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A System Dynamics Approach to value-based Complaint management including repurchase behavior and word of mouth

by

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A SYSTEM DYNAMICS APPROACH TO VALUE-BASED COMPLAINT MANAGEMENT INCLUDING REPURCHASE BEHAVIOR AND WORD OF MOUTH

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Abstract

Although the importance of complaint management for the success of companies is acknowledged, it is little noticed in comparison to other issues of customer relationship management. In literature on complaint management we barely find concrete approaches that focus on a sustainable increase of shareholder value as well as on dynamic effects like e. g. repurchase behavior and word of mouth. By the growth of online social networks along with the evolution of Web 2.0 technologies, the importance of these effects on value-based management is increasing. As a consequence, there is a lack of well-founded decision making on how to allocate resources for complaint processing in business practice. This paper contributes to embedding the concept of value-based management in the field of complaint management particularly by considering the dynamic effects of repurchase behavior and word of mouth. It is based on a design research approach where the artifact is a basic system dynamics simulation model which was prototypically implemented. The results of the paper show how customer equity – as a measure for shareholder value – is influenced by dynamic effects. The model is meant to be adapted to different company- or industry-specific environments.

Keywords: complaint management, system dynamics, word of mouth, management support systems, customer equity, design research.

1 MOTIVATION AND OBJECTIVE OF RESEARCH

Although it is common knowledge that retaining existing customers causes less effort than acquiring new ones (e. g. Mittal et al. 2001), there are only few contributions on value-based complaint management.

A closer look at the “black box” of complaint management reveals that we have to deal with a complex system consisting of elements which have positive as well as negative effects on shareholder value. Moreover, characteristics of this system are several dynamic effects and feedback loops. For example, customers being satisfied with the complaint process will more likely repurchase. Additionally, they will spread positive word of mouth (WOM) (Maxham 2001). As a result, a certain fraction of potential customers causes an increase in the number of new customers. In the following periods some of these new customers complain, are satisfied, repurchase, spread positive WOM themselves, generate new customers, and so on. Of course, in the case of insufficient products or services this works vice versa: Dissatisfied customers rather defect from the organization and tend to vent their anger more intensively than satisfied people who communicate their positive experiences (Halstead 2002). Hence, their WOM may have an even higher negative impact on shareholder value.

Furthermore, a motivation to intensify research in this field arises from several current technological developments. By the evolution of Web 2.0 – in particular online social networks (OSN) – the impact of WOM effects increases and firms might have more possibilities to monitor and control these effects (Brown et al. 2007). So far, we barely find applications of this technology with significant impact on shareholder value. Complaint management might be such a field of application. Thus, the following general research questions arise: How should the limited resources for complaint management be used for different targeted customer segments in order to maximize shareholder value considering dynamic effects? How much should be spent on complaint solutions for particular customers? What are “limits to growth”?

The work that has already been undertaken investigating the effects of complaint management on shareholder value encounters difficulties because of the dynamic problem characteristics described above. Therefore, it seems to be promising to use system dynamics (SD) simulations as methodology to gain more advanced insights. Literature shows that this approach is appropriate to analyze time-continuous, long-term, and aggregated characteristics of the model behavior being used in this context (Sterman 2000).

Thus, in order to find substantiated answers to the general questions on resource allocation from above, the key objective of this paper is to develop a basic SD model for value-based decision making in complaint management considering repurchase behavior and WOM effects (with respect to the development of OSN). Our hypothesis is that taking into account WOM effects causes a higher shareholder value than typical decision rules in business practice. Detailed research questions deduced from this objective are: *1) How can the influence of expenditures for complaint management on shareholder value be modeled? 2) What are typical simulation scenarios to analyze the repurchase behavior and the WOM effects of satisfied and dissatisfied complainants? 3) How can threshold values be determined?*

The paper relies on a design-oriented, formal, and deductive approach (Hevner et al. 2004). Section 2 environs the core research objectives, compares existing approaches, and identifies the research gap. Section 3 proposes the SD model as artifact. Section 4 evaluates the results of the simulation for a sample case. Section 5 summarizes the insights and points out future research.

2 RELATED WORK

2.1 Customer lifetime value and customer equity as metrics for value-based management

The comprehensive discussion about value-based management in the last years led to an increasing need for future- and customer-oriented key measures since customer relations are critical value drivers (Hogan et al. 2002, Kumar et al. 2007). Key metrics in this area are customer lifetime value (CLV) and customer equity (CE). Literature offers a quite consistent definition. For example, Gupta et al. (2003) define CLV as “the present value of all future profits generated from a customer”. Nevertheless, we often find several synonyms for this metric, like lifetime value, customer profitability, customer valuation, customer relationship value or customer lifetime profits (e. g. Borle et al. 2008, Kumar et al. 2007). As CLV focuses on the valuation of a single customer relationship, CE aims at calculating the value potential of the whole customer base. Rust et al. (2004) define it as “the total of the discounted lifetime values summed over all of the firm’s current and potential customers”. So, CE may be regarded as an aggregated CLV.

