

## Big Data





# Big Data

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A Road Map for Successful Digital Marketing

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# Preface

Imagine being able to target an audience made up of highly qualified and purchase-ready prospects and easily building them into loyal clients by anticipating their needs and hence offering true value. This is the power of big data for digital marketing. Big data is an immense amount of information that is analyzed computationally to produce conclusions and demonstrate a company's ongoing innovation. With the help of big data, marketers can analyze every action of the consumer. This will allow digital marketers to acquire better insights and transparency in an organization. Big data has transformed how businesses used to evaluate their customers' behavior around the world. Along with the potential of analyzing past trends, it can also envision future customer behavior and uncover numerous new opportunities for an enterprise. When it comes to audience segmentation, sentiment analysis and targeted marketing, big data plays a prominent role. This book will strengthen research in the following fields:

- Applications of big data in digital marketing
- Leveraging big data for digital marketing
- Using big data to engage online customers
- Role of big data in predicting consumer behavior
- Integration of big data with other data sources
- Recent trends in big data and digital marketing
- Big data and social media analytics
- Big data and mobile marketing
- Big data and search engine optimization
- Customer relationship management and big data enabled digital marketing

Big data provides insights to lower customer acquisition cost (CAC), customer lifetime value (CLTV), and manage many other customer driven metrics. It helps digital marketers to make more accurate and advanced marketing strategies as it enables personalized targeting, increasing sales, improves the efficiency of a marketing campaign, budget optimization and enables more accurate measuring of a campaign's results. As collection methods become more streamlined through the Internet of Things, use of mobile devices, voice search in homes and vehicles using AI assistants, data may become even more accurate, sophisticated, and expedited. Companies that leverage this data could potentially create better retargeting campaigns, craft more relevant product suggestions, and deliver advertising content that speaks directly to their audience.

Gaining a competitive advantage in your respective field will become more difficult as more marketing groups gain access to the same consumer data. This will require marketers to distinguish themselves from the pack through innovation. The need for advanced tools to analyze and store data will grow. It's safe to say that very soon all marketing efforts will need to invest in online software specifically

geared toward handling big data. Furthermore, the big data tools of today need to evolve or will be outdated tomorrow.

As the marketing world moves into a data-focused future, the success of marketing efforts will be wholly based on attention to detail in data analysis and effectively acting on insights in order to implement changes that will deliver improved results. With this focus in mind, this book will help digital marketers to better understand the role of big data; it will act as a road map for successful digital marketing.

Dr. Amandeep Singh

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Bui Huy Khoi

## Chapter 1

# AIC Algorithm for Employee Motivation

## Introduction

A successful and effective business is always based on the contribution of a good staff. This contribution is reflected in their actions toward the business. To attract employees who are both enthusiastic and loyal, businesses are constantly improving in terms of human resource development, remuneration policies, as well as remuneration for their employees. What we all realize is that when an employee feels they are working in an environment with satisfactory regimes (e.g., there are always many opportunities for development and improvement), they will do their best to complete the job, from which the results exceed expectations.

In deciding work satisfaction levels, job motivation plays a critical role. This study aims to examine the effect of job motivation on job satisfaction. The result of multiple regression analysis shows that job motivation influences job satisfaction significantly and positively. This means that it is critically necessary to boost job motivation to increase job satisfaction among employees (Omar et al., 2021).

Laurence et al. (2020) conducted a study that focuses on job creation by studying the role of enjoying work, and successful and employment-oriented users as the job creation engine. A total of 154 Google monitoring employees were surveyed. Excitement about the job and motivation are supported as incentives of job creation. An interaction effect was observed, with a low impulse to work undermining the relationship between job enjoyment and fabrication. Job creation mediated the relationship between motivation and job performance. The author complements researchers with an understanding of job creation while making the first attempt to explore the phenomenon of job creation in East Asia.

Saether (2019) conducted research analyzing the relationship between motivational forms from self-determination theory and the concept of the personal organization (PO) to provide insight into some of the factors in the innovative work behavior (IWB) of the high-tech research and development (R&D) staff. The research method is quantitative and qualitative. Survey data from R&D staff in three high-tech organizations show that employees with a higher PO level have higher autonomous (deterministic and intrinsic) motivation and employees are motivated to participate in the IWB more often. Autonomous dynamics mediate PO's relationship with IWB. Furthermore, the fair pay (i.e., distributive equity) and the creative support of the organization are closely related to the PO, suggesting that these may be useful for managers to consider concerning employees, employee motivation,

and those who are creativity cautious so as to match the values of the employee and the organization, and to support employee autonomy.

This chapter will present the theoretical basis of employee work motivation, summarizing many studies on employee motivation throughout the world as well as in Vietnam, from which the proposed research model includes seven factors: salary, promotion opportunities, peers, organizational priorities and strategies, reviews, rewards, and staffing plans.

## Methodology

### Sample Approach

According to Bollen (1989), the minimum sample size to undertake a study is 5 samples for one parameter. The sample size can be defined as 5:1 (5 observations per 1 variable) (Hair et al., 2006). This study was carried out with 230 survey forms in Mobile World Corporation in Ho Chi Minh City in Vietnam. Of the 230 votes that were collected, 210 votes were filtered, 20 were left blank and selected only one column in Table 1.1. The table describes statistics of sample characteristics.

**Table 1.1:** Statistics of sample characteristics.

Characteristics	Amount	Percent (percent)	
<b>Sex and Age</b>	Male	76	36.2
	Female	134	63.8
	18–25	130	61.9
	26–35	51	24.3
	36–45	28	13.3
	Above 45	1	0.5
<b>Monthly Income</b>	7–9 million VND	123	58.6
	10–12 million VND	47	22.4
	13–15 million VND	28	13.3
	Over 15 million VND	12	5.7
<b>Time Working</b>	Below 1 year	54	25.7
	1–3 years	144	68.6
	> 3–5 years	9	4.3
	> 5 years	3	1.4

Table 1.1 (continued)

Characteristics		Amount	Percent (percent)
Education	Certificate	79	37.6
	Diploma	104	49.5
	Degree	17	8.1
	Master's	10	4.8

We use the 5-point Likert scale to evaluate the level of consent for the related factors for 180 respondents. Therefore, this chapter also uses the 5-point Likert scale to evaluate the level of consent for all observed variables, with 1: Disagree . . . and 5: Agree in Table 1.2.

Table 1.2: Factor and item.

Factor	Code	Item	Mean	SE
Salary (SA)	SA1	Understand how salary is calculated in the company.	3.85	0.822
	SA2	Salary commensurate with capacity.	3.72	0.875
	SA3	Reward policy promptly and publicly.	3.75	0.810
	SA4	The company's income is high.	3.69	0.791
	SA5	The company has many rewarding programs for employees.	3.74	0.808
Working Promotion (WP)	WP1	The company has different career promotion plans.	3.81	0.732
	WP2	The company always has many opportunities for career advancement.	4.09	.845
	WP3	The company's promotion and promotion policies are fair and transparent.	3.43	1.001
	WP4	Clear company promotion plans in the company.	4.00	0.891
	WP5	The company promotion policy is fair.	3.49	0.994
Colleague (CO)	CO1	Colleagues are always friendly and sociable.	4.10	0.910
	CO2	Colleagues have high internal solidarity.	4.13	0.890
	CO3	Colleagues always support, help, and motivate each other at work.	3.94	0.993
	CO4	Collaboration working well.	3.98	0.958
	CO5	Colleagues are willing to share work experience.	3.78	0.919
	CO6	Trusted colleague.	3.85	0.936

Table 1.2 (continued)

Factor	Code	Item	Mean	SE
<b>Organizational Strategy (OS)</b>	OS1	The necessity of creating an organizational strategic plan.	3.88	0.925
	OS2	There are priority policies for each organization.	3.77	0.899
	OS3	Priority creates personal success.	3.78	0.891
<b>Evaluation (EV)</b>	EV1	The company has highly rated tools.	4.23	0.769
	EV2	The monitoring company is likely to lead the assessment interview.	4.30	0.727
	EV3	The company is highly specialized in the field.	4.03	0.779
	EV4	The company has professional and objective reviews.	3.97	0.877
<b>Reward (RE)</b>	RE1	The company has a timely reward policy.	3.89	0.805
	RE2	The company has been rewarded in many different forms.	3.98	0.866
	RE3	Company rewards with company profits.	3.89	0.919
	RE4	Company rewards based on performance.	3.87	0.885
<b>Personnel Plan (PP)</b>	PP1	The importance of workforce planning.	4.21	0.840
	PP2	The organization has a development management system that has a staffing plan.	4.00	0.816
	PP3	Human resource planning helps to systemize work.	4.10	0.827
	PP4	Human resource planning positively affects the quality of service provided.	3.92	0.823
<b>Working Motivation (WM)</b>	WM1	Voluntarily improve your skills to do better.	3.88	0.565
	WM2	The company is inspired at work.	3.93	0.782
	WM3	Intent to quit work.	4.03	0.731
	WM4	Willing to sacrifice personal interests to get the job done.	3.82	0.849
	WM5	Get excited about your current job.	3.75	0.742

## Blinding

For the duration of the study, all study staff and respondents were blinded. No one from the outside world had any contact with the study participants.

## Results

### Akaike Information Criterion Selection

Akaike's Information Criteria (AIC) was utilized to choose the best model by R software. AIC has been used in the theoretical context for model selection. When multicollinearity occurs, the AIC approach can handle multiple independent variables. As a regression model, AIC can be applied, estimating one or more dependent variables from one or more independent variables. An essential and useful measurement for deciding a complete and straightforward model is the AIC. Based on the AIC information standard, a model with a lower AIC is selected. The best model will stop with the minimum AIC value in Table 1.3 (Burnham & Anderson, 2004; Khoi, 2021).

**Table 1.3:** Akaike information criterion selection.

Model	AIC
MW = f (SA, WP, CO, OS, EV, RE, PP)	-507.2
MW = f (SA, WP, CO, EV, RE, PP)	-507.96
MW = f (SA, WP, EV, RE, PP)	-508.61

In Table 1.3, R reports show the steps of searching the optimal model. The first step is to start with all seven independent variables with AIC = -507.2. The second step is to find the best model; R stops with a model of five independent variables (SA, WP, EV, RE, PP) with AIC = -508.61.

**Table 1.4:** The coefficients.

MA	Estimate	Std. Error	t-value	P-value	Decision
-Intercept	0.07572				
SA	0.23471	0.03747	6.264	0.000	Accepted
WP	0.15015	0.03040	4.940	0.000	Accepted
EV	0.14253	0.04056	3.514	0.000	Accepted
RE	0.15223	0.03305	4.607	0.000	Accepted
PP	0.28744	0.03627	7.924	0.000	Accepted

All variables have a *p*-value lower than 0.05 [8], so they are correlated with working motivation (WM), which is shown in Table 1.4. Salary (SA), working promotion (WP), evaluation (EV), reward (RE), and personnel plan (PP) impact WM.

