Big Digital Data, Analytic Visualization and the Opportunity of Digital Intelligence
Content Provider

Suneel Grover is a Senior Solutions Architect for Customer Intelligence and Advanced Analytics at SAS. Grover provides consulting services that blend marketing strategy (integrated/omnichannel, digital) with marketing analytics, visualization and customer intelligence technologies from SAS to solve complex business challenges in the media, entertainment, hospitality, communications, content and technology industries. In addition to his role at SAS, Grover is an adjunct professor at George Washington University, teaching in the MS in Business Analytics graduate program within the School of Business and Decision Science. Grover also serves on the program advisory committee for the Direct Marketing Association (DMA).
Introduction

Digital-savvy consumers today have high expectations when it comes to how brands interact with them. For example, they expect that the companies they engage with and buy from understand their preferences—regardless of the interaction channel. They expect them to provide a nonintrusive, yet personalized experience that adds value every step of the way.

In “Predictions 2014: The Year of Digital Business,” Martin Gill of Forrester Research talked about the challenges and trends facing executives as they grapple with how to help their businesses make the transition to digital, often in the absence of a defined digital leadership role. The vast majority of executives expect their digital budgets to grow this year, and more than half expect to spend more on innovation.¹

Research by Adobe in its September 2013 study Digital Distress: What Keeps Marketers Up at Night? validates this trend with the following insights:

- Sixty percent of marketers expect their companies to invest more in digital marketing technology this year.
- Only one in three marketers surveyed think that their companies are highly proficient in digital marketing.
- Ultimately, 61 percent of all marketers think that, for most companies, digital marketing approaches are a constant cycle of trial and error.²

In “Digital Intelligence Replaces Web Analytics,” James McCormick of Forrester Research noted, “Given the significant new investment and revenue at stake for digital-centric business objectives, analytics is critical to supporting the development,

---

**Figure 1. Predictions 2014: The Year of Digital Business.**

validation and optimization of digital channels. And web analytics is the logical hub of interactive channel analysis, based on the historical centrality of the website.

Unfortunately, however, traditional approaches to web analytics are inadequate for helping organizations accomplish these new digital objectives. McCormick calls traditional web analytics “vestiges of a simpler time, when understanding traffic sources and on-site user behavior were paramount.”

Updating your approach to digital analytics is critical, McCormick says, if you want to avoid continually being plagued by poor customer experiences, irrelevant business reporting and siloed customer insights.

As web and customer analytics teams attempt to work together to combine digital data and offline channel data, their success is impeded by what McCormick characterizes as “a clash of approaches and culture from:

- Data types – structured versus unstructured, known data versus anonymous.
- Skills – data scientist versus web geek.
- Analysis – advanced analytics versus ‘good enough’ analytics.
- Time-to-delivery – best possible reporting versus satisfactory instantaneous reporting.”

Clearly, marketing analytics must evolve to keep pace with marketing’s evolving responsibility to encompass more and more interconnected touch points throughout each customer’s journey. To bridge the divide between traditional web analytics and comprehensive analytics for digital marketing, organizations must modernize their approach, says McCormick. Forrester Research calls this “digital intelligence,” defined as:

“The capture, management and analysis of customer data to deliver a holistic view of the digital customer experience that drives the measurement, optimization and execution of digital customer interactions.”

---

A History of Fragmented Data and Analytics Tools

Marketers have long had the challenge of stitching together different types of data and data sources to achieve their vision of integrated marketing. This includes:

- Internal, first-party CRM and transactional data.
- Digital analytics data from web analytics and advertising offerings – e.g., Google Analytics, DoubleClick, Adobe Omniture or Right Media.
- Third-party data from data management platforms like Nielsen, BlueKai or X+1.

Unfortunately, it has been difficult to take advantage of such data sources because they have been stuck in silos. Marketers have struggled to bring together available online, offline and third-party data in a way that is logical, efficient and usable.

Until recently, many marketers depended primarily on various third-party web analytics tools. These tools were designed to aggregate digital data to create reports describing what happened in the past. Getting an integrated, omnichannel view across such a fragmented digital environment was extremely difficult. That made it practically impossible to get a comprehensive, data-centric view of the customer that could feed integrated marketing analytics – or more specifically, prescriptive recommendations for marketing processes.

While data-driven marketers and analysts have used powerful advanced analytics for many years to perform sophisticated analyses – such as regression, decision trees or clustering - they have been limited to using offline and traditional channel data. This has been because of the limited availability of digital data and insufficient integration capabilities. Additionally, web and digital analytics tools primarily aggregate and report on historical information and do not enable predictive analysis, which requires a combination of both traditional and digital data sources in order to provide the most insight.
For the most part, web analytics tools are designed with the visualization of data as the primary driver for users. That’s because data visualization enables a faster, deeper understanding of the insights and trends hidden within data in a more consumable manner. The ease of use and visual appeal of data visualization tools have helped marketers get a better understanding of the important trends and insights within data. However, data visualization largely has been very descriptive in nature – that is, primarily about reporting, business intelligence and descriptive statistics.