In literature we find several calculation methods for CLV and CE. They all base upon discounted cash flows. One of the most significant differences arises from economic assumptions about the customers, e. g. “lost for good” customers, which cover their whole demand with one supplier, and “always a share” customers, which buy at different vendors. For the first category customer retention models are suitable, for the second category we find customer migration models (e. g. Dwyer 1997). In our paper we focus on “always a share” customers. We could hardly find any models considering dynamic effects. One is proposed by Netzer et al. (2008). Based on a hidden Markov model, the authors represent the dynamics of customer relations. The model differentiates several relationship states from “very strong” to “very weak”, but there is no deeper insight into the underlying concepts and attitudes, as the authors note self-critical. Moreover, Burmann (2003) investigates the suitability of different CE concepts as measure for value-based management. He differentiates three categories: black box, behavioral, and hybrid models. Especially hybrid models turn out to be an excellent measure in certain markets since they analyze customer relations based on periodical contracts and historical shopping behavior data. Due to these findings, we focus on CE as an adequate measure, referring to an industry where these prerequisites are fulfilled, e. g. the telecommunications or insurance industries.

2.2 Complaint management

The general goal of complaint management is to increase “the profitability and competitiveness of the organization by restoring customer satisfaction, minimizing the negative effects of customer dissatisfaction on the organization, and using the indications of operational weaknesses and of market opportunities that are contained in complaints” (Stauss et al. 2004). Moreover, Fornell et al. (1987) define complaint management as defensive marketing strategy which strives for the goal “to minimize customer turnover (or, equivalently, to maximize customer retention) by protecting products and markets from competitive inroads”. Therefore, complaint management primarily aims at transforming dissatisfied into satisfied customers. This, in turn, contributes to the objective of value-based management by stabilizing endangered customer relationships and thus retaining valuable customers (Anderson et al. 1994).

According to the research question mentioned above, we concentrate on the repurchase behavior of complainants at first: For example, Johnston (2001) shows that these direct effects of complaint management activities lead to increased profits. This is confirmed by Davidow et al. (1998) substantiating that complainants being satisfied with the complaint solution are characterized by a higher repurchase rate. However, inappropriate complaint management will lead to dissatisfied complainants who defect to competitors and thus reduce CE (e. g. Walsh et al. 2006) and the firm’s future cash flows (Luo 2009). Then, we examine what indirect effects satisfied and dissatisfied complainants create on existing and potential customers through positive and negative WOM (e. g. Davidow 2003). Swanson et al. (2001) investigate these effects analyzing satisfied complainants who have a strong propensity to

spread positive WOM. Though, dissatisfied complainants more likely tend to share their negative experiences with others than satisfied complainants (e. g. Halstead 2002).

2.3 System Dynamics

Based on system theory, SD is able to comprehensively identify, analyze, and simulate complex causal structures of managerial systems – like complaint management – for the “design of improved organizational form and guiding policy” (Forrester 1969, Forrester 1971). According to Morecroft et al. (1994), the application of SD models often results in revisions and adaptations of decision rules and learning effects in terms of future decision making. These enhancements are based on the integration of time delays, nonlinearities, and non-intuitive feedback loops (e. g. Sterman 2000, Wolstenholme 2003). Sterman (2000) confirms that the most complex behaviors usually “arise from the interactions (feedbacks) among the components of the system, not from the complexity of the components themselves”.

Although there are many papers in complaint management literature that investigate dynamic effects, we barely find papers referring to the SD methodology in this context in order to integrate feedback loops and nonlinearities. For example, Liu et al. (2006) provide an SD model investigating the effects of complaint management in a national mobile market. Even though this paper conducts an empirical study to evaluate the simulation results, the authors take an aggregated position: They neither distinguish between different customer groups nor integrate dynamic WOM effects. Furthermore, the financial perspective is neglected.

Since SD strives for the goal of qualitative description and exploration as well as quantitative simulation and analysis for the design of complex system structure and behavior (Sterman 2000), this approach is suitable for investigating complaint management in terms of repurchase behavior as well as WOM effects.

3 SYSTEM DYNAMICS MODEL

3.1 Scope and limitations

The proposed SD model aims at improving decision making in the area of value-based complaint management. Our objective is the optimal resource allocation in order to achieve the maximum contribution to the key measure CE mentioned above. This paper does not deal with the question of how to organize other fields of customer relationship management. We assume that there is already a general resource allocation between the several fields of customer relationship management.

The results show that – compared to heuristic decision rules – considering dynamic effects leads to different optimal budget allocations in order to maximize CE and therefore shareholder value (see section 4). The optimal allocation in a specific case depends on several factors explicated in the model. Some of them are assumptions to reduce complexity so that it is possible to present the model within the restrictions of this paper. Of course, these limitations need to be relaxed in future work. Other assumptions concern the values of input parameters for the simulation. They are necessary because we do not an empirical study for one case, but propose a general model possibly being used for several industries and company types. In section 3.2, we first present a core SD model only considering direct repurchase behavior effects of complainants. In section 3.3, we extend this model by including indirect WOM effects.

3.2 An SD model for complaint management excluding WOM effects (core model)

At his point, we introduce the assumptions for reducing complexity of our core model only considering repurchase behavior of customers and complainants.

