

# **Business process change and inadvertent mischarging**

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## **Abstract**

*This paper examines a situation whereby a process change in one division of an organization, through a cause and effect chain, resulted in the organization overbilling a customer. The paper examines the mechanism by which the overbilling occurred and discusses the organization's response when overbilling was brought to its attention. The paper uses an in-depth case study approach and is written in the form of an investigative report. The paper demonstrates clearly that due to the complexity of the modern organization over-billing can occur unbeknownst to a company. The paper also shows that the boundary-spanning processes of the organization failed: the customer service process failed to deal with the over-billing situation. The paper concludes that misbilling was not intentional but was the result of an innovation in one business process (meter reading) whose consequence for another business process (billing) was not fully understood or explored.*

## **Keywords**

**business process, billing, pricing, complexity, estimating, overcharging**

## **1. Introduction**

Overcharging of customers by organizations occurs on an all too regular basis and many instances have been exposed: Sutherland (2001) reports on overcharging for roaming services by telecommunications operators; Thompson et al (2007:355) report on overbilling of expenses by accounting firms; Ferrell et al (2002:250) report that the stock price of a medicare organization fell significantly after it became known that it was overcharging for medical services.

The modern organization is a complex system comprising many interdependent activities which if synchronised provide a firm with its competitive advantage (Porter, 1996). However, the chain of cause and effect between an action taking place in one part of the organization and its effect on another part of the organization can be long, involved and difficult to follow. Senge (1990) refers to such a phenomenon as dynamic complexity. Dynamic complexity and causal ambiguity can inhibit firm resources from being imitated by competitors allowing the firm maintain its competitive advantage, a tenet of the resource based view of the firm (Dess et al, 2006:88). However, causal ambiguity can also lead to unanticipated results: Weick (1993) documents how a series of seemingly unrelated events together led to a major disaster.

This paper demonstrates how an innovation in the meter reading business process of an organization in the energy sector, coupled with a complex pricing and billing structure, resulted in the misbilling of customers. The paper also discusses the response of the organization to mischarging when this was brought to its attention by a customer. The paper is organized as follows: section 2 provides a literature background to the case study. The case study itself is elaborated in section 3. Section 4 discusses the issues raised by the case study and section 5 concludes.

## **2. Background**

Operations management is a business discipline that historically has focused on getting things done (Voss, 2006): converting inputs to outputs through some transformation process. Operations management techniques have been used in the service industry (Chase and Apte, 2007, Deming, 2000): for example, time and motion studies have been used in operating theatres in order to minimise a surgeon's movements and improve the success rate of operations; McDonald's has a production-line approach to their services which has proven to be both efficient and profitable; Disney takes an industrialized approach to their operations.

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The service industry accounts for over two-thirds of total national output in advanced countries (Begg et al, 2000:7). Particular services such as 'communications, banking, finance, and insurance' have played a vital role in economic growth (Chandler, 1977; Chase and Apte, 2007). However, Van Biema and Greenwald (1997) found that while productivity in the manufacturing sector is improving in the services sector it is declining. Mohanty and Behera (1996) note that improvement initiatives have been applied more readily to manufacturing industries and Reid (2007) suggests that traditional service management thinking is more 'reactive' than proactive. The intangible nature of service offerings makes it difficult to control their quality (Yang, 2005) and the simultaneity of production and consumption, where the customer is intimately involved in the production process, can impact negatively on operational performance (Schroeder, 1993). Baltacioglu et al (2007) point out that while much research has been carried out in the area of manufacturing supply chains there is a dearth of research into service sector chains. All this implies a need for more research into service sector operations.

