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Automation Opportunities for Subscriber Management in Cable Television

A Technical Paper prepared for SCTE•ISBE by

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Introduction

The lifecycle of a subscriber relationship is composed of identifiable and controllable interactions. Automation models can incorporate all events that compose the experience through a comprehensive business logic and ontology. Systems can elicit or preempt subscriber behaviors through defined measures designed to control outcomes. This paper describes the promise of automated subscriber management (ASM), the migration process, system design considerations, target outcomes and results of operator implementations. ASM can deliver improved customer satisfaction and retention, remove costs, promote and deliver service enhancements. Properly designed and implemented, an automated platform will continuously improve cable operator performance.

Content

1. Subscriber Management – A Continuum

The continuum of customer interactions is known and addressable. Operator business models are based on a lifecycle of delivering services over an expected duration. When subscribers perceive the value of the product exceeds its price, the relationship is maintained over the expected period. Perceptions include indirect contributors that create friction, or additional cost - altering the value/price relationship and affecting the expected outcome. Through subscriber management, the contributing factors to maintaining the expected customer lifecycle are addressed.

Figure 1 - Subscriber Activities

Subscriber management addresses a finite set of manageable variables. Services are provided over a known infrastructure; subscribers consume and pay for the product. Problem instances create friction in the relationship resulting in financial costs; negative impact on value perception and outcomes such as termination. When expected performance is compromised, subscribers will behave in a predictable manner according to available options.

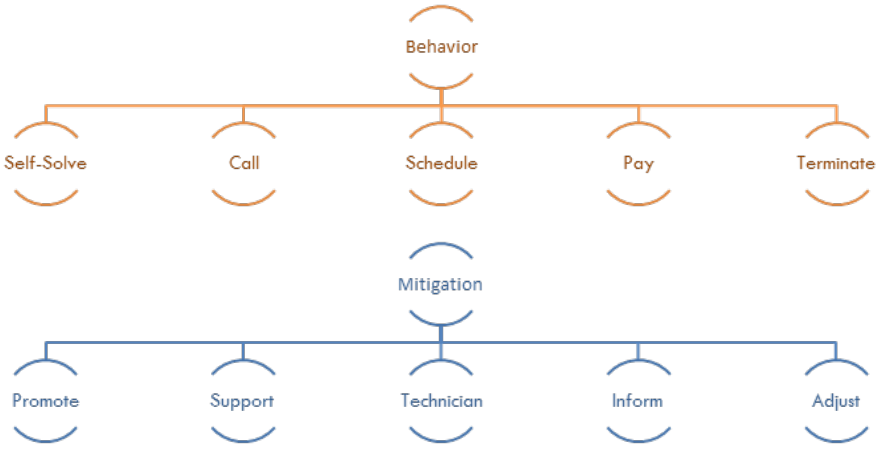

Figure 2 - Behavior and Mitigation Measures

Operator mitigation measures are also discrete - primarily the provision of instructional, temporal, and financial information; enhanced through personalization and timeliness.

The effectiveness with which these dynamic, controllable and measurable variables are managed determines the customer experience and resulting lifetime value of the subscriber relationship.

2. Automation – Systematic Migration of Customer Interactions

Operators have invested significantly in traditional means of subscriber management. Call centers and service fleets address subscriber needs. This support structure reliably handles subscriber events such as 100% monthly calls, 7% monthly technician service call rate, 10% missed truck rolls/repeats, and 15% late pay. Significant expenditure is dedicated to these services, but satisfaction ratings remain low and monthly subscriber termination averages 2.5%.

Within the modern plant, network monitoring and detection capabilities are comprehensive and accessible. The data, systems and capabilities required to automate subscriber management exist. Every element of the operator – subscriber relationship is monitored, tracked, and archived. Business rules, problem mitigation strategies, marketing promotions, and resolution procedures are determined. Human resources are committed but the frequency, scope and scale of activity limits fast, customized and optimal results.

The business logic of customer interactions can be codified into software systems. Automation can improve scope, scale and efficiency; and act in real time - handling millions of simultaneous interactions personalized to the individual. Algorithms can mine and monitor data to discover correlations, predict events and reliably preempt high friction experiences through contextual communications.

Automated subscriber management (ASM) can improve customer satisfaction, retention and profitability. The migration from existing processes is described.

2.1. Phase One

Initial candidates for automation include routine events that drive a high volume of frictional interactions. Examples include outages, service calls, billing events, and troubleshooting. Described are generic events, the automated subscriber management function and projected results.

