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Decision Making in Reference to Model of Marketing Predictive Analytics – Theory and Practice

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Abstract

Purpose: The objective of this paper is to describe concepts and assumptions of predictive marketing analytics in reference to decision making. In particular, we highlight issues pertaining to the importance of data and the modern approach to data analysis and processing with the purpose of solving real marketing problems that companies encounter in business.

Methodology: In this paper authors provide two study cases showing how, and to what extent predictive marketing analytics work can be useful in practice e.g., investigation of the marketing environment. The two cases are based on organizations operating mainly on Web site domain. The first part of this article, begins a discussion with the explanation of a general idea of predictive marketing analytics. The second part runs through opportunities it creates for companies in the process of building strong competitive advantage in the market. The paper article ends with a brief comparison of predictive analytics *versus* traditional marketing-mix analysis.

Findings: Analytics play an extremely important role in the current process of business management based on planning, organizing, implementing and controlling marketing activities. Predictive analytics provides the actual and current picture of the external environment. They also explain what problems are faced with the company in business activities. Analytics tailor marketing solutions to the right time and place at minimum costs. In fact they control the efficiency and simultaneously increases the effectiveness of the firm.

Practical implications: Based on the study cases comparing two enterprises carrying business activities in different areas, one can say that predictive analytics has far more been embraces extensively than classical marketing-mix analyses. The predictive approach yields greater speed of data collection and analysis, stronger predictive accuracy, better obtained competitor data, and more transparent models where one can understand the inner working of the model.

Originality: Authors describe the importance of analytics which enhance the decisions that the company makes as it executes strategies and plans, so that the company can be more effective and achieve better results. The key factor that enables to execute marketing strategies accurately and build competitive advantage in the future includes predictive modeling. The ability to predict probable futures allows us to shape the future, rather than merely survive whatever it brings.

Keywords: model of predictive analytics, marketing, decisions

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| Introduction – how data analytics rule in marketing practice

Statistical measurement and data analysis is a critical part of the marketing environment. So when one builds a marketing campaign, one also needs to adapt specific measurements in order to further determine which model outperforms another, or understand how outcomes may have been different if a campaign had been based on a different segmentation strategies. Analytics lends itself to measurement – so one can use it to see what the actual state of the environment is, or what problems are concerning the company business. Different types of analytical research will provide insightful information needed to create better marketing campaigns and develop better modeling when constructing future campaigns (Lilien and Rangaswamy, 2004).

Therefore analytics are key elements of thinking in planning, organizing, implementing and controlling marketing activities. The only gap appears between theoretical assumptions and practical issues related to analytical execution. It is because analytics are spread across many functional areas and because it is based on various fields of science, e.g., IT, statistics, econometrics, mathematical modeling or economics (in particular marketing). From the point of view of consumers' investigation studies, (Kohavi et al., 2002; Davenport and Harris, 2007), one can build a framework for marketing with analytics that would help the company to:

1) increase response rates, consumer loyalty, and ultimately ROI,
2) choose the right consumers with highly relevant offers and messages,
3) reduce campaign costs by targeting consumers most likely to respond,
4) decrease attrition by accurately predicting consumers most likely to leave and developing the right proactive campaigns to retain them,
5) deliver the right message by segmenting consumers more effectively and better understanding target populations.

As a result, analytics *tailor marketing* and overall company's business solutions to the right time and place, and at minimum costs. In fact it controls the efficiency and simultaneously prompts or increases the effectiveness of a firm. And the question in marketing was always dependent on whether marketing provides significant added values, thus reducing costs, and improving the company's performance in general or proves to be useless, as a time and funds consuming element of the company organizational structure (Stubbs, 2011).

Therefore, marketing in order to be effective and to maximize return on marketing investments, there is a need integrate marketing process and strategy that is consumer-centered and powered by deep *analytical insight.* Achieving marketing objectives and strategies will require a much more granular analysis of consumers and prospects than ever before, that is based on **marketing analytics**.

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General ideas and assumptions of marketing analytics

Marketing attention paid to analytics was the result of two socio-economic trends such as: incredible explosion of data being created by governments, businesses and consumers and secondly, the shift in power from companies to consumers that's been driven by advancements in technology.

