Critical Drivers of Firms' Performance

A journey through the insights and results generated by a system dynamics project

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Abstract

When business managers drive a company 'off the cliff', accelerating as they go, it's a tragic and puzzling event. When they are cheered on by investment analysts saying, "more, more, more!" one can't help but ask: how did they all get it so wrong? The case of Exodus Communications Inc illustrates how this can happen and how clear dissonance can emerge between Critical Value Drivers and the targets pursued by management. The System Dynamics technique illustrated in this paper provides insights into how management can better anticipate significant and critical shifts in the metrics they need to watch. It also illustrates how a System Dynamics approach can lead to exceptional insights in the data collection phase, when the model is still on paper.

Impetus for this Research

It is extremely difficult both for managers and researchers to understand the impact that changes within a firm's boundaries and its surrounding environment will have on its projected performance trajectory.

To cope with this problem, business managers try to identify and constantly monitor what they believe to be the critical drivers of their business performance and design their strategies accordingly. Similarly, investment analysts use a regularly updated list of Critical Value Drivers (or CVDs) to perform firms' strategic valuations. As one research house institution defines them, Critical Value Drivers are factors, within a company as well as in its external business environment, which significantly impact (positively and negatively) the value of the company's discounted free cash flows. This primarily includes factors impacting: revenue growth/decline, cost of service, cost of investment required to provide and maintain service, cost of capital.

A Critical Value Driver is therefore a variable, internal or external to the firm's specific strategic architecture, a rate or a stock, that deeply influences a firm's current and future performance.

As the case to be presented suggests, CVDs are not easy to prioritize and quantify. Moreover, despite their high degree of sophistication, current techniques seem to be incapable of capturing the dynamics leading to changes of CVDs over time.

Fascinated by the challenges posed by this problem, we have engaged on a project aimed at understanding what System Dynamics has to offer to the approaches currently in use.

When the project was ended, the amount of insights and deeper understanding that had been generated was so impressive that it was possible to conclude that a System Dynamics approach to CVDs is an ideal one (if not the only) for understanding CVDs and anticipating their change and impact on a firm's performance.

The case study and specific project objectives

As a test case for our research, we used the boom and bust story of Exodus Communications, Inc (or Exodus), a former leader in the US web hosting industry. This choice was determined by the fact that our client was a firm that had an interest in gaining insights into the structure underlying its financial performance.

Exodus was the successor to a Maryland (US) corporation formed in August 1992 as a computer-consulting services provider. Its management had a clear strategic vision of how it would ensure itself a leading role in the market by building on its existing competencies as well as by taking advantage of the opportunities expected to arise from the changes in the business environment resulting from the advancement of the internet era. In late 1995, Exodus pioneered the server hosting services sector, which consists of providing facilities (Internet Data Centers, or IDCs) for corporate/government users to house their (or their vendors') computer servers and electronic storage, as well as providing necessary power, appropriate communications equipment, and internet access. By mid-2000 Exodus had established itself as a clear leader in the server (or web) hosting industry worldwide, having built 25 IDCs, six of which were outside of the US (Europe, Asia and Australia). Despite the weakening economic environment of late 2000 and signs of the looming dot.com bubble, Exodus Communications, confident in its position as industry leader (its largest US competitor was half its size in terms of capacity) and analysts' strong financial valuations, continued to believe in its successful business model and planned to double its capacity by the end of 2001. However, contrarily, Exodus' earnings and other financial indicators in 2001 were quite disappointing, especially when compared to previous expectations. To avoid violating its loan covenants, the company repaid some of its debt in September; as a result it failed to meet its cash requirements and was forced to file for Chapter 11 on September 26, 2001. Consequently, Cable & Wireless Plc., a British telecom firm, selectively acquired a number of Exodus' assets, concluding the rapid demise of what had been a successful empire only a few months earlier.

In retrospect, the story behind Exodus' rapid growth and decline may seem simple. As the surrounding environment changed, so did the critical drivers of Exodus' performance. As outsiders, the financial community, bombarded with a myriad of information and heavy time constraints, did not identify this change and its implication on the firm's performance given its current strategies and cost structure. And as insiders, Exodus' management did not recognize that the conditions that had made the existing growth strategy originally so successful had changed, making it essential to shift its strategic priorities and adapt its policies accordingly.

But many questions remain unanswered. How could the destiny of an extremely successful company change so dramatically and unexpectedly? What did the entire financial community so clearly overlook? And what prevented the company's management, which had an excellent track record in successful strategy and execution, from effectively recognizing and coping with the challenges posed by the new environment?

We find that giving a detailed answer to the above questions is the only viable way to research and then prove the potential impact that System Dynamics can have on CVDs valuations.

As a consequence, this paper will describe the parts of the project that we think are more relevant in answering the following two questions: (1) Had we used the concepts and tools provided by System Dynamics to analyse data available to researchers to evaluate Exodus, would we have made better predictions regarding what was about to happen? (2) And as business consultants, would we have been able to "prove" to Exodus' managers in a timely and convincing manner when and why a shift of strategy focus had become necessary, and, perhaps more importantly, would we have had a practical impact on their decision processes?

The two insights generated during the data collection phase of the project have provided an answer to the first question. In particular, they suggest that the Exodus story is a good case study of how managers' policies and analysts' valuations of firms can be influenced by a systematic bias due to misperception of stocks and flows (first insight), and due to misperception of feedback (second insight). A large stream of research from the System Dynamics literature has provided evidence indicating exactly this possibility. Indeed, the first insights that will be described seem to provide evidence of something even more basic, suggesting that an important outflow had been completely ignored.

The System Dynamics model that has subsequently been built addresses the second question, as it shows how a model based on data from the public sources available at that time would have pointed out the need for a strategic shift from policies focused on customer acquisition to policies focused on customer retention as the web hosting industry went through different growth phases.