**Table 1.5:** Model test.

VIF	SA	WP	EV	RE	PP
	1.424989	1.199228	1.544997	1.714816	1.441121
<b>Autocorrelation</b>	Durbin-Watson = 1.8423		test for autocorrelation		
			<i>p</i> -value = 0.1192		
<b>Model Evaluation</b>	Adjusted <i>R</i> -squared = 0.7294		<i>F</i> -statistic	<i>p</i> -value:	
			113.6	0.00000	

## Variance Inflation Factor

The multicollinearity phenomenon occurs when there is a high degree of correlation between the independent variables in the regression models. Gujarati and Porter (2009) showed some signs of multicollinearity in the model when the variance inflation factor (VIF) coefficient is greater than 10 (see Table 1.5).

According to Table 1.5, VIF for the independent variables is less than 10 (Miles, 2014), so there is no collinearity between the independent variables.

## Autocorrelation

The Durbin-Watson Test shows that there is no autocorrelation from the model in Table 1.4 because the *p*-value = 1.8423 is greater than 0.05 (Durbin & Watson, 1971) in Table 1.5.

## Model Evaluation

According to the results from Table 1.5, SA, WP, EV, RE, and PP the impact of WM is 72.94 percent in Table 1.5. The analysis shows the following regression equation is statistically significant (Greene, 2003):

$$MW = 0.07572 + 0.23471SA + 0.15015WP + 0.14253EV + 0.15223RE + 0.28744PP$$

## Solutions

The results of the AIC Algorithm for WM showed that five independent variables: SA, WP, EV, RE, and PP have a positive impact on WM because their *p*-value is greater than 0.05. The impact level of these four variables on the dependent variable WM in

descending order is as follows: personnel plan (0.28744), salary (0.23471), reward (0.15223), working promotion (0.15015), and evaluation (0.14253). The Mobile World Corporation must regularly pay attention to motivating issues for employees so that they can work spiritually and contribute to the company more effectively.

The Mobile World Corporation needs to pay more attention to working conditions and a better working environment for its employees so that employees can work in the most comfortable environment possible. It would then be possible to maximize their capabilities and devote more to the Mobile World Corporation.

The Mobile World Corporation needs to organize more confidential conversations with employees to motivate them and increase solidarity among each other, so leaders can understand employees' aspirations and give them a chance to express their opinion.

The Mobile World Corporation encourages a balance between work and family life and takes note of employees' birthdays, employees' family members' status, etc. so they consider the company like a second family.

Mobile World Corporation has a salary and bonus policy for employees working overtime. The sales lines beyond 50 km should support more gas and food expenses so that employees will have a sense of comfort and dedication.

Mobile World Corporation creates rewarding policies to motivate employees to work better; besides, managers often pay attention to the attitude and working motivation of each employee so that they stay on for a long time and are dedicated to their job.

## Conclusion

Researching the motivating factors for employees is a job that is essential for all businesses. This helps businesses understand the essential factors that motivate employees to work more efficiently and reduce the pressure during the work process. Since then, there are reasonable policies and ways to impact and motivate employees to achieve high efficiency. This research creates a very good competitive advantage if businesses capture and apply it well. WM showed that it was influenced by SA, WP, EV, RE, and PP. Accordingly, all five factors discussed earlier have a positive impact on WM. Besides, the AIC Algorithm also shows the influence of five independent factors on the dependent factor. The results of the study analysis are quite like the results of some previous studies cited earlier.

## Further Research

When employees are motivated, they work harder than expected to deliver the best results, which is an important feature of company development in the present as well as in the future.

If the company handles this well, employees are always motivated to work with them for a long time, rather than actively looking for new jobs, and always recommend the company as the best place to work. Mobile World Corporation does not spend a lot of time training or on training costs for new employees.

As mentioned in the earlier part of this study, the goal of this study is to keep the company's employees motivated by making them feel that the working environment is the best for long-term employment. However, motivation needs to have a measure of work efficiency, so it is necessary to study the factors that affect employees' performance as well as the factors that affect the intention to quit. Then, the factors built into the original model may play a different role in the correlation relationship for these two factors, and at the same time, motivation will be considered as a factor affecting the employee's work performance and the intention of quitting.

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Reena Malik, Sonal Trivedi

## Chapter 2

# Big Data Analytics in Predicting Consumer Behavior

## Introduction

With the advent of the internet and consumers being exposed to new technology, it has become harder for marketers to predict ever-evolving consumer behavior. Machine learning has allowed studying buyer behavior and has made it easier to anticipate the buyer's next move for future purchases. Electronic commerce has made it more complex for consumers to buy products as nowadays there are a vast number of options along with comparisons. Overexposure to digital platforms requires a deeper scrutiny of these digital platforms. Data analytics tools are being used to track the digital footprint of the buyers. Marketers need to infer the relevant information from the big data collection from varied digital platforms. When big data analytics come into the picture to analyze customer behavior, it is referred to as customer analytics. By using customer analytics, marketers can draw valuable information and predict buyer behavior, which may lead to enhanced sales, personalized marketing, optimization of the market, fraud identification, and many more applications. Using big data, companies can predict consumer behavior more accurately than with conventional statistical techniques alone (Balar, Malviya, Prasad, & Gangurde, 2013). Big data is emerging as a new power that can drastically change the way companies analyze customer behavior. There are four V's of big data: volume, variety, velocity, and the fourth one is emerging as the most significant to the marketers, and that is value, as companies understand there is a huge difference in the online and offline behavior of customers. Most of the industries are trying to get one step closer to big data by seeing the various opportunities it has to offer. Retail has always been an important part of our economy and our lives since in order to fulfill our needs (business and customer), we must buy products and services every day. The retail sector is also important for the economy as it significantly contributes to the national economy. To better understand the needs and wants of customers and to satisfy them, most of the companies are getting help from big data. E-vendors can avail market and managerial transaction cost and time effectiveness by using big data analytics as they can easily track buying behavior of an individual and can convert them into regular customers. Consumer behavior data now can be measured and analyzed even for the customer experiences as it can tell what they need, want, and think.

## Review of Literature

The advent of the internet has revolutionized the world, and algorithms are ruling it. These mathematical equations are encountered by each one of us – in recommendations of movies, serials, blogs of your choice, to ad pop ups and social media feeds (Finley, 2014). Big data applications are most commonly used by enterprises not for the benefit of companies and organizations but for personalized and customer understanding and experience, and building a long-term rapport with customers in order to make them loyal, as big data helps in predicting what a customer wants (Chen et al., 2012). Big data analytics has proven to be a very effective tool in improving interactions with customers, which aids in effective development of marketing strategies. With numerous brands being able to connect through more channels with consumers, improving and maintain relationships are essential (Uğur & Türkmen Barutçu, 2017). Many industries are successfully applying big data and reaping the benefits of it in terms of increasing profits and growth rate by understanding the real purchase behavior of customers. Using big data analysis helps enterprises and their customers by providing them a competitive marketing advantage as it promotes customization (Linoff & Berry, 2011). The collected data can be manipulated in different ways to figure out the things customers like, prefer, bought together, and what, when, and how to buy (Tirunillai & Tellis, 2014). Big data analytics helps in predicting and segregating the total customer base, based on their demographic and psychographics features.

## Tools of Predictive Analytics in Marketing

Predictive analytics is now widely applied by the marketers to understand the customers and frame marketing strategies accordingly. In marketing it can be used in segmenting the market, forecasting, demand pricing, and better customer satisfaction. The following models are widely used for predictive purposes:

### RFM Modeling

**Recency:** customers who have spent money recently on products or services are more likely than others to spend.

**Frequency:** customers who have spent money repeatedly are more likely than others to spend.

**Monetary:** customers who have spent more money at a business are more likely to spend again.

The RFM model is being widely used in retail today to understand customer purchasing patterns and behaviors, such as how frequently they are buying, their recent purchases, and their involvement (heavy/low) with the product.

By calculating customer lifestyle value with the help of RFM, various sales and marketing strategies can be framed out (Khajvand et al., 2011).

## **Black-Box Model**

This model deals with the external stimulus response, that is, environmental stimuli, including economics, technology, and culture and marketing stimuli, which in turn include product, price, and promotion. These stimuli lead customers to make their own buying decisions. In this model the marketing mix acts as a stimulus, and customers respond to these stimuli as they can influence purchasing decisions. The internal factors also influence the purchase decision, for example, values, beliefs, lifestyle, etc. The decision-making process is also a part of the black-box model as customers realize the arousal of a certain need and the fulfillment of that need by purchasing or not purchasing a particular product or service.

## **Personal Variable Model**

Under this model consumers make decisions based on internal factors (beliefs, opinions, values, tradition, and goals). The complex model includes both internal and external factors. This model mainly focuses on the internal stimuli and the influence of that internal stimulus on the purchasing decision. Some contemporary models include Bettman, EBK model, Markow model, etc.

## **Statistical Analysis and Market Research Tools**

For efficient integration of customer behavior data into marketing strategies, different techniques have been used such as multiple regression, conjoint analysis, Hypothesis testing, tests for statistical significance, discriminant analysis, factor analysis, and cluster analysis. These tools help in combining the vast data and provide the most relevant factors, which can be taken into consideration for preparing various marketing strategies and tactics. So that only those factors can be targeted which are crucial; cluster analysis provides such a compilation.

## Gaining Insights from Big Data Analytics

Increasing reliance on big data for information has made it challenging for marketers to understand and evaluate marketplaces. Converting data into meaningful insights useful for decision makers is one purpose of marketing research (Hyman & Sierra, 2010).

**Venn diagram:** By combining different segments together, an effort is being made to discover hidden relationships and explore customers that bought different categories of products together. This analysis helps marketers in understanding what types of products are generally bought together, so they can be placed on shelves accordingly. Consumers who are not data literate can benefit from this technique as it presents data in a simplified way.

**Data prefoliation:** Identifying customers who have common features and similar behavior, purchase patterns from the data set to frame efficient marketing strategies. Customers having similar tastes and preferences can be targeted easily as a deeper study of that group is possible and tactics can be framed out accordingly.

**Time series analysis:** Prediction about monthly sales volume or orders placed in the near future can easily be anticipated accurately using time series analysis. Time series analysis provides insight for anticipating costs and sales as it gives a certain pattern over years that would assist in identifying and anticipating consumer behavior. Based on the relevant information, marketers can easily frame out various strategies and tactics.

**Mapping:** Under mapping, colors are used to identify consumer behavior. A map is prepared that is divided based on geography and indicates in different colors which products sell the most. A particular region can be identified for catering to the customers, and specific marketing strategies can be framed on that basis.

**Basket analysis:** Most useful insights are inferred from basket analysis such as products often bought together by customers, and when they buy, which customers are not buying and why? The answers to such questions reinforce the understanding of customers by the marketers as to what products can be put at similar places ensuring greater sales and increased revenues as they frequently will be bought together.