Admittedly the world contains an unimaginably massive amount of digital data today, and it's increasing tenfold every year. Not only are companies jumping on the data – collecting, storing and linking massive amounts of data – but consumers are generating massive amounts of new digital information through postings on Facebook and Twitter. Data is created as they click through Web pages, or provided by cookies and product reviews written by users and more. This kind of data is growing exponentially in both size and strategic value to marketers who need to engage in a 1-to-1 manner with consumers, as this data can be turned into a gold mine of unique consumer insight (Laursen and Thorlund, 2010).

The continuous shift of power to consumers surely creates advantages for them and not companies. Consumers are free in searching for lowest-cost offers for their preferred goods, and by using e-mail spam filters, they can avoid marketing communications from businesses that they don't want to receive. In fact without knowing their expectations and needs according to products and services, a company will frustrate consumers and fail to meet their satisfaction. Hence marketing analytics helps the company to uncover (in its maximum possible way) the suitable information that's personally relevant, timely and delivered via their preferred channels.

Statistical approach to build competitive advantage over predictive analytics

Analytics mainly enhance the decisions that the company makes as it executes on strategies and plans, so that the company can be more effective and achieve better results. The key factor that enables the firm to execute marketing strategies accurately and build competitive advantage in the future includes predictive modeling. And quite often, the greatest benefit of data analysis, comes from using our knowledge of what happened in the past to predict what might happen in the future - which is called *predictive statistics* or *predictive analytics*. If we understand data well enough to describe the past clearly and accurately, we can build a model that can be used to predict what will likely happen in the future as a result of particular conditions, events, or decisions. This interest in prediction has always been a preoccupation of statistics. The ability to predict probable futures allows us to shape the future, rather than merely survive whatever it brings. When supported by good visualizations, predictive analytics come alive in ways that not only help statisticians, but also make it possible for a much broader audience (e.g., marketers, decision makers) to become involved in shaping the future.

The definition of **predictive analytics** might be as follows (…) "Predictive analytics encompass a variety of techniques from statistics and data mining that analyze current and historical data to make predictions about future events. Such predictions rarely take the form of absolute statements, and are more likely to be expressed as values that correspond to the odds of a particular event or behavior taking place in the future. And in business, predictive models exploit patterns found in historical and data (e.g. transactional) to identify risks and opportunities. Models capture relationships among many factors to allow assessment of potential risk, pertaining to particular set of conditions in the market" (Few, 2008, p. 2).

In point of view given by McLean, there is one more important factor related to emphasis on "probability" and features the role of models. He says that (…) "Statistics is commonly taught as a set of techniques to aid people in decision making, by extracting information from data. It is argued here that the underlying purpose, often implicit rather than explicit, of every statistical analysis is to establish one or more probability models that can be used to predict values of one or more variables. Such a model constitutes "information" only in the sense, and to the extent, that it provides predictions of sufficient quality to be useful for decision making. The quality of the decision making is determined by the quality of the predictions" (McLean, 2000, p. 28).

In conclusion the goal of statistics, when used for analytical prediction, is not to produce certainty, but to reduce uncertainty to a level that will allow us to make better decisions. To do this, we rely on *statistical model* or *predictive model*. In concept, they're quite simple, just like more familiar models of other types. Generally speaking, models are representations of things or events, which we use to examine and understand those things or events when it isn't possible or practical to observe or interact with them directly. *Statistical models* represent mathematical relationships between the parts that make up the thing or event. *Predictive models* are those that we can interact with to investigate the results of hypothetical conditions, by changing the values of particular variables. Predictive models make it possible for us to do what some people call *what-if analysis*, to find answers for the following hypothetical questions:

- what if such and such a market condition existed or event occurred?
- what would happen as a result?

Virtually predictive models give us the means to predict what would *probably* happen (the probable outcomes of *dependent variables*) if particular conditions arose naturally or by intention (specified input values to one or more *independent variables*).

| Predictive analytics versus traditional marketing-mix model analysis

Predictive analytics has embraced far and wide marketing-mix analyses. Assuredly there is great need for better, often more ***real-time*** marketing-mix solutions. And *classical marketing-mix*

