Modeling and Analysis of Customer Success Management Operational Workflow

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In this paper, we introduce Customer Success Management (CSM) operations as an area for operations management research and describe the role of Customer Success Management Professionals (CSMPs) within subscription-based businesses. We explain the workflow associated with CSM operations (which contrast sharply with Customer Support/Technical Support operations that are typically modelled as call centers), identify the metrics by which CSM operations are usually evaluated, and highlight some of the challenging dynamics associated with managing these types of operational systems. To address these challenges, we develop a simulation model for CSM operations that can be used to quantify trade-offs associated with different operational decisions and/or planning assumptions. We then illustrate the use of this type of model in a case study based on industry data from an enterprise Software-as-a-Service (SaaS) company's CSM operations.

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I. INTRODUCTION

Customer Success Management (CSM) is a concept that is ubiquitous within subscription-based businesses, particularly within the technology industry. In recent years, several scholars have examined CSM as a customer-facing professional role, as a functional area, and as an organizational philosophy (Hochstein et al. 2023, Hochstein et al. 2020, Mehrotra and Subramanian 2022, Eggert et al. 2020, and Hilton et al. 2020). In this paper, we examine the operations of a CSM team from a service operations management perspective.

Like customer support and technical support (CS/TS) resources, Customer Success Management Professionals (CSMPs) play a post-sales customer-facing role within their organizations. CS/TS operations are usually modeled as call centers and have been studied extensively by operations management researchers (Ibrahim et al. 2016, Aksin et al. 2007, Gans et al. 2003 and references therein).

However, there are several significant differences between CS/TS operations and CSM operations. Most significantly, CS/TS organizations typically operate in a reactive mode with a focus on the short-term resolution of individual issues raised by customers. As a result, the metrics used to evaluate the performance of CS/TS operations typically focus on how quickly and successfully individual customer issues are resolved, and

thus, for a given combination of forecasted call arrivals and staffing levels, queueing models (Green et al. 2001, Ibrahim 2018) or simulation models (Mehrotra and Fama 2003, Saltzman and Mehrotra 2007) can be used to produce system performance estimates for even very granular time increments.

In contrast, CSM teams strive to operate in a proactive manner on an ongoing basis during the life of a customer relationship, typically in the context of subscription-based businesses in which retaining customers is vital to the success of the enterprise. In particular, the work that CSMPs do is driven by a long-term focus on customer value realization, which is understood to be strongly correlated with customer retention (Mehta 2022). As a result, the most important CSM operational metrics are customer retention rates and financial outcomes that can only be observed over a much longer time frame than the duration of any individual customer interaction (Mehrotra and Subramanian 2022).

For this reason, CSM operations are significantly more complex and difficult to manage than traditional CS/TS operations. In particular, CSM operations feature multiple decision variables, significant operational design choices, and randomly varying levels of demand for services, all of which impact the metrics that are used to measure CSM operational performance. As a result, CSM leaders routinely struggle to answer key managerial questions to support critical operational decisions.

In this paper, we present an analytical model designed to enable CSM leaders to make better data-driven operational decisions, specifying model inputs and sources of variability, illustrating system dynamics, and identifying key operational performance metrics. We also present a case study to demonstrate how this model can be utilized to examine operational choices and compare different decisions to improve overall system performance.

This paper makes several important research contributions. First of all, this work represents the first attempt by researchers to examine CSM operations, which today employ over 250,000 CSMPs worldwide (Mehta 2022). Secondly, we provide a model for analyzing CSM operations that takes into account costs, revenues, and randomness. Thirdly, we demonstrate how this type of model can be utilized for operational analysis and decision support. Finally, we suggest several fruitful areas for future research.

The remainder of the paper is organized as follows. In Section 2, we introduce subscription-based businesses and describe the role of CSMPs and CSM teams within those type of businesses. In Section 3, we describe CSM operations in more detail, highlight key system dynamics, present our CSM planning and analysis model, and identify several operational planning questions that such a model can help managers to address. In Section 4, we present a case study of how our model can be used to examine several challenging operational questions. In Section 5, we summarize our findings and offer suggestions for future research. The Appendix provides additional details about the implementation of our discrete event simulation model of CSM operational workflow.

II. INTRODUCTION TO CUSTOMER SUCCESS MANAGEMENT AND CSM TEAMS

In this section, we provide a brief description of subscription-based businesses, illustrate their revenue model, formally articulate the business purpose of Customer Success Management, and introduce the role of Customer Success Management Professionals.

For subscription-based businesses (referred to hereafter for brevity as “vendors”), customers do not purchase its products or services in the sense of a traditional transaction or exchange. Instead, when a vendor acquires a

new customer, the two parties engage in a contract that gives the customer the right to use the vendor's product or service for a specific period of time ("contract period") in exchange for a specific payment. At the end of the contract period, the customer then chooses either to extend its relationship with the vendor by committing to a new contract or to terminate its relationship with the vendor. A customer who commits to a new contract is referred to as a "retained" customer while a customer who terminates its relationship with the vendor is said to have "churned."

We note that a large percentage of subscription-based businesses are Software-as-a-Service (SaaS) vendors. For subscription-based businesses in general and SaaS vendors in particular, there are usually significant costs associated with the sales and marketing efforts required to acquire a new customer (known as "Customer Acquisition Costs") that are often greater than the financial value of the customer's first contract with the vendor. Consequently, after acquiring a new customer, a vendor has a strong economic motivation to retain that customer, and customer churn has a significant negative impact on a vendor's financial performance.

To illustrate this, consider a vendor whose Customer Acquisition Cost is $5,000. The customer pays $2,500 to the vendor as part of their initial contract, and an additional $2,500 for each future annual contract renewal. As shown in Table 1 below, the total revenue received by this vendor from this customer depends on the number of annual contract renewals. Note that a customer who chooses not to renew its contract after the first year causes the vendor to lose money, while a customer who ultimately renews its contract many times produces a very positive net revenue for the vendor.

TABLE 1. SUBSCRIPTION CASH FLOW ILLUSTRATION

# of Customer Renewals	Customer Acquisition Cost	Contract Revenue	Cumulative Net Revenue
0	($5,000)		($5,000)
1		$2,500	($2,500)
2		$2,500	$0
3		$2,500	$2,500
4		$2,500	$5,000
5		$2,500	$7,500
6		$2,500	$10,000
7		$2,500	$12,500
8		$2,500	$15,000
9		$2,500	$17,500
10		$2,500	$20,000

A current customer's future contract decision is strongly correlated with the value that it has received from the vendor's product or service during the term of its current contract. The term "Customer Success Management" refers broadly to the vendor's efforts to enable the customer to capture value from its product or services, and typically includes a variety of efforts across the organization. Through this lens, customers can be viewed as strategic assets that are to be managed with the goal of maximizing their long-term value, which is

dependent on the renewal/churn decisions that customers make at the termination of each contract.