2.1.1. Event: Outage / Function: Select Outage Notification

ASM discovers outages through integration with network monitoring software, or inbound notifications from subscribers and parses the affected segment through mapping, such as per affected node. Historical data indicates likely individual subscriber behavior and constructs mitigation measures based on business rules and preexisting content. Informational notifications are delivered in real time to select subscribers regarding resolution at a predetermined frequency or based on continued inbound inquiries. Business rules can incorporate financial considerations and adjust activity accordingly. Preemptive notifications reduce high friction experiences for subscribers. Informational needs are eliminated, resulting in removal of call center volume.

2.1.2. Event: Service Call / Function: Real Time Logistics

ASM interfaces with field management, service scheduling and subscriber data. It requests, confirms or reminds the account holder at a frequency determined by business rules and review of historical data. It also monitors real time status of service technician and delivers schedule options to the subscriber awaiting arrival and communicates change request to field management and service technicians. Upon completion (e.g. closed work order), it polls the subscriber to confirm issue resolution and reports exceptions to field management and service tech while on premise. It allows the subscriber to engage the technician on their timetable and terms and reduces wait time, friction, missed appointments, repeat truck rolls, and call center activity.

2.1.3. Event: Service Suspension / Function: Billing Mitigation

ASM monitors billing data for late payment and engages automated mitigation measures based on business rules and preexisting content, such as payment scheduling. It accepts inbound inquiries from subscribers; constructs and delivers content regarding account status, payments due, scheduled suspension, and payments received. It also mines customer historical data for indicators of likely termination and creates and communicates customized alternatives based on business rules. Communication activities deliver faster collections, avoidance of call center calls, and reduction of high friction subscriber experiences. Business logic can incorporate pricing and plan adjustments to impact profits and preempt account suspension or subscriber termination.

2.1.4. Event: CPE Management / Function: Self-Service

ASM integrates with network monitoring systems to identify equipment problems or receives inbound notification from subscribers. It correlates network and premise equipment measurements with the subscriber problem and creates resolution measures based on business rules and preexisting instructional content. It also reviews historical data for the account. It instructs subscriber activities (cycle), provisions automated procedures through network operations center (NOC) control systems (reset), interfaces with monitoring software to confirm issue resolution, and polls the subscriber for outcome. Business rules can escalate to advanced resources such as visual engagement (how to) or provision service calls to address complex situations. Enabling self-service supports avoidance of high friction experiences, reduction in call center volume, and faster time to resolution.

The above cases illustrate high impact opportunities to identify and interrupt a **cascading cycle** of problem instances leading to costly, high friction experiences and avoiding reduced perception of value/price which may contribute to a termination decision.

2.2. Phase Two

Further candidate interactions include revenue generation through upselling products and services. Across all activities and events, the opportunity exists to 'wow' customers with intuitive insights.

2.2.1. Event: Upsell / Function: Intelligent Targeting

ASM mines the account and NOC systems for conditions that qualify for a promotional offer, according to predetermined business rules. (Example: speed or quality of service (QOS) complaints compared to network capacity improvements.) Polling can further determine subscriber preferences, price sensitivity and demand. Per criteria, curated content is delivered. Upon affirmative response the ASM provisions order to account and billing system and manages authentication and confirmation. Resulting upgrades, enhanced value/price perception, elimination of high-friction solicitations, and avoidance of traditional promotional costs improve lifecycle profitability.

2.2.2. Event: Customer Care / Function: Personalization

ASM integrates with the customer account and historical data and marketing campaign strategy and content. It then polls selected subscribers with opt-in offers for recommendations, reminders, special offers and personalized content. It creates subscriber preference profiles, monitors systems, and mines account data for conditions that meet marketing criteria or subscriber requested content. It also delivers personal notifications, polls subscriber on utility of content and adjusts based on feedback. As subscribers opt-in for personalization features, opportunities for merchandising of services or content for new revenue generation increase, and the system delivers increased value perception and loyalty.

2.3. Advanced Services

Automation systems can enhance the functionality, productivity and value of advanced, data-intensive services such as **security, in-home medical monitoring, and programmable smart homes**.

In summary, the modern systems available to the operator can monitor infrastructure, equipment and subscriber data to maintain a real time customer profile. Automation delivers preemptive information, striking the perfect balance of software-provisioned mitigation management and human interaction.

3. Outcomes – Modeled and Measured

Automation of subscriber management can deliver improved customer retention and financial performance for the operator. Presented are impact models and performance data from ASM implementations.

3.1. Risk Model

The table below depicts profits of a subscriber lifecycle, the cost of common subscriber behaviors in a non-automated environment, and impact (loss avoidance) of service upgrades and retention.