McCormack and Johnson (2001) define a business process as a specific group of activities and subordinate tasks which results in the performance of a service that is of value to a customer. How to achieve efficient and effective co-ordination among the various activities in business processes has been a long-standing organizational research issue (Thompson, 1967; Mintzberg, 1979). Porter (1985) argues that the value chain is a way of understanding the linkages that occur in an organization and that the configuration of such activities into a process can effectively create competitive advantage. Porter (1996) extends the value chain concept pointing out that competitive advantage derives from a network of interlinking activities. However as this paper shows, a network of activities is a two-edged sword: if the activities do not dovetail then competitive advantage may be lost.

The development of operations research in service management and the growth of importance of the sector to the economy have led to an increased focus on service organization processes. The focus on process work in services is yet at an early stage. This paper focuses on one key service process, billing, and shows the outcomes associated with a failure in service, a failure in service quality and more importantly a failure to manage an effective recovery process.

### **3. The misbilling case study**

This section introduces the case study itself. The case is elaborated in four parts. Firstly the pricing structure used by the organization is examined. Then the link between meter reading and billing is explained. The mechanism by which misbilling occurs is then examined in detail. Six scenarios are examined two of which lead to overbilling and two lead to underbilling; the remaining two scenarios lead to over or under billing in one year which is rectified in the following year. Finally, the reaction of the company to an overbilling complaint is discussed.

#### **3.1 The pricing structure**

The organization under discussion provides fuel for cooking and heating purposes for residential, commercial and industrial customers. The fuel is provided on a metered basis and the organization operates a number of different tariff structures. The one relevant to this paper we will refer to as the commitment tariff. Customers on the commitment tariff guarantee to purchase a minimum amount of fuel each year, whether or not that amount is used. In response to this commitment the organization applies a unit rate substantially below the standard or pay-as-you-go rate for each unit of fuel consumed; any fuel used above the commitment amount is billed for at the special commitment rate. The commitment tariff was regarded as the most cost effective tariff for family homes<sup>2</sup>.

#### **3.2 The impact of meter reading impact on billing**

Customer meters are manually read on a regular basis by a meter reader. This reading is returned to the billing department and the customer is billed for the fuel used since the last reading, according to the tariff structure agreed with the customer. The organization traditionally bills on a bi-monthly basis and so meters have been traditionally read bi-monthly. Shortly prior to the overcharging event discussed in this paper the organization changed its meter reading policy; it decided to read meters only on every alternate occasion and to estimate the meter reading otherwise. It is not known to the authors if this decision was made at the level of the operational

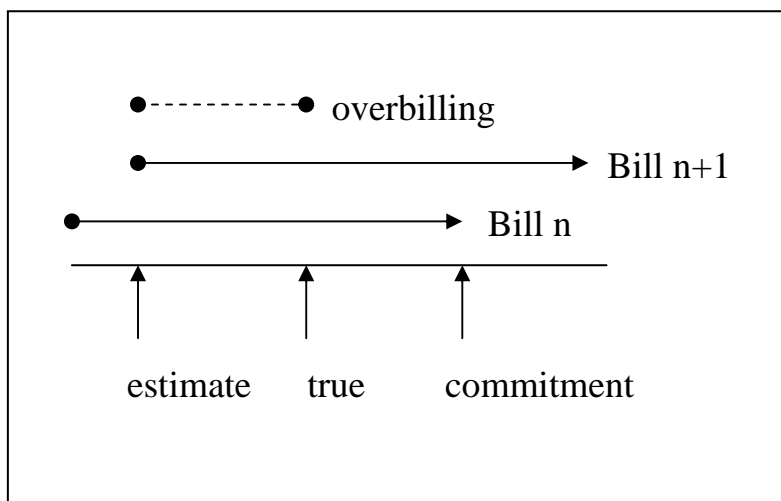
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<sup>2</sup> The company discontinued the commitment tariff in October 2007.

department or at the level of top management. This paper will demonstrate that this decision had an unforeseen consequence that led to systematic customer misbilling.