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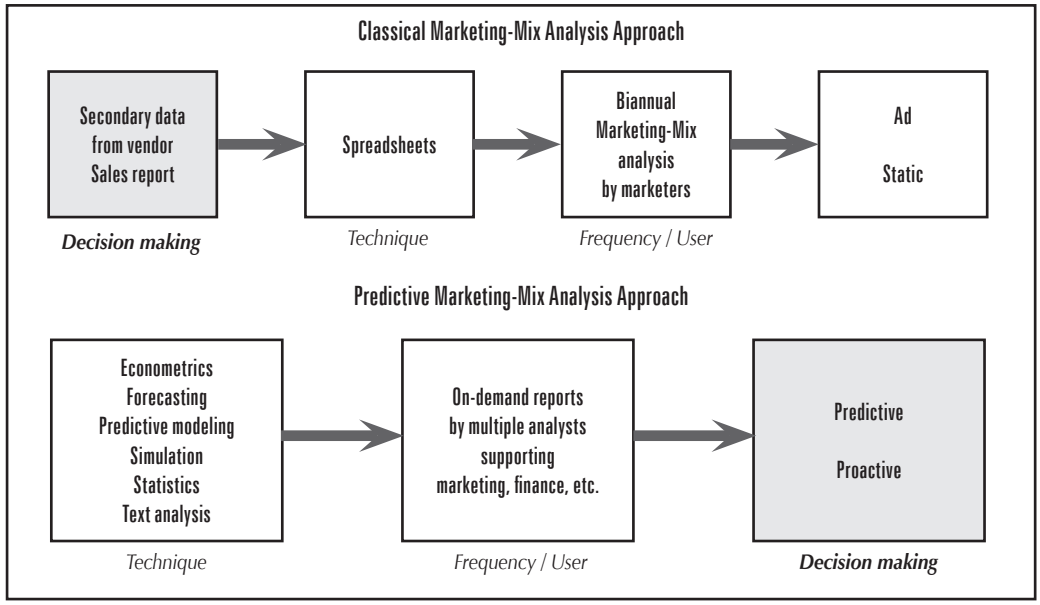
data analysis is bulky. It tends to be historic and not predictive, and is marginally useful for decision making. Data is usually dumped into spreadsheets without any sophisticated diagnostic tools. Some of the past problems related to classical approach to marketing-mix analysis are focused on several aspects. One of them is the *secondary data time lags.* For instance, the typical biannual evaluation of marketing mix is insufficient given increased market competition across more regions. There is a lag between analyzing secondary data and actual events. Another aspect relates to *the analysis that is outsourced with high costs of operations.* Typically vendors of secondary data often conduct marketing-mix analysis for companies and act as consultants to review the data. The vendors send the data to the companies' marketing departments, which then request more refinements. Weeks may pass for successive iterations of aging data, which becomes costly. Also with traditional approach to marketing-mix analysis, *new channel spending cannot be accurately tracked.* This is the case as long as the firms shift away from sales reps and focuses on websites (consumer or any other web initiatives), where marketing managers don't know how to collect data (Leeflang et al., 2000).

In contrast marketing-mix based on predictive approach yields greater speed of data collection and analysis, stronger predictive accuracy, better obtained competitor data, more transparent models, where one can understand inner working of the model. More interestingly it gives more dynamic model that helps the marketer to respond quickly to the market. Both predictive marketing-mix and classical marketing-mix approaches are presented in Figure 1.

In short, a predictive marketing-mix model satisfies all of these ideas and resolves many of the problems that are encountered in classical marketing-mix analysis. It consists of the following benefits, e.g. (Tarka, 2012):

- **integration of wide range of data with wide range of visualizations** – where software combines internal with external data sources. This includes data from mainstream companies data vendors plus reports on individual sales calls, econometric forecasting and financials. Models can be built from data already warehoused and new data can be added as it comes in and analyzed with a wide range of visualizations.
- **description or otherwise "taking a picture" of social media data** as marketing-mix analysis shifts from product-driven TV and radio ads to Web-enabled educational sites, a system needs to be able to capture data from those sites.
- simulations – next-generation marketing mix analysis can perform what-if analyses scenarios to simulate what would happen when a variable in a marketing mix is changed. Classical marketing-mix analysis systems merely provide a static snapshot of the past. Predictive marketing mix analysis systems can give marketing managers answers to questions posed by finance and senior management. The answers can be buttressed by statistical analyses that can provide more assurance than intuitive guesses. At the push of a button and next generation systems can automatically run analyses, which optimize expenditures across geography and media channels.

Figure 1 | Comparison of predictive marketing-mix with classical approach to marketing-mix analysis



Source: own construction based on Tarka (2012).