**Decision tree:** When it comes to classification, the decision tree has been used as an important tool. It helps in recommending the right products to customers and even helps in identifying potential customers. Probability of choosing a product can be analyzed by using this technique. Predicting and understanding customer behavior is very complex but with the help of big data analysis tools, marketers can modify their marketing strategies to reach the right audience.

## Big Data and Consumer Purchase Decision

To access every “P” of marketing, that is, product, price, place, and promotion (McCarthy, 1960) requires collecting data relevant to these P’s, which are then analyzed by using various statistical tools to gain useful insights for decision-making by the marketers. Traditional methods and big data when combined with decision-making helps companies reduce their product failures (Xu et al., 2016). Understanding of big data for success cannot be ignored as “small data” can not be scaled up to tackle complex marketing problems. Big data can alter a five-step traditional consumer purchase decision (Hofacker et al., 2016) as they get influenced by exposure to the vast information available. From the very first stage of need recognition and to the last stage of post-purchase decision, consumers easily get influenced as meaningful information reduces the need for search and recommendation agents, and filtering tools provide automated evaluation of alternatives as customer preferences can easily be analyzed and accessed by a ranking system. Feedback and ratings provided online influence the purchase decisions. With vast social networks, different consumers participate in the evaluation of post-purchase decisions. Presence and participation of consumers in online/virtual communities has made it even more relevant for markets to understand consumers’ group behavior as well.

Prediction in any area has many benefits as it is a combination of advanced statistical analysis, data mining, real time access, predictive modeling, etc. When it comes to benefits of predictive analytics, the major work revolves around security such as fraud detection and chargebacks, which every retailer wants to tackle as it can reduce the overall fraud that can help withdraw products from assortments that are more prone to fraud occurrence. It is also beneficial for the entire E-commerce industry, backed by the features it offers. Predictive analytics for supply chains also serve and help in understanding the demand for customers effectively. This will include all the forecasting related to the delivery and fulfillment of the orders and their returns, etc.

## Analytics – The Road Ahead

As per the recent report released by Statista, the big data market is about to increase rapidly from 23.7 billion (US) dollars in 2016 to 92.2 billion (US) dollars by 2026. Analyzing large data has only become possible with the help of big data analytics. Most of the industries are benefiting from predictive analytics and reaping various benefits in terms of correctly analyzing consumer behavior.

## Conclusion

Big data is emerging as a new power, which can change the way companies analyze customer behavior drastically. The Indian retail sector is transforming rapidly propelled by rising household incomes, technology advancements, e-commerce, and increased expectations. New innovative technologies are being used by retailers to provide a seamless and unique shopping experience to the customer. With the advent of the internet and consumers being exposed to new technology, it has become harder for marketers to predict the ever-evolving consumer behavior. Machine learning has allowed studying buyer behavior. Electronic commerce has made it more complex for the consumers to buy products as today the availability of vast data can be compiled easily and of course will help marketers for making better decisions. All the digital activities of the consumers can easily be traced in real time like their browsing history, downloading history, etc., which helps marketers analyze the data collected for understanding the future moves of customers. Big data offers various advantages to the marketers and helps in building brand loyalty. The rise in big data and analytics puts a magnifying glass on the consequences that have arisen from the use of the internet in this digital age.

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Seprianti Eka Putri

## Chapter 3

# Using Big Data on Customer Behavioral Analysis in Indonesia

## Introduction

Big data analytics has been revealed as a method for assisting managerial decision-making and exploration activities by presenting previously unknown results that can lead to new insights (Dyché, 2014). Big data analysis has a meaningful impact on the value of a company and its success, resulting in cost savings, increased returns, enhanced customer relationships, and growth. Conditions are not always perfect for big data collection in some institutions (Duan & Xiong, 2015), but big data has definitely increased the volume, speed, and variety of data in today's world. Data analysis is simpler to do, more accurate in statistics and model improvement (Chen et al., 2012), and in decision-making in e-commerce, e-government, database segmentation, and social network analysis. In this era of digitalization, information coming from a well-structured quantity of information and relevant technology from big data has a significant effect on consumer-to-consumer (C2C) e-commerce.

## Overview of C2C E-Commerce

Today big data technology is developing in Indonesia and in the last two years the use of big data in different forms and shapes has reached 90 percent of the world. In Indonesia the utilization and application are still minimal in various aspects. From the research results, it is evident that consumer behavior in a digital society will be influenced by an increase in the number of possibilities that lead to emergent and unexpected behavior, and there is a tendency for future generations to want unlimited access to content on the internet.

Electronic business is a process that utilizes the employment of computerized innovation with the internet in these main operations. E-business includes internal management activities of a company as well as coordination activities through suppliers and business partners (Laudon & Laudon, 2014). E-commerce is the division of e-business that bargains with purchasing and selling goods and services via the internet. It also includes activities that support these transactions, such as advertising, marketing, consumer support, security, shipping, and payments (Laudon & Laudon, 2014).

In this case the type of e-commerce to be discussed is C2C, which refers to companies that provide a network platform. Consumers can easily transact on such sites, such as eBay, and buyers and sellers can conduct business online. The e-commerce business in the form of C2C involves consumers who sell directly to consumers. Generally, these transactions are carried out online through third parties that provide online platforms or marketplaces to carry out these transactions so that C2C becomes an intermediary between sellers and buyers such as Tokopedia, Shopee, OLX, and others. In many countries, such as Malaysia, Singapore, Thailand, and Pakistan, e-commerce has increased the number of buyers (Bhatti et al., 2020), even Indonesia has experienced a significant increase (Sudaryono et al., 2020). Many foreign investors are interested in investing in e-commerce companies so that businesspeople can increase the scale of their business. E-commerce is considered to have good prospects in the future. Based on a report released by McKinsey, entitled “Unlocking Indonesia’s Digital Opportunity,” the digital economy is predicted to be able to increase the national economy to US\$150 billion by 2025. Likewise, Ipsos Indonesia, as reported by Marketeters, predicts that Indonesia has the potential to become a big player in e-sector commerce in Asia and even in the rest of the world.

Moreover, the Population Census Report shows that the total population in Indonesia reached 270.20 million in September 2020 (Badan Pusat Statistik Indonesia, 2020). The report by Asosiasi Penyelenggara Jasa Internet Indonesia (2019) has shown that the number of internet users in the second quarter has grown significantly compared to the behavior of internet users in 2018. The number of users in 2020 reached 196.7 million or 73.7 percent of the population. This number increased by about 25.5 million users compared to 2020. Big data and consumer behavior research will yield behavioral information about customers, which businesses will use to gain a competitive edge. Consumer behavior analysis, in general, refers to tools that assist in the discovery of hidden trends in data, and businesses have produced much more data than they can use through connected systems in recent years (Fayyad et al., 1996; Friedrich et al., 1983).

## Defining Big Data

The literature gives a few meanings of big data (De Mauro et al., 2015; McAffe et al., 2012; Popović et al., 2018; Provost and Fawcett, 2013). They can be characterized as organized information like authoritative data sets, and unstructured information created by new correspondence advances like the IoT, just as pictures, recordings, sound. These IoT gadgets—regardless of whether they are cell phones, online purchases, inter-personal organizations, electronic correspondences, GPS, or hardware—create deluges of information by interfacing with and observing individuals. In other words, enormous information is only the acknowledgment that buyers are currently generators

of both customary and unstructured information (Erevelles et al., 2007). By utilizing the information created by IoT and big data, organizations can settle on more viable choices (McAfee et al., 2012).

## Define Consumers in Big Data

The average shopper has become part of a pattern because of advances in technology, structured, transactional, and contemporary behavior (McAfee et al., 2012). Data diversity, as well as high-speed continuous data generation, are transforming marketing decision-making. Quantity, velocity, and variation are the three dimensions that make up big data (IBM, 2012; Lycett, 2013; Oracle, 2012).

## Volume

The size of data is measured in petabytes, exabytes, or zettabytes. Walmart is estimated to generate 2.5 petabytes of hourly shopper data; one petabyte is the same as 20 million standard filing text cabinets (McAfee et al., 2012). As the information index grows in scale, this metric will become obsolete. Likewise, in 2013, the advanced universe was estimated to be 4.4 zettabytes (1 zettabyte is equivalent to 250 billion DVDs) (Cisco 2014). The advanced universe must be 44 zettabytes in volume. In this case, the organization endeavors to control the expanding difficulties. On the global demand for programs, software, and administration in storage, data investigations are projected to double every few years (IDC, 2014).

## Velocity

This is the subsequent key component of huge information (Lycett, 2013) or uninterrupted data generation speed. Marketing executives with admittance to rich, perceptive, and up-to-date data can improve choices dependent on proof at some random time, not on instinct or lab-based buyer research. There is a big discrepancy between the United States statistical records and the patron information received with the help of a main girls' clothing company whose advertising heads are continuously aware of the variation in consumer exchanges and what customers do within the interpersonal commercial enterprise. Both types of statistics are detailed, well-sized, and informative. Only the latter, however, equips marketing executives with the tools they need to make new, evidence-based decisions in the face of competition; big data insights will be difficult to compare.

## Variety

Several big data sources provide variations where the transition from organized transactional data to unstructured behavioral data is the main difference between contemporary and conventional big data (Integreon Insight, 2012). Marketers have been collecting structured data (scanner or sensor data, documents, files, and databases) for a long time. Textual (blogs and text messages) and nontextual data are examples of unstructured data (videos, images, and audio recordings).

Individuals exchange personal and behavioral information with friends and family on social media, which generates a lot of unstructured data. Semi-structured data is created by combining various types of software that can organize unstructured data. Standard Generalized Mark-up Language software, for example, allows organizations to identify common elements in instructional videos (e.g., a YouTube video shows people using the product).

## Consumer Behavior is Affected by Big Data

Traditional purchasers' conduct isn't like the circumstance of purchasers in this big data era. The accumulation of huge information and the C2C e-trade version era has delivered new influences, which includes converting purchaser conduct in Indonesia. The purchaser shopping selection version has several stages. It's equal to buying in a conventional buying environment. With the appearance of the "big records" era, the large use of accumulation and generation modified purchaser conduct and feelings. We need to investigate what has an impact on purchaser online buying conduct, then guide that online buying behavior.

Further, the information scanning activity related to consumer behavior consists of several parts and these are discussed below.

### Scanning Information on Needs Recognition

It is easy for emotional consumers to drive their purchase wants and demands through information networks. Second, as rational consumers, information-rich service products can better meet their rational assessment needs and reduce information retrieval costs (Cao, 2006).

## Scanning Information Against Information Seeking

When making online purchases, consumers often gather information. Online shopping is more energy-efficient and knowledge-based than shopping at conventional stores.

Consumers can benefit greatly from the ability to purchase high-quality and low-cost goods.

## Scanning on Alternative Evaluations

The primary decision is based on complete information. Buyers, on the other hand, have limited resources (including time, energy, and money). Consumers want to gather information online quickly and comfortably.