### 3.3 The mechanism by which misbilling occurs

Given that meters are read on alternate bi-months the final reading for any billing year may turn out to be read or estimated. On average the final reading will be read on 50% of occasions and estimated on 50% of occasions. When the final meter reading is read then the customer will be correctly billed according to the tariff that they have selected. When the final meter reading is estimated and the customer is not on a commitment tariff structure then the customer will be correctly billed (any misbilling that occurs in one billing year will be rectified in the following billing year, which is normal practice). However, if the customer is on a commitment tariff and the final bill for the year is estimated then it is likely that misbilling will occur and this misbilling will not be rectified in the following billing year.

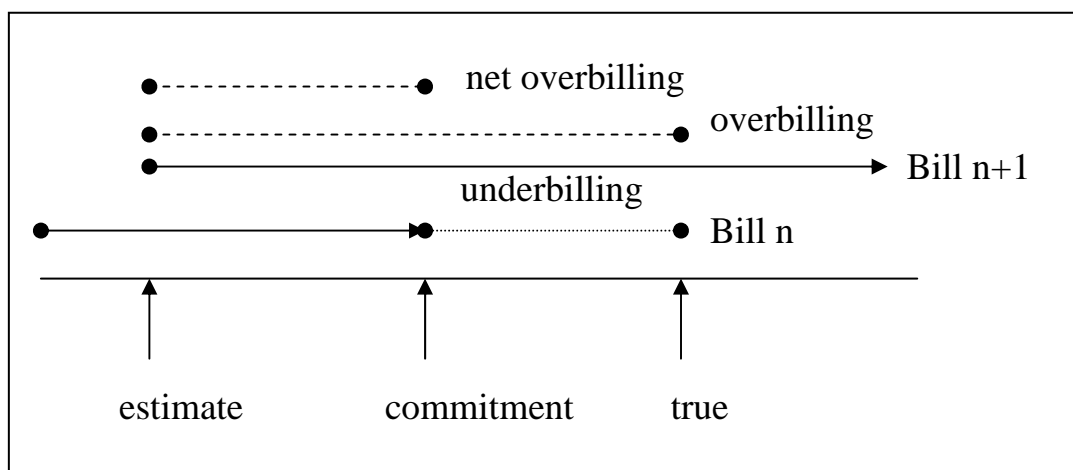


**Figure 1: Scenario 1 (overbilling)**

To understand the mechanism by which misbilling occurs we must examine the relationship between three crucial meter readings: the estimated meter reading at year end, the actual meter reading at year end, and the commitment reading. Six ways of ordering these three readings exist. Two of these orderings always result in overbilling and two always result in underbilling. The remaining two orderings lead

to over or underbilling in one billing year that is rectified in the following billing year. We will now look in detail at these six scenarios.

Scenario 1, where the estimated reading lies below the true reading and both of these readings are below the commitment reading, is shown in diagram form in figure 1. The final bill for the billing year is shown as 'bill n'. This will bill the customer for the commitment amount (ie. up to the commitment reading) as per the commitment tariff agreement. However, the first bill of the next billing year, 'bill n+1', will bill from the estimated reading. It can be seen from the diagram that the customer will be billed twice for the amount of fuel between the estimated reading and the true reading. Clearly the extent of the overbilling depends on how close the estimated reading is to the true reading: the closer these two readings are the less the overbilling.