Indeed, because of how important these contract decisions are to a vendor's business success, nearly all subscription-based businesses invest in hiring, training, and employing a team of Customer Success Management Professionals (CSMPs), referred to herein as a "CSM team." Employing a CSM team is a significant financial investment by the vendor, and it is made explicitly for economic reasons. The purpose of a CSM team is to enable the vendor's customers to capture value from their use of the vendor's product or services, which is expected to increase the likelihood that customers renew their contracts with the vendor, leading to revenue in future periods. Thus, a CSM team's performance should be assessed in terms of the overall economic impact associated with its efforts, typically measured in terms of customer retention rates, labor costs, and future customer revenues.

The role of the CSMP is a large and growing professional position within the rapidly expanding world of subscription-based businesses. As mentioned earlier, there are currently over 250,000 CSMPs employed today, and this number continues to grow steadily (Zimbler 2023) with the size of the subscription-based economy, which is projected to reach $1.5 trillion by 2025 (Robinson 2024).

III. CSM OPERATIONS OVERVIEW

3.1. CSM Operations, Performance Metrics, and Model Overview

The operations of a vendor's CSM team can be modelled a queueing system, with the vendor's CSMPs playing the role of servers. However, the workload that these servers face is not characterized by jobs that arrive individually, but rather by a sizeable stream of future activities that arrive with each customer contract (either customers who are new to the vendor or customers who have renewed their contract with the vendor). For each customer contract, the associated CSM activities are intended to be completed in sequence within the customer's contract period (and are referred to herein as the "customer journey"). Activities not completed within the contract period are removed from the queue that the CSM team faces. If a customer renews their contract, a new customer journey is created that is associated with that customer's next contract period.

Each customer contract contributes a set of activities to the overall workload of the vendor's CSM team, with the time required from a CSMP for each of these activities being a random variable. Thus, the utilization of these CSMPs ("servers") is driven by the number of customers that the vendor currently has at any given time, the prescribed set of activities that make up the customer journey ("jobs"), the random time required to complete each of these activities, and the duration of each customer's contract. However, the operational performance of a CSM team is not based directly on traditional queueing metrics such as average waiting time or utilization rate. Instead, a CSM team's performance should be measured and evaluated in terms of several related metrics, all of which are directly connected to financial outcomes.

Customer Retention Rate: For any given time period, the retention rate is defined as the number of customer contracts renewed divided by the number of customer contracts that were completed. This metric, which is a direct output from our simulation model, is also a key driver for several other metrics described below.

CSMP Costs: The primary variable cost associated with a CSM team's operations is labor. The total CSMP cost is equal to the number of CSMPs on staff during each period multiplied by the per period cost of a CSMP. Adding a CSMP to a team increases the operating cost and capacity for the team beginning with the period in which the CSMP is

added. Similarly, if a CSMP leaves the team during a particular period, both the cost and the capacity of the team decrease from that point forward.

Renewal Revenue: This metric is defined as the number of contracts renewed multiplied by the average annual contract value. All other things being equal, Renewal Revenue increases directly with the Customer Retention Rate. However, while labor costs are incurred on a per-period basis, renewal revenues are a lagging metric, in that a customer's decision about contract renewal takes place only at the end of its current contract. The lagging nature of these renewal revenues means that it is important to analyze the system's operations over multiple periods and to explicitly account for the value of customer retention when evaluating operational performance.

Net CSM Financial Contribution: When a customer renews its contract with the vendor, some portion (α) of the financial value of the new contract is credited to the efforts of the CSM team. Thus, in our model, the Net CSM Financial Contribution equals α*Renewal Revenue – CSM Costs, where $0 < \alpha \leq 1$. In practice, the question of how α is determined, i.e., what proportion of Renewal Revenue is credited to the CSM team, depends on organizational dynamics between several functional areas with responsibility for revenue, including marketing, sales, product management, finance, and customer success.

Customer Portfolio Lifetime Value: In the context of subscription-based businesses, an individual customer's lifetime financial value is estimated to be (Annual Contract Value) / (1 – Customer Retention Rate). The concept of Customer Lifetime Value has been the subject of significant academic research (see Castéran et al. 2022 and the many references therein), and our estimate is made using standard practices based on a decaying infinite series model of future customer revenues (for simplicity, we have not included a discount factor on future revenues).

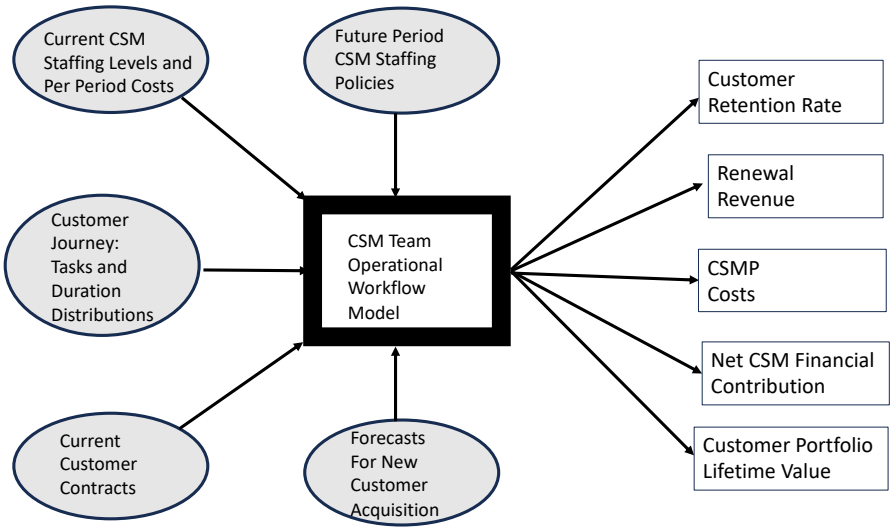

FIGURE 1. CSM OPERATIONAL WORKFLOW MODEL

3.2. System Dynamics

In this section, we describe the system dynamics of a CSM team's operations, with the goal of providing an understanding of the underlying operational complexity as well as some insights into the value of our operational workflow model.

We begin with the assumption that each customer's decision about whether or not to

renew its contract is a random variable whose outcome is partially influenced by the work of a vendor's CSM team. From a business perspective, the underlying hypothesis is that increasing the proportion of the customer journey completed by CSMPs has a quantifiable positive impact on a customer's likelihood of renewing its contract. However, based on the number of CSMPs who are available during a given period, a vendor's CSM team has a fixed amount of time available to work with its customers during that period.