- (A-1) The firm (F) offers one type of product (PT) in form of periodical service contracts for a premium standard rate sr_A as well as for a low-budget standard rate sr_B , with $sr_A > sr_B$ and $sr_A, sr_B \in [0; \infty[$.
- (A-2) The customers of F can be unambiguously allocated to one of the two customer groups A or B. A-customers only purchase PT for sr_A . B-customers only purchase PT for sr_B . A-customers have higher expectations than B-customers and react more sensible on problems with PT. This effect is indicated by the retention parameter γ , with $\gamma_A > \gamma_B$, and $\gamma_A, \gamma_B \in [0; 1]$.
- (A-3) The total number of customers in the market c for PT is the sum of existing customers ec of F and potential customers pc in the market. Variable c remains constant for the entire simulation. Due to this distinction and the different customer groups from assumption (A-2), there are four categories of customers: existing A-customers ec_A , existing B-customers ec_B , potential A-customers pc_A , and potential B-customers pc_B (where $ec_A, ec_B, pc_A, pc_B \in [0; \infty[$ and $ec_A + ec_B + pc_A + pc_B = c$).
- (A-4) If ec are dissatisfied, they will articulate one complaint per period to F. This is represented by the number of incoming complaints ic ($ic_A, ic_B \in [0; \infty[$) and the complaint rate cr . According to Reinartz et al. (2000), we assume $cr_A > cr_B$ (where $cr_A, cr_B \in [0; 1]$). Dissatisfied customers who do not complain directly to F are neglected.
- (A-5) In order to transform dissatisfied into satisfied customers, decision makers receive a budget for complaint management bcm_{total} ($bcm_{total} \in [0; \infty[$) as a share of the revenue of the company of the last period which is set fixed for the simulation: rc is the sum of the revenues gained by A- customers rc_A and B-customers rc_B (where $rc_A, rc_B \in [0; \infty[$). The decision makers have to allocate bcm_{total} for (the monetary equivalent of) complaint solutions cs to the different customer groups ($cs_A, cs_B \in [0; \infty[$). In every period, bcm_{total} will be disposed completely.
- (A-6) All complainants receive cs , i. e. that no complaint will be ignored. Each complainant obtains the same cs as other members of this customer group; differences only occur between the customer groups (i. e. $cs_A \neq cs_B$). In general, if $cs \geq sr$, the complainants will be totally satisfied. In this case, complainants will repurchase PT in the next period with a retention rate rr of 100% ($rr_A, rr_B \in [0; 1]$). If $cs < sr$, only a certain fraction of the complainants will repurchase PT in the following period. As mentioned above, we assume that A-customers have higher expectations as B-customers due to $sr_A > sr_B$. Thus, we reason that a relatively higher investment in cs_A is necessary than in cs_B to reach a certain rr_A . This interrelation is exemplarily demonstrated by the functions illustrated in Figure 1.

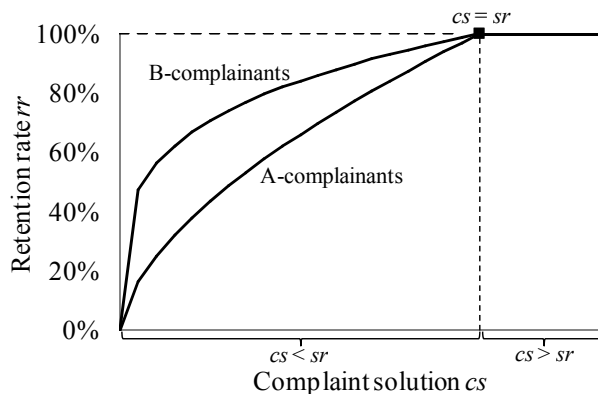


Figure 1. Interrelation between cs and rr

In order to conduct the simulation, Table 1 determines sample input parameters differing in values for A- and B-customers. The concrete parameter values can be obtained by internal business intelligence

and data warehouse solutions as well as by market research. It is not scope of our paper to investigate the values of these parameters. Our scope is to develop a more sophisticated methodology for decision making in complaint management. Nevertheless, these input parameters as far as possible refer to studies on complaint management and repurchase behavior.

Besides the variables from above, $prpm$ represents the purchase rate of potential customers through marketing efforts of F and $rrem$ is the retention rate of existing customers despite marketing efforts of competitors ($prpm, rrem \in [0;1]$). For the determination of the net present values npv ($npv \in]-\infty;\infty[$), we need input parameter values for other expenses (production, sales etc.) for customers oec ($oec \in [0;\infty[$) and for the discount rate d ($d \in [0;1]$). The number of simulation periods is set to 12 in order to obtain long-term results including the development of customers and complainants.

Input parameter [unit]	A-cust.	B-cust.	Substantiation
premium standard rate sr [EUR]	25	10	own assumption
existing customers ec [#]	600	1,400	own assumption: we defined a 0.3 to 0.7 ratio for A- to B-customers
potential customers pc [#]	2,400	5,600	
complaint rate cr [%]	0.4	0.2	according to Stauss et al. (2004) and Goodman et al. (2000)
retention parameter γ [%]	0.4	0.1	according to Reinartz et al. (2000)
purchase rate of potential customers through marketing efforts of the firm $prpm$ [%]	0.2	0.2	own assumption
retention rate of existing customers despite marketing efforts of competitors $rrem$ [%]	0.8	0.8	according to Gupta et al. (2003)
other expenses (production, sales etc.) for customers oec [EUR]	10	5	own assumption
discount rate d [%]	0.1	0.1	according to Gupta et al. (2003)

Table 1. Sample input parameter values for SD model simulation (core model)

We generated the SD model following the methodology of Sterman (2000). It contains the steps problem articulation, formulation of dynamic hypotheses, formulation of simulation model, testing, as well as policy design and evaluation. This seemed to be suitable because of the comprehensive application, the iterative procedure, and the high level of awareness in SD literature. Since it would be too extensive to present all intermediate results of the modeling process (e. g. causal loop model), we focus on the stock and flow model (see Figure 2). Due to space restrictions, we present the model structure for A-customers. All calculations also apply for B-customers replacing the A-index with B, just with different values of the parameters.