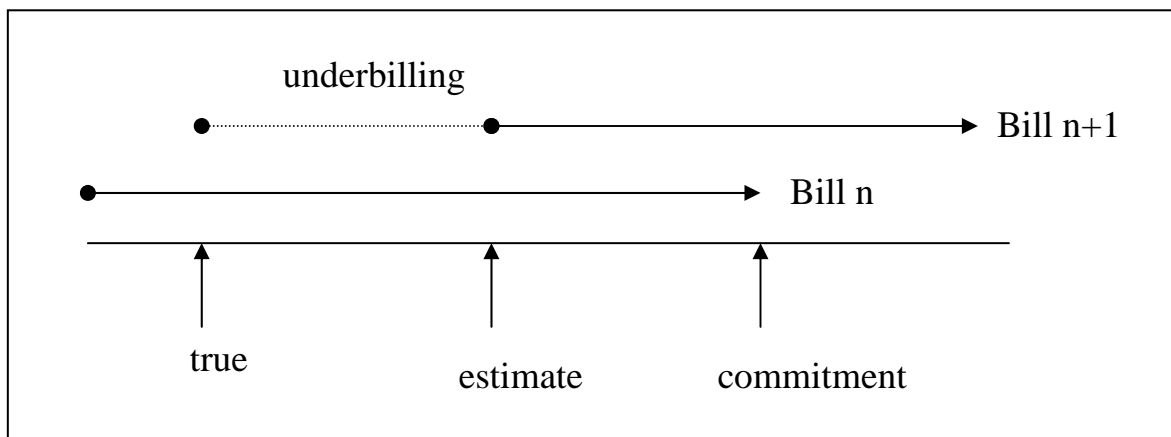


**Figure 2. Scenario 2 (net overbilling)**

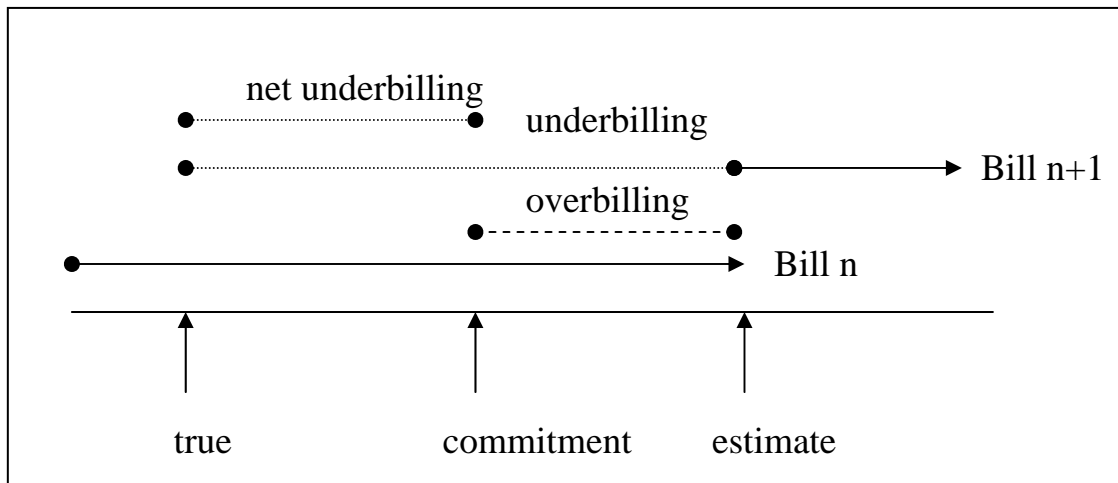
Scenario 2, the second overcharging scenario, is more complex. This occurs when the estimate is low and the true reading is higher than the commitment reading as shown in figure 2. Here the final bill of the billing year, bill n in figure 2, undercharges the customer as it only bills up to the estimated amount whereas the true amount was actually used. The underbilling is in the amount of the fuel between the commitment reading and the true reading. The first bill of the following billing year then overcharges the customer as it bills from the estimated amount; the overcharging is in the amount of fuel used between the estimated reading and the true reading. The net overcharging is the difference between the undercharging of bill n and the overcharging of bill n+1 as shown in figure 2.

Overcharging therefore occurs whenever the estimated reading is the lowest of the three readings. The firm can determine the commitment reading from previous readings and the commitment amount which forms part of its agreement with the customer, and so the firm will know if the estimated reading is below the commitment amount. The true reading is unknown and so the firm will not know for certain if the estimated reading is above or below the true reading, although previous customer history may give an indication of the likely true amount.

