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ONE SIZE FITS ALL? SEGMENTING CUSTOMER BASE FOR MAXIMUM RETURNS

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ABSTRACT

Large corporations can achieve significant cost savings by developing and employing a sophisticated and continuously updated, billing and credit policy. Days of sale outstanding (DSO) is a major cost driver for corporations with large revenues, as this leads to an increased risk of default, increased dunning and collection costs, a non-optimal billing procedure with attendant costs and perhaps most importantly, an increase in the order-to-cash cycle time and the significant increase in hidden costs this implies. Segmentation of the customer base according to behavior and risk combined with the design of bespoke billing and credit policies suited to the behavior and risk associated with each segment, can lead to a significant decrease in the costs mentioned above. This paper illustrates the work done at Norway's largest telecommunication operator, Telenor, to address these issues using the continuous simulation methodology as well as other econometric tools.

1 INTRODUCTION

Although Telenor has business activities within the mobile, fixed and TV sectors, as well as other miscellaneous activities, this paper will be confined to the fixed line residential segment alone. With 1.7 million fixed line subscribers within the residential segment of a total of 1.96 million households in Norway (Statistics Norway 2003) as well as 72% (Telenor 2003) of traffic, Internet traffic included, Telenor is by far the most dominant telecommunications player in Norway.

A majority of residential fixed line subscribers are allocated to quarterly billing cycles i.e. they are invoiced every three months. (The words customer and subscriber are used interchangeably). Defining the order-to-cash (OTC) cycle as the time elapsed from a call is made until that call is paid for: for those customers on a quarterly cycle, it takes about 80 days for this cycle to complete on average. This rather long lead or cycle time ties up a sizeable amount of working capital – shortening of this lead time by just one day can lead to significant cost savings.

This is an ongoing project and is expected to start in earnest mid-August 2003 and be completed by late October 2003. Therefore, it will be difficult to discuss issues such as outcomes, validation and recommendations at the time of submission of this paper. This paper presents background information on the project, describes our modeling approach, and presents a preliminary analysis.

The main objectives of the project are as follows:

1. Reduce the order-to-cash cycle or lead time
2. Reduce dunning and collection costs
3. Reduce the amount of bad debt (write-offs)
4. Determine optimal invoice production
5. Provide the Client with a dynamic and strategic planning tool.

2 BACKGROUND

Prior to deregulation, the entire telecommunication industry in this country was controlled by a state-run monopoly, Televerket. Market liberalization, increased competition and more recently, the meltdown in the telecommunication industry in general, has brought about an increased focus on costs and measures to reduce costs and increase profitability. Measures have already been taken to reduce, rather drastically, the more obvious large capital outlays such as investment in IT infrastructure, use of consultants, manpower etc. Focus is now turning to the less obvious and "harder to pluck" costs, including costs that appear neither on the balance sheet nor the income statement: so-called hidden costs. For large corporations the loss in income due to hidden costs are substantial: a reduction in the amount of tied-up capital - whether it be in inventory or accounts receivable - could greatly improve profitability, albeit in a subtle manner.

As this is a complex issue with a large amount of causal and feedback loops and trade-offs, the system dynamics approach was found more suitable.

The modeling software being used is Powersim.

3 SOME DEFINITIONS AND CONCEPTS

- A Call Detail Record or CDR is created when a customer makes a phone call. It is the basic unit or entity that flows through the core of a telecom operator. These CDR's contain information such as call duration, origin and destination (referred to at Telenor as A and B numbers respectively) and are stored in switches. CDR's are downloaded from these switches at regular intervals during the day. They are then rated, rebated etc., in batches, within a system called Message Processing. After being processed they are transferred to their respective Bill Cycles (BC's), ready for invoicing.
- As mentioned earlier, the order-to-cash (OTC) cycle as defined in this project is the time elapsed between the generation of a CDR and the payment for that particular call. The average time elapsed is about 80 days for those on the quarterly cycle.
- Customers on the quarterly cycle account for about 80% of all customers, monthly cycles make up approximately 15% of customers whilst the remaining 5% or so are segmented into modified billing cycles for high-risk customers.
- High-risk customers moved temporarily to these modified billing cycles do not receive periodic, cyclic invoices. Instead, customers are invoiced as soon as usage reaches a certain amount.
- One of the less desirable outcomes in trying to reduce the OTC cycle time is that this often, if not always, leads to an increase in the number of invoices produced. Costs to produce one single invoice can be as high as several dollars.
- There is a trade-off between the increase in the costs of invoice production needed to shorten the OTC cycle, and the benefits achieved by shortening the aforementioned cycle, as illustrated in Figure 1 below.