## Informed Scanning of Purchasing Decisions

When consumers, who have enough time and comfort to analyze prices, quality, and performance, search for goods on the internet, this becomes important in making purchase decisions.

## Information Scanning of Post-Purchase Behavior

Consumers may find fascinating information that they can filter and use systematically to affect their product or service assessment. Then, the effect of the security system on post-purchase actions can be seen in the relationship with the shopping network, where the spacetime blocks allow consumers and producers to share information through network availability.

Delivery of products is usually carried out by the logistics company as a third party. All of this has discouraged consumers from monitoring the efforts of the entire trading process. Consumers have no way of knowing if all confidential data is adequately secured during transmission. This will make customers feel nervous, particularly those who have had problems with shopping security in the past. This is a common reason why people don't worry about the specific IoT devices they have because they don't consider the data collected sensitive or accept the effectiveness of protecting themselves from privacy or security-related threats.

## **Credibility Impact and Security System on Consumer Behavior**

The following two things are important and need to be considered:

- 1) The impact of credibility on consumer behavior
- 2) Credibility in evaluating options

Previous encounters and relationships with other people have credibility. For both sellers and buyers, knowledge is asymmetrical (Zhao, 2012). When buyers prefer high credit scores and better products, they expect vendors to provide high-quality service.

### **The Buying Decision's Credibility**

The greatest benefit of online shopping over conventional shopping is cost savings. The use of “big data” technologies allows for the transfer of knowledge at a low cost of operation. This has the important benefit of establishing a reputation.

### **Post-Purchase Behavior's Credibility**

Consumers will display their good online experience after a purchase if they are satisfied (C. B. Li, 2013). Nevertheless, if customers are disappointed after shopping, they are more likely to express their dissatisfaction on social media, and therefore, many potential customers may lose interest in buying the item.

## **Consumer Behavior and the Impact of Security Systems**

Online shopping is conducted in a simulated world in C2C e-commerce. Information flow, cash flow, and logistics are all separated by time and space. This gives commodity manufacturers access to confidential information and raises the possibility of confusion in the shopping network. The majority of customers are worried about the unauthorized violation of personal information during the network shopping process, which would affect their online shopping habits.

### **Information Retrieval on the Security System**

With the advancement of information technology, collecting, analyzing, and using personal information without permission has become relatively simple. Since an

interpretation of commodities on the network can only be achieved by image and text descriptions, there is a possible personal privacy risk if the definition of product information is not clear. Several vague definitions can easily lead to different interpretations.

### **The Assessment Alternatives' Safety System**

Unlike traditional shopping, online shopping, especially online payments, necessitates the transmission of information over the internet. Unauthorized offenders are likely to tamper with the transmission mechanism. Personal details, such as credit card numbers, have been modified, copied, and removed. If not managed properly, this would enhance consumer fears of the risks of online shopping.

### **The Security System on Purchasing Decisions**

Companies entering and exiting the industry may find their capital exhausted due to networking, and online retailers can suddenly disappear. When compared to traditional shopping, returning items purchased online is inconvenient. Online retail products, on the other hand, are dependent on impersonal electronics stores to complete transactions.

## **Conclusion and Recommendation on Customer Buying Behavior**

The rise of big data is a challenge for data protection, and customer analytics is at the heart of the revolution. New tech allows capturing the wealth and abundance of information related to the real-time customer phenomenon in Indonesia—volume, velocity, and variant that can be obtained from personal consumers. The convenience and short records seek to allow consumers to depend on big data. Recommended networks offer extra alternatives for purchasers. Many that have had more marketing exposure would seek personal knowledge and become interested in marketing.

Massive amounts of data itself have three main components or characteristics; therefore, big data provides solutions for businesses or the IT industry to identify new opportunities that might be managed.

- 1) **Volume:** Big data as a large data set can function as a data collector from various sources. The data collected varies greatly, such as transaction data, social media, and data obtained from automatic machine sensors.

- 2) **Velocity:** As a data set and with the large amount of data collected, it requires high-speed flows to handle the traffic of incoming data. From the incoming data, it will be distributed appropriately so that it can be presented in real-time via the device.
- 3) **Variation:** The amount of data that enters and accumulates in big data, of course, has certain and unique variations. This wide-ranging data can be in the form of documents, photos, videos, emails, databases, and many other variations of data contained in big data.

Big data is a collection of data that has great characteristics and benefits for business development and has the potential to become an insightful opening for businesses, which will certainly be useful.

Some of the benefits of using big data for businesses are discussed below.

### **Get to know Customers Better**

By applying big data, we collect all information from customers who use our services or business. We can use this collection of information as a reference to understand consumers who we can better provide products to according to their needs and desires. From the data collected in big data, we can see the facts in the field, consumer trends, and their behavior and activities. By using big data, the process can be done faster.

### **Build a more Effective Marketing Strategy**

With all the customer or consumer data that we have today, it will not be difficult to build an effective marketing strategy that can reach every consumer according to our market. Using the right marketing strategy will prevent us from shrinking market shares caused by relationships that have not been fully developed with our customers.

### **Building Relationships and Consumer Trust in the Business**

Our strategies will also affect the risk factors that will begin to decrease along with the implementation of the right strategy. An effective strategy, in addition to increasing consumer confidence, will also increase revenue in the business we are running.



## **Improve the Consumer Shopping Experience**

The amount of data that is contained in this big data can be used to improve the shopping experience of our consumers. Producing products and services based on customer wants and satisfaction as revealed by data inputted into big data. When a consumer visits our website, it does not mean that they will just shop right away, but they are also looking for other product insights that they think they need. Having this consumer data as a business owner can provide product recommendations according to what consumers need and want through their search history. Thus, we can also analyze consumer data from the time they visit our website until they leave the website.

## **Increase e-Commerce Innovation**

Innovation is a necessity that needs to be done by businesspeople and intended to bring the company flexibility in the face of shifting trends. Business actors can see the trends of their consumers through information so that they can take advantage of this tendency to create new, more targeted innovations.

Hereinafter, the recommendation system will view evaluation of commodity information, customer interest, product matching, recommending customers for similar goods (S. X. Wang, 2013).

## **Recommendation System About Needs**

According to research, consumers are unable to shape stable and distinct preferences because they lack an accurate understanding of product details. Consumer preferences are often not set because of knowledge adjustments during the purchasing process. Therefore, a recommendation system provides complete and personal information to consumers. The survey results also show that consumers are influenced by website information and promotions. They think that the recommendation is to provide them with more references (Zhao, 2012).

## **Recommendation System of Information Search**

Information review is the recommendation framework's greatest strength. The advice offers customers knowledge that is more detailed and more completely personalized. To reduce the cognitive deviation between different brand items, buyers must have a deeper and more detailed assessment of product function, performance, and price of the product.

## Recommendation Framework for the Evaluation of Alternatives

The prescribed framework additionally gives data to clients simultaneously such as professional and customer reviews. This will influence the assessment and attitude of consumer products to differing forms. The purchasing decision process is a component of the recommendation system that influences customer preferences, product ratings, and selection strategies.

## Recommendation System on Post-Purchase Behavior

This suggestion method will save shoppers time by finding, analyzing, and selecting information, offering more precise and productive data to the buyer. The suggestion system enhances the assortment of items and evaluations; empowers purchasers to have a more noteworthy assortment of merchandise, aligning with the customer's buying behavior. This improves consumer confidence and enhances trust.

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B. J. D. Kalyani

## Chapter 4

# Customer Vision with Big Data Analytics

## Introduction

Adelman et al. (2002) introduced integration of big data analytics with digital marketing that provides business intelligence, which in turn helps the rise in revenue and reduces risk. According to the International Data Corporation (IDC) report “Worldwide IT Industry” (2019), “total revenues from big data and business analytics will rise from \$122 billion in 2015 to \$187 billion in 2019. And enterprises who invest in big data and obtain the power to quickly analyze the large-scale data and extract actionable information can get an additional \$430 billion in terms of productivity benefits over their competitors.”

Cui et al. (2007) demonstrate that big data enables enterprises to better understand customers and provide real time customer insights to retain customers. Big data facilitates enterprises to utilize the data in a more innovative and stable way when designing a product for a potential customer (Anjariny & Zeki, 2013). Due to digitization enterprises have enormous data to deal with. Big data extracts all the valuable data that can drive a company’s benefits.

## Influence of Big Data on Digital Marketing

The following have a great impact on digital marketing collaboration with big data:

### Personalized Learning Management

The outstanding features of big data in the digital marketing is specified by Malhotra (2000); marketers visualized a decline in their expenses, in addition to being able to promote their product development process by improving quality and reducing costs. The application of voluminous datasets, enormous computing power, advanced analytics, and classy data modeling can assist the management significantly to engage the customer on a large scale. Goodhue et al. (2002) points out that big data can also be helpful in creating personalized campaigns targeting individuals.

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Marketers can easily grasp patterns of customer behavior, which in turn engages audiences at the distinct level.

## **Improved Customer Behavior Analysis**

Hartemo (2016) focused on big data analytics, which deals with customizing the user experience with related offers that are personalized to the right audience. The customer behavior analytics of Jenster et al. (2009) provides essential customer insight by highlighting both lagging and leading customer trends and offers predictive models for the marketing department to follow and act upon.

## **Enriched Employee Retention Processes**

The predictive analytics that Harding (2003) focused on supports the smarter employee retention process, which includes directly interviewing people, surveys, feedback from the target audience to assess skill, analyzing expertise, and a deep understanding of audience behavior. The new drivers of data analytics affect every area of the recruitment process including vacancy marketing, talent development, and filtering of prospective candidates (Kannan & Li, 2016).

## **Rise in Revenue**

The integrated technologies of big data like “Apache Hadoop”, “Ambari and Cloud Computing Analytics” result in noteworthy cost advantages especially with regard to sustenance for storing large amounts of data. Market analytics creates greater prospects of companies getting better in decision-making, goal setting, boosting revenue, and providing better services to their customers (Durmaz & Efendioglu, 2016). With the power of big data, businesses are now able to foster great innovations, taking customer experiences to greater levels.

Once the marketer successfully gains an accurate and deep understanding of their audience’s behavior, they can strategize how to make use of the existing data and provide insight into how to impart it into their digital marketing operations (Brea, 2012). Artificial intelligence and machine learning technology strategies (Yuniarthe, 2017) used to access volumes of data about consumer preferences and to allow enterprises to discover how to optimize branded items, such as customized logos with colors and font styles that boost consumer engagement, lead to lower design costs and improved revenues.

## Present Data Content with Statistics

Lou (2017) insisted that content can serve as an initial touch point that funnels a customer toward a desired action. When creating content, based on customer interest, the content is designed with graphs, pictures, and histograms. Using data enterprises can help discover key insights into customer behavior that helps to create quality content and increase audience engagement (Ruhi 2014).