The data collection phase

The starting point for the research was the revenue forecasts published by financial analysts from 1998 until a few months before Exodus declared bankruptcy. The chart below (Exhibit 1) shows one sequence of consecutive revenue forecasts from well-respected equity research houses (figures in 000$).

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Exhibit 1

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In 1998 and in 1999, revenue forecasts consistently underestimated growth, while revenues predicted in and post 2000 seem to have no correlation at all with the actual revenues. A large percentage of the revenues in the web hosting sector have a recurring nature as they originate from

the monthly fees paid by existing customers. Hence, in order to predict revenues it is necessary to have credible growth estimates for Exodus' customer base and its monthly revenues per customer.

We concluded that historical data on Exodus' customer base represented the appropriate reference mode from which to draw a dynamic hypothesis of what caused revenues not to grow as anticipated and what was overlooked by the financial analysts.

To our surprise, it was extremely easy to gather quarterly data on Exodus' total customer numbers, but when we tried to find data relative to customers won and lost on a quarterly (or even an annual) basis, we realized that no such figures where publicly available, and analysts were reporting quarterly figures simply based on net customer additions/losses (Exhibit 2).

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Exhibit 2

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This lack of information triggered our attention. Information on customer additions and losses is critical to understanding changes of Exodus' customer base. In fact, customer base is a stock whose future levels are determined by its current level, and by the number of customers that will be added minus the number of customers that will be lost: without accurate information on these flows, it is not possible to predict customer base. Hence, we believe that accurate information on customer won and lost should have been pivotal to Exodus' revenue forecasts.

After much deliberation, it was decided to use revenue churn to estimate figures on lost customers. Exodus reported this data on a quarterly basis. Exodus bases revenue churn on the annualized monthly recurring revenues for installed customers who completely cancelled service during the previous 12 months. This measure is then divided by the annualized recurring revenue run rate at quarter end, which includes installed customer revenues and backlog, to get a relative measure.

Interestingly, the extremely low revenue churn (about 2% p.a.) associated with high switching costs in the industry had been reported by financial analysts until the end of 2000, supporting their predictions of high profitability for the web hosting business model and justifying the high premium attributed to Exodus' shares as a consequence of its first mover advantage. Based on public figures for quarterly churn and quarterly annualised revenue per customer, we calculated the actual customer churn.   Exhibit 3 shows the pattern of customer additions and losses from January 1997 to the second quarter 2001, that is until data on revenue churn and annualised revenue per customer have been reported (Exodus filed for bankruptcy at the end of the following quarter).

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Exhibit 3

The first insight: the hidden churn

As Exhibit 3 shows, customers started to leave at an exponentially growing rate as early as in second quarter 2000. Exhibit 4 and 5 below show respectively customers churn and then customers lost as a percentage of customers won from 1997 to Exodus' dissolution.

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Exhibit 4

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Exhibit 5

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Given the evidence shown by the above two graphs, we were able to conclude already at this very early stage of the project that customer churn became in 2000 a Critical Value Driver: it was a key indicator that should have been constantly monitored for its crucial implications on revenues and on marketing and sales costs. Despite this critical issue, the many reports that have been collected for this research show no evidence that this factor was incorporated into the revenue forecasts or had any impact on earnings forecasts. The exponential growth of monthly fees in 2000, which was a delayed response to the capacity constraints Exodus had experienced in previous years, and the low emphasis that was placed on separating inflows and outflows as the only possible causes of change in the stock of customers, prevented analysts from detecting the change of CVDs from customer acquisition through IDCs build out and sales force hiring to customer retention. The following passages, selected from the financial reports reviewed for this work, serve to better illustrate this point and give a flavour of what analysts regarded as CVDs at the end of 2000.

" Metrics to keep an eye on for Q3 2000 are: (1) Data centre rollout to reach 24 IDCs with 2 new additions in the quarter, (2) total square footage to reach 2.4 M sq. ft. from 2.2M last quarter, (3) a continual shift in revenue mix towards managed services […], (4) monthly ARPU of $19,663, a 10% rise over last quarter, and (5) 400 new customers to reach 3,733 customers total.".

"…The company added 245 customers at a rate, net of churned customers, of 2.7 per day, ending the quarter at 3,992.[…] Annualised revenue per customer reached $ 329,000 from 299,000 last quarter, an impressive 10% increase. [Revenue] churn continued to remain very low at below 3% annually, higher by 1% than last quarter as a result of the previously mentioned dot com credit issues…".

The second insight: the undetected reinforcing loop

When the focus of our enquiry was turned to Exodus' management, not one quote could be found from the firm's management that identified the problem of the increasing customer loss rates. And although it is difficult to believe that the top executives were not aware of the impact that a rising churn would have had on the firm's costs (e.g., sales efforts, disconnections) , the rapid expansion that continued throughout 2001 indicates that the firm continued to focus on customer acquisition rather than retention. One explanation for this was the high mortality rate of dot.coms, which constituted a large fraction of Exodus' customer base and inevitably caused higher customer churn; also, managers at Exodus knew that a large fraction of their customer losses resulted from the reduction in the firms' IT spending due to the weakening economy. Although we believe that these were the causes of the initial churn rise, the company's statements and analysts' reports indicated that, by the end of the first quarter 2001, the company had almost completed the shift from internet to corporate customers, and churn should have returned to the historical levels. Such beliefs were incorporated into the operating profits forecasts made in the year 2000 and 2001: they all pointed to the costly shift of Exodus' customer base from internet to corporate customers as a robust explanation for an increase and subsequent recovery of Exodus' operating losses respectively in 2001 and 2002 (Exhibit 6).