Dynamic #1: Given the variability in the number and duration of tasks and the limited time available, the CSM team will complete some unknown percentage of the tasks associated with a given customer prior to the expiration of the customer's contract.

Dynamic #2: For any given customer the probability of renewing its contract with the vendor increases as a function of the percentage of its prescribed CSMP activities that are completed prior to the expiration of that contract.

New customers can be acquired by the vendor during any time period. However, the actual number of new customers acquired in any given period is a random variable based on a forecast. Likewise, new CSMPs can be hired during any time period, with the number of new CSMs to be added in each period of the planning horizon being a managerial decision.

Dynamic #3: Acquiring new customers comes with additional contract revenue and additional potential from future contract renewals, but also with additional activities to be done by the CSM team.

Dynamic #4: Hiring additional CSMPs increases operational costs but also increases the number of CSM activities that are completed and, therefore, also increases expected customer retention rates and renewal revenue.

3.3. CSM Operational Model Structure

In this section, we provide additional details about the structure our model of a CSM team's operational workflow. Our objective is to provide an understanding of the discrete event simulation model used in our case study. Specific information about our implementation of this simulation model in the Arena software package can be found in the Appendix.

3.3.1. Planning Horizon, CSMP Hours, and Staffing Levels

The planning horizon for our model starts at $t = 0$ and continues for T periods, where each period is modeled as H working hours. At the start of the planning horizon, the CSM team is comprised of N CSMPs (indexed by $n \in \{1, 2, \ldots, N\}$) who engage with customers by working with them on activities as described below. Every month, each CSMP is available for h_n hours, where $h_n \leq H$. We note that the incremental $(H - h_n)$ hours are spent on additional professional commitments (meetings, pre-sales work, analysis, internal communication, vacation time, etc.) that are not explicitly associated with the tasks directly associated with customers' journeys.

In our model, new CSMPs can be hired and added to the team at the beginning of any period in the planning horizon, and there is no attrition for the CSMPs. As we discuss in Section 5 below, the process of hiring, training, and retaining CSMPs can be far more complex in practice. For example, there may be a random delay that represents the time required to hire and train a new CSMP after the decision has been made to hire and also a period of learning during which the productivity of a CSMP increases over time.

In addition, there may be several factors that contribute to CSMP attrition. For example, the number of hours that a CSMP spends working with customers can also be increased, but this can also increase the probability that a CSMP chooses to terminate their working relationship with the vendor.

3.3.2. Modeling New Customer Arrivals and the Customer Journey

Typically, vendors pursue new customers on an ongoing basis. In our model, for each period t of the planning horizon, we represent the number of new customer contracts as a Poisson random variable with a finite expected value λ_t. Each new customer contract c has a start date B_c, and an end date E_c. In addition, the arrival of a new customer contract results in a set of activities $\{A_1, A_2, \ldots, A_{Kc}\}$ that are to be executed by a CSMP, where K_c is the fixed total number of activities for contract c. Each activity A_i has an expected duration d_i and a minimum delay δ_i prior to the start of the next task A_{i+1}. Because the customer journey is intended to be completed between the contract start and end dates, we require that $\Sigma_i (d_i + \delta_i) \leq E_c - B_c$. We model the time between activities δ_i as EXPO($(h_n - W)/K$), where W = the total number of hours of work activity required per period to service a customer and K is the total number of activities per period.

At any given time, a CSM team has a list of activities that are associated with the set of customers who are currently under contract. In this context, it is natural to model the CSM team's work as a queue, where the CSMPs are the "servers" and the activities associated with current customers are the "jobs" that queue for these servers.

3.4. Key Operations Management Questions

The core business value of our model is its ability to utilize a set of inputs, model the dynamics of the CSM team's operations, and produce estimates for the key operational metrics described in Section 3.1 above. This enables managers to examine and compare different scenarios, where any given scenario is defined by a combination of managerial decisions and assumptions about random inputs. This model can thus be used to provide visibility into several key business questions:

- What is the best CSMP hiring strategy for a given set of assumptions about new customer forecasts and customer journey design?
- For a given CSMP hiring plan, what is the impact of higher-than-expected levels of new customer acquisition?
- Can we justify a significant capital investment in technology that would reduce the level of CSMP effort required for each customer journey?
- What is the business value associated with strengthening the relationship between CSMP activities and the likelihood of customer retention?

IV. CSM TEAM OPERATIONAL ANALYSIS: CASE STUDY

4.1. Case Study Overview

This research is motivated by many conversations with industry leaders responsible for managing CSM teams (Mehrotra and Subramanian 2022, Hochstein et al. 2023). The challenges of effective operational analysis emerged as a recurring theme in these interviews and led directly to this research. In support of this research, we received significant amount of data from an industry partner that we have used as the primary basis for this case study.

We begin our case study by providing an overview of our model inputs in Section 4.2. In Section 4.3, we present results from experiments that explore different CSMP hiring practices. Section 4.4 examines the impact of making changes to the customer journey that are often driven by the adoption of technology to automate different types of CSMP activities.

4.2. Model Inputs and Simulation Parameters

4.2.1. Financial Parameters

The CSM team that we studied works

with high-value customers who spend an average of $250,000 per year with the vendor. Given the importance of retaining these customers, CSMPs are clearly vital to the success of the vendor's business, and are also highly compensated professionals, with an annual fully loaded cost of $125,000.

4.2.2. Customer Journey Details

Table 2 provides detailed information about the customer journey that drives the CSM team's workload. Specifically, this vendor's CSMPs engage with customers in four different ways with varying frequencies. For each customer, the complete customer journey features 78 CSMP activities per month, where the mean activity duration varies by activity type.

The most significant activities each month are a structured customer meeting (A1), lasting an average of 1.5 hours, and four customer drop-in sessions (A2), lasting an average of one hour. The 73 remaining activities are one of two types of emails (A3 and A4) that each consume an average of a quarter hour of CSMP time. In total, every customer ideally consumes an average of 23.75 (285) hours of CSMP time monthly (annually).