## Methodology

Integrating big data techniques with digital marketing strategies involves five steps as shown in Figure 4.1.

### Learn

Sivadasa et al. (1998) proposed that enterprises focus on customer preferences, shopping habits, and market surveys to learn customer behavior. This step involves web analytics to process volumes of data, which is unstructured, semi structured, and structured from databases, websites, warehouses, and social sites. Various distributed storage and processing tools used in this step includes Hadoop, “Apache Spark is a unified analytics engine for large-scale data processing” n.d. Spark, “snowflake data cloud,” n.d. snowflake, and “Apache storm” n.d. storm.

### Decide

With predictive analytics the enterprises analyze the past, pick up current trends, and foresee the impact in the future in a simulated platform and rely on the desired results to apply strategy leading to dynamic decision-making, Search Engine Optimization, paid search. Market basket analysis and content marketing are all other forms of digital marketing aided by the big data of M. Goyal et al. (2012). Grandon and Pearson (2004) state that marketing teams should concentrate on understanding the online marketing channel and use these non-traditional data sources, like search engine information, customer transaction, and other big data sources available. In addition, focus on online data, which is the energy that drives any successful digital marketing campaign.



**Figure 4.1:** Digital marketing with big data steps.

## Buy

Enterprises are initiating data analytics as a service by integrating data base management system solutions, voluminous storage, and ETL tools for small business that can utilize these services through dashboards (Hatta et al., 2017).

## Use

Harris and Attour (2003) emphasize on most of the enterprises. The main task is to catch real time customer insights and enhance customer experience due to heavy competition and to retain the customers. The sentimental analysis, customer shopping analytics, and forecasting market trends with statistics of big data tools can help businesses to offer such insights and catch customer thinking (Lanquillon & Mallow, 2015).

## Reengage

Information integration, governance, stream computing, social transactions, and enhanced algorithms are helpful for reengaging with big data for digital marketing. “Zoho cloud software suite,” Zoho, “SAP Hana in memory database,” Hana and “Apache Cassandra software foundation,” and Cassandra are some tools used for reengaging.

## Case Study

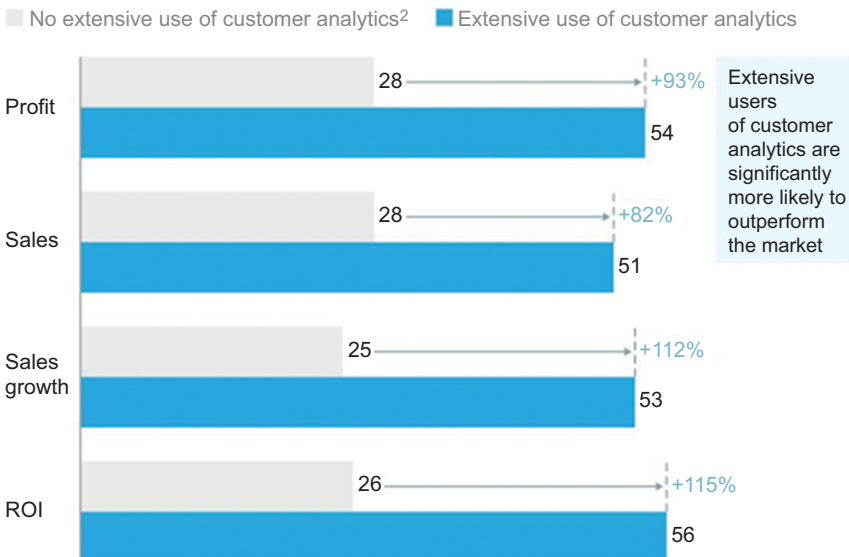
Monitoring and managing strategic customers in a corporate sector is very important for planning customer satisfaction, customer retention, and repeat new project works.



In view of Hennig-Thurau et al. (2012), most of the corporate sector across the globe require such systems with enhanced data, image analytics, and artificial intelligence by developing customer vision project. A recent McKinsey Survey shows investors have the desire for good. The McKinsey survey found that companies that extensively use customer analytics are reporting 115 percent higher return on investment (ROI) and 93 percent higher profits as shown in Figure 4.2.

### Extensive use of customer analytics drives corporate performance heavily.

% of companies above competition<sup>1</sup>



<sup>1</sup>Based on "Please describe the performance of your firm/business unit in the following areas relative to your average competitor." "Above competition" defined as 6 to 7 on 7 point scale: 1 = Well below competition, 7 = Well above competition.

<sup>2</sup>Based on "Please indicate how much you agree or disagree with the following statement: In our firm/business unit, we extensively use customer analytics." Scale 1 to 7: 1 = Strongly disagree, 7 = Strongly agree. Comparison of low 2 vs top 2 box.

McKinsey&Company

**Figure 4.2:** McKinsey survey.

The main activities of the customer vision project are as follows:

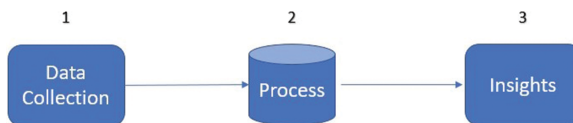
- Identify top customers.
- Create image profiles of these customers.
- Create a training set of customers with suitable marketing parameters, such as customer acquisition costs and lifetime value.

- In the corporate sector, enterprises should have various marketing meetings and symposiums.
- Develop imaging analytics and track enterprise key customer movements and participation.
- Develop analytics using python illustrated by Hawking and Sellitto (2010) and Anaconda described by Tvrdikova (2007), data science, and image processing tools and libraries.
- Identify key customer interests and associations.

## Data Flow Diagram

According to Crespo et al. (2010), the data flow model involves three phases as shown in Figure 4.3.

1. Enterprises track every touch point of the customer from websites, mobiles, and social sites with big data tools like Google Analytics, HubSpot, Mailchimp, Optimizely, etc., which are used for data collection (Borka et al., 2012).
2. In view of Kearns and Sabherwal (2006), corporate customer data platforms, like segment, Zeotap, SAP to preprocess data, and data analysis, prioritized with MongoDB, BigQuery, and Postgres.
3. Customer analytics are carried out with customer relationship management (CRM), Labview, and R and Python programming (Artun and Levin, 2015).



**Figure 4.3:** Data flow model.

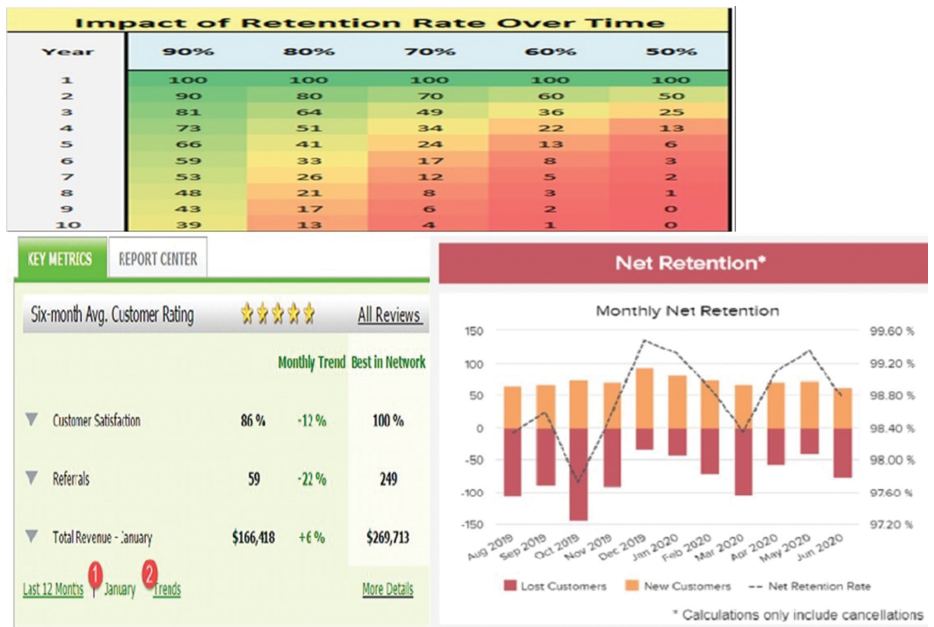
## Implementation

Corporate sales and marketing teams are generally interested in customer vision and various risk factors involved at each stage of implementation as described in Table 4.1.

**Table 4.1:** Risk factors in implementation.

Area	Risk Factor	Risk management/m
S/H environment	Low	The software’s used in the development are Python and Anaconda, highly proven for prediction in data analytic problems.
Development process	Low	Implementation is carried out with data supervisory and decision table models for a comprehensive solution.
Training and test data sets	Medium	Explore global training data sets to minimize risk.

The key metrics of data collection at every touch point of customer at stage 1 are illustrated in Figure 4.4.



**Figure 4.4:** Customer dashboard.

## Results and Discussions

To apply customer analytics two key parameters are considered and they are customer acquisition cost (CAC) and the lifetime value LTV, which are applied to a music app. Most of the corporate operational customer analytics are carried out with these two

factors. Enterprises use proactive measures to reach potential customers when they primarily start a trail. The customer retention based on eight favorite songs is illustrated in Figure 4.5.

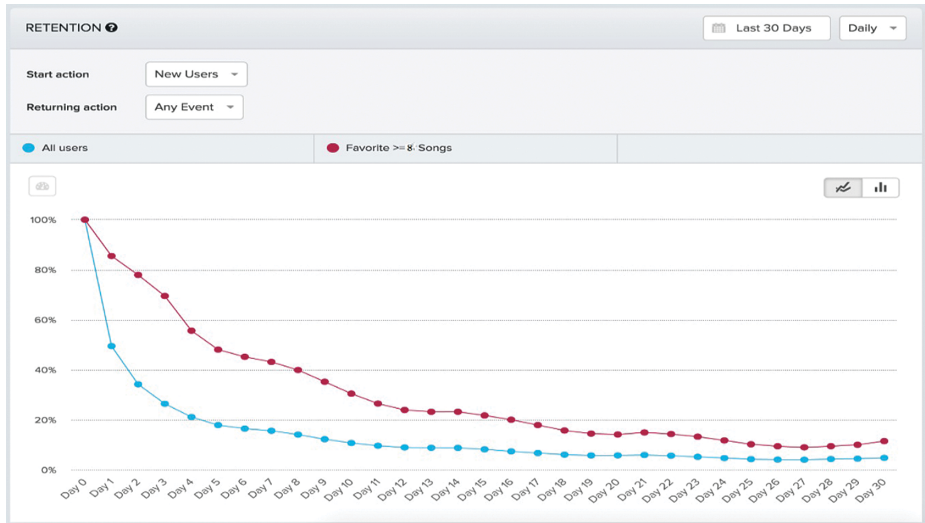


Figure 4.5: Customer retention.

It is worth noting that the ratio of LTV and CAC plays an important role in customer analytics, and in customer vision project the recommended ratio is 3:0 for investing in marketing for faster growth. After noticing the ratio for consecutive years the time needed to increase marketing by focusing advertising budgets rigorously at that time is described in Figure 4.6.