Individual Customer-Level Digital Data Is a Valuable Commodity

The challenge facing marketers today is how to progress beyond the multichannel analytic limitations of aggregated data collection methods used by traditional web analytics. There’s an opportunity to have a digital data collection framework that enables both business intelligence and predictive analytics. This methodology requires organizations to:

• Collect data from web, social and mobile app sessions (that is, multidomain visits).
• Accurately stitch together digital visits attributed to one visitor profile (whether anonymous or known).
• After authentication, accurately connect digital visits across devices, browsers and multiple domains attributed to one customer profile.

The vision of digital intelligence requires marketers to focus on understanding the who, what, where, when and, most importantly, the why of digital experiences. In order to do so, however, you must rethink how you collect digital behavioral data, considering larger downstream business applications. For example, some digital marketers love to perform website pathing analysis, which describes visitor page sequencing. What if you wanted to perform predictive analysis (e.g., decision trees and regression) to identify which behaviors in a visitor’s digital journey connected strongly with business conversion events?

Other predictive digital marketing applications include:

• Analytically forecasting website and mobile app visitation by traffic source, and identifying which ad-centric channels best predict overall traffic.
• Predicting techniques and improving outbound and inbound targeting rules for future marketing communication and personalization efforts.

To succeed in these endeavors, you must get data that originates from the web or from mobile apps out of traditional silos. If this data is collected and prepared appropriately, you can merge it with your company’s first-party (or company-owned) customer data, and then stream it into your analytics, visualization and marketing automation systems.

Solution for Collecting, Normalizing and Making Digital Behavioral Data Accessible With Business Context

Recent research has shown the biggest data challenges facing digital marketing involve the storage and integration of large amounts of data, and preparing it for analysis. In addition, emerging digital data is not being collected to the level it needs to be in order to glean valuable insight from it; rather, the vast majority of organizations have ready access only to traditional purchase and demographic data.

In the past few years, there has been a notable upswing in new and incremental abilities to process very large amounts of information. Data repositories – from Hadoop environments to traditional relational databases like SAP, Teradata and Oracle – are getting bigger, stronger and faster. Now that it’s possible to handle very large amounts of information, we can approach digital data differently. As Figure 5 depicts, the biggest opportunity lies in collecting web analytics data and preparing it for multichannel integration. Regrettably, aggregated web data does not have the level of detail that predictive analysis requires, and – for the most part – it cannot be de-aggregated.

SAS® Adaptive Customer Experience Supports Your Digital Marketing Efforts

SAS Adaptive Customer Experience is a digital marketing support solution that is designed to collect and feed big digital interaction data – in the appropriate structure and context – into your organization’s discovery, enterprise data warehouse, visualization, advanced analytics, marketing automation and real-time decision systems. Let’s take a look at the capabilities this solution provides.

Collecting Digital Interaction Behavior via a Single Line Insert

The single line insert (that is, Client Side Adaptor) records all online behavior – down to the millisecond – against the session, visitor and the customer. This gives you an unprecedented level
of insight into how your customers behave on your single- and multiple-domain digital properties – including websites, browser-based mobile apps and social media branded pages.

Compared with traditional web analytics data collection methods, this approach has two important benefits:

1. The single line insert captures all interactions. This significantly reduces tagging management process challenges, and it improves analytic potential downstream.
2. The single line insert does not need to be updated when new content is added to the website or app. As a result, issues with outdated, broken and missing tags cease to exist.

Adding Business Context to Semistructured Digital Data

Normalization is the conversion of raw event digital data into usable data with a business context. Through normalization, data is classified into different types of digital activities, each with its own attributes. SAS Adaptive Customer Experience organizes and structures this data appropriately for feeding into its analytical data mart.

Digital marketing requires data normalization and multi-channel integration, both of which can be quite complex tasks – especially if you don’t have the right tools. Even the seemingly simple aspect of defining what a web session is has hidden complexities. For example, how do you define sessions that span multiple data-processing windows or web domains? Regardless of how data normalization is done, you need to define and set up a huge number of business rules to drive the classification process. These two examples illustrate what we mean:

- Perhaps you want to identify which pathing activities result in an unusually high number of abandoned sessions. There’s an online form that you know most customers do not take the time to complete – but you do not understand why. To identify and address this, you need to know at what point most people stop completing the form. Looking at raw data events alone would indicate form activity levels – and you could have multiple records per form. A visitor could also try to fill in the form twice in the same session – something you would need to use business rules to discern.