In Figure 2, the variables in angle brackets ($\langle \rangle$) represent so called shadow variables indicating that they also exist “somewhere else” in the model with the same value. They are used to improve readability.

The starting point is ec_A . Modeled as a stock, there is a kind of “natural” fluctuation which is typical for “always a share” customers. That means that there is a certain inflow in_A caused by marketing efforts of F $ame_A (= pc_A * prpm_A)$ and a certain outflow out_A caused by marketing efforts of competitors $lme_A (= (ec_A - ic_A) * rrem_A)$. As the focus of our paper is to investigate the effects of complaint management, we modeled the outflow of A-complainants $outc_A$ as an own variable. It depends on ic_A and rr_A which, in turn, depends on cs_A, sr_A , and γ_A . The budget allocation rate bar_A represents the fraction of bcm_{total} that is available for all cs_A ($bar_A \in [0;1]$). To illustrate the repurchase behavior of A-complainants, we define:

$$rr_A = MIN \left(\left(\frac{cs_A}{sr_A} \right)^{\gamma_A}, 1 \right). \quad (1)$$

According to assumption (A-6), the term $\left(\frac{cs_A}{sr_A}\right)^{\gamma_A}$ implies the concave course of the repurchase behavior of A-complainants. The minimum function was chosen for the following reason: If $cs_A > sr_A$, this would not change the effect that all A-complainants are totally satisfied and repurchase PT in the next period (i. e. $rr_A = 1$).

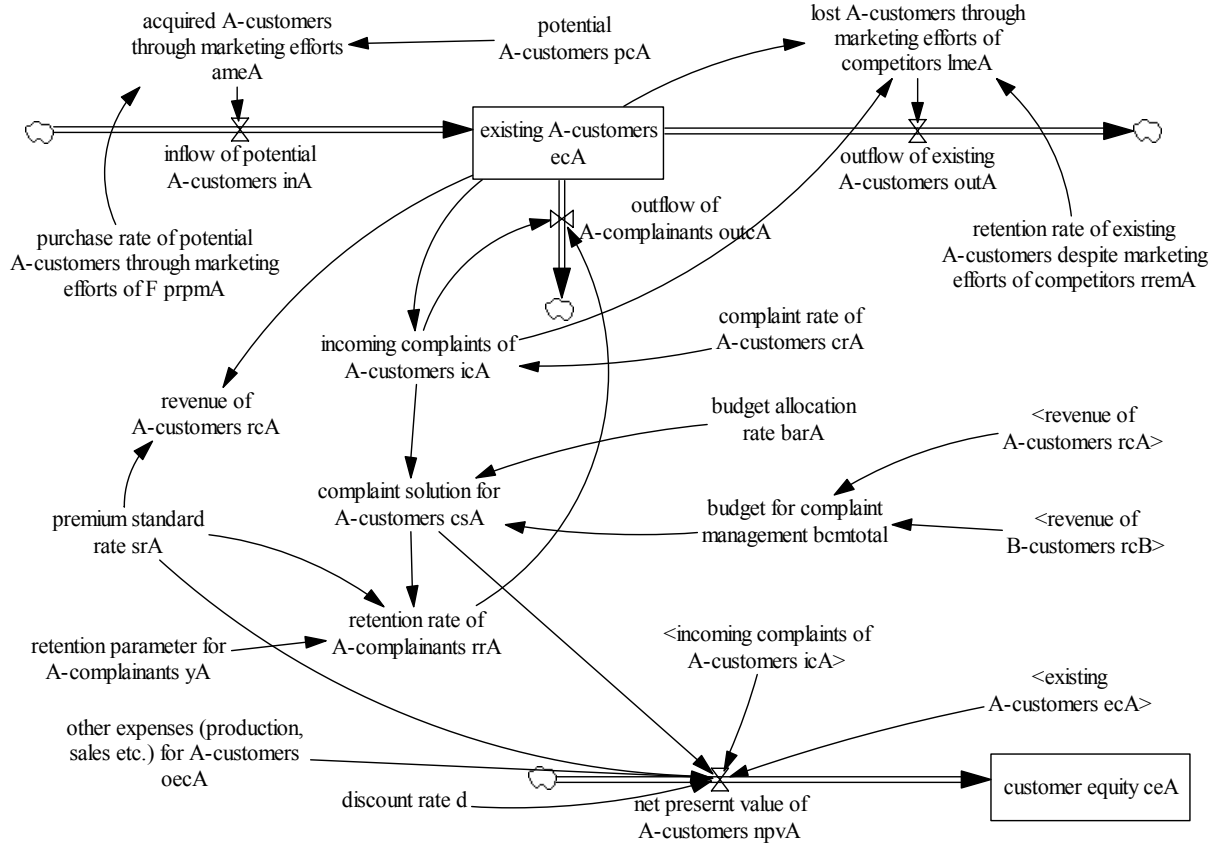


Figure 2. SD model for A-customers excluding WOM effects – core model (extract)