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Exhibit 6
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So, why did customer churn continue growing exponentially throughout the second quarter 2001 undermining the already deteriorating financial conditions of Exodus? Once again, financial reports underestimated customer churn rates even throughout the first two quarters of 2001, that is when the problem caused by the high level of churn became apparent, and their revenue forecasts continued to be well above the real data. Moreover, Exodus continued to sustain very high IDCs construction rates despite the high customer churn, and the policies undertaken by the firm to

enhance growth and boost revenues in 2001 suggest that at one point management had misinterpreted what was causing its customers to leave, and did not recognize in time the benefits of allocating additional resources to customer retention initiatives. The adequate supply and high geographical penetration of Internet Data Centres throughout the US, which had indeed been a key driver of the high rates of customer acquisitions from 1997 to 2000, was still regarded by managers and investment analysts as crucial for the long term profitability of the business (Exhibit 7), and hence was still included in their lists of CVD.

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Exhibit 7

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When we began investigating other causes that may have convinced Exodus' customers to outsource their web servers elsewhere, it struck us how "reliability" of the hosting company was a critical factor determining customer's satisfaction and choice. This led to the creation of the hypothesis that Exodus' financial stability was an important component of perceived reliability. Its customer portfolio at the end of 2000 included an elite group of successful corporations that could not afford to have a sudden disconnection of their web site (which would have resulted from Exodus' bankruptcy). We concluded that the financial stability perceived by Exodus' customers was the main factor driving their degree of overall satisfaction with the firm. We found out that the average time needed to move a company's servers to a new data center is about two months and we could estimate what fraction of the total customer churn in 2001 was a consequence of dot.coms bankruptcies. The financial data we had gathered from Exodus' quarterly reports allowed us to "close the loop" and formulate the dynamic hypotheses shown in Exhibit 8.

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Exhibit 8

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In summary, towards the end of the first quarter 2001 Exodus' customers started making plans to leave the company as a result of their growing concerns about the financial viability of the firm. Moreover, Exodus' determination in carrying out its previously stated IDCs' built out plans and achieve its target market penetration, which is partly responsible for the remarkable customer acquisition rates of the previous months, was also speeding up the depletion of customers' trust in the firm's financials; this phenomenon accelerated the accumulation of dissatisfied customers, and the subsequent high churn that was about to take both analysts and the firm off guard and convince the covenants to withdraw their loans.

We believe that a "stock" representation of their customers' pipeline would have helped Exodus' management be alert of the detrimental reinforcing feedback loop triggered by the loss of internet customers back in mid 2000 and caused by the intangible accumulation of the survivals' negative perception of the firm's weakening financial health. In addition, we are convinced that an effort aimed at plotting the actual flow of customers becoming dissatisfied and research aimed at obtaining factual information on the level of customers' perceptions through time would have helped managers anticipate the shift of CVDs. These two critical factors (the first being a rate and the second a level) were definitely pointing out with much anticipation at the crucial importance of policies focused on customer retention rather than acquisition.

The following quotations from press releases validate our hypothesis.

"Dan Agronow, vice president of technology at Weather.com, the web site of the Weather Channel Enterprises Inc. in Atlanta, said Exodus' bankruptcy filing was only one of the several factors in his company's decision to switch to WorldCom Inc. for its hosting services just last week. While Weather.com was satisfied with the service it received, it had concerns related to the ongoing Exodus support and financial stability, […], he said. Since we had those concerns, we started looking around, explained Agronow. The final decision to switch was made before the Exodus bankruptcy was announced, he said.".

"Increasingly concerned about the viability of its web hosting outsourcing provider, global electronic giant Royal Philips Electronics NV has decided to pull hosting responsibilities for 350 of its web sites in house. […]. We started questioning the viability of Exodus in August *[2001]*, and I raised a point about this becoming a business risk because our primary data center was at the mercy of their ability to remain in business", *said Richard Bogues, director for the corporate data center whose servers were relocated.*

Purpose of the system dynamics model and results

One of the most delicate phases of the whole project has been judging whether or not the additional energy necessary to construct a System Dynamics model would have been compensated for by sufficiently higher payoffs than those that had already been obtained in the data collection phase. Clearly, this is a difficult question to answer before an actual model was built and tested. What rendered this question even more difficult was our client's belief that the dynamic hypothesis

that we have illustrated in Exhibit 8 was more than just a hypothesis, as it appeared to have been sufficiently validated by the press releases we had gathered. Moreover, we feared that a System Dynamics model aimed at testing this hypothesis could have been influenced (and consequently invalidated) by hindsight. To put it simply, we needed to come out with a clear problem articulation that our client felt was an important issue and which we thought a System Dynamics model would have a positive likelihood of successfully addressing.

On a general level, the case that we have described seems to confirm that Critical Value Drivers do exist, that they change over time, and that anticipating their change and redesigning policies accordingly can create massive value for a firm. On a more specific level, the two insights suggest that at one point customer retention became a Critical Value Driver for Exodus. We decided to build a system dynamics model aimed attesting this hypothesis and at capturing the shift of CVD from customer acquisition to customer retention. In addition, we hypothesized that customer retention became a critical factor even before the reinforcing detrimental feedback loop, revealed in the second insight, was triggered: this feedback loop has therefore been left out of the model..

This purpose assisted us during the entire model building process in shaping the structure and boundaries of the model. The System Dynamics model has been carefully calibrated to the Exodus' cost structure and to the macroeconomic data relative to the industry evolution from 1997 to 2001. Moreover, the parameters that we believe to be pivotal in designing the scenarios characterizing the four industry eras illustrated in Exhibit 9 have been included within the model boundaries as exogenous (Exhibit 10).