- **change of projects into processes** – predictive marketing-mix systems can turn marketing mix analysis from a one-off project to an ongoing process. As the data is updated, analysts can run simulations and forecasts that escaped classical marketing-mix. As a result it becomes a portal to interactivity by taking historical trends and running simulations on the impact of shifts in advertising and marketing spending by product line, region and channel.
- **extension of mature stage of product life cycle** – as products age, original brand plans need to be changed. Predictive marketing-mix analysis systems can help fine-tune marketing spending as the product moves toward patent expiration. To maximize their ROI, marketing managers can analyze the optimal point of investment.
- **sustaining the independence** – in the past, many marketing managers outsourced often their marketing-mix analysis to their advertising or marketing research agency or secondary data vendor. Independent software vendors now offer hosted marketing-mix analysis packages. This avoids potential conflicts of interests from outside consultants and puts the analyst back in the driver's seat with prebuilt analytical dashboards.

Some selected techniques used in predictive data analysis

Predictive analytics capabilities enable company to identify the specificity of the targeted population that is likely to respond positively to a specific campaign or other marketing

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activity. More importantly one can also use it to understand and predict the behavior of targeted groups. The goal is to use one or more *predictive analytical techniques.* And in practice there are wide variety of predictive modeling techniques to meet company's needs. For example in **decision tree analysis** we have the following situation where, a consumer's population is split into subgroups that tend to be more homogeneous than the original sample. Each of the subgroups continues to be split into even smaller subgroups until the model cannot be improved. Decision trees allow for nonlinear relationships, but they also clump probabilities and allow for less distribution.

On the other hand with **clustering** technique, groups of individuals are identified based on their proximity to each other. The cluster procedure and discriminate analysis utilizes an effective method for finding initial clusters with a standard iterative algorithm that minimizes the sum of squared distances from the cluster means.

In another technique namely – **logistic regression** we are based on generalized linear model for predicting probabilities. This calculates the probability of a particular record being a member of a target group based on the values of the predictors. Relationships can be also considered in terms of modern **neural networks**, where data can be processed in a parallel way to quickly find complex relationships. Nodes in neural networks sum information from other nodes being connected to it and pass information to the other nodes. This allows for more complex e.g., nonlinear relationships, but they can make interpretation difficult.

And finally in **survival modeling** technique one can determine time-to-event for one-time events. The model includes both the actual probability of events and the effects of covariates. It can be used to study survival trends by demographic area, channel, credit class, rate plan and type of churn, as well as to estimate remaining lifetimes for present consumers.

In consequence all above discussed techniques pertain to predictive analytical solutions in marketing which help marketers to:

- foresee and identify which consumers will stay (for how long) and which (for some reasons will go away),
- determine how to maximize revenue – for example, by understanding which consumers will buy which products and designing campaigns accordingly,
- calculate a consumer's propensity to buy specific products – insight needed to develop highly targeted campaigns and offers,
- identify the sequential order of purchases by performing a market basket analysis,
- identify when a purchase will likely be made by consumer segments or individual consumers by using a survival model.

Marketing analytical orientation pertaining to business organizations operating on Web site – case studies

In order to present on how analytics rules in business organization and to what extent it helps them to tune their marketing activities to consumers, we chose from Analyx's[3] list of clients two enterprises carrying business activities in different areas. One of them acts in highly commoditized world of e-commerce, which has historically been focused on high transaction volume versus better consumer insight. The enterprise is called *Expedia* and is operating in hotel, plane and car reservations. It is typically a marketing data-driven organization, where analytics are used to predict and optimize online consumers' experiences, as well as increase the lifetime value of each consumer. The effect of fact-based (information) strategy associated with analytical capabilities helped the company to: understand what marketing promotional changes drive conversations on the site, optimize its marketing spending by channel, increase consumer lifetime value, and improve the overall experience of consumers while on the site and most importantly to predict their behavior in the next stage. These applications significantly reduced *Expedia's* cost. As the Vice President of Web Analytics put it bluntly:

"We used for example Cox regression model in our web analytics. Rather than doing a more traditional regression or clustering analysis, we tried this model out and had phenomenal success. We employed a model that looked at all touches across all consumer sections to figure out what really influenced a transaction with us. We discovered that we weren't even close with our prior models. What this means, is that we spent increased levels to drive incremental transaction, which using the old model, would have looked inefficient but was actually more profitable. We would have spent too little and made less money. We didn't know that we were leaving money on the table".