Having determined rr_A , we obtain the customer equity ce_A (i. e. the cumulated discounted npv_A over the entire simulation) for A-customers, where t includes is the current simulation time:

$$ce_A = \sum_{t=1}^T npv_A = \sum_{t=1}^T \frac{ec_A(t) * (sr_A(t) - oec_A(t)) - (ic_A(t) * cs_A(t))}{(1+d)^t}. \quad (2)$$

3.3 An SD model for complaint management including WOM effects (extended model)

In equation (2) we explicated the direct complaint management effect by $ic_A * cs_A$. As mentioned in section 1, particularly influenced by the development of OSN, the impact of WOM on CE may increase for certain company types. Therefore, we extend the core model now including WOM effects, which may also be regarded as indirect effects of complaint management. At last, WOM only changes ec_A . Hence, the calculation of CE remains the same in the extended model. However, we will investigate the different calculations of in_A and out_A of ec_A in more detail. According to section 3.2, we will explain the model referring only to A-customers, as the model structure for B-customers is the same.

The above mentioned assumptions (A-1) to (A-6) also apply for this model investigating repurchase behavior as well as WOM effects for customers and complainants and, for this purpose, are extended as follows:

- (A-7) Only complainants spread WOM to existing and potential customers. Complainants do not spread WOM to other complainants. These assumptions are necessary in order to understand the specific indirect effects of complainants to other customers at first.
- (A-8) Positive and negative WOM effects will only take place within one customer group. This means that existing and potential B-customers will not be influenced by inter-group WOM effects of A-complainants and that existing and potential A-customers will not be influenced by inter-group WOM effects of B-complainants respectively.
- (A-9) Negative WOM has a stronger impact than positive WOM (e. g. Mukherjee et al. 2001). This means that A-customers who receive both positive and negative WOM messages will act disadvantageously (i. e. they cannot be acquired or defect from F).

Compared to section 3.2, the simulation model requires additional input parameters incorporating positive and negative WOM effects: First, for the WOM effects on pc the following variables are necessary: the average number of potential customers with negative WOM messages $apnw$, the purchase rate of potential customers despite negative WOM effects $prpn$, the average number of potential customers with positive WOM messages $appw$, the purchase rate of potential customers through positive WOM effects $prpp$, and the purchase rate of potential customers through marketing efforts of F $prpm$ (where $apnw, appw \in [0; \infty[$ and $prpn, prpp, prpm \in [0; 1]$).

On the other hand, the WOM effects on ec are represented by the following variables: the average number of existing customers with negative WOM messages $aenw$, the retention rate of existing customers despite negative WOM effects $rren$, the average number of existing customers with positive WOM messages $aepw$, the retention rate of existing customers through positive WOM effects $rrep$, and the retention rate of existing customers despite marketing efforts of competitors $rrem$ (where $aenw, aepw \in [0; \infty[$ and $rren, rrep, rrem \in [0; 1]$).

For an easier unbiased comparison of the WOM effects, we set the input parameter values for A- and B-customers equal (see Table 2).

Input parameter [unit]	A- and B-cust.	Substantiation
<i>average number of potential customers with negative WOM messages $apnw$ [#]</i>	5	according to Goodman et al. (2000)
<i>the purchase rate of potential customers despite negative WOM effects $prpn$ [%]</i>	0.01	own assumption
<i>average number of potential customers with positive WOM messages $appw$ [#]</i>	3	according to Goodman et al. (2000)
<i>purchase rate of potential customers through positive WOM effects $prpp$ [%]</i>	0.5	own assumption
<i>purchase rate of potential customers through marketing efforts of F $prpm$ [%]</i>	0.2	own assumption
<i>average number of existing customers with negative WOM messages $aenw$ [#]</i>	4	according to Goodman et al. (2000)
<i>retention rate of existing customers despite negative WOM effects $rren$ [%]</i>	0.01	own assumption
<i>average number of existing customers with positive WOM messages $aepw$ [#]</i>	2	according to Goodman et al. (2000)
<i>the retention rate of existing customers through positive WOM effects $rrep$ [%]</i>	0.99	own assumption
<i>retention rate of existing customers despite marketing efforts of competitors $rrem$ [%]</i>	0.8	own assumption

Table 2. Sample input parameter values for SD model simulation (extended model)

In Figure 3 the additional variables compared to the core model in section 3.2 are bold typed. Since the input parameters (see Table 2) are only used for calculations, they are not visualized in the model in

order to maintain readability. However, as mentioned above, in the extended model we concentrate on the different calculations of the flow variables in_A and out_A in more detail.

The effects of WOM on the inflow in_A are as follows:

$$in_A = anw_A + apw_A + ame_A. \quad (3)$$

Variable anw_A indicates the acquired A-customers despite negative WOM:

$$anw_A = MIN(pc_A, (1 - rr_A) * ic_A * apnw_A) * prpn_A. \quad (4)$$

The minimum function is used to ensure that the number of potential A-customers influenced by negative WOM messages does not exceed pc_A . The multiplication $(1 - rr_A) * ic_A * apnw_A$ results in the number of pc_A contacted by dissatisfied complainants with negative WOM messages who turn into ec_A with $prpn_A$.