TABLE 1. MONTHLY CSMP ACTIVITIES WITH EACH CUSTOMER

Activity Type	A1 Structured Customer Meetings	A2 Customer Drop-In Session ("Office Hours")	A3 Emails (Customer Users and Technical Leads)	A4 Emails (Executive Sponsors, Gatekeepers, Influencers)	Total
Monthly Frequency	1	4	55	18	78
Relative Frequency	1.3%	5.1%	70.5%	23.1%	100%
Mean Duration (hrs.)	1.5	1.0	0.25	0.25	
Monthly Total (hrs.)	1.5	4.0	13.75	4.5	23.75
Annual Total (hrs.)	18	48	165	54	285

4.2.3. CSMP Calendar, Working Hours, Simulated Activities, and Initial Staffing Levels

All CSMPs have 21 working days per month, where the duration of each working day is 8 hours. CSMPs are available for customer interactions for 70% of each working day. For each customer, the simulation model generates activities of all four types in proportion to their relative frequencies shown in the second row of Table 2, with each of these activities requiring a random amount of time to be completed by the CSMP, as discussed in the Appendix.

At the beginning of each simulation run, there are a total of 51 CSMPs on staff. In Section 4.3, we explore different strategies for adding CSMPs to meet customer demand. For the experiments presented in Section 4.4 below, we explore different customer journeys for given a set of initial CSMP staffing levels and future CSMP hiring decisions.

4.2.4. Initial Customer Population, New Customer Acquisition, Customer Contract Renewals

The vendor begins with 250 existing customers. Each simulation run begins with a warmup period in order to create a starting point with exactly 250 customers having a random set of contract expiration dates. Output statistics for this warmup period are not included in our analysis. New customers are forecasted to be acquired randomly over time and are modeled

to arrive following a Poisson process with a constant mean rate of $\lambda = 10$ per month. Each new customer engages in a one-year contract with the vendor.

When a customer contract is completed, the simulation model randomly determines whether the customer has renewed its contract with the vendor or terminated its relationship with the vendor, where the probabilities associated with these two outcomes are based on the proportion of the CSMP activities in Table 2 that have been completed. Specifically, we model the probability of customer retention as a nonlinear function of the percentage of completed CSMP activities as shown in Fig. 2. In particular, the model sets the retention probability based on the logistic function $e^{\mu}/(1 + e^{\mu})$, where the logit $\mu = -8 + 0.107$(percentage of completed activities). This curve passes through the inflection point (75%, 50%), *i.e.,* a customer with 75% of their activities completed has a 50% chance of retention. Furthermore, we impose maximum and minimum retention rates of 90% and 10%, respectively, in the belief that regardless of the efforts of the CSMP team, 10% of customers will still choose to churn or renew as a result of other factors.

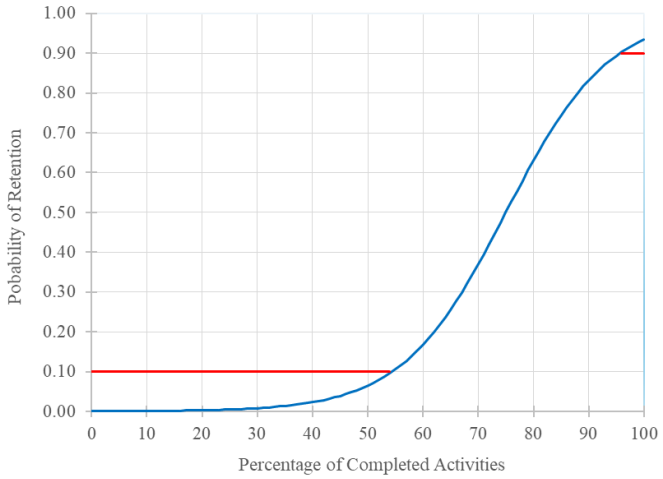

FIGURE 2. CUSTOMER RETENTION PROBABILITY AS A FUNCTION OF THE PERCENTAGE OF COMPLETED CSMP ACTIVITIES.

4.2.5. Model Replications and Output Data Collection

For the experiments presented in Sections 4.3 and 4.4 below, all reported simulation results are based on data captured across 20 replications. In particular, we report the sample mean ("average") of each metric across the replications along with the half-width ("hw") of the 95% confidence interval for the true model mean. Once initialized, each replication runs for a period of three years during which output statistics are gathered, with this output being used to calculate the metrics from Section 3.1.

4.3. Experiments Examining Different CSMP Hiring Policies

One key managerial question for CSM leaders is when to hire new CSMPs. In many organizations, CSMP hiring decisions are often made on an annual basis as part of a vendor's budgeting cycle. However, over the course of a year, the vendor will acquire new customers as well as retain some of its existing customers. As a result, over time there may be a significant mismatch between the demands of serving customers and the number of CSMPs available to provide this service. In this first experiment, we examine the tradeoff between hiring on an

annual basis (which corresponds to lower labor costs) and hiring on a quarterly basis to meet increased demand for CSMP resources (which will potentially improve customer retention but at a higher cost).

If the vendor is aiming to match the level of CSMP resources with the requirements of the customer journey and the existing population of customers, then the target level of CSMPs at the start of a given quarter or year would be as follows:

$$\text{CSMP Target Level} = \frac{\text{Number of Customers at Start of Period}}{\text{Customers Per CSMP}} \quad (1)$$

$$\text{Customers Per CSMP} = \frac{\text{CSMP Hours Available Per Month For Customer Activities}}{\text{Hours of CSMP Activity Per Customer Per Month}} \quad (2)$$

For our case study, each CSMP has a total of 117.6 hours available per month for customers activities (8 hours per working day * 21 working days per month * 70% of hours spent on customer journey activities). From Table 2, we see that each customer's journey requires 23.75 hours per month of CSMP time. Thus, Customers Per CSMP is equal to 4.95 (117.6 hours per CSM / 23.75 of CSMP time per customer). Along with the Number of Customers at Start of Period, this value is used to calculate the CSMP Target Level.

Table 3 shows the differences in operational metrics between quarterly and annual hiring. By hiring earlier and more frequently (quarterly hiring), the model estimates that the Customer Retention Rate is 2.3% higher. Our analysis also shows that this seemingly modest increase in the Customer Retention Rate is a statistically significant improvement at the 5% significance level. In addition, this increase in Customer Retention Rates leads to substantial (and also statistically significant) increases in Renewal Revenue (9.0%), Total Retained Customers at the end of the simulation period (8.3%), and Customer Portfolio Lifetime Value (32%).

To achieve these outcomes, however, requires the vendor to invest substantially more money (11.8%) on CSMPs as a result of earlier hiring. However, we see that this increased investment results in higher levels of Net CSMP Contribution for all levels of α.