Table 1 - Expected Profit At Risk

Event	$ Net Profit	% Net Profit
Subscriber target lifecycle at 5 Yr $100 ARPU at 40% net profit	$2,400	100%
Subscriber contacts call center once/month at $6/contact	($360)	(15%)
Subscriber requests one service visit per year at $100/roll	($500)	(20%)
Subscriber terminates one year earlier than target	($480)	(20%)
Subscriber avg. 10% more likely to upgrade service by $20/month	$120	5%
Profit Impact Opportunity	$1,460	60%

3.2. Impact Model

ASM impact opportunities and financial gains to a 1M-subscriber system are illustrated.

Table 2 - ASM Impact Opportunities

Event	ASM Impact	Description	Annual Gain
Call Volume	20% Reduction	100% monthly call rate reduced by 20% at $6 cost/call	$14,400,000
Missed Appointment	80% Improvement	100% annual rate with 10% missed at $100/roll, reduce missed by 80%	$8,000,000
Customer Retention	10% Improvement	25% annual churn reduced by 10% at $480 profit/year	$12,000,000
Upgrade	5% Take Rate	5% customers speed upgrade by $20/month	$12,000,000
Total			$46,400,000

3.3. Return on Investment (ROI) Model

One and five-year cumulative financial gains are projected for a range of system sizes.

Table 3 - Impact Range Per System Size

# Subs	100,000	1,000,000	5,000,000	10,000,000
One Year Impact	$4,640,000	$46,400,000	$232,000,000	$464,000,000
Five Year Impact	$23,000,000	$232,000,000	$1,100,000,000	$2,320,000,000

4. Measured Performance – Implementation Data

Background: Results are based on operator trials. Activation of the subscriber base grew to 25% over the measured period. Activated subscribers were provided a self-service menu for inquiry/response and operators delivered event triggered mitigation messages via simple messaging service (SMS). Results are period-to-period changes versus non-activated subscribers.

4.1. Call Center Impact

When mitigation measures were deployed against identified triggers of subscribers placing a call to the call center, the operator reported an **average reduction in actual call volume of 26%** year to year 2017/2016. Importantly, 70% of activated subscribers stopped calling altogether. As shown in the trending graphic, impact on call center reduction increases as automation begins to change the way subscribers interact.

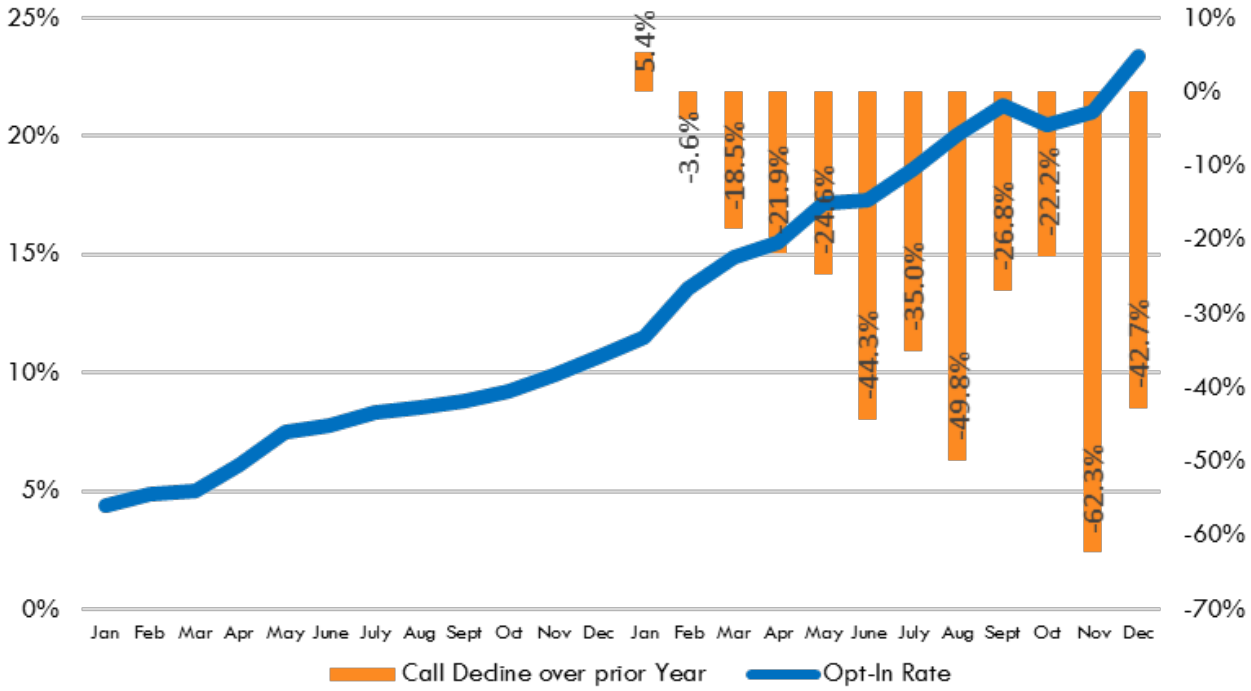

Figure 3 - Call Center Impact

4.2. Missed Appointments

When mitigation measures were deployed against identified triggers of missed appointments, the operator reported an **80% reduction in missed appointments** over the course of a year for activated subscribers. The 80% improvement virtually eliminates missed appointments for activated subscribers.