Having considered the negative WOM effects, satisfied complainants could reach the maximum capacity of $pc_A - anw_A$ potential customers. The multiplication $rr_A * ic_A * appw_A$ yields the number of pc_A who have been contacted by positive WOM messages. They will become existing A-customers with $prpp_A$. This results in the acquired A-customers through positive WOM effects apw_A :

$$apw_A = MIN(pc_A - anw_A, rr_A * ic_A * appw_A) * prpp_A. \quad (5)$$

Finally, there are potential A-customers ame_A who have neither been contacted by dissatisfied nor by satisfied A-complainants. These customers only base their purchasing decisions upon marketing efforts of F. We assume that ame_A will become existing A-customers of F with $prpm_A$. Although ame_A has the same meaning as in the core model, it is calculated differently because of the additional WOM effects:

$$ame_A = (pc_A - anw_A - apw_A) * prpm_A. \quad (6)$$

On the other hand, the effects of WOM on out_A are calculated as:

$$out_A = lnw_A + lpw_A + lme_A. \quad (7)$$

Here, variable lnw_A indicates the lost customers through negative WOM:

$$lnw_A = MIN(ec_A - ic_A, (1 - rr_A) * ic_A * aemw_A) * rren_A. \quad (8)$$

The minimum function is used to ensure that the number of existing A-customers contacted by A-complainants does not exceed $ec_A - ic_A$ customers. The multiplication $(1 - rr_A) * ic_A * aemw_A$ results in the number of existing A-customers who received negative WOM messages and will remain customers with $rren_A$.

Having considered the negative WOM effects, satisfied A-complainants could reach $ec_A - ic_A - lnw_A$ customers with positive WOM messages. The product $rr_A * ic_A * aepw_A$ (or $ec_A - ic_A - lnw_A$ respectively) multiplied by $rrep_A$ represents the number of lost A-customers despite positive WOM effects lpw_A :

$$lpw_A = MIN(ec_A - ic_A - lnw_A, rr_A * ic_A * aepw_A) * rrep_A. \quad (9)$$

Finally, ec_A who neither have been contacted by dissatisfied nor satisfied A-complainants through WOM will remain existing A-customers of F with $rrem_A$:

$$lme_A = (ec_A - ic_A - lnw_A - lpw_A) * rrem_A. \quad (10)$$

As WOM in our model at last only influencees ec_A , the calculation of CE (see equation (2)) remains the same. Whether WOM increases or reduces ec_A depends on the company-specific simulation parameters. Therefore, in the following section 4 we simulated different scenarios.

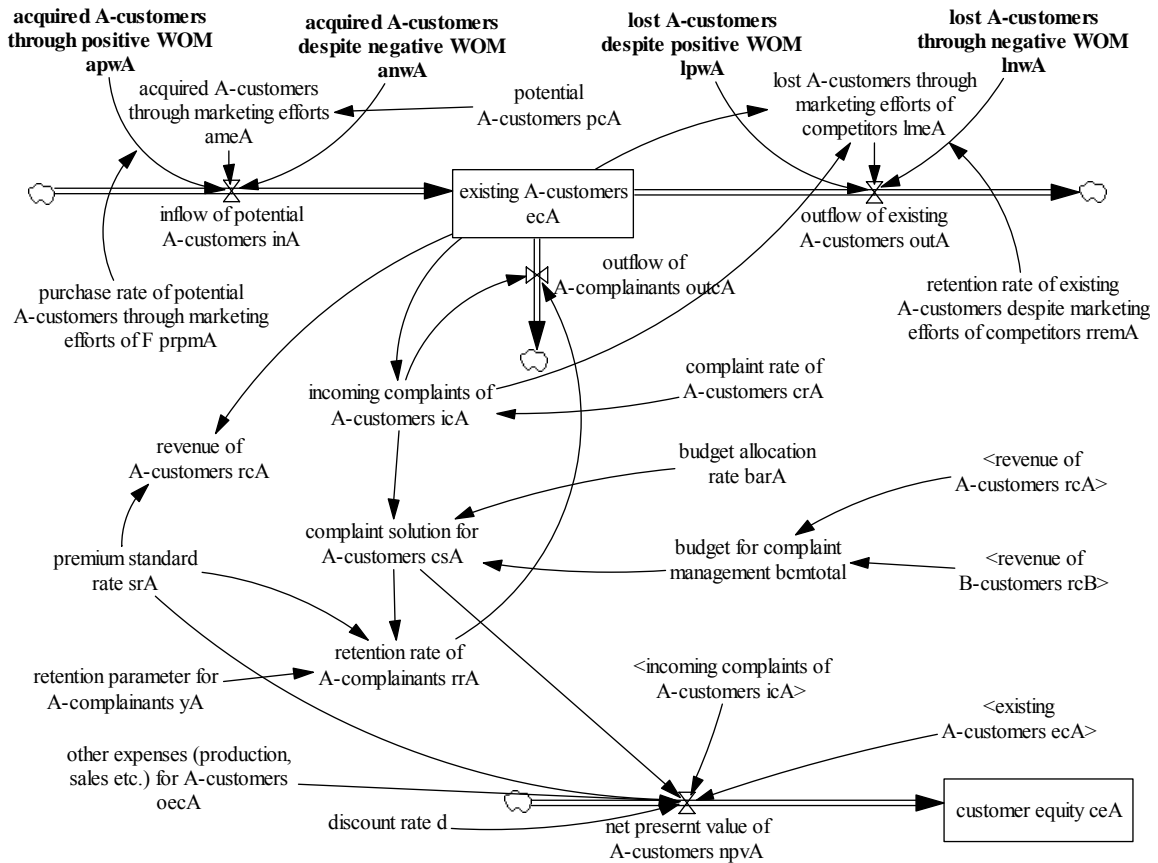


Figure 3. SD model for A-customers including WOM effects – extended model (extract)

4 RESULTS

As discussed at the beginning of this paper, the objective was to develop a general methodology that supports decision makers in complaint management to allocate resources in a way that CE is maximized. Hence, in a sample case, we simulated the impact of different budget allocation rates bar_A on CE after 12 periods. We analyzed scenarios excluding as well as including WOM. The results are illustrated in Figure 4a and Figure 4b and will be discussed in the following.