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Exhibit 9

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Exhibit 10

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Normal industry churn refers to the customer churn that is typical of a certain industry in different growth phases. In web hosting, normal industry churn is assumed to be initially very low (2% per year) and then gradually increase to about 15% per year as a result of lower switching costs and higher visibility of performance differences between web hosting providers (when the industry was emerging it was difficult for a firm to distinguish - at times even understand - between the various services offered by alternative web hosting companies and compare their respective value

for money). The compound annual growth rate of demand for web hosting services is assumed to be initially very high and then to decrease as the stock of potential firms needing web hosting depletes. Target market shares and capacity are initially very high as a result of the importance - earlier noted - of building IDCs ahead of the expected demand as a critical factor to attract new customers. This fact, reinforced by the facility of funding IDCs build out plans rising cash from the financial markets, is responsible for the oversupply that characterized the sector in 2000 and eventually resulted in the consolidation era. As a result of this effect, target market shares and target capacity have been assumed to be much closer to their current levels in the mature and consolidation scenarios. All these assumptions are consistent with what has been noted in reality in the web hosting industry in the US from 1997 to today.

The system dynamics model includes three main sectors:

1)   Rivalry sector, where demand growth is exogenous and the dynamics leading to Exodus' market share growth are explained

2)   Supply sector, explaining the structure underlying the total supply of IDCs (a distinction is made between IDCs built by Exodus and those built by its rivals)

3)   Financial sector, capturing the impact of the two sectors above on Exodus' financial performance and value (defined as the Net Present Value of the cash flows generated during each simulation)

The reference modes used are the growth of IDCs, sales and customer service staff of Exodus from 1997 to 2000. We have conducted a structural validation of the model's equations through interviews with industry experts, and the simulated behaviour has been compared for further validation to the historical data we had gathered about Exodus and the web hosting industry in the US. Once enough confidence in the model's validity was achieved, we started designing tests aimed at quantifying the impact on Value from changes in customer retention and acquisition effectiveness. In order to be able to make appropriate comparisons between the results, we have defined the productivity of each policy (customer retention/acquisition) as the extra NPV created by each extra customer acquired or retained as a consequence of the hypothesized improvement in effectiveness (which is simulated as an exogenous input).

Exhibit 11 illustrates how we have visualized the shift of CVDs from customer acquisition to retention as the microeconomic conditions changed. The results have been obtained assuming a 10% higher effectiveness in customer retention or customer acquisition in each scenario.

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Exhibit 11

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As the graph shows, during the year 1999, when demand was estimated to be growing at a compound annual growth rate (CAGR) of 68% and customer churn was as low as 2%, the productivity of initiatives aimed at customer acquisition was 141% of the productivity of initiatives aimed at customer retention. In the following year, as a result of rising customer churn and slower growth, customer retention and acquisition initiatives appear to have the same productivity. Back in 2000, using what was feared to be a likely scenario of increasing customer churn and lower growth, the model would have pointed out the critical importance of customer retention initiatives and the need to shift strategic priorities.

In order to check the robustness of these findings and of the consequent recommendations, the same tests were performed designing scenarios in which Exodus is assumed to have a higher or lower ability to attract and retain customers than its competitors. Also, we repeated the tests assuming uncertainty and imperfect information about the exogenous inputs used to define each scenario. The findings have been confirmed also under such circumstances.

These results, which have been recalibrated to our client's data, have had a huge impact on the way our client evaluates its marketing and sales initiatives. In fact, such a model is now used on a regular basis as a living reference to monitor the effectiveness and appropriateness of our client's current strategies.

Conclusions

This paper illustrates how strategic modelling and System Dynamics' concepts can provide a deeper understanding of the critical drivers of a firm's performance (CVDs). The actual case that has been described offers clear evidence that wider utilization of System Dynamics applications both by researchers and managers can play a key role in performing better strategic valuations and assigning strategic priorities. The evidence is represented by the specific and detailed answers that the project has provided to the two questions posed by the Exodus case. On one hand, the insights generated during the data collection phase have shed light on one critical indicator, customer churn, which had been overlooked by analysts; moreover, it has given a practical example of how a System Dynamics approach can help identify and understand the impact key intangible resources such as the financial stability perceived by Exodus' customers. On the other hand, it has been
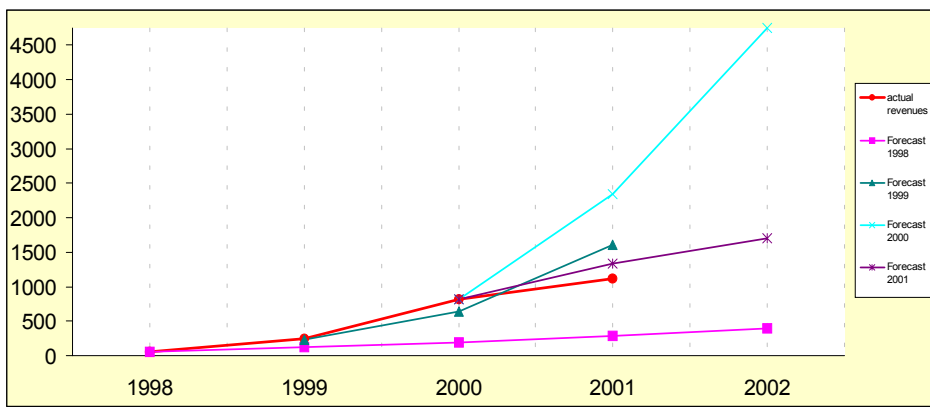
shown how a System Dynamics model can be used to quantify CVDs and capture their changes over time.
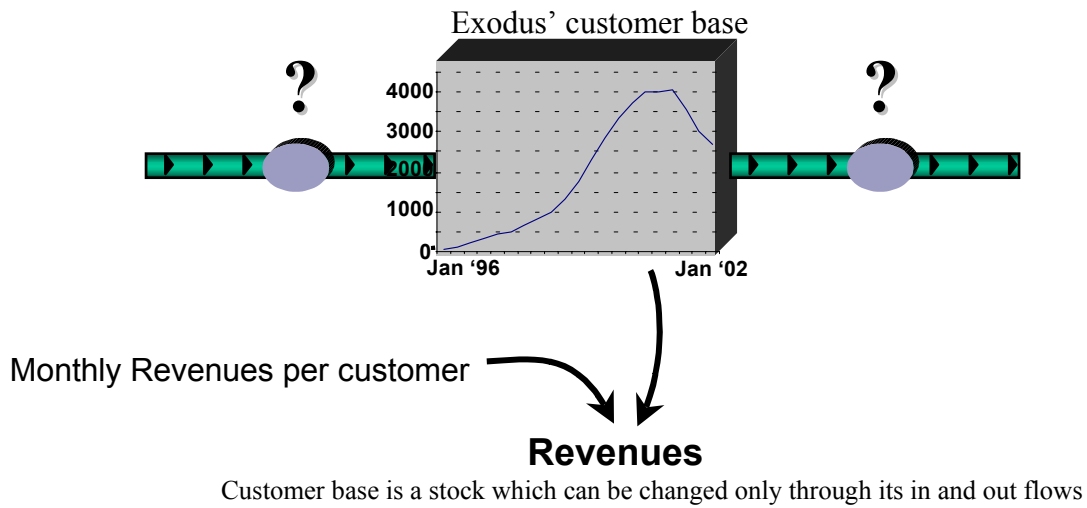
Acknowledgements