TABLE 3. COMPARING QUARTERLY HIRING WITH ANNUAL HIRING

Operational Metric	Quarterly Hiring Average ± hw	Annual Hiring Average ± hw	Quarterly – Annual Diff.	% Diff.	Signif?
Customer Retention Rate (%)	89.6 ± 0.9	87.3 ± 1.1	2.3	2.6%	Yes
Renewal Revenue ($K)	229,650 ± 3,228	210,675 ± 2,539	18,975	9.0%	Yes
Total Retained Customers	503.4 ± 9.4	464.9 ± 7.7	38.5	8.3%	Yes
Customer Portfolio LV ($M)	1,247 ± 117	945 ± 79	302	32.0%	Yes
CSMP Costs ($K)	25,027 ± 360	22,392 ± 227	2,634	11.8%	Yes
Net CSMP Contribution ($K) $\alpha = 1.00$	204,623 ± 2,894	188,283 ± 2,355	16,341	8.7%	Yes
Net CSMP Contribution ($K) $\alpha = 0.75$	147,211 ± 2,088	135,614 ± 1,721	11,597	8.6%	Yes
Net CSMP Contribution ($K) $\alpha = 0.50$	89,798 ± 1,283	82,945 ± 1,089	6,853	8.3%	Yes
Net CSMP Contribution ($K) $\alpha = 0.25$	32,386 ± 487	30,277 ± 465	2,109	7.0%	Yes

In addition to the frequency and timing of CSMP hiring, CSM team leaders often wrestle with what level of staffing to target. Given the uncertainty associated with new customer acquisition and future contract renewal decisions, vendors can be hesitant to hire at the Target Level in (1) above because of the associated near-term costs. However, our

CSM operational model provides a platform for examining the impact of different target staffing levels. To explore this, we define a set of Adjusted CSMP Target Levels that are driven by a scaling parameter that we refer to as the Capacity Adjustment Factor ("CAF"), where CAF > 0.

$$\text{Adjusted CSMP Target Level} = \frac{\text{Number of Customers at Start of Period}}{\text{Customers Per CSMP} * \text{CAF}} \quad (3)$$

Our original CSMP Target Level (1) corresponds to a CAF = 1. When CAF > 1, CSMP staffing capacity is being added at a slower rate than the new customer workload that has been acquired to date. While higher values for the CAF correspond to lower CSMP Costs, our model provides a structured way to examine the impact of adjusted CSM Target Levels on other CSM operational metrics.

Starting with the Quarterly Hiring results from Table 3 as our base case, we utilized our model to examine the impact of different target levels, considering CAF values from 1.0 to 1.2. In Fig. 3 below, we can see the negative impact of higher CAF values (that is, lower CSMP Target Levels) on the Customer Retention Rate.

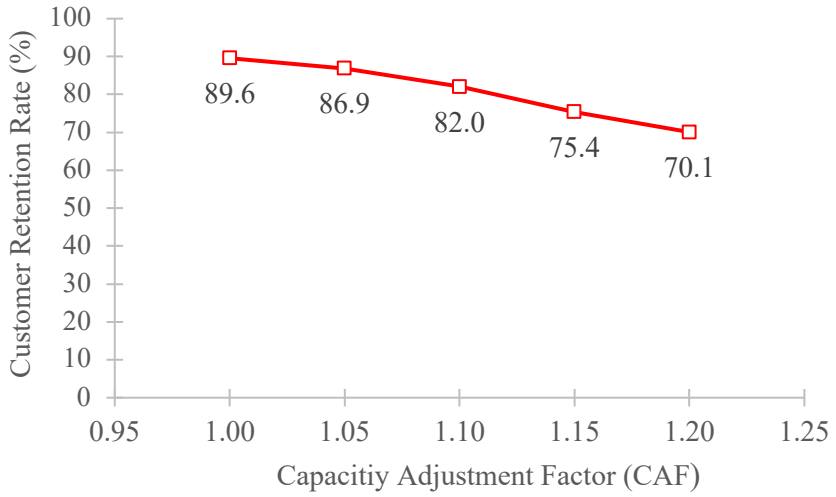

FIGURE 3. IMPACT OF LOWER CSMP HIRING TARGETS ON CUSTOMER RETENTION RATES

Table 4 below provides more detailed results associated with these lower CSMP target staffing levels. While lower staffing targets do result in slightly lower CSMP staffing costs, the resulting decreases in Customer Retention Rates lead to significantly lower Renewal Revenue, Net CSMP Contribution, and Customer Portfolio Lifetime Value. In addition, the Net CSMP Contribution decreases as the CAF increases, regardless of the value of α.

TABLE 4. IMPACT OF TARGET HIRING LEVELS ON CSM OPERATIONAL METRICS

Operational Metric	CAF = 1.00 Average ± hw	CAF = 1.05 Average ± hw	CAF = 1.10 Average ± hw	CAF = 1.15 Average ± hw	CAF = 1.20 Average ± hw
Cust. Retention Rate (%)	89.6 ± 0.9	86.9 ± 0.7	82.0 ± 0.8	75.4 ± 1.1	70.1 ± 1.0
Renewal Revenue ($K)	229,650 ± 3,228	221,463 ± 3,282	206,688 ± 3,067	190,638 ± 3,299	172,088 ± 3,394
Total Retained Cust.	503.4 ± 9.4	482.2 ± 9.0	444.8 ± 9.4	403.6 ± 10.1	362.5 ± 9.2
Cust. Portfolio LV ($M)	1,247 ± 117	931 ± 53	625 ± 27	413 ± 18	304 ± 10
CSMP Costs ($K)	25,027 ± 360	23,545 ± 345	21,950 ± 308	20,395 ± 297	18,781 ± 312
Net CSMP Contrib. ($K) $\alpha = 1.00$	204,623 ± 2,894	197,917 ± 2,964	184,738 ± 2,792	170,242 ± 3,025	153,306 ± 3,105
Net CSMP Contrib. ($K) $\alpha = 0.75$	147,211 ± 2,088	142,552 ± 2,145	133,066 ± 2,026	122,583 ± 2,201	110,284 ± 2,257
Net CSMP Contrib. ($K) $\alpha = 0.50$	89,798 ± 1,283	87,186 ± 1,327	81,394 ± 1,262	74,923 ± 1,378	67,263 ± 1,410
Net CSMP Contrib. ($K) $\alpha = 0.25$	32,386 ± 487	31,820 ± 516	29,722 ± 507	27,264 ± 559	24,241 ± 568

4.4. EXPERIMENTS EXAMINING DIFFERENT CUSTOMER JOURNEY STRUCTURES

In addition to staffing levels, CSM team leaders also influence CSM operational performance through changes to the CSMP tasks associated with the customer journey. In particular, with the recent emergence of interactive Generative Artificial Intelligence ("Gen AI") technologies, many CSM teams are looking at ways to replace some CSMP-customer interactions with automated solutions. In the second set of experiments, we demonstrate how our CSM operational workflow model can be used to examine the impact of making changes to the customer journey.