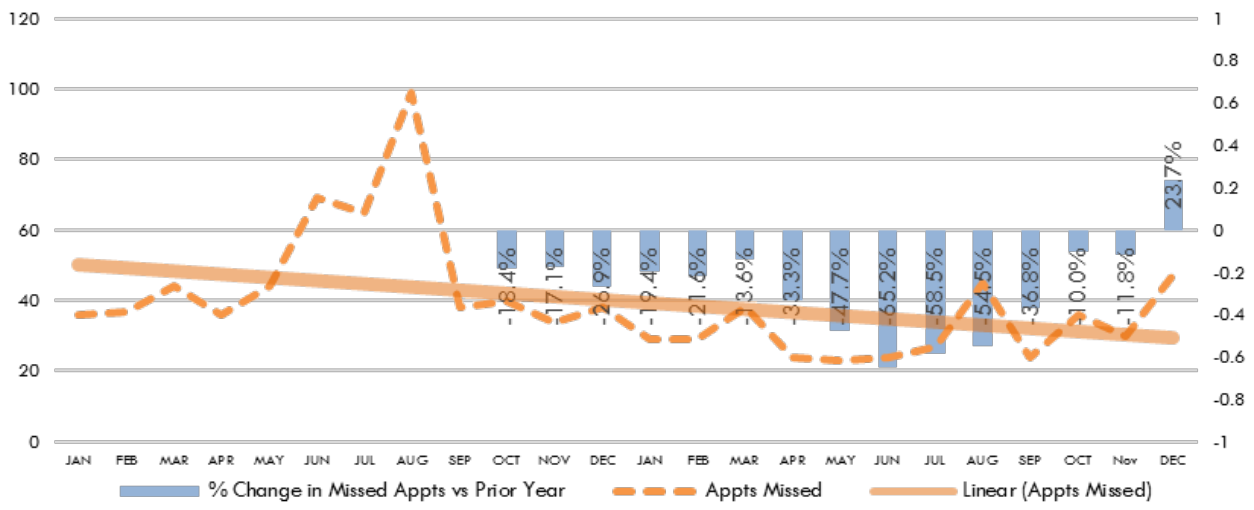

Figure 4 - Missed Appointments Impact

4.3. Billing Collections

When mitigation measures were deployed against identified segment of subscribers that historically pay late, the operator experienced a **50% reduction in the collection period** - the time between subscriber entering late pay status to payment.

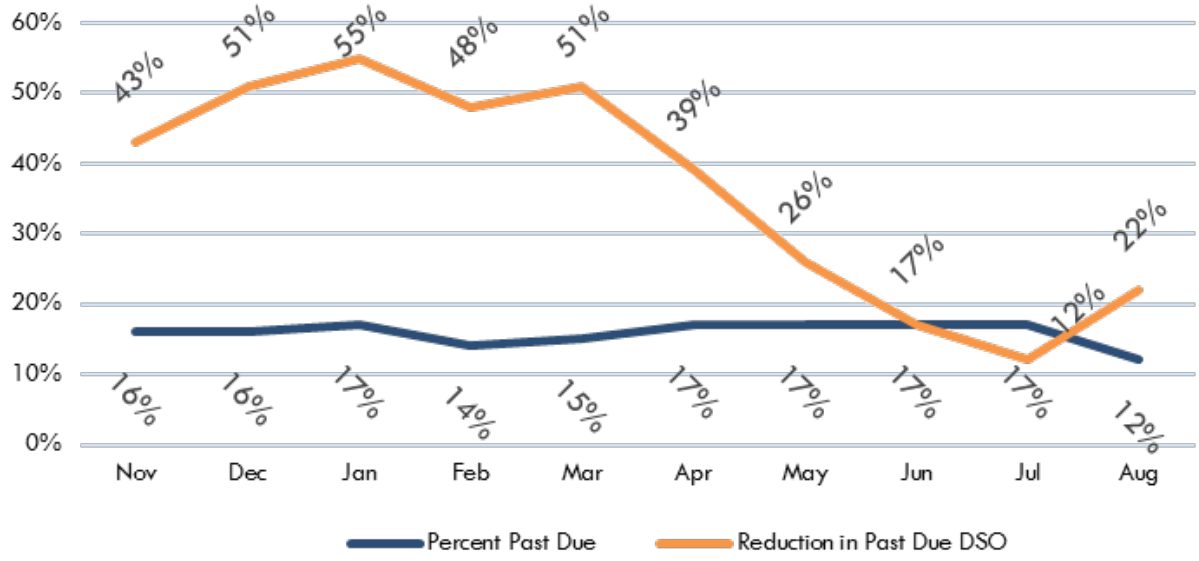

Figure 5 - Billing Collections Impact

4.4. Targeted Promotion

In a system trial, analytics were conducted leading to segmentation of a subscriber base targeting accounts with a predicted propensity to upgrade their service to a higher speed/bandwidth offering. Business rules were based on system characteristics (availability based on recent construction) and not historical