Exhibits

Exhibit 1

Revenues of Exodus Communications Inc. and a series of projections made by one analyst

Exhibit 2

Exodus' customer base

Monthly Revenues per customer

Revenues

Customer base is a stock which can be changed only through its in and out flows

Exhibit 3
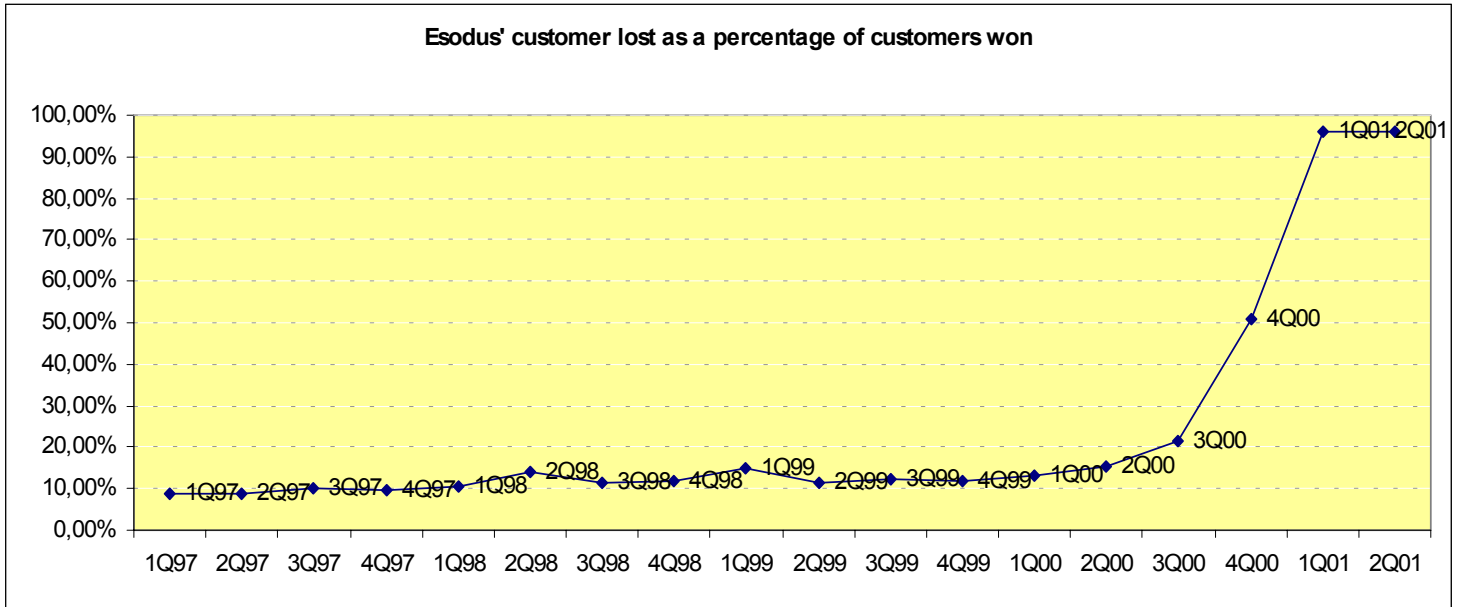

Exodus' customer base