As our starting point, we consider a situation where CSMP staffing levels are set on a quarterly basis and constrained to be lower than desired (CAF > 1) in order to see what kind of impact an automated solution, such as proactive Gen AI-driven messages to customers, might have on overall CSM operational performance. In particular, in terms of the Adjusted Target Staffing Level from (3) above, we assume that the CAF is equal to 1.15 and that the number of Customers Per CSMP is calculated based on the original customer journey from Table 2 above. We can interpret this as a managerial decision to constrain staffing levels and to instead utilize automation to increase CSMP productivity.

Prior to implementing an automated solution for customer interactions, it is unclear how successful this solution will be in reducing the number of customer interactions for which CSMPs are required. As such, we examined scenarios in which automation successfully eliminates the need for 10%, 20%, and 30% of all email activities done by CSMPs.

The results of our analysis are presented in Figure 4 and Table 5 below. We can see immediately that reducing the number of tasks that each CSMP must undertake has a dramatic impact on Customer Retention Rates as well as all other key output metrics. Notably, for these particular staffing targets, reducing emails by 20% and 30% produces results that are statistically indistinguishable from one another, suggesting that even lower staffing targets may be sufficient to produce similar results.

In addition to the uncertainty in the level of effectiveness of automation solutions mentioned above, we note that such technologies (including those based on Gen AI) are often expensive for a vendor to acquire and implement. Thus, there is significant value to being able to quantify the impact of such solutions on not only the customer journey but also on a CSM team's overall operational performance.

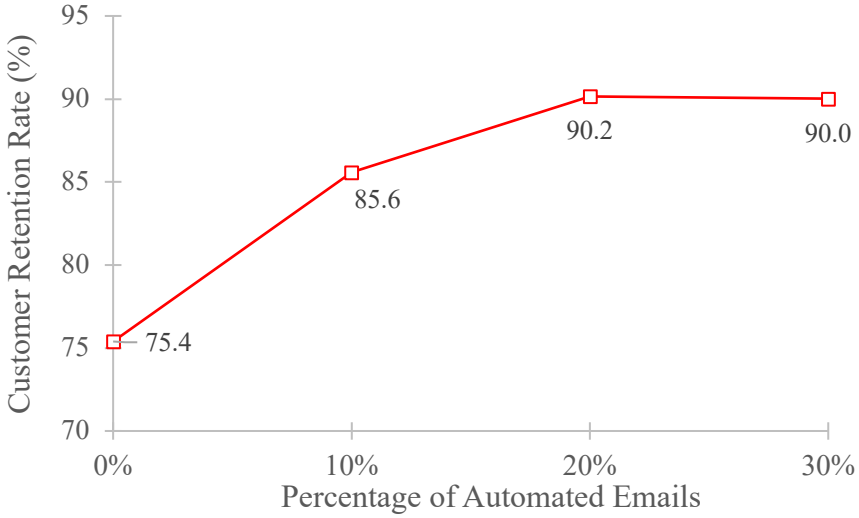

FIGURE 4. IMPACT OF AUTOMATION ON CUSTOMER RETENTION RATE

TABLE 5. IMPACT OF AUTOMATION ON CSM OPERATIONAL METRICS

Operational Metric	0% Automation Average ± hw	10% Automation Average ± hw	20% Automation Average ± hw	30% Automation Average ± hw
Cust. Retention Rate (%)	75.4 ± 1.1	85.6 ± 0.7	90.2 ± 0.6	90.0 ± 0.6
Renewal Revenue ($K)	190,638 ± 3,299	219,813 ± 2,399	230,700 ± 3,723	229,713 ± 2,232
Total Retained Customers	403.6 ± 10.1	476.1 ± 7.2	506.0 ± 10.6	504.3 ± 8.4
Customer Portfolio LV ($M)	413 ± 18	834 ± 42	1,303 ± 76	1,279 ± 72
CSMP Costs ($K)	20,395 ± 297	21,603 ± 259	22,008 ± 320	21,938 ± 241
Net CSMP Contrib. ($K) $\alpha = 1.00$	170,242 ± 3,025	198,209 ± 2,168	208,692 ± 3,424	207,775 ± 2,030
Net CSMP Contrib. ($K) $\alpha = 0.75$	122,583 ± 2,201	143,256 ± 1,570	151,017 ± 2,494	150,347 ± 1,474
Net CSMP Contrib. ($K) $\alpha = 0.50$	74,923 ± 1,378	88,303 ± 973	93,342 ± 1,565	92,919 ± 919
Net CSMP Contrib. ($K) $\alpha = 0.25$	27,264 ± 559	33,350 ± 383	35,667 ± 640	35,491 ± 374

V. CONCLUSION AND DIRECTIONS FOR FUTURE RESEARCH

In this paper, we have introduced Customer Success Management and the important role that it plays in subscription-based businesses and examined the work of Customer Success Management Professionals and CSM teams from a service operations management perspective. From here, we developed an analytical model of CSM team operational workflow, defined key operational performance metrics, and provided insights into the dynamics of these types of systems. Finally, we presented a case study of how our model can be used to help CSM team leaders examine different scenarios and make informed decisions with significant financial consequences.

As this is the first research paper to examine CSM team operations from a service operations management perspective, we believe that there are several possible directions for future research. First of all, while our model provides a strong initial attempt at accurately representing CSM team operational workflow, there are many ways that this model could be extended. For example, in our model, all customers have the same profile in terms of customer journey requirement and contract revenues. Future models might relax these assumptions and include different types of customer profiles as well as different routing and priority rules for CSMP activities and/or represent a more personalized approach in which specific CSMPs are assigned to particular customers. In addition, it is possible to extend the model by adding a variety of different customer outcomes that feature not only churn and renewal but also new contracts at different revenue levels.

Similarly, our case study represents a growing business in which new CSMPs are added to meet increased customer demand on an as-needed basis. Our model could be extended to include hiring costs, hiring lead times, and training/learning periods, as well as voluntary and involuntary CSMP attrition, and to examine situations where there is more heterogeneity in future customer acquisition forecasts.

One notable feature of our model is the relationship between CSMP activity and customer retention. While our case study modeled this relationship based on high-level input from our industry partner, we believe that this is an area that is ripe for empirical research based on detailed data that is being captured by vendors' increasingly sophisticated information systems for CSM team operations. Similarly, as vendors become more effective in tracking the "health" of their customer relationship (Hochstein et al. 2023), there will be a need for research on the impact of different ways of prioritizing customers and allocating limited CSMP resources.