According to CEO of *Expedia,* one key area of focus (as already mentioned) has been the understanding and improving of consumer lifetime value in the future. This was a particularly difficult task for the company given that many consumers who reserved through *Expedia* did not always create an account, which means, the company needed to connect the dots to better understand the behavior of its consumer base. Thus, the company constructed a long history of consumers. Analysts spent significant time building data sets, clusters and predictive models to determine how much *Expedia* should spend in order to acquire a consumer on the first transaction, and which types of transaction or campaigns will have the highest probability of driving a second or third transaction. Consumer lifetime value analysis also demonstrated that the cost to drive future transactions will decline among loyal consumers. Thus analytics helped *Expedia* to generate relevant offers when consumers came to the site to reserve, for example, hotel accommodations. Also in order to improve the online consumers' experience, as well as to avoid lost revenue due to site usability glitches, *Expedia* also employed analytics to help developers

[3] Analyx company helps their clients worldwide to understand their consumers better via advanced analytics.

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discover and fix issues that might be impending consumers' satisfaction and new revenue opportunities. In one such case, the identification of a usability glitch saved the company from losing millions dollars in annual revenue.

Another company, applying analytics in its business environment is Macy's Inc. which is one of America's most iconic retailers. The company enjoys a loyal base of consumers who come to its store and shop online each day. The company applies analytics solutions to better understand, predict and enhance its consumers' online shopping experience, while helping to increase the retailer's overall profitability.

In the first row Macy's investigated consumers' lifetime values. Marketers wanted to know how long consumers stay with company's web site, how often an email from the company triggers them to visit the site. In short they wanted to engage with their consumers through interactions. As a result, in a feedback, the company was able to track valuable consumers, predicting their future values as well as provide on time valuable right promotions in order to serve them the best way possible.

Here is what Vice President in Macy's said: "Consumers share a lot of information with us – their likes and dislikes – and our task is to support them now in return for their loyalty by providing them with what they want, instantly." To do so, a group of analysts created a variety of mission-critical reports (some daily, some weekly, and others monthly) that go to employees in marketing and finance. These data-rich reports had taken so far analysts four to 12 hours to produce – much of it busy work involved cutting and pasting from simple software e.g., Excel spreadsheets. After implementing predictive marketing analytics model based on SAS, they did it automatically. As a result the company was able to reduce the time dramatically. And it saved the company approximately $500,000 a year in terms of employee time and consumers interactions. Macy's is a very information-hungry organization. Streamlined systems eliminated errors, guaranteed accuracy and increased the speed with which the company is able to address requests of their consumers. As a result the company is predicting better consumers' next shopping move and is able to foresee their future buying behavior. With analytical orientation company moved from being reactionary to proactive.

Conclusions

It is not true that nowadays, firms do not have the right powerful analytical tools to turn enormous volume of data and information into useful marketing knowledge resulting in better and valid decisions that are affecting indirectly marketing campaigns. They all help organizations (in some sort of analytical – quantitative way) to support daily routine marketing operations, build or sustain strategic advantage in business and most importantly, to assist them in better planning and implementation (that is also coordination) future market activities. From recent times these

tools are known as predictive analytics although they include techniques described by well-known rules derived from the fields of econometrics and statistics, where elements of forecasting, modeling, simulation are applied.

It is also not true that companies are not making the necessary and considerable investments in building complex and sophisticated analytical models or systems in order to effectively evaluate the surrounding external environment factors which, have effect on profitability and strongly depend on the evaluation of consumers profiles and groups, life time trend values, styles of living, behaviors and so on. These companies recognize incredible value and lots of opportunities standing for predictive solutions and information. In fact they try with their best to apply them in order to understand better and adjust appropriately future communication with consumers, planning better product and price levels, and selection of appropriate channels of distribution. Such companies do not leave such opportunities to open chance. Unutterably they need these tools so that they can believe in numbers and pure facts, - not just intuition or creativity off the managers. For these reasons they are convinced and aware of their beneficial importance in building and sustaining future strong relations with consumers, but above all they feel great an urge towards modern models and techniques of data analysis about consumers. Therefore we suppose their level of interest in pursuing marketing-mix through predictive analytical models will be rather ascending than descending.

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