purchasing or other private subscriber data. Messaging was delivered by SMS to subscriber phones. The automation platform delivered a **6% take rate on the promotional offering** within two days versus past direct mail conversion of <1%. The system completed automated billing and provisioning functions through an operational support systems (OSS) interface.

4.5. Reduction In High Friction Experiences

Operators noted the removal of high-friction experiences such as complaint calls, missed appointments and repeat billing inquiries. The on-demand provisioning of useful account information received positive feedback from responding subscribers. Although every interaction provides subscribers the option to opt-out of the service, few chose that path.

Reduced calls translate 1:1 to removal of high friction experiences for subscribers.

In summary, automation of subscriber management applied in the field has improved operator performance through reduced call volume, improved appointment attendance, reduced truck rolls, faster collections and higher promotional take rates. The removal of high friction experiences is inherent in problem avoidance.

5. Architecture of ASM

5.1. Platform

An automated services workflow supports both inbound inquiry/response and event driven, operator generated communications through a common platform architecture.

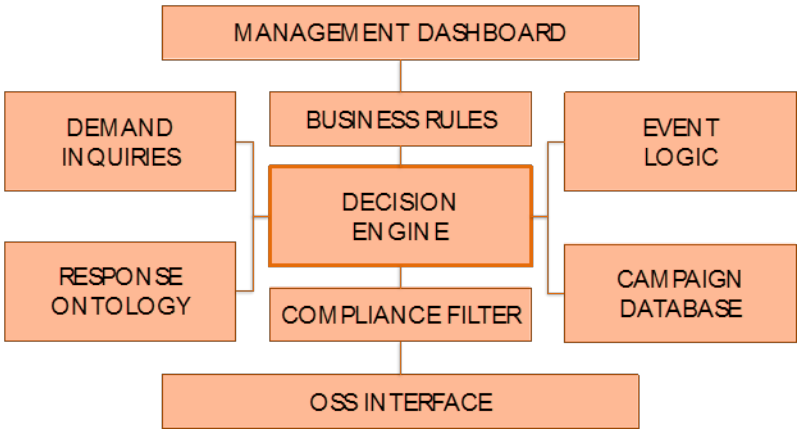

Figure 6 - ASM Platform Abstract

Decision Engine: monitors and collects inputs for activity generation. Inputs are solicited through an OSS systems interface, directly from inbound subscriber inquiries or autonomously generated from a status monitor of candidate events that meet predetermined thresholds in the business rules.

Business Rules: govern action taken for inbound inquiries and system generated qualifying events; built from a detailed review of business practices, processes and strategy.

Demand Inquiries: inbound requests generated by subscribers are assigned to the response ontology for manufacture of response content, amended with OSS-derived data.

Event Logic: qualifying events are assigned to event logic ontology for manufacture of outbound content per the campaign database, amended with OSS-derived data.

Compliance Filter: necessary rules and processes that support security, privacy and Federal Communications Commission (FCC)/carrier regulations related to utilized messaging mechanisms and communication channels.

Management Dashboard: a repository of event elements and transactions, activity tracking, outcomes and impact reporting, serving as the user-interface for platform management.

By abstracting the workflow and architecture the system is designed for maximum flexibility. Systems interfaces are defined through an application layer. Considerations for scale, adaptation and extension are inherent in the centralized logic, shared functions and resources of the platform.

5.2. Scope

An adaptable platform will support the chosen scope of ASM. Business requirements determine the complexity of the system. Selected and defined events and mitigation strategies require workflow, ontology and knowledge bases available to support automated decision-making and activity.

5.3. Workflow

ASM addresses events originated internally, through subscriber requests, or other sources. An abstraction of the person to application (P2A) and application to person (A2P) process is described in Figure 7 and Figure 8.

Figure 7 - Workflow of Subscriber Initiated Inbound Inquiry (P2A)

When an inbound inquiry is made, such as a simple text inquiry generated from a subscriber phone, business logic is applied, and the response ontology assembles predetermined content relevant to the inbound request, amended with system data; resulting in a response event. Information is delivered through chosen mechanisms.