For subscription-based businesses, customers will continue to be key strategic assets that must be managed by CSM teams. At the same time, the cost of skilled CSMP resources and the technologies needed to support CSM teams means that vendors must manage these types of operations effectively. As such, we believe that CSM operations will prove to be an important and fruitful area for future research for service operations management scholars.

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APPENDIX: DETAILED DESCRIPTION OF THE SIMULATION MODEL

We built our Customer Success Management Simulation (CSMS) model with the well-known Arena simulation software package, Version 16.2 (Kelton, Sadowski and Zupick 2015). Customers are the main entities that move through the model and interact with CSMPs (resources). Individual activities are represented in the model as *clones* of the original customer entities. We assumed that all CSMPs can perform activities for any customer. A small number of logical entities are also used, *e.g.,* to initiate book-keeping activity at the end of the warm-up period and to modify CSMP capacity at the send of each subsequent quarter or year. Each replication of the model consists of a 6-year run length, with the first 3 years used for the warm-up period (to ensure that the model is initialized with the desired number of customers) and last three years to gather output statistics. Route times used for animation purposes are all small (0.0001 hours) and do not materially affect model results.

Some key features of the model can be seen in the snapshot of the animated portion of the model (Fig. A1). The top of the layout displays the current year, day, and day of the current quarter. In the snapshot, the vendor has 343 customers, each of whom is represented as a circle with a color and number that reflect the number of years the customer has been with the vendor (the large customer queue in the top half of the layout only displays up to 125 customers). Every year that customers renew their contracts, the color of their entity picture gets a little darker. While customers are held in the large queue, clones comprising the streams of the activities can be seen either waiting in the CSMP queue (lower left corner of the layout) or getting served by a CSMP (lower right-hand box). Currently, all 60 available CSMPs are busy processing activities, while 9,520 activities have built up in the queue (only a small fraction of which are explicitly displayed). Whenever a CSMP finishes processing an activity, the number of activities completed by the corresponding customer in the current year increases by one.

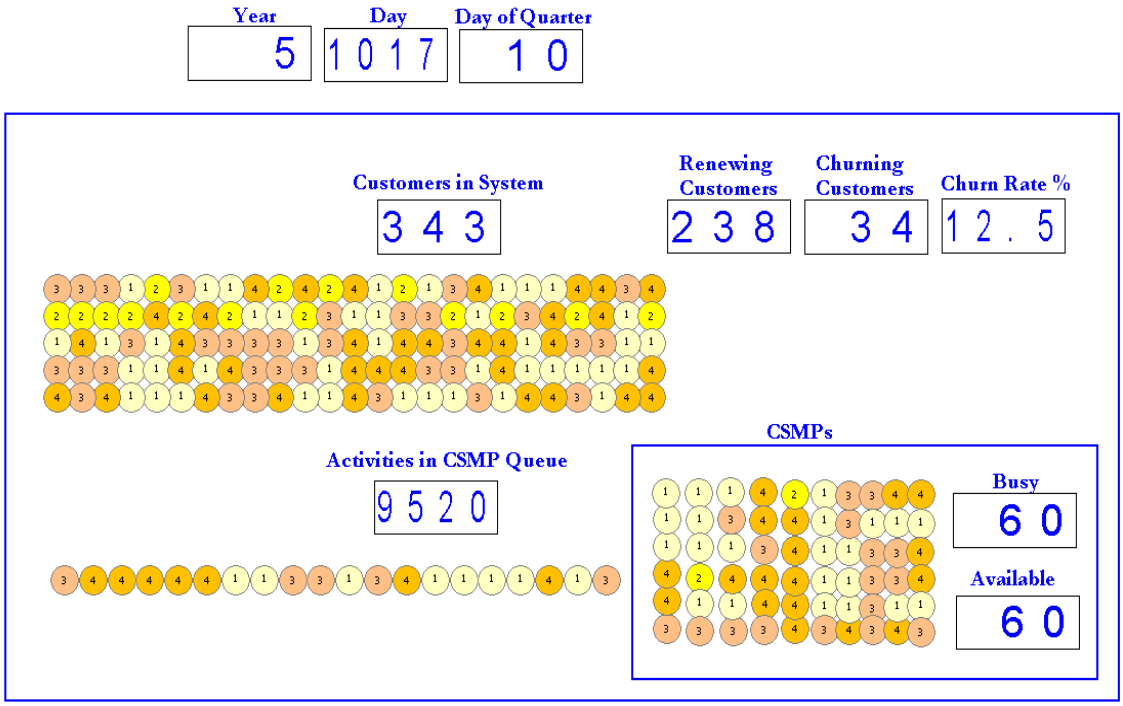

FIGURE A1. ANIMATED PORTION OF THE ARENA CSMS MODEL

At the end of every month, unprocessed activities associated with a customer are removed from the CSMP queue. Meanwhile, customers entities wait in the large customer queue until their contract end date E_c at which time the percentage of the customer's annual number of activities that have been finished is computed. This percentage is used to find the probability that the customer renews their contract for another year as described in Section 4.2.4 above. Customers who renew return to the queue holding all the vendor's customers, while those who churn exit the system. In either case, the model updates the renewing and churning customer counters shown in the upper right corner of the layout, along with the cumulative churn rate percentage (12.5%).

By building an animated model whose behavior can be observed on screen as the customer success process unfolds over time, we were able to verify that the simulation worked as intended. All of the dynamic queues and operational graphics (Sargent 2009) seen in Fig. A1 that display counts at various locations during model execution provide numeric confirmation of what is taking place within the model. As for validation, we ran the animated model in the presence of our industry partner who provided us with the input data for our case study and is intimately familiar with the customer success process. He found that the model accurately captured the essential aspects of the process he oversees as a manager, giving the model face validity. We also performed a number of sensitivity analyses (not reported here) with input parameters that resulted in output measures changing in the expected directions. Unfortunately, our industry partner did not provide us with actual performance metrics from his company, so we were unable to validate our model output against real-world performance. In the future, it would be desirable to obtain both input and output data from industry partners to help us further validate the model.