In business practice, complainants are often not treated differently according to their customer group. This would mean that the bar_A equals the proportion of ic_A / ic_B . In the sample case, this leads to a bar_A of 30% and a CE of 50,625 EUR. As Figure 4a shows, this typical decision policy leads to suboptimal results as the maximum CE of 63,817 EUR is reached at a bar_A of 85%. This means that in our example the company should invest disproportionately high in A-customers. Moreover, we simulated scenarios with stronger WOM effects. They might become more and more realistic in the future because of fast growing OSN, where members evaluate products as well as services and thus can spread comparatively more WOM messages. Therefore, we changed the WOM parameters as follows: First, according to Dellarocas (2003), we determined a five times higher $apnw$ and $aenw$ to illustrate the hazards through increased negative WOM. In this case, we receive a maximum CE of only 15,889 EUR at a bar_A of 25%. On the other hand, we set a five times higher $appw$ and $aepw$ indicating the positive effects of WOM through OSN. Here we obtain a maximum CE of 130,420 EUR at a bar_A of 85%.

As the results in Figure 4b show, strong positive WOM leads to higher CE and a higher investment in A-customers. On the other hand, strong negative WOM causes a drop of CE – as expected. However, interestingly in this case, the company should focus more on the low-budget B-customers in complaint management in order to reach the maximum CE in this specific scenario. A reason might be that the WOM effects of the higher number of B-customers dominate the regular higher cash inflows of A-

customers. Of course, with different company-specific parameter values which can be gained by internal reporting and external market research, the results might be different. Though, this example case proves that the above mentioned dynamic effects might have a significant impact on the optimal bar_A and the shareholder value.

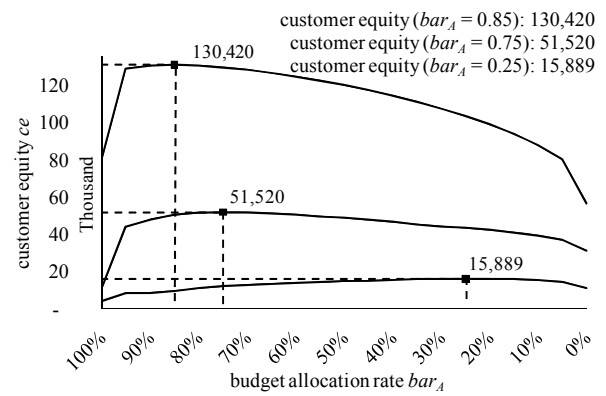
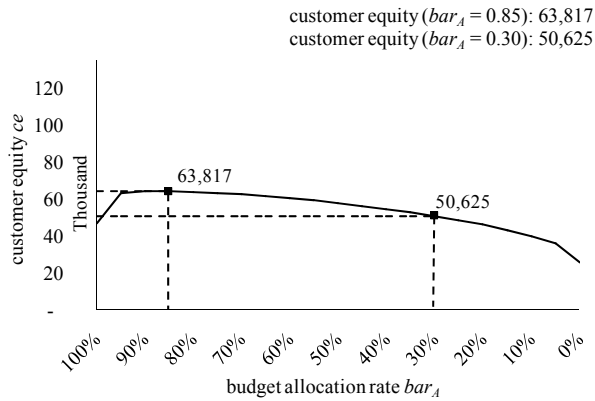


Figure 4a. Scenario 1 - CE excluding WOM Figure 4b. Scenario 2 - CE including WOM

5 CONCLUSION AND FUTURE WORK

The primary objective of this paper was to develop an SD model for decision making in complaint management including dynamic repurchase behavior and WOM effects. The simulation results indicated that there are constellations where a budget allocation leads to a maximum CE – and therefore a maximum contribution to shareholder value – which cannot be achieved by simple decision rules or, as often done in business practice, by intuition.

Admittedly, this research entails problems: First, we concentrate on two groups of customers only in order to demonstrate the general application of this model in business practice. However, more customer groups could be considered in the SD model by duplicating the calculation for A-customers for other customer groups. Second, even though we used findings in literature to approximate the system behavior, empirical evidence is missing. Therefore, it would be insightful and strengthen evaluation to conduct own additional studies. Nevertheless, the proposed model is a first step towards a more sophisticated decision making in complaint management and will be subject in future research.