Costs attributes to DSO (red curve) are shown on the Y-axis whilst the X-axis depicts the number of invoices (blue curve). As the number of invoices increases the cost associated with DSO decreases. The intersection of the red and blue curves (green arrow) shows the optimal quantity of invoices.

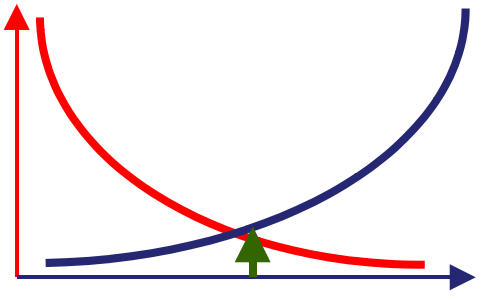

Figure 1: Schematic Diagram of the Trade-Off Between DSO Costs and Number of Invoices

4 THE PROJECT

The scope of the project, originally, was to segment customers according to the risk associated with them. Credit Managers recognized the need for:

1. A more sophisticated segmentation of the customer base.
2. A credit policy that is in tune with the changing economic climate.
3. A more responsive and proactive credit policy.
4. A strategic planning tool to test out new policies prior to implementation.
5. A cash management and budgeting tool to improve cash flow.

Achieving the above would entail, amongst other things, moving high-risk customers to an invoicing procedure that was more flexible than a cyclic one, i.e. moving them to modified billing cycles and, most likely, increasing the number of invoices produced.

However, invoicing costs cannot be ignored. An analysis performed by a leading international consultancy and Telenor showed, in apparent contradiction to the original hypothesis, that substantial savings could be achieved by reducing the number of invoices. The rationale behind this claim, backed up by a Business Case, was that there was more to gain by invoicing low-volume, low-risk customers less often. The scope of the project was therefore extended to encompass this issue as well.

5 MODELING APPROACH

Such a complex problem with trade-off situations, a high degree of inter-dependency between variables as well as uncertainty called for the use of a proven methodology. Close inspection of the problem and the issues mentioned above, lead to the conclusion that the system dynamics methodology was most appropriate.

5.1 Causal Loop

Consultants from BestSys were present at an initial workshop with subject matter experts within the Credit Department in Telenor. This workshop provided crucial and invaluable insight as to how the system works, i.e. how the technical aspects of the invoicing system works, the design of and logic behind current credit and billing strategies etc. Based on the insight gleaned from the workshop an initial causal loop diagram was constructed. This was presented to the Client. Comments from the Client were taken into account in adding refinements and additional information to the diagram so as to capture the texture of the problem more fully. Figure 2 below depicts a more detailed diagram.

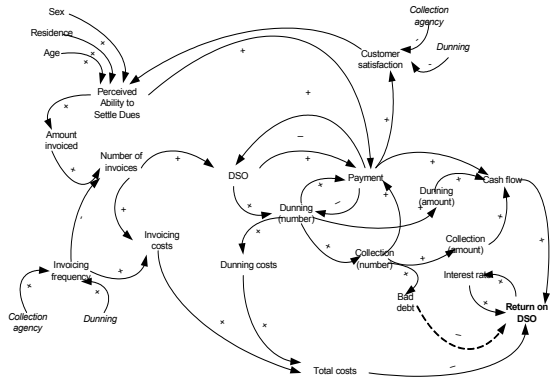

Figure 2: Causal Loop Diagram

The notation here is standard (Sterman 2000). The word collection is used for invoices sent to the collection agency.

5.2 Data Collection and Analysis

Data was collected for a period of 18 months: January 2001 through June 2002. Data analysis was started around December 2002 giving a margin of about six months to ensure that most, if not all, customers had paid their dues. (Due to project delays and increase in scope of the project, it will be necessary to additional and more recent data and analyze data once again).

The raw data had valuable information such as invoice date, amount invoiced, customer address and age, customer name, date amount settled, whether the customer had received any reminders etc. Some of the variables that could be of interest, such as sex, ethnic origin and customer income were not divulged as it was against Norwegian law. (However, the customer's first names provided strong clues to the sex of the person, for example).

Figures 3 and 4 below are examples of some of the initial analyses undertaken.