In the following description of the model, bracketed numbers refer to numbered sections of the model logic shown in Fig. A2 while italicized words refer to model quantities such as variable, attribute, queue, and module names. The simulation begins in section [1] by creating customer entities and assigning each a unique Customer ID number (*CID*). At the start of every year, customer attributes are initialized or updated, such as their arrival time B_c, renewal time E_c, and years of service. Immediately after this, the customer is cloned, the master copy of which is held in the *Hold Till Renewal Day* queue until its renewal decision takes place (described in section [6] below). In [2], the cloned copy of the customer loops around to create 12 months' worth of activities for this customer. The original monthly clone is sent to section [3], where it is similarly used to create the monthly number of activities (*e.g.,* $K = 78$) for that customer. In [3], the delay time between activities is EXPO(*MeanIAT*), where the expression $MeanIAT = (h_n - W)/K$. Meanwhile, the original version of the customer is delayed for a month at which time the *CSMP Queue* is searched for any of the customer's unfinished activities; any such activities are removed from the queue and disposed of. If this is not the last month of the customer's year, the entity returns to the beginning of the loop and creates another set of monthly activities. Conversely, if the end of the year has been reached, the total number of activities completed by the customer this year (*ATY*) is computed and stored, and a signal is sent back to the *Hold Till Renewal Day* module in section [1] that enables the original customer entity to proceed to the renewal hour logic of section [6].

Cloned activities from section [3] enter *Station PreQ* in section [4] to get ready for processing by a CSMP. First, the activity is assigned an activity type attribute (1, 2, 3 or 4, as described in Table 1) using an appropriate discrete probability distribution. Then it is assigned a mean service time based on its type (which may be reset to 0 in the activity

automation experiments described earlier in the paper) before being routed to *Station CSP* in section [5]. At *Station CSP* activities wait in line to seize a CSMP resource for an exponentially distributed amount of processing time. After counting the type of activity just completed (helpful for validation purposes), the customer attribute *ATY* is incremented by one. Section [6] handles customers whose contract renewal date has been reached.

First, the customer's percentage of activities done for the year (*PctActivsDone*) is calculated. Then the customer's probability of renewing (*RetainProb*) is computed using *PctActivsDone* as the argument of the logistic function given in Section 4.2.4. If the customer churns (with probability 1 – *RetainProb*), then the total number of churners is incremented by one and the customer departs from the system. If the customer renews, then the total number of renewals is incremented by one and the customer is routed back to the start of year station in section [1].

Section [7] creates a sequence of logical entities starting at the end of the warmup period. The first such entity records the number of active customers in the system at that time which is used to determine how long the warmup period should be for the system to contain the desired number of customers before output statistics are collected. This first entity also sets the values of two variables: *Warming* = 0 indicates that the warmup period is now over, and *MaxCust* = 10000 is referenced in the second of the two Create modules of section [1] to create more customers once the warmup period has ended. From this point on, a logical entity is cloned every subsequent quarter in a loop in order to modify the available number of CSMP agents at the desired time. In section [8], the variable *Switch* causes the number of available CSMP agents to be updated at the end of each quarter (*Switch* = 1) or year (*Switch* = 0). Finally, in section [9], a logical entity is created at the end of the model run to compute and record key performance measures such as the final number of customers, the last year's churn rate, and the financial metrics described in Section 3.3.

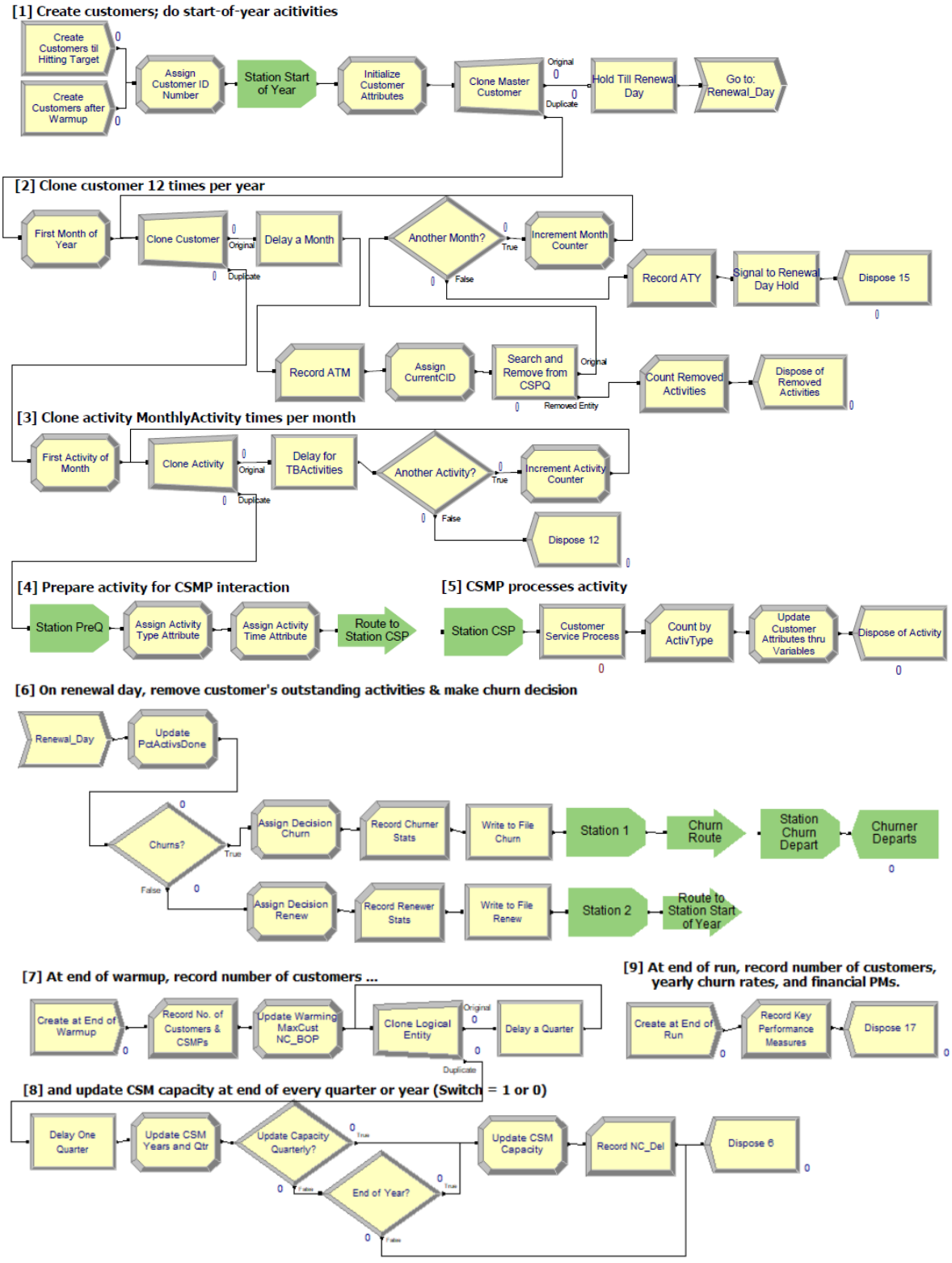

FIGURE A2. LOGIC MODULES OF THE ARENA CSMS MODEL