Underbilling occurs in scenarios 3 and 4 shown in figures 3 and 4. When the estimated reading is above the true reading and both are below the commitment amount then underbilling occurs, as shown in figure 3. The logic here is very similar to that used in the discussion of scenario 1. Figure 4 illustrates that underbilling also occurs when the estimated reading is higher than both the true reading and the commitment reading. This situation is more complex than that of scenario 3 in that underbilling and overbilling occur in consecutive billing periods but the net effect is that of underbilling. For underbilling to occur the true reading must be below both the estimated reading and the commitment reading.



**Figure 3. Scenario 3 (underbilling)**



**Figure 4. Scenario 4 (net underbilling)**

In scenarios 5 and 6 the commitment reading is the lowest of the three readings. Under this condition neither overbilling nor underbilling occurs: customers are billed correctly whenever the commitment reading is lower than both the true reading and the estimated reading.

One issue with respect to the overbilling scenarios is that overbilling in one billing year does may not become apparent to the customer until the following billing year. Apart from the fact that overbilling in one year manifests itself in the following year, two further months have elapsed and the customer may not notice that overbilling has taken place.

### **3.4 The organization's reaction**

In one particular situation known to the authors a customer brought an instance of overcharging to the attention of the organization. The company was slow to respond to the customer but after several telephone calls and two letters from the customer the organization eventually refunded the amount overcharged: €68.63. This overcharging represented approximately 15% of the customer's annual charge.

It is interesting to estimate the total extent of possible mischarging by the organization. There are 1,288,000 households in the marketplace in question (from

2002 census data) and the vast majority of these households use fuel for heating and cooking. The organization in question has approximately 515,000 residential customers in this marketplace (from the organization's 2005 annual report). At a conservative estimate we will assume that 50% of these customers are on the commitment tariff ie. 257,500 customers. The year end meter reading will be estimated on average for 50% of these customers, ie. 128,750 customers, and on average 33% of these will be overcharged ie. 42,917 customers. If the amount overcharged is the same as in the case referred to above this would amount to an estimated overcharging of €2.9 million per annum. By the same logic 33% of customers would be undercharged by that amount. This scenario would imply that one group of customers is subsidising another group of customers, unbeknownst to either group.

If estimated readings are consistently low (lower than both the true and commitment readings) then the extent of overcharging, using the above market size figures, could be up to €8.8m per annum; this would represent approximately 10% of the organization's annual profits (from 2005 annual report). If estimated readings are consistently high (higher than the commitment amount) then customers would be billed correctly 66% of the time and underbilled 33% of the time; losses to the organization could amount to €2.9 million per annum, representing approximately 3% of annual profits for the year 2005.

At the time of writing the company continues to estimate alternate meter readings, with the consequent 66% probability of mischarging customers on the commitment tariff. A change in procedure could avoid such mischarging: for example, meter reading schedules could be altered so as to ensure that for commitment tariff customers the reading at the end of the billing year was always read and not estimated.

#### **4. Discussion**

This paper deals with three main issues: how this mischarging situation arose, the implications of mischarging for the organization and for the customer, and how the

organization dealt with the situation when made aware of it. Each of these is now discussed in turn.

Mischarging arose because an operational change in one business process (meter reading) had an unanticipated consequence for another business process (customer billing). Given the complex nature of administrative business processes in the modern organization it is understandable that such an unanticipated consequence could occur. Porter (1985:ch.2) advises that not only must activities themselves be well managed but also linkages between different elements of the value chain must be well maintained for an organization to be effective. It would appear in this case that management of business process change was not fully coordinated across the organization. A contribution of this paper is to demonstrate how a process change in one area of the business had a significant unforeseen consequence for another business process. While causal ambiguity can be the source of resource based competitive advantage in this case it has led to an undesirable side-effect.