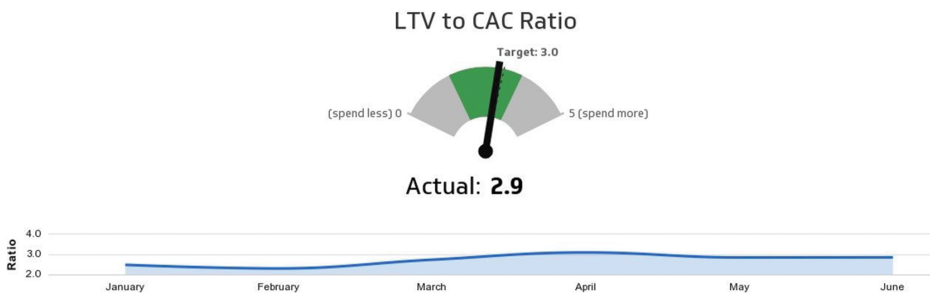


Figure 4.6: Ratio of LTV and CAC.

It is evident that digital marketing with big data provides proactive risk assessment, gains visual insights into real time customers, and identifies customers with precision.

## Conclusion

Digital marketing with big data provides managers smart decision-making, implements customer retention strategies, and gains real-time customer insights. Big data integrated with digital marketing improves the revenue of enterprises and minimizes the business risk. In a customer vision project, the right time to focus on digital marketing is when LTV and CAV ratio is greater than 3:0. This project can be extended with the image analytics libraries of Python to determine and monitor customers.

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# Chapter 5

## Digital Transformation in Real Estate Marketing: A Review

### Introduction

The availability of computers in the 1990s changed marketing demonstrations as integrated marketing communications (IMC) focused on promotion. In 1996, Hutton hoped that IMC would broaden the outlook of advertising and cement the relationship between public relations and marketing. Pomirleanu et al. (2013, 166–181) have presented the growth of the internet in figures. The number of websites increased globally from 23,000 in 1995 to over 644 million in 2012. In the US alone, internet driven sales revenues rose from a negligible amount in 1995 to \$256 billion in 2011. The evolution of digital marketing motivated the real estate industry (Gangly et al., 2017, 1–20) to create novel experiences that were not previously possible (Lamberton & Stephen, 2016, 146–172).

### Background and Rationale

A great deal is written about marketing, both offline and online, but technology is changing, and it would be unrealistic to think, particularly regarding online real estate marketing, that the subject has been conclusively researched and completely understood. This chapter begins with an overview of digital marketing, and from that context hones in on the field of real estate marketing, where new technologies impact on current management thinking and practice. In real estate and more widely in digital marketing, it is imperative to see the effects of marketing through system dynamics. Thus, Section 5 on real estate begins and ends with that perspective.

This review seeks to draw out the implications of what is taking place and critically clarify the nature of new technologies and their defining involvement in the practice of digital marketing and real estate marketing, in particular. In that regard, the function of virtual and augmented reality reflects a later day storytelling in the world of imagination that draws human interest while demanding high levels of technology. At the same time, questions regarding the implementation of the Internet of Things (IoT) involve difficult decisions because they are so far-reaching, and they demand choices that – no matter how difficult – are not going away. This chapter aims to trace the development of digital marketing within the electronic revolution and gauge the effects of new technologies on the real estate business.

## Methodology

After consulting a range of articles on digital marketing and current technology, this review comments on attitudes and beliefs that reflect current views on digital marketing and current technology in business, and particularly in real estate. Digital marketing concerns business-to-business (B2B) and business-to-consumer (B2C) issues. In real estate the emphasis is on B2C matters, although there will be cases where a video record is kept of apartment block construction; and ROI can also involve B2B (Leeflang et al., 2014, 1–12). Both B2B and B2C can effectively use digital marketing tools (Malik, 2017, 715–718).

Mustafi et al. (2011, 16–17) discuss three types of online-offline division in real estate. Kotler and Armstrong (2008) viewed online marketing as part of the offline marketing framework. Chaffey and Smith (2017) concluded that real estate companies have separate online and offline marketing frameworks within a nominal overall marketing framework. They also shared a third approach, enabling optimal integration between online and offline marketing functions. Mustafi et al. (2011, 16–17) adopted the third approach, allowing writers on both online and offline marketing to express their viewpoints.

The methodology used is the selection of published material on topics evident for understanding digital marketing for real estate. Ullah, Sepasgozar, and Wang (2018, 3142) use a dynamic approach to real estate to identify the role of “disruptive” new technologies in the real estate business. Their article comments critically on the term “disruptive” in this context, as we do not know whether any or all technologies will disrupt the existing market position (Ullah et al., 2018, 3142). Referring to the 2016 Global Information Technology Report (Baller et al., 2016), they placed Australia in a global picture of technological use for real estate. Soon after, Ullah and Sepasgozar (2019) discussed the adoption of IT in real estate management. Winson-Geideman and Krause (2016, 17–20) investigated the role of big data in real estate. In 2015, Yasmin and colleagues (2015, 69–80) published a study on the effectiveness of digital marketing.

The references in this section on methodology outline key steps in research for this article, with a viewpoint expressed in one article balancing viewpoints expressed in the other articles. The result is not encyclopedic, but reading relevant documents, following leads, and writing the text of the article has enabled findings as expressed below.

## Literature Review

Marketing is challenged by technological advances resulting from demanding customer relationships and expansion of the service economy (Rust, 2020, 15–26).



Product mix could be expanded to cater to these challenges (Harvey et al., 1996, 1–15), but the internet, network expansion, big data, and artificial intelligence (AI), the 4 Ps—product, price, promotion, and place (a description of the marketing mix dating from 1960)—are obsolete (Rust, 2020, 15–26). Social media marketing, with its viral basis, is “the non-commercial proactive product promotion among peers through any internet-based social media network” (Rust, 2020, 15–26). “The driving forces persuading Facebook members, who are also prospective real estate consumers, to develop favourable attitudes toward any real estate product displayed in their network” (Shareef et al., 2018, 258–268). They believe that members of a social network differ in terms of behavior and attitude, from traditional consumers who are persuaded by traditional advertisements. Five constructs that might motivate members of social networks, as opposed to more objective attitudes that might come out of scholarly analysis (Shareef et al., 2018, 258–268) are: hedonic motivation, self-concept, source derogation, message informality, and experiential message.

Digital marketing technical skills gaps are inadequate evaluation metrics and technological future proofing (Royle & Laing, 2014, 65–73). They note the problem that digital marketing in real estate is not fully integrated with established marketing practice. Talent gaps, adjusting organizational design and actionable metrics are important challenges for real estate companies (Leefflang et al., 2014, 1–12).

There exists a lot of complexity in online retail behavior and this helps in determining the developing structure of retail centers (Alexiou et al., 2018, 97–109). Decisions on whether to go online in retail shopping are influenced by demographics, including age and socioeconomic status, convenience, and accessibility. For example, a population cluster of young professionals are more likely to shop online (Alexiou et al., 2018, 97–109). The multichannel customers, using a mixture of face-to-face and ICT channels can cross a “line of visibility” that allows them to see into the organization’s back-office systems (Tate & Johnstone, 2011, 66–98). That suggests that organizations must focus on consistent quality delivery and internal back-office procedures to maintain customer confidence (Tate & Johnstone, 2011, 66–98).

A list of peer-reviewed articles dealing with digital marketing, digital technologies, social media marketing, digital technologies in real estate industries, real estate consumer behavior, and consumer attitude toward digital marketing in real estate industries or any combination of the terminology mentioned earlier, were identified. An extensive analysis of the literature was performed on various pertinent articles from different journals (see Table 5.1), resulting in factors that have revolutionized real estate marketing industries and the impact of digital technology on real estate consumer attitude and buying behavior. A summary is presented in Table 5.1.

**Table 5.1:** Summary table, a thorough review and analysis of the literature.

<b>Author(s) and Year</b>	<b>Topic</b>	<b>Findings</b>	<b>Journal</b>
Alalwan, A. A., Rana, N. P., Dwivedi, Y. K., & Algharabat, R. (2017).	Social media in marketing: A review and analysis of the existing literature.	Social media marketing has effective influence on business performance and contributes to the firms' marketing aims and strategy.	<i>Telematics and Informatics</i>
Ashley, C., & Tuten, T. (2015).	Creative strategies in social media marketing: An exploratory study of branded social content and consumer engagement.	Social media channels and message appeals customer engagement.	<i>Psychology and Marketing</i>
Aytekin, Ç., & Demirlí, S. M. K. (2017).	The role of social media in real estate marketing: A research on the transformation of real estate marketing in Turkey.	New online tools, including social media are being developed and incorporated into business models across the real estate industry.	<i>Journal of Marmara University Social Sciences Institute/ Öneri</i>
Boyd, D. E., & Koles, B. (2019).	Virtual reality and its impact on B2B marketing: A value-in-use perspective.	Virtual reality and technology supporting B2B marketing.	<i>Journal of Business Research</i>
Christensen, C.M., McDonald, R., Altman, E. J. and Palmer, J. E. (2018).	Disruptive innovation: An intellectual history and directions for future research.	Disruptive innovation theory is maximising business performance and eventually surpasses existing needs.	<i>Journal of Management Studies</i>
Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019).	The impact of virtual, augmented and mixed reality technologies on the customer experience.	The combination of technology-mediated experiences and current customer core experiences results in integral technology-enhanced experiences, which increases the value provided to customers.	<i>Journal of Business Research</i>

Table 5.1 (continued)

Author(s) and Year	Topic	Findings	Journal
Ganguly, A., Das, N., & Farr, J. V. (2017).	The role of marketing strategies in successful disruptive technologies.	Disruptive technology facilitates the creation of marketing strategies to promote them effectively to the target market.	<i>International Journal of Innovation and Technology Management</i>
Hutton, J. G. (1996).	Integrated marketing communications and the evolution of marketing thought.	Technological revolution has ongoing influences on consumer confidence but not controlling over marketing process including communication.	<i>Journal of Business Research</i>
Jones, S., & Benjamin, Z. (2013).	Framing ICT usage in the real estate industry	This study noted that ICT positively influences the real estate industry through directly affecting the performance of property agents.	<i>International Journal of Organizational Design and Engineering</i>
Labrecque, L. I., vor dem Esche, J., Mathwick, C., Novak, T. P., & Hofacker, C. F. (2013).	Consumer power: Evolution in the digital age.	Companies should provide accurate information in order to build consumer trust and empowerment in internet and social media contexts.	<i>Journal of Interactive Marketing</i>
Lamberton, C., & Stephen, A. T. (2016).	A thematic exploration of digital, social media, and mobile marketing: Research evolution from 2000 to 2015 and an agenda for future inquiry.	New technologies and DSMM (digital, social media, and mobile marketing) has increasingly highlighted its transformational power in business and consumer life.	<i>Journal of Marketing: AMA/MSI Special Issue</i>
Mahalaxmi, K. R., & Ranjith, P. (2016).	A study on impact of digital marketing in customer purchase decision in Trichy	Consumers prefer digital marketing to buy product but does not support the customers in a change of opinion when purchasing a product.	<i>International Journal for Innovative Research in Science &amp; Technology</i>

Table 5.1 (continued)

Author(s) and Year	Topic	Findings	Journal
Taffese, W. Z. (2006).	A Survey on Application of Artificial Intelligence in Real Estate Industry.	Information technology and application of Artificial Intelligence effect on the profession, as well as influence on the Real Estate Industry.	<i>3rd International Conference on Artificial Intelligence in Engineering &amp; Technology</i>
Ullah, F., Sepasgozar, S. M., & Wang, C. (2018).	Systematic review of smart real estate technology: Drivers of, and barriers to, the use of digital disruptive technologies and online platforms.	Technologies needs to be transferred to end users, or consumers to make better decisions in the real estate industry.	<i>Sustainability</i>

## The Role of the Influencer

The credibility of influencers and para-social interaction both relate positively to purchase intention (Sokolova & Kefi, 2020). The authors discuss how these factors relate to social and physical attractiveness, and compatible attitudes, based on four popular beauty influencers in France (Sokolova & Kefi, 2020). They note that compatible attitudes (homophily) relate to para-social interaction but show no evidence of positive relationships.