Data Roll-Ups: Tying Digital Data to the Customer

Traditional web analytic solutions and their respective data collection methodologies can populate a data mart with aggregated data for web business intelligence. This gives you aggregated information about your website, such as:

- Achievement of online goals and completion of online transactions.
- Shopping basket information.
- General details about visitor origination.

SAS Adaptive Customer Experience enables you to combine this intelligence with individual customer records in the appropriate structure and format for use in data mining, predictive analytics, forecasting and optimization. Without this level of information, you would be severely limited in terms of the level of detail to which you could perform analyses.

Data Management: Ensuring Completeness and Quality

SAS Adaptive Customer Experience uses SAS Data Management technologies to identify, match and consolidate digital data. Together, these capabilities provide the appropriate context and level of accuracy for one-to-one customer analytics, marketing and relationship management.

For example, given the many channels and devices through which customers can interact with your organization, identity management is a complex problem for marketing and IT departments to tackle. How do you know if a given set of anonymous website visits from one IP address involves the same or a different human being? Sometimes it isn’t possible to be sure, but sophisticated matching techniques that use retrospective processing can ensure the greatest effectiveness and accuracy.

SAS Adaptive Customer Experience provides capabilities for synchronizing data, eliminating duplicates and tying data from
current customer web or mobile app visits to data from past sessions to allow a complete view of customer behavior over time. Effective data management also involves ensuring data quality; for example, it is crucial to prevent customer records from becoming corrupted through false matching data. Good data quality improves the performance potential of marketing analytics and visualization.

Digital Data Model and Data Ownership: Breaking Down the Web Analytics Silo

An open, configurable and fully documented extract, transform and load (ETL) data model includes 56 structured tables for session, visitor and customer level views. The information is stored in a digital data mart that you can access by any SQL query or SAS tool for query, reporting and analysis – for example, SAS Visual Analytics or SAS® Enterprise Miner™.

Compared with traditional web analytics data collection techniques, the data model and organizational ownership of SAS Adaptive Customer Experience offer three key benefits:

1. Organizations own the digital data streams that come from their respective web properties, and it can be used in any way desired, without limitation. In contrast, most web analytics vendors own and limit access to the underlying data.
2. You can configure how the data model is populated to match your organization’s unique digital properties, objectives and goals.
3. The data model not only reduces the time analysts must spend accessing and preparing data for downstream analytics and marketing, but it also provides the level of detail that analysts need. Web analytics data models don’t provide this level of detail. The data model enables analysts to combine customer-level digital data with any other source of internal or third-party data, and efficiently move through their workflow.

Figure 7. Visualizing SAS Adaptive Customer Experience.
SAS® Visual Analytics Enables Prescriptive Analysis for Digital and Integrated Marketing

Predictive analytics and exploratory data mining thrive on detailed data. When we can bring together very granular digital data streams that highlight consumer behavior and feed that into visual predictive models, we can improve our approaches to segmentation, personalization, ad targeting and customer experience management.

SAS Visual Analytics gives us the opportunity to watch predictive analytics and visualization technology mesh together. The biggest value of this data-neutral, advanced visualization platform is that it enables you to see predictive insights that could never before be seen using traditional web analytics tools. As the famous mathematician John W. Tukey said in his 1977 book *Exploratory Data Analysis*, “The greatest value of a picture is when it forces us to notice what we never expected to see.”

SAS® Visual Analytics and Predictive Marketing: Visual Advanced Forecasting

To illustrate how advanced visual analytics can help you improve your approach to digital intelligence, let’s analyze digital visitation to sas.com (collected by SAS Adaptive Customer Experience, which uses SAS Visual Analytics as the front-end user interface) from both a historical and predictive perspective.

**Historical View**

Suppose that a manager asks, “What did our web traffic look like over the last few months?” You can get the answer in just a couple of clicks by assigning the Visitor Date and Visit Identifier elements to the visual, as seen in Figure 8.

**Predictive View**

Now suppose the department manager asks, “What’s going to happen to web traffic in the next two weeks?” In one click, you can show a forecast of expected site traffic of any duration – no coding required.

*Figure 8. Historical traffic visitation pattern.*

*Figure 9. Web traffic forecast.*
What’s more, the technology uses champion/challenger forecasting. That means that multiple forecasting algorithms are applied to the data in near-real time. The algorithm that is most statistically accurate is then selected for the visualization. In other words, you get the most accurate result, no matter your quantitative skill level.

**Improving the Forecast**

You can improve how this model predicts future website traffic by providing more information from which it can learn. In Figures 8 and 9, the visualization only represents visitors by date. Now we will add more data elements to describe the originating visitor traffic sources – paid search, organic search, social, blog, affiliate and direct visitors who came to sas.com without the stimulus of an advertisement.