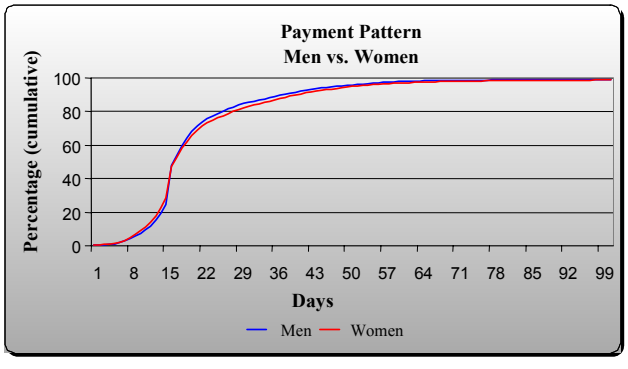

Figure 3: Payment Patters for Men and Women

As Figure 3 above illustrates there is practically no difference in the payment patters of men and women i.e. the sex of the person is not a factor in determining how quickly a customer settles the amount due.

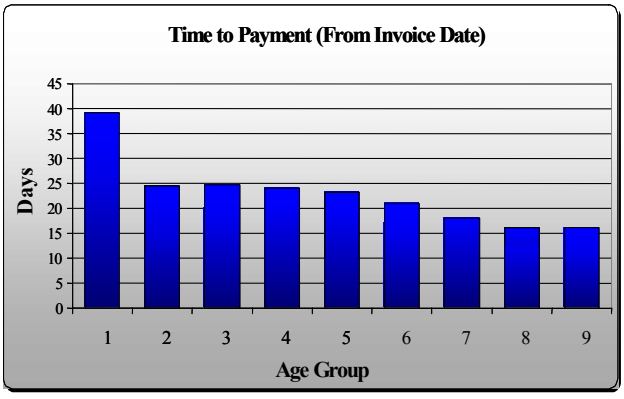

Figure 4: Time to Payment for Different Age Groups (in Ascending Order)

Figure 4 above, however, shows that age does play a role in the payment pattern of customers.

Several such analyses with various combinations of parameters have been performed to get a "feel" for the information that could be gleaned from the raw data, before more rigorous statistical analyses (estimating correlation coefficients, for example) will be performed. Correlation coefficients and other relevant parameters will be used in the simulation model and, thus, provide some sort of Customer Profiling and Scoring model for the Client.

5.3 Model Building

At present, customers are put into four segments:

1. Quarterly Bill Cycles.
2. Monthly Bill Cycles.
3. Two Modified Billing Cycles:
   a. Quarterly cycles with an upper limit.
   b. Monthly cycles with an upper limit.

Whilst customers in standard quarterly or monthly bill cycles are not moved around (having their terms of payment changed), high risk customers are temporarily moved to one of these special cycles. The highest risk customers are in the monthly cycles with the less risky ones placed in the quarterly cycles. As soon as the customer reaches the upper limit an invoice is generated and sent to the customer. If the customer is deemed less risky he or she is moved backed to the standard quarterly or monthly bill cycles.

The causal model built in Powersim was supplemented with parameters from the analysis described above. The causal diagram with results depicting invoicing and payment from the customer is shown in Figure 5.

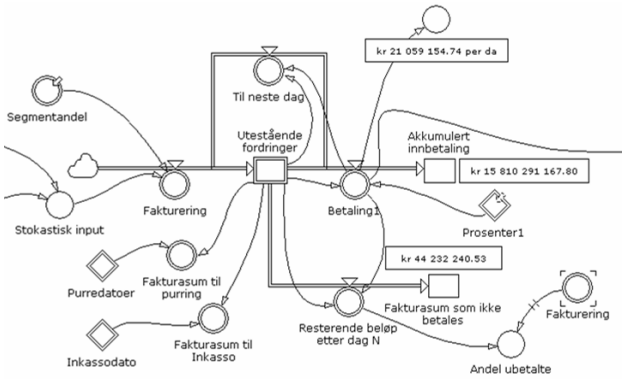

Figure 5: The Invoice and Payment Part of the Simulation Model

REFERENCES

Statistics Norway 2003. Folkemengd, etter kjønn, alder og sivilstand. 1. januar 2003.

Sternman, J. D., 2000. Business Dynamics: Systems Thinking and Modeling for a Complex World, Irwin McGraw-Hill.

Telenor 2003. Annual report 2002.

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