Figure 8 - Workflow of Event Driven Operator Initiated Campaign (A2P)

When a threshold is met in the status monitor, an event is created, and business logic engaged. Target subscribers are qualified, campaign ontology enacted, and relevant content is amended with data drawn from supporting systems.

5.4. Ontology

ASM events are categorical entities with dependent activities. The system accesses capabilities, data repositories, content and feedback according to the ontological model. Sample categories and sequences are shown in Figure 9.

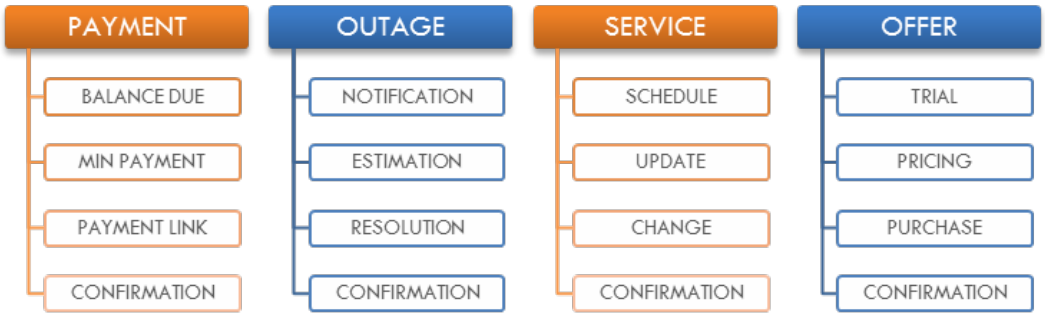

Figure 9 - Sample First Level Ontology Categories and Event Sequence

5.5. Knowledge Base

Decisions for each sequence are dependent on the knowledge base represented in the system, requiring uniform access from different data sources, such as those represented in the matrix in Figure 10.

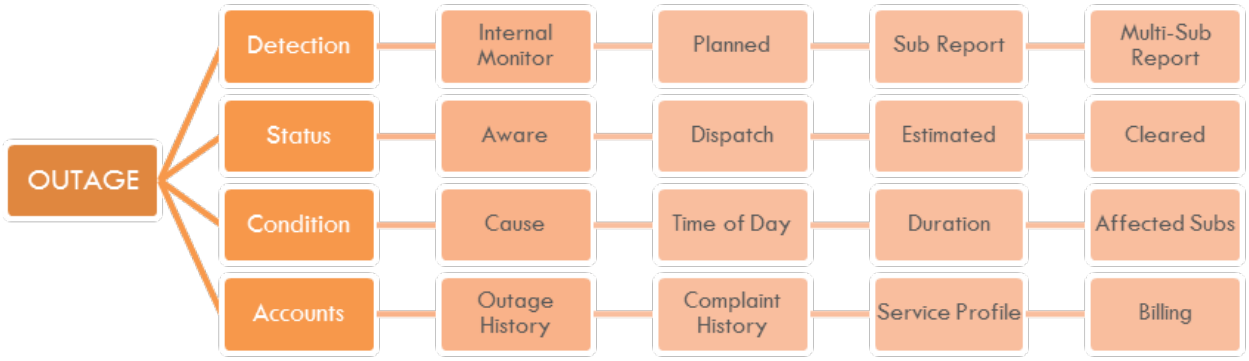

Figure 10 - Generic Knowledge Base for Event Management

Thus, the scope of decision-making is based on available data, process ontology and workflow. Routine events and mitigation strategies have predetermined content constructed from highly available systems and rules – for instance, notifying affected subscribers of an outage. Higher-level ontologies can tailor responses, such as providing prioritized treatment based on profile, history and rules.

Emerging technologies will drive a company's competitive differentiation through customer service. Software robots perform routine business processes and make simple decisions by mimicking the way that service agents interact. Companies can automate entire end-to-end processes, with humans typically only managing exceptions. Expect to see continued focus on automating repetitive rules-based tasks. (Forrester 2017)

Conceptual frameworks can incorporate subscriber satisfaction and retention analysis through direct polling or evidence-based correlation of hidden contributors. At scale and in real time, inferential insights can be presented for management consideration and performance optimization.

The capabilities of an automation suite depend on available resources. Real time performance data on network services and equipment exist for the most part. The addition of models and knowledge bases incorporating problem instances, consumer behavior, and operator mitigation opportunities represent a more complete ontology of subscriber management. Acting upon a codified representation of these scenarios generates results and measures that enable learning and performance improvement.

6. Implementation – Building A New Customer Channel

6.1. Planning

Preparing for automated subscriber management is a process involving disciplines of business strategy, marketing content development, software and data access design, regulatory compliance and financial measurement.