References

- Anderson, E., Fornell, C. and Lehmann, D. (1994). Customer Satisfaction, Market Share, and Profitability: Findings from Sweden. *Journal of Marketing*, 58 (3), 53-66.
- Borle, S., Singh, S. and Jain, D. (2008). Customer Lifetime Value Measurement. *Management Science*, 54 (1), 100-112.
- Brown, J., Broderick, A. and Lee, N. (2007). Word of Mouth Communication within Online Communities: Conceptualizing the Online Social Network. *Journal of Interactive Marketing*, 21 (3), 2-20.
- Burmann, C. (2003). „Customer Equity“ als Steuerungsgröße für die Unternehmensführung. *Zeitschrift für Betriebswirtschaft*, 73 (2), 113-138.
- Davidow, M. and Leigh, J.H. (1998). The Effects of Organizational Complaint Responses on Consumer Satisfaction, Word of Mouth Activity and Repurchase Intentions. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior*, 11, 91-102.
- Davidow, M. (2003). Have You Heard the Word? The Effect of Word of Mouth on Perceived Justice, Satisfaction and Repurchase Intentions Following Complaint Handling. *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior*, 16, 67-80.
- Dellarocas, C. (2003). The Digitization of Word-of-Mouth: Promise and Challenges of Online Reputation Mechanisms. *Management Science*, 49 (10), 1407-1424.

- Dwyer, F.R. (1997). Customer Lifetime Valuation to Support Marketing Decision Making. *Journal of Direct Marketing*, 11 (4), 6-13.
- Fornell, C. and Wernerfelt, B. (1987). Defensive Marketing Strategy by Customer Complaint Management: A Theoretical Analysis. *Journal of Marketing Research*, 24 (4), 337-346.
- Forrester, J.W. (1969). *Industrial Dynamics*. 6th Edition. MIT Press, Cambridge.
- Forrester, J.W. (1971). *Principles of Systems*. 2nd Edition. Wright-Allen, Cambridge.
- Goodman, J., O'Brien, P. and Segal, E. (2000). Turning CFOs into Quality Champions. *Quality Progress*, 33 (3), 47-54.
- Gupta, S. and Lehmann, D. (2003). Customers as Assets. *Journal of Interactive Marketing*, 17 (1), 9-24.
- Halstead, D. (2002). Negative Word of Mouth: Substitute for or Supplement to Consumer Complaints? *Journal of Consumer Satisfaction, Dissatisfaction and Complaining Behavior*, 15, 1-12.
- Hevner, A.R., March, S.T., Park, J. and Ram, S. (2004). Design Science in Information Systems Research. *MIS Quarterly*, 28 (1), 75-105.
- Hogan, J.E., Lemon, K.N. and Rust, R.T. (2002). Customer Equity Management: Charting New Directions for the Future of Marketing. *Journal of Service Research*, 5 (1), 4-12.
- Johnston, R. (2001). Linking Complaint Management to Profit. *International Journal of Service Industry Management*, 12 (1), 60-69.
- Kumar, V. and George, M. (2007). Measuring and Maximizing Customer Equity: A Critical Analysis. *Journal of the Academy of Marketing Science*, 35 (2), 157-171.
- Liu, J.L., Kang J., Bai, Y. and Zhang, X. (2006). The Study of Customer Complaints Management Based on System Dynamics: Modeling and Simulation. In *Proceedings of the Fifth International Conference on Machine Learning and Cybernetics*, p. 2040, China, Dalian.
- Luo, X. (2009). Quantifying the long-term impact of negative word of mouth on cash flows and stock prices. *Marketing Science*, 28 (1), 148-165.
- Maxham, J.G. (2001). Service Recovery's Influence on Consumer Satisfaction, Positive Word-of-Mouth, and Purchase Intentions. *Journal of Business Research*, 54 (1), 11-24.
- Mittal, V. and Kamakura, W. (2001). Satisfaction, Repurchase Intent, and Repurchase Behavior: Investigating the Moderating Effects of Customer Characteristics. *Journal of Marketing Research*, 38 (1), 131-142.
- Morecroft, J.D.W. and Sterman, J.D. (1994). *Modelling for Learning Organizations*. 1st Edition. Productivity Press, New York.
- Mukherjee, A. and Hoyer, W.D. (2001). The Effect of Novel Attributes on Product Evaluation. *Journal of Consumer Research*, 28 (3), 462-472.
- Netzer, O., Lattin, J. and Srinivasan, V.S. (2008). A Hidden Markov Model of Customer Relationship Dynamics. *Marketing Science*, 27 (2), 185-204.
- Reinartz, W. and Kumar, V. (2000). On the Profitability of Long-Life Customers in a Noncontractual Setting: An Empirical Investigation and Implications for Marketing. *Journal of Marketing*, 64 (4), 17-35.
- Rust, R.T., Lemon, K.N. and Zeithaml, V.A. (2004). Return on Marketing: Using Customer Equity to Focus Marketing Strategy. *Journal of Marketing*, 68 (1), 109-127.
- Stauss, B. and Seidel W. (2004). *Complaint Management: the Heart of CRM*. 1st Edition. Thompson/South-Western, Ohio.
- Sterman, J.D. (2000). *Business Dynamics – Systems Thinking and Modeling for a Complex World*. 1st Edition. McGraw-Hill/Irwin, Boston.
- Swanson, S.R. and Kelley, S.W. (2001). Service Recovery Attributions and Word-of-Mouth Intentions. *European Journal of Marketing*, 35 (1/2), 194-211.
- Walsh, G., Dinnie, K. and Wiedmann, K.P. (2006). How Do Corporate Reputation and Customer Satisfaction Impact Customer Defection? A Study of Private Energy Customers in Germany. *Journal of Services Marketing*, 20 (6), 412-420.
- Wolstenholme, E.F. (2003). Towards the Definition and Use of a Core Set of Archetypal Structures in System Dynamics. *System Dynamics Review*, 19 (1), 7-26.