The financial implications of such mischarging are significant and could potentially result in millions of euros lost or gained by the organization with a corresponding loss or gain to customers. The organization would gain financially if it consistently estimated low (ie. below the commitment reading and below the true reading); the organization would lose financially if it consistently estimated high (ie. above the commitment reading). There is clearly a financial incentive for the organization to estimate low rather than high.

While it is understandable that mischarging could inadvertently arise given the process change undertaken, it is difficult to condone the behaviour of the organization after it was made aware of the overcharging. The organization did make a refund but only after much persistence by the customer. Also, the organization does not appear to have reviewed the flawed process: at the time of writing bills are still being estimated for commitment tariff customers which will inevitably result in some level of continued mischarging. It would appear that either the complaint never moved upwards to alert senior management of the flaw in the process or the complaint did move upwards and was ignored. Both possibilities indicate organizational flaws although of different kinds: with respect to the first possibility the complaints

handling and complaints escalation procedures appear to be in need of review; the second possibility is more grave indicating that management perceive the instance as an isolated case and are not aware of the possibility of systematic mischarging of customers. McMahon-Beattie (2005) points out that 'trust is hard won and easily lost'. Managers of this organization could potentially lose the trust of their customers and would do well to heed that advice.

## **5. Conclusion**

System failures often occur due to a series of small errors or coincidences each separately of little significance but together amounting to a significant failure or even catastrophe. Weick (1993) discusses the series of minor errors that cumulatively led to the Tenerife air disaster. The Gare de Lyon train disaster in 1988 resulted from the cumulative effect of several independent small errors or events. The situation described in this paper similarly arose as a result of decisions made independently by two different organizational units which together resulted in a process failure. The genesis of process failure is the first major issue discussed in the paper.

The second major issue discussed in the paper is the response of the organization to the failure situation. Brandenburger and Nalebuff (1996) discuss the case of a minor flaw in the pentium chip, initially hidden by Intel but which subsequently became public knowledge; Intel initially downplayed the impact of the flaw and then undertook a limited product exchange on a case by case basis. However their response was regarded by the market as insufficient and the crisis quickly escalated resulting in an extensive product recall and write-off of \$475 million. Brandenburger and Nalebuff contrast Intel's reaction with that of Johnson and Johnson during the Tylenol situation which was immediately to admit the problem and issue a full product recall. In the situation described in this paper the organization's response has been limited to individual refunds: no public response has been made to date.

Organizations that bill according to readings from meters located on consumer premises are typically large and often monopolies. Meter based bills are usually based on complex tariff structures, for example commitment structures as in the case discussed in this paper, or two-part tariffs with a standing charge and a usage-based

charge; in either case bills are difficult for customers to read and decipher. Bills are received on a regular basis with customers becoming used to them and less inclined to check each bill for accuracy. It is incumbent on such organizations to correctly bill their customers as it is difficult for customers to spot billing errors. The mischarging situation discussed in this case study is not unique. Ross (2007a,b) reports on mischarging by a utility where meter readings are estimated and where price increased between one billing period and another.

The case study in a slightly different format has been used for teaching purposes with an undergraduate business studies class; the case was used to explore ethical dimensions and repercussions of strategic action. Due to the complexity and interaction of the pricing, meter-reading and billing processes students found it difficult to see how misbilling took place and so the process by which misbilling occurs must be drawn out by the case facilitator. The case study clearly lends itself to a class discussion of operational and process complexity.

The paper discusses an individual case using an investigative approach. The paper contributes to the literature on process failure by giving an in-depth example of a significant failure due to multiple small causes and describes the inadequate response of the organization to the failure. A limitation of the study is that it is a single, albeit in depth, case study and this poses problems of generalization. However the exact circumstances of this case study are unlikely to arise frequently and so a search for documented parallel situations may prove fruitless. However, a possible avenue for further research in this area is to examine other system failures and consider the mechanism by which a series of small changes can coincide to produce a dramatic result.

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