Monthly Revenues per customer

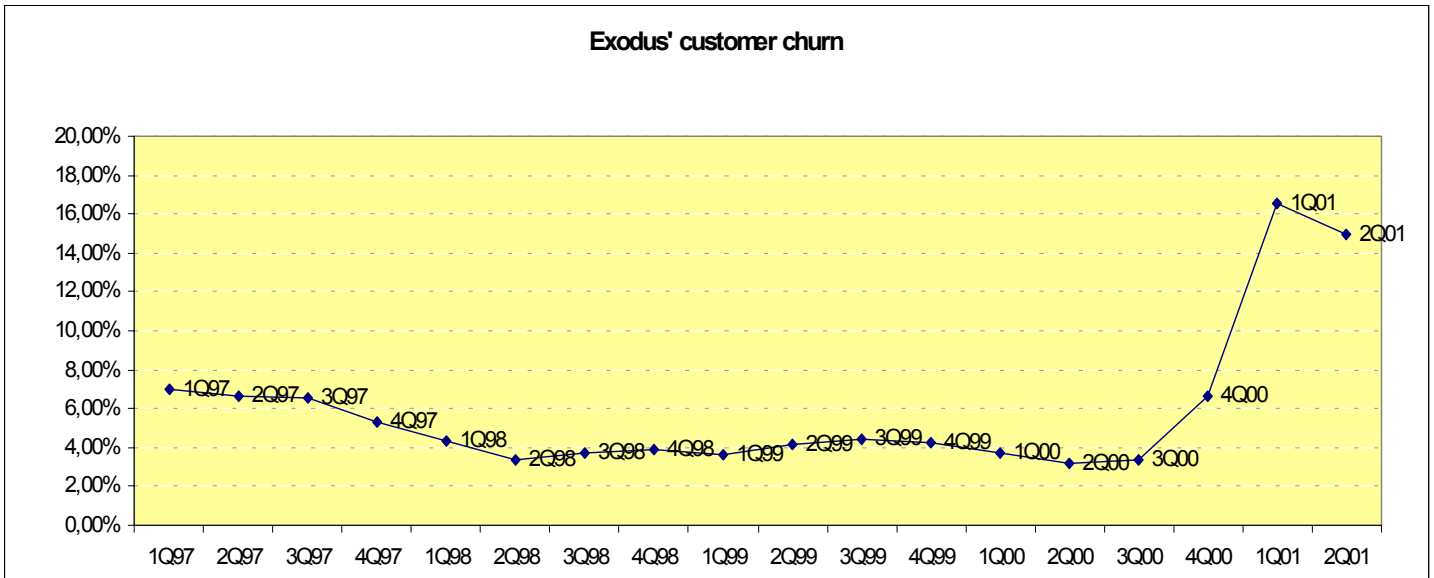## Revenues
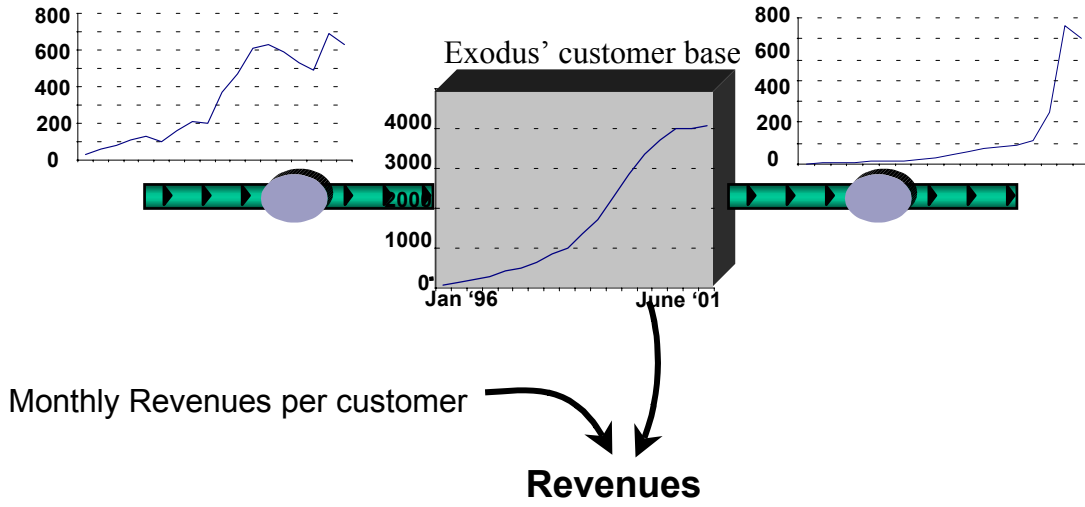
Historical data on Exodus Communications Inc. customer acquisition and loss rates are necessary to understand what is behind Exodus customer base changes
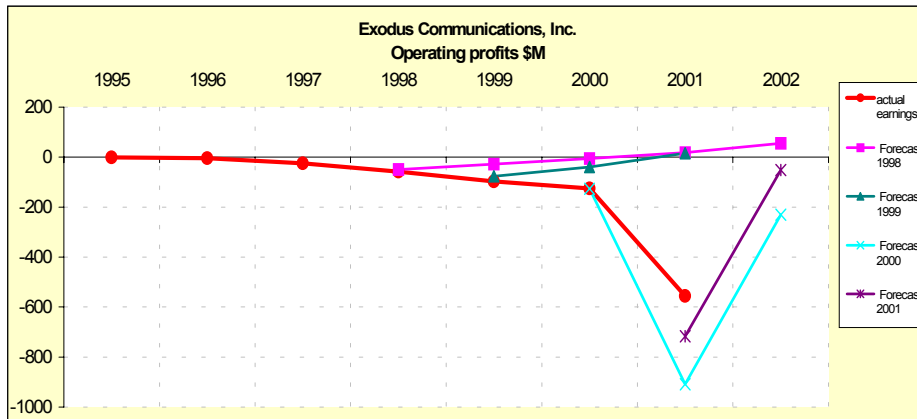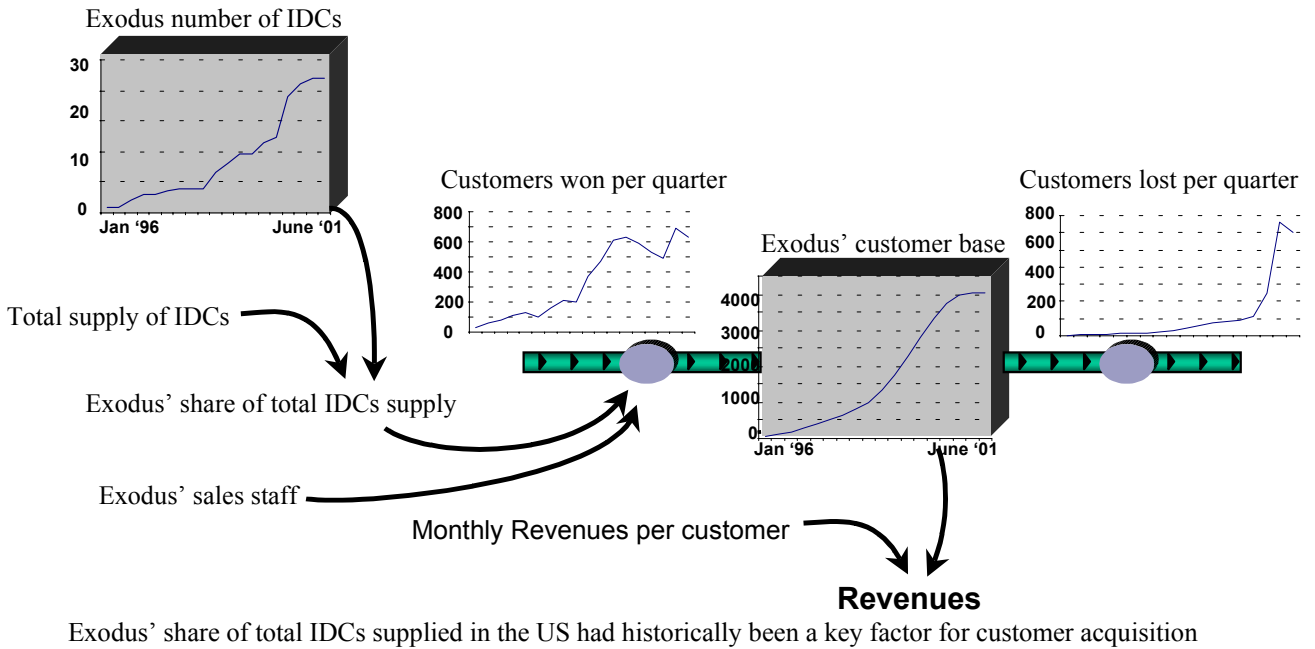
Exhibit 4