Killiann and McManus (2015, 539–549), explained how social media fit into a firm's existing marketing communications strategy. They found that managers segregate social platforms into four categories: relationship management, newsgathering, creativity, and entertainment. As social platforms continue to develop in real estate, niche platforms are emerging. Platforms that were nonexistent two years ago now have millions of users (Killiann & McManus, 2015, 539–549). Real estate brand managers need to be adept at recognizing the strengths of different platforms and using these to further the customer-brand relationship in this very personal space (Killiann & McManus, 2015, 539–549).

Everyday consumer activities, especially online, are affected by corporate power. Search algorithms control accessible information, and bloggers and other opinion leaders influence consumption decisions through recommendations and product tests distributed across social media (Labrecque et al., 2013, 257–269). The concept of influence in social media environments as a type of control was studied by Labrecque et al. (2013, 257–269). These authors explore the intersection of real estate consumer behavior and digital media by clearly defining consumer power and empowerment

via the internet and social media. Real estate consumers can change the way they browse online if they feel that giving out personal information might give companies too much power over them. Thus, the rise of the internet and the development of social media are signs of increased consumer power (Labrecque et al., 2013, 257–269). In this technologically advanced world, ordinary consumers can access large stores of information and influence their lives in commercial and other contexts.

Recalling Levitt's (1960, 24–47) influential article "Business Myopia," Smith, Drumright, and Gentile (2010, 4–11) see companies focused on the customer and ignore other stakeholders. They define customers and their needs narrowly and are oblivious to decision-making in the broader social context, where there are multiple stakeholders. The authors put forward a vision for marketing management that will broaden marketer views and engage multiple stakeholders in the process of value creation (Smith et al., 2010, 4–11).

## The Future of Marketing

The growth of technology will continue to contribute to the theory and practice of marketing (Lee, 2017, 293–303). Big data represents a new technology paradigm for high volume, high velocity, and high variety data that can revolutionize real estate business operation across many industries (Müller et al., 2016, 289–302). At the same time, the incursion of marketing into a wide range of human activity will give rise to ethical issues. For example, access to data in social media; using big data; consumer segmentation; marketing to ethnic groups; and marketing to vulnerable communities (Kitchin, 2014, 1–41).

Finally, social media and big data will continue to play a substantial part in digital marketing to consumers, as marketers endeavor to understand consumer thinking and promote their products and services (Müller et al., 2016, 289–302). Consumers will not adopt an entirely passive role in this. Rather, consumer reaction will influence the feasibility of marketing particular products at specific prices (Lee, 2017, 293–303).

Alalwan et al. (2017, 1177–1190) review themes and trends in social media marketing from 144 articles, covering marketing and social media; electronic word of mouth; CRM; and firm brands and performance. Sources of user information, including user trust, perceived marketer credibility and reliability, along with user-marketer interactivity, are the primary focus of most social media studies (Aytekin & Demırl Demırlı, 2017, 17–36). However, the authors comment that users' perception of online marketing activity and their related behavior are difficult to measure accurately (Kitchin, 2014, 1–41). Therefore, factors influencing user reactions to marketing on social science platforms will remain the focus for future research (Alalwan et al., 2017, 1177–1190).

With the popularity of social media, real estate companies can readily and economically reach consumers. Big data 2.0 is driven by Web 2.0, which developed from the web technologies of the 1990s and social media. In doing so, it created a paradigm shift in organizational collaboration (Alalwan et al., 2017, 1177–1190). Unlike web analytics, which are mainly used for structured data, social media analytics analyze social media behavior. Understanding this behavior helps real estate companies target consumer segments, tailor products and services to consumers, and develop marketing campaigns (Müller et al., 2016, 289–302).

Lee (2017, 293–303) notes that as long as managers can exploit the data, there is potential for real estate companies to create new businesses, improve business operations, and develop new products and services, at the same time as maintaining cost savings and improving product and service quality. Personalized marketing is possible through analysis of shopper preferences. The challenges, however, are data quality and data security, and – from a consumer perspective – privacy (Lee, 2017, 293–303).

## Big Data Analytics

The creation of data-driven research is engendering paradigm shifts across various disciplines (Kitchin, 2014, 1–41). Big data is continuously generated, and it produces massive, dynamic flows of diverse, fine-grained, and relational data. Kitchin (2014, 1–41) argues that big data challenges existing definitions of knowledge and social life.

Big data analytics offer a novel and complementary source of data and a methodology for data analysis (Müller et al., 2016, 289–302). However, the skills for data preparation and the use of analytical tools and criteria for cross-instrumental evaluation are necessary for data mining, machine-learning algorithms, neuro-linguistic programming techniques, and graphic visualization for the intuitive understanding of large data sets (Müller et al., 2016, 289–302).

The availability of methodologies impedes our understanding of real estate consumer thinking. However, decision makers must know the rationale behind various methods for examining and assessing markets from the perspective of consumers (Alalwan et al., 2017, 1177–1190). Big data raised the stakes in marketing through greater ability to discriminate among alternative approaches to real estate consumers. Nonetheless, there must be post-positivist insights that complement or overtake decisions indicated by positivist or big data research (Kitchin, 2014, 1–41). Callahan & Elliott (1996, 79–114) studied the metaphors of listening and conversation to the search for proper understanding of the significance of events. They conclude that free narrative is a valuable approach to our everyday understanding and of real-world behavior as clients are involved in discussions that concern their interests (Callahan & Elliott, 1996, 79–114).

## Virtual Reality in Marketing

Beginning with science fiction, virtual reality (VR) can take the participant away from reality into another world where different measures of sensation and time are valid. VR has shown promise in various fields, including education, science, and engineering (Flavián et al., 2019, 547–560). In real estate marketing, it can catch the imagination of a client and convey a convincing message. Documenting the construction of a building can be a practical use of VR. That is because it is linked with a subsequent exploration of the significance of the architecture, and the inclusion of stereoscopic elements can form part of augmented reality (Berg & Vance, 2016, 1–17). But the production of thoughtful, impressive VR projects may lie beyond the resources of many marketing units. Brooks (1999, 16–27) describes VR as an encounter where the user is “effectively immersed in a responsive virtual world” with dynamic control over the viewpoint he or she takes within that world.

VR and mixed reality technology are examples of integrating physical and virtual objects at different levels, so that various devices provide hybrid experiences within the customer experience landscape (Flavián et al., 2019, 547–560). However, the boundary between virtual, augmented, and mixed reality technologies has not been established (Brooks, 1999, 16–27). Flavián et al. (2019, 547–560) propose a new taxonomy of technologies that integrate technological, psychological, and behavioral perspectives, which might add meaning to client experiences with VR.

The use of VR in B2B marketing has not been fully explored. The remaining deficits in our knowledge for implementing VR in society affect the post-purchase stage of the supplier-buyer relationship, especially regarding the level of workload stress (Boyd & Koles, 2019, 590–598). VR is also used in psychological therapy. Most research on this subject is related to the phenomenon of presence, and there is a theoretical consideration of the roles for attention as a mental process, and models of the virtual space (Boyd & Koles, 2019, 590–598). More needs to be learned regarding the relation between presence and emotional responses to virtual stimuli, as research on such responses could play an important role in developing new VR applications (Schuemie, 2001, 183–201). Yoon and Vargas (2014, 1043–1045) find that individual behaviors aligned with the predetermined traits of individual avatars in virtual environments could be accentuated with possible antisocial effects.

VR is a set of technologies that enable immersion in a world beyond reality and engagement in encounters that mimic participants’ interpretation of reality (Berg & Vance, 2016, 1–17). Despite their emphasis on the inherent complexity of the underlying technologies involved in VR, Berg and Vance (2016, 1–17) maintain constant attention to the value of the experience (Berg & Vance, 2016, 1–17).

## Digital Marketing in Real Estate

The internet is the primary source of information for consumers, and digital marketing has allowed the real estate industry to reach the masses (Despinola, 2018). A study by Bankwest (2018) found that in the last five years, Australian real estate revenue increased by 5.4 percent to USD 16.3 billion. The daily work of a real estate agent depends on advertising and the following specific activities. An agency may use Search Engine Optimization, blogs, keyword research and video marketing; the agency may also use pay per click search engine marketing (SEM) advertisements, Google Adwords, social media Adwords with specific hashtags, or paid listings with real estate aggregators (Benjamin & Benjamin, 2013, 137–148). An agency may use email marketing, automatic messaging tools – Boost or HomeSpotter, for example. It may use Instagram for walk-throughs, open house and new listing photos, and Facebook for Lead Ads, events, testimonials, and industry news (Ullah & Sepasgozar, 2019). It may advertise on leading realty portals to generate verified and qualified leads in Multiple Listing Service (MLS) using an automatic and manual XML (Extensible Markup Language) system (Ullah et al., 2018, 3142).

Some agencies have found that the ROI in digital marketing in real estate has attracted real estate customers and associates through digital platforms (Ullah et al., 2018, 3142). They may find that the language of a marketed property creates an image for interested buyers and that the content of messages should be personalized, relevant, educational, authoritative, and backed by technical knowledge of marketing (Abelson & Chung, 2005, 265–281). An imaginative agent may initiate a virtual tour of a property under construction or use augmented reality to satisfy a client's interest in a piece of residential real estate.

Digital technology continues to facilitate real estate marketing. To show the strength of this link, it is worthwhile reflecting on our movement away from routine advertising and automatic responses to a more thoughtful and imaginative approach to technology (Ashley & Tuten, 2015, 15–27).