By adding these segments to the forecast model’s consideration, you can see that the confidence interval (that is, best- and worst-case scenarios) of the prediction gets much tighter. This showcases greater accuracy in the model’s prediction compared with the earlier iteration. In addition, significance testing identifies which segments have an impact on the prediction.

Below the forecast line graph in Figure 10, SAS Visual Analytics is used to perform scenario analysis, sometimes referred to as simulation or what-if analysis. The model identifies that two segments - organic search and paid search - had a significant effect on the forecast. You can then simulate inflated and deflated effects of these independent variables.

As a digital marketer – and more specifically, a digital advertiser or media planner – you have a limited amount of control over organic search traffic. You have more control over paid search, which is an ad-centric channel. What if you increased your paid search advertising budget by varying amounts? What effect would that have on overall site traffic? That is actually very easy to answer.

Figure 11 shows a simulated a 35 percent increase in paid search advertising. Let’s see how this change will affect the traffic pattern forecast for the entire website. With today’s ever-changing ad budgets and short time windows, having the ability to simulate increases or reductions in ad spending in different marketing channels can be very valuable.

**Business Question:** What if we increase our paid search ad budget by 35% in the forecasted time period? How will that impact overall site traffic?
SAS® Visual Analytics, Digital Segmentation and Outbound Marketing: Visual Decision Trees

Now there are two numbers representing website traffic for Jan. 2 in Figure 12. The baseline is the original prediction: 1,085. If you increase paid search by 35 percent, you can expect 1,323 visitors. That means that a 35 percent increase in ad spending on paid search is predicted to produce a 22 percent increase in overall traffic over the next two weeks.

Based on how your organization manages budgets and decisions, you could explore different what-if scenarios. For example, you could determine if the impact of increasing paid search advertising by 25 percent or 45 percent would be worth the investment. This would be valuable information, indeed, for a manager or director.

What Drives Conversions on sas.com?

Suppose that a manager asks, “What are the most important factors that differentiate visitors who convert and do not convert on our website?” This is the perfect question for a supervised predictive model.
After the target variable has been added, you can see that 90 percent of visitors did not convert, and 10 percent of visitors did convert. You can now visually select potential predictors to identify unique characteristics of higher- and lower-value audience segments using an advanced data mining algorithm that iteratively goes through thousands of potential scenarios before arriving at a statistically supported answer.

The in-memory processing power of SAS Visual Analytics enables you to apply sophisticated math, such as a decision tree, to large digital data and get near-real-time responses. This is tremendously beneficial for addressing segmentation challenges, as you can very quickly identify attractive audiences.

Figure 15 provides one example of how the decision tree analyzed the parent population of digital visitors and delivered insights into important behaviors that help explain why this specific segment is attractive. Specifically, visitors to sas.com who show high scores of engagement, and originate from an organic search, display higher likelihoods of converting compared with peers who displayed other behaviors. It is the interaction of these two characteristics together that drives this result. The next logical step is to take action on this insight.

The solution enables you to select unique segments and subset the audience to a new visualization. This is empowering, as no programming or coding is required, and the intelligence of the algorithm that defined this audience segment will carry over to the next step within the filter. In addition, you can easily filter out members of this segment who have achieved conversion and focus on lookalike prospects who are showcasing conversion signals, but have not crossed the finish line.

The last step is to create a targeted audience list. After selecting the variables, you can use this attractive segment in a marketing automation system, real-time decision platform or communication optimization exercise.
Figure 16. Visual segment selection.

• Select Segment
• Click
• Choose "Create Visualization From Node"

Figure 17. Prepopulated filter.

Figure 18. Audience segment table available for export.
Conclusion

Consumers today have high expectations when it comes to how brands interact with them. Marketers understand this. They know that to meet these expectations, they need deeper insight into their customers across all channels - including web, social and mobile. To meet this challenge, the two worlds of advanced analytics analysts and digital analysts must converge and begin working together rather than in silos.

SAS Adaptive Customer Experience helps you achieve this by collecting detailed digital data and providing business context to connect the integrated marketing department to online customers. The predictive marketing capabilities that are accessible to data miners and business analysts through SAS Visual Analytics are designed to meet the market’s rising demand for enabling big data analytics to take full advantage of digital marketing insights.

Learn More

Get more information about SAS Adaptive Customer Experience.

Find out more about SAS Visual Analytics.

Learn about SAS Customer Intelligence solutions.

Explore hot topics in marketing at Marketing Insights.

For fresh perspectives from other marketers, read our Customer Analytics blog.

Follow us on Twitter: @SAS_CI

References


