=us&l=en&s=corp (accessed March 14, 2009).

Dell, Michael. *Direct from Dell: Strategies that Revolutionized an Industry.* Collins Business Essentials, 1999.

Jarvis, Jeffrey. *Dell Hell.* June 21, 2005. http://www.buzzmachine.com/archives/cat_dell.html (accessed March 14, 2009).

Keating, Elizabeth, Rogelio Oliva, Nelson Repenning, Scott Rockart, and John Sterman. "Overcoming the Improvement Paradox." *European Management Journal,* April 1999: 120-134.

Krazit, Tom. *Study: Dell customer rating plunges; Apple leads pack Customer service, not products, were source of dissatisfaction for Dell.* August 16, 2005. http://www.computerworld.com/hardwaretopics/hardware/story/0,10801,103959,00.html (accessed March 14, 2009).

Lee, Louise, and Emily Thornton. *Hanging Up On Dell?* October 10, 2005. http://www.businessweek.com/magazine/content/05_41/b3954102.htm (accessed March 14, 2009).

Oliva, Rogelio. "Tradeoffs in Responses to Work Pressure in the Service Industry." *California Management Review,* 2001, Summer 2001 ed.: 26-43.

Paxton, Blaine. "The Dell Operating Model." Thesis, MIT Sloan School of Management and Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA, 2004, 87.

Pettey, Christy. *Gartner Newsroom.* Gartner. January 15, 2009. http://www.gartner.com/it/page.jsp?id=856712 (accessed February 19, 2009).

Repenning, Nelson P., and John D. Sterman. "Nobody Ever Gets Credit for Fixing Problems that Never Happened: Creating and Sustaining Process Improvement." *California Management Review* 43, no. 4 (Summer 2001): 64-88.

Rowello, Robert. "Customer Service that Helps Your Customers--And You Too." *PRTM Insight,* February 15, 2006.

Service Untitled Blog. *Interview: Dick Hunter, VP of Customer Experience at Dell.* May 15, 2007. http://www.serviceuntitled.com/interview-dick-hunter-vp-of-customer-experience-at-dell/2007/05/15/ (accessed May 1, 2009).

Silverman, Dwight. *Updated: Dell drops in customer satisfaction survey.* August 16, 2005. http://blogs.chron.com/techblog/archives/2005/08/dell_drops_in_c.html (accessed April 30, 2009).

Spooner, John G. *Growing pains hit Dell's customer service.* 02 24, 2004. http://news.cnet.com/2100-1042_3-5162141.html?tag=nefd_lede (accessed 4 30, 2009).

Steers, Kirk. *PC Reliability & Service: Who Can You Trust?* September 29, 1998. http://www.pcworld.com/article/8258-20/pc_reliability_and_service_who_can_you_trust.html (accessed April 29, 2009).

Sterman, John. *Business Dynamics: Systems Thinking and Modeling for a Complex World.* Irwin McGraw-Hill, 2000.

Temkin, Bruce D., and Steven Geller William Chu. *Customer Experience Correlates To Loyalty.* February 17, 2009. http://www.forrester.com/Research/Document/Excerpt/0,7211,53794,00.html (accessed March 14, 2009).

Tucci, Linda. *HP beats Dell (again) at its own game.* February 22, 2007. http://searchcio.techtarget.com/news/article/0,289142,sid182_gci1244810,00.html (accessed March 16, 2009).

United States Central Intelligence Agency. *Field Listing - GDP - composition by sector.* March 19, 2009. https://www.cia.gov/library/publications/the-world-factbook/fields/2012.html (accessed March 31, 2009).

University of Michigan, Ross School of Business. "American Consumer Satisfaction Index." July 2008.

—. *Scores by Industry: Personal Computers.* http://www.theacsi.org/index.php?option=com_content&task=view&id=147&Itemid=155&i=Personal+Computers (accessed March 14, 2009).

Womack, James P., and Daniel T. Jones. *Lean Thinking.* Free Press, 2003.