Design: A flexible, open, scalable architecture can incorporate new capabilities. Application programming interfaces (APIs), content databases and analytics applications should be adaptable and extensible; as systems, network and consumer premise equipment evolve.

Business Requirements: Requirements are derived from a logistics and business process review of subscriber interactions. Business logic includes rules and qualifications for system functionality. Logic governs qualification parameters, event descriptions, thresholds, activity triggers and content selection.

Ontology: The representation of relationships between events and actions depends on business logic and rules. This core element powers the automated decision-making process, such as mapping events to supporting subsystems.

Content: Content development will relate to the scope of business logic and ontology. The system will draw from a predetermined content database to generate mitigation measures or other subscriber communications. In a two-way system, ASM detects distinct inquiry nomenclature, relates response content, and amends with custom data based on account characteristics. For event driven outbound campaigns, content is selected based on the ontology of events that trigger mitigation measures to a qualified segment of subscribers.

Systems Availability and Data Access: ASM requires integration with operator systems according to a data extraction and API logic. ASM integrates with billing, scheduling, field services, marketing, analytics and other applications.

Compliance, Privacy and Security: Best practices must be applied. Delivery mechanisms will incorporate FCC and carrier regulations. Data exchange from systems carrying customer proprietary network information (CPNI) data must be properly parsed.

Reporting: Historical data is captured to support indexing of outcomes compared to past performance. Normalizing data for extraneous events supports effectiveness tracking, learning and optimization of the system.

Opt-In Management: A recruitment campaign facilitates activation of subscribers through advertising media or directly through CSR origination, advance registration via terms of service, or mobile SMS messaging.

Limitations: Technology capabilities limit the scope of automation. While process logic and ontologies can reliably manage distinct interactions, consumer psychology cannot be fully represented - requiring escalation mechanisms to engage human resources. Operational considerations include resistance to disinvest in existing processes.

6.2. Make Or Buy

Benefits of internal development include insights into the performance characteristics and subscriber dynamics of the system. Maintained, there will be no dependency on third party resources or external financial commitment.

Considerations for Make:

- Long-term commitment of talent from multiple disciplines.
- Committed engineering resources for maintenance and extension.
- Financial, marketing, operations and customer care oversight.
- Continuous tracking, reporting and optimization required to maximize benefits.
- Time to reach deployment may alter the ROI of a make v. buy decision.

Contrarily, outsourcing inherently represents a low-cost implementation; available content ontology; fast integration with disparate systems; existing security, privacy and compliance measures; and perspective on program success factors across multiple operators and extensive subscriber interactions.

Considerations for Buy:

- Broadband infrastructure and systems experience.
- Integration with common billing, OSS and field management software.
- Open and adaptable programming interfaces.
- Available process ontologies and content inventories.
- Demonstrable efficacy in implementation, compliance and impact reporting.
- Capabilities in security, privacy and FCC regulatory adherence.

Typical in the make/buy evaluation is time to market. In Figure 11, savings associated with an immediate deployment are compared to a twelve-month development delay.

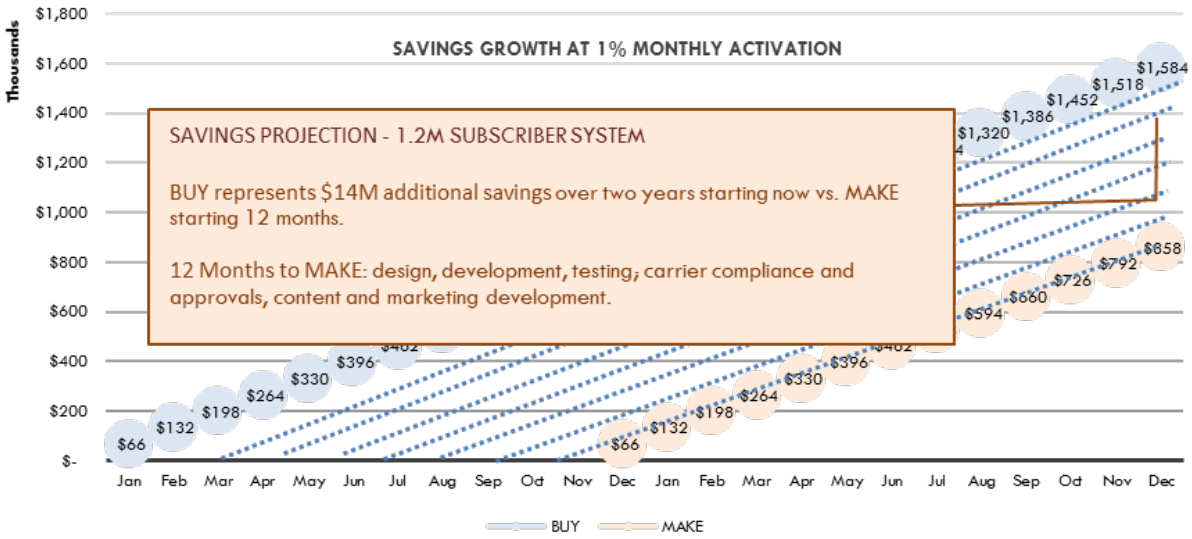

Figure 11 - Make Versus Buy

Leveraging internal knowledge and resources to maintain maximum control and security, while leveraging vendor expertise and availability represents a hybrid combination of make versus buy.