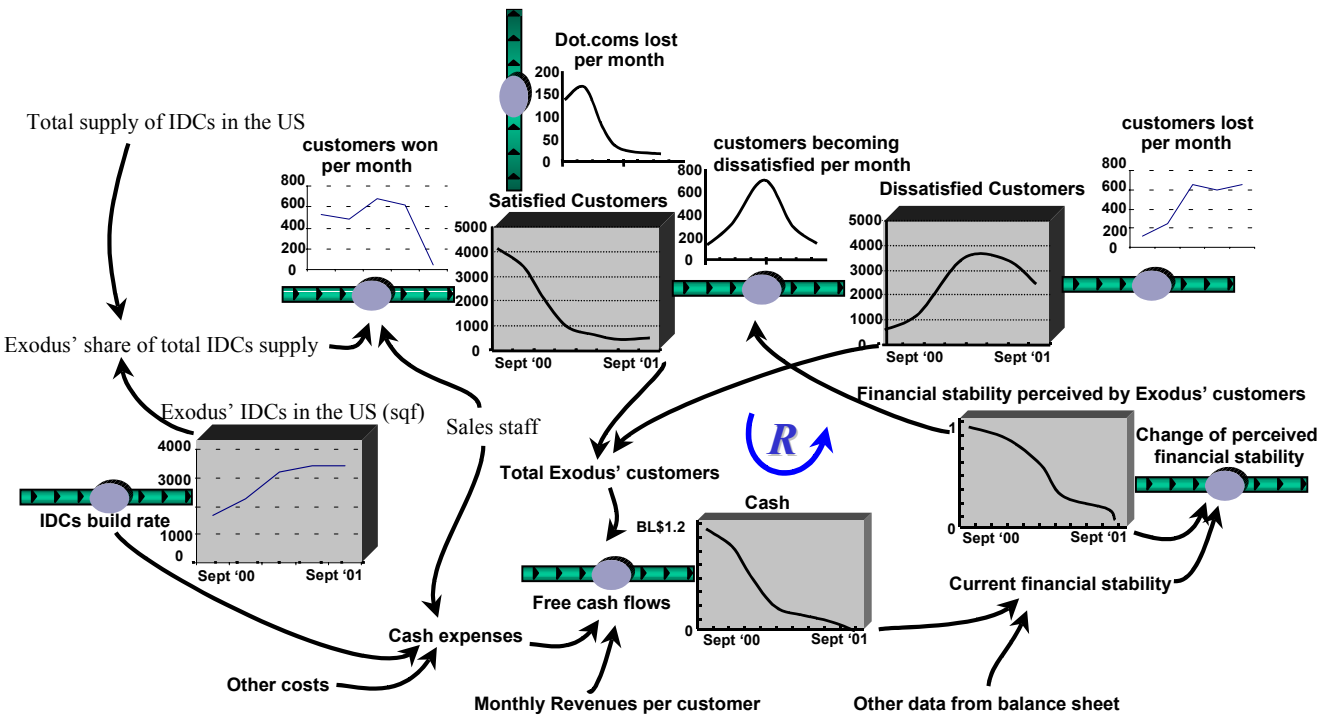**Esodus' customer lost as a percentage of customers won**

Exhibit 5

Exodus' customer churn

Exhibit 6

Operating profits of Exodus Communications Inc. and a series of projections made by one analyst