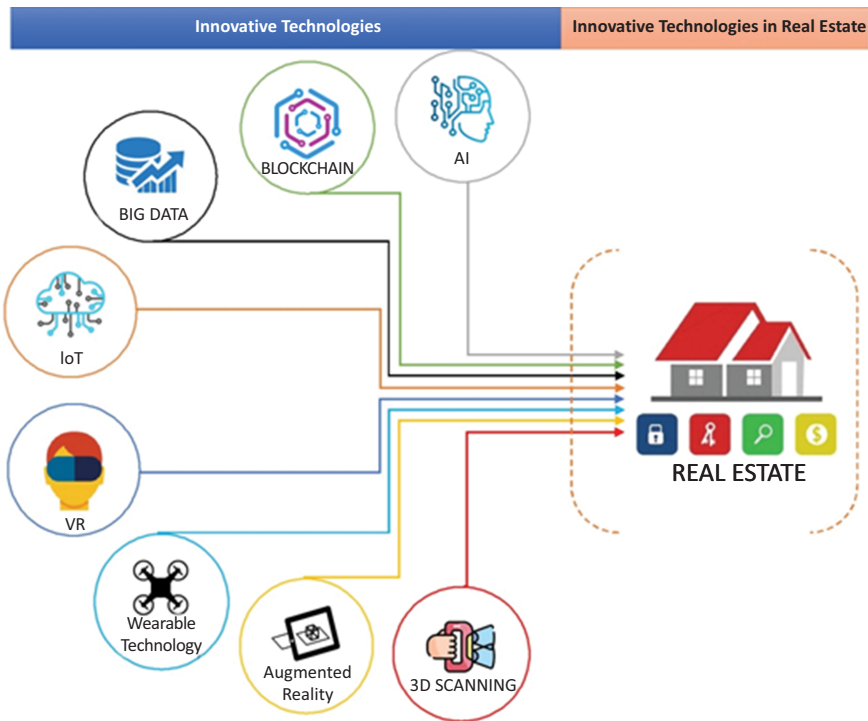
## Innovative Technologies

“Innovative technologies” refers to the shift from traditional real estate to “smart real estate” using smartphone technology, websites and social media-based online platforms, and the need for sustainable, user-centered real estate (Ullah, Sepasgozar, & Wang, 2018, 3142). They examine the adoption of disruptive technologies or innovations that create a new market with new values which overtake existing markets (Ullah, Sepasgozar, & Wang, 2018, 3142). The application of technologies showing in Figure 5.1, such as drones, IoT, clouds, software as a service (SaaS), big data, 3D scanning, wearable technologies, VR and augmented reality (AR), AI, and robotics



should help real estate consumers gather as much information as possible and prevent regret over purchase decisions (Ullah, Sepasgozar, & Wang, 2018, 3142).

Although Australia is technologically advanced, Ullah, Sepasgozar, and Wang (2018, 3142) rank Australia behind the US and the UK in global technology adoption. The top three countries for technology adoption readiness are Singapore, Finland, and Sweden, respectively (Ullah, Sepasgozar & Wang, 2018, 3142). Among the 139 countries studied, the US ranks the highest on most criteria, followed by the UK and Australia, showing that the US, the UK, and Australia are leveraged to adopt and implement the latest technologies and likely to attract investment in online real estate. Ullah, Sepasgozar and Wang (2018, 3142) see “smart real estate” management as user-centered and sustainable, utilizing innovative technologies to achieve holistic benefits.



**Figure 5.1:** Innovative technologies in real estate.

Information and Communications Technology (ICT) has already made its mark in the real estate industry, changing the nature of real estate agents’ work (Jones & Benjamin, 2013, 137–148). Social media platforms have also improved client access to real estate information (Ashley & Tuten, 2015, 15–27). Ullah and Sepasgozar

(2019) suggest the adoption of new technologies such as 360° cameras for VR or AR (Ullah & Sepasgozar, 2019).

## Disruptive Innovation

In Christensen's (2018, 1043–1078) “disruptive innovation,” simplicity and accessibility enable a new product or idea to form in a complicated, high-cost market that eventually redefines the industry (Christensen et al., 2018, 1043–1078). However, new technologies can have either sustaining or disruptive effects on real estate companies, depending on the company and its fortunes in real estate marketing (Christensen et al., 2018, 1043–1078). The concept of disruptive technologies applies to cases where an innovation occupies a particular niche or proves efficient in such a way that elements in the industry rely on it to the point where existing markets are disrupted (Christensen et al., 2018, 1043–1078). New technologies, if not strategically approached and adequately embedded in the organizational structure, can erode the competitive position of brands and shrink their marketing edge.

## Blockchain and the Internet of Things

The adoption of blockchain is an incremental innovation that can lead to substantial changes in real estate marketing. The gains from this technology may significantly reshape existing real estate marketing practices and improve established business processes. Six propositions suggested by Rejeb et al. (2020, 1–12) provide starting points for further research to identify enablers and barriers. They believe that blockchain technology: creates contemporary market structures by fostering disintermediation, helps combat click fraud, helps reinforce real estate consumers' trust in brands, enhances privacy protection, empowers digital marketing security, and can enable creative loyalty programs. Disadvantages of this technology are that storing transactions is complicated and expensive, and cost and security burdens may outweigh the value of its marketing applications (Rejeb et al., 2020, 1–12). Furthermore, blockchain technology does not have a suitable governance structure, maintenance is expensive, and, where a “proof-of-work consensus protocol” is used, there is high energy consumption (Rejeb et al., 2020, 1–12).

Kibet's (2019, 327–334) blockchain-based smart contract design aimed to make transactions shorter, more transparent, and more reliable, particularly regarding taxable income, reducing operational costs and obviating the need for middlemen. Nowinski and Kozma (2017) discuss the possible disruption of existing business models. Blockchain offers “data security, transparency and integrity, anti-tampering and anti-forgery, high efficiency, and low cost” (Zhu & Zhou, 2016, 1–11). Thus, it will be useful

for data exchange where security is required, and it can work through authenticating traded goods and disintermediation.

IoT will cause real estate issues, especially if a property is already embedded in an arrangement or series of arrangements for internet connection. Yeo et al. (2014, 568–571) propose an “IC design in cloud” as a turnkey infrastructure for IoT development (Yeo et al., 2014, 568–571). IoT is a complex area where change is inevitable, and so are difficulties. It will benefit infrastructure, transport, industry and agriculture, and disability and healthcare, at the same time as challenging existing regulatory frameworks (Yeo et al., 2014, 568–571). Mainwaring (2017, 265–289) uses “provider network” to denote the different private and public sector actors providing “eObjects” and the associated system. At the same time, customers can be individuals, corporate entities, not-for-profit entities, or public agencies (Yeo et al., 2014, 568–571). Equipment, software, or services may be supplied by different entities, privately, or publicly. Manufacturers, assemblers, and distributors, as well as providers of software services and testers, enter the picture from a consumer point of view (Mainwaring, 2017, 265–289). Mainwaring and Hall (2019) cite evidence that IoT will be more vulnerable to interference and remote attacks than conventional connected computers. Harm is likely to emerge when a vulnerability is exploited, allowing access to controls of cars or industrial safety shutdown systems. Cyber-crime, privacy, safety, security, and equal treatment are all matters of concern (Mainwaring & Hall, 2019).

With the exponential growth of network size, blockchain’s decentralized, autonomous capacities could solve some key security challenges associated with the cloud (Kshetri, 2017, 68–72). Blockchain can verify its information and transactions, and this can help trace insecurities in supply chains and deal with crises such as locating security and safety vulnerabilities (Kshetri, 2017, 68–72). However, Fernández-Caramés and Fraga-Lamas (2018) point to complex technical challenges related to blockchain and IoT, especially issues of scalability, security, and cryptographic requirements. Interoperability and standardization in the public interest will require compromise by all stakeholders. Decentralized ownership and international jurisdiction are major issues to be solved by research and collaboration with organizations and governments in relation to blockchain and IoT (Fernández-Caramés & Fraga-Lamas, 2018).

Santoro et al. (2017, 347–354) see “new disruptive technologies” in the context of IoT as demanding an internal knowledge management capacity coupled with a capacity for innovation. Amid of the various issues surrounding IoT, Santoro et al. (2017, 347–354) underline the real estate concern that a client who is put through an IoT arrangement for their home will need to ensure that the security and effectiveness of the network is guaranteed by all agencies involved.

## Artificial Intelligence

In “Smart Factories,” under the umbrella concept of AI, intelligent robots, tools, IoT, and big data interact to achieve self-optimizing production (Benotmane et al., 2019, 143–163). Fountaine, McCarthy and Saleh in 2019 wrote an article entitled Building the AI-Powered companies in the Harvard Business Review (Fountaine, McCarthy, & Saleh, 2019, 62–73). They argue that AI may need patient adaptation to succeed, but leaders must first understand AI and then motivate the workforce to change. Rather than being risk-averse, leaders must be experimental and adaptable (Fountaine, McCarthy, & Saleh, 2019, 62–73). Highlighting worker success with a new AI tool is one way to inspire other workers. Several initiatives with different time schedules may be useful: AI-assisted fraud detection, for example, may take several months, while AI-supported customer service may take years (Benotmane et al., 2019, 143–163). A leader should be able to detect and discourage signs of resistance to AI initiatives. As innovation succeeds, a virtuous circle can spread AI throughout an organization, and individual decision making can flatten organizational hierarchies (Benotmane et al., 2019, 143–163). In short, there are advantages in collaboration between humans and machines (Fountaine, McCarthy, & Saleh, 2019, 62–73).

In response to the *Harvard Business Review* article, Latshaw (2019, 72–78) as editor of the *Corporate Real Estate Journal* points to the enormous flood of data as a cause of company failure in adapting to AI, and not the technology itself. She argues that “AI is not about IT or cybersecurity, and corporate real estate (CRE) is not about real estate” (Latshaw, 2019, 72–78). Rather, AI is about core business strategy and support of the business; and CRE is in the business of customer service. Latshaw (2019, 72–78) quotes Michael Ford, Microsoft General Manager for Global Real Estate and Securities, who says that as “a data-driven culture,” Microsoft’s products and services pervasively utilize technology through “Artificial Intelligence, machine learning, augmented reality, IoT devices and much more.” Latshaw, (2019, 72–78) comments that CEOs who may not have Ford’s qualifications can still engage in data analysis and knowledge management. She notes, CRE already shares in data analytics aimed at transforming the workplace. Latshaw’s (2019, 72–78) suggestions for CEOs may be summarized in terms of alertness to changes in priorities and readiness to be involved in new business activities (Latshaw, 2019, 72–78).

Taffese (2016) explains that the real estate profession is responding to client demand for faster and more accurate property valuations. The author presents two AI valuation methods, Artificial Neural Networks (ANN) and Expert System (ES). Both methods have their advantages and disadvantages and can become a hybrid system. GeoInformation Neural System (GINS) integrates a Geographic Information