6.3. Delivery Mechanism

Alternate communications channels are available. ASM can support email, set top, custom-built apps or standard phone-based SMS delivery; each with its advantages and challenges.

95% of Americans have a cell phone, 90% home-internet, and 90% email access. (Pew Research)

Email: This ubiquitous medium is highly available to subscribers. It is comprehensive in capabilities when hypertext markup language (HTML)-enabled, resides on computing devices with browser access to cloud services and can be customized to include additional interactive features. **Challenges include:** Frequency of engagement, lack of immediate notifications and reaction. Clutter and whitelisting also present engagement barriers.

Apps: Dedicated applications provide extensive functionality and leverage device capabilities. Rich features can extend to other operator objectives. **Challenges include:** Cannot automatically opt-in a subscriber base without download. App builds require native implementations and maintenance updates. Consumer interest has waned, and usage statistics show low engagement. Notifications must be enabled to support timely response.

Research Perspectives:

- **Majority of US consumers download zero apps per month.** (comScore)
- **Only 36% of apps are retained after one month, only 11% for a year.** (comScore)
- **77% of users never use an app again 72 hours after installing.** (comScore)

Set Top: Where available to subscribers, notifications delivered through the set top box appear in a familiar context. Utilization of the set top equipment is costless. **Challenges include:** Navigation imposing on a viewing medium. Subscribers may engage away from the television screen. Any footprint required on the set-top will present challenges of available processing capabilities.

Simple Messaging Service: SMS messages utilize the notification layer, which elicits immediate response. Consumer engagement is high and frequent. Operators can activate subscribers through common business practices. **Challenges include:** SMS messages must comply with FCC and carrier regulations. Subscribers must provide their cell phone number and opt-in to a notification program. SMS is text-based, with a per message cost.

Research Perspectives:

- **Over 80% of American adults text, making it the most common cell phone activity.** (Pew Internet)
- **Text messages have a 98% open rate, while email has only a 20% open rate.** (Mobile Marketing Watch)
- **90% of all text messages are read in under 3 minutes.** (Connect Mogul)
- **It takes the average person 90 minutes to respond to email, 90 seconds to respond to a text.** (CTIA)

Operators may choose alternate or combined approaches to implementing an automated subscriber management system. Make versus buy decisions will be determined by resource availability, time sensitivity and cost.

7. Evolution of Capabilities

"Companies will anticipate needs by context, preferences, and prior queries and deliver proactive alerts, relevant offers, or content. They will become smarter over time via embedded artificial intelligence."

Forrester: 2017 Customer Service Trends: Operations Become Smarter And More Strategic

Automation of subscriber management is an investment in the future. Initially an ASM platform addresses routine, high-volume interactions. Focused efforts reduce financial risks and create opportunities to provide new utility to subscribers. Subsequent phases rely on adaptation of business rules and content to increasingly reliable audience profiling, segmentation and management based on the relative state of each subscriber in the continuum of service. Business logic and ontology can incorporate new event variables and mitigation measures dynamically. Each interaction is programmatically tallied, harvesting data for further learning and improvement.

Contemporary automation opportunities target identifiable and deterministic processes where conditions can be monitored and decision support data is available. Deployments have demonstrated efficacy. Capabilities of data mining, analytics, and machine learning are enabling autonomous, intelligent management systems. On the experimental frontier, ASM can engage subscribers and discover new ways to improve the relationship.

The subscriber experience will improve accordingly. Today, operators can eliminate the majority of high friction interactions through automated provisioning of just-in-time information and support. As systems evolve, subscribers will enjoy the convenience of transparency and control; and experience smart,

personalized service. The economic impact to operators will expand from efficiency to profit production and subscriber retention.

Investing in automation will ensure the constancy of innovation in the broadband services industry.

Abbreviations

A2P	application to person
API	application programming interface
ARPU	average revenue per unit
ASM	automated subscriber management
CPE	consumer premise equipment
CPNI	customer proprietary network information
FCC	Federal Communications Commission
HTML	hypertext markup language
NOC	network operations center
OSS	operational support systems
P2A	person to application
ROI	return on investment
SCTE	Society of Cable Telecommunications Engineers
SMS	simple messaging service
QOS	quality of service

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