Exhibit 7

Exodus number of IDCs

Total supply of IDCs

Exodus' share of total IDCs supply

Exodus' sales staff

Customers won per quarter

Exodus' customer base

Customers lost per quarter

Monthly Revenues per customer

Revenues

Exodus' share of total IDCs supplied in the US had historically been a key factor for customer acquisition

Exhibit 8

Total supply of IDCs in the US

Exodus' share of total IDCs supply

Exodus' IDCs in the US (sqf)

IDCs build rate

Sales staff

customers won per month

Dot.coms lost per month

Satisfied Customers

customers becoming dissatisfied per month

Dissatisfied Customers

customers lost per month

Total Exodus' customers

BL$1.2

Cash

Free cash flows

Cash expenses

Other costs

Monthly Revenues per customer

Financial stability perceived by Exodus' customers

Change of perceived financial stability

Current financial stability

Other data from balance sheet

The gradual depletion of the intangible resource "Financial stability perceived by Exodus' customers" is responsible for the high customer losses experienced in mid 2001

Exhibit 9

Web hosting industry's phases

1996 ➤ *2002*

Emerging **Rapid growth** **Maturation** **Consolidation**

Customer acquisition · · · · · · · · · · · · · · · · ➤ *Customer retention*

Shift of CVDs
### *Need to change polices' focus*

Purpose of the System Dynamics model: show how customer retention policies became critical in the web hosting industry as the sector went through its maturation phases

Exhibit 10

Endogenous	*Exogenous*	*Not included*
Sales staff	Number of competitors	Exodus' activities outside the US
Customer service staff	Total demand in the US	M&A activities
Exodus and rivals' customers	CAGR of demand for web hosting in the US	Inflation
Total supply of IDCs in the US	Normal industry churn	
Financial statements for Exodus	Target market share for Exodus and rivals	
	Ability to rise cash from investors	
	Monthly revenues per customer	

Relevant variables endogenous, exogenous and not included in the System Dynamics model

Exhibit 11
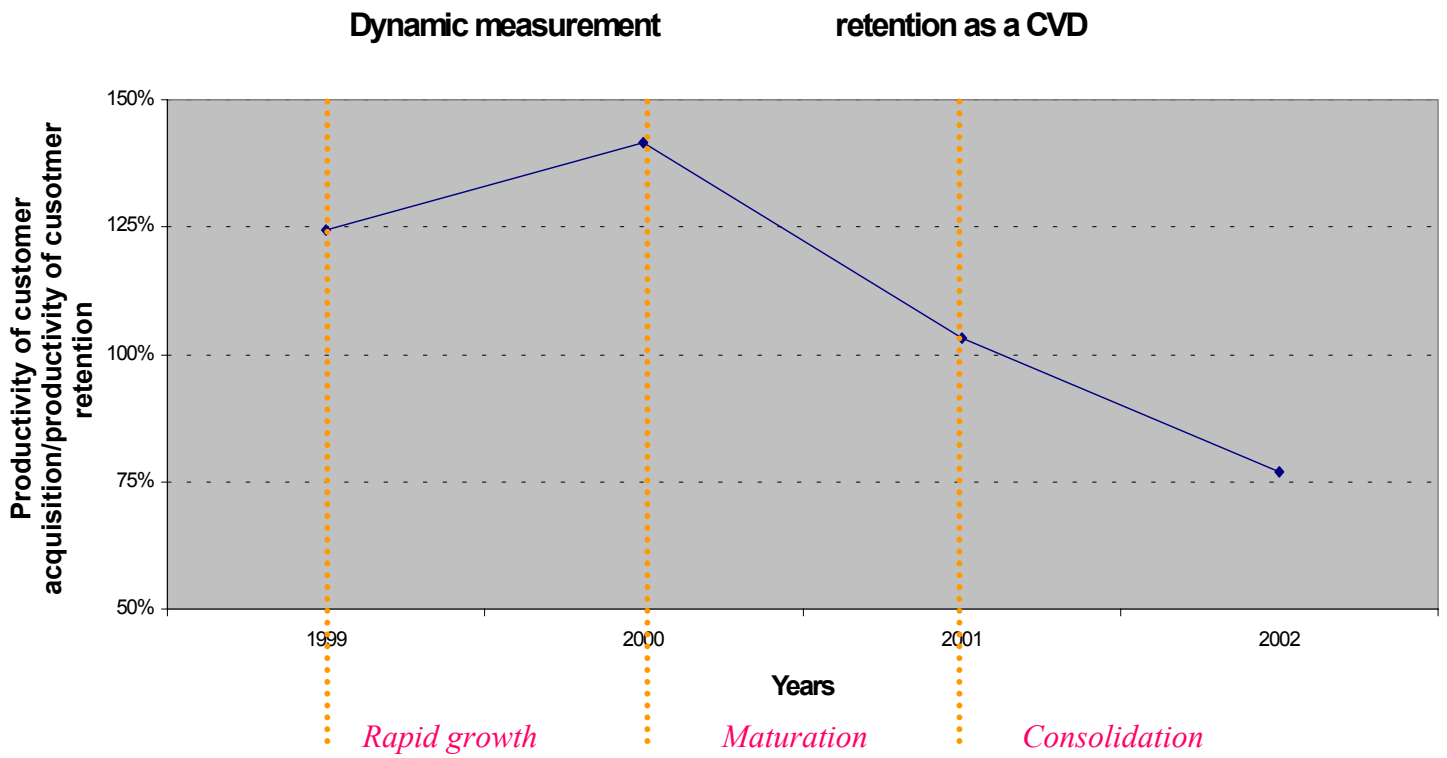
Findings from the System Dynamics model: After 2000 initiative aimed at improve customer retention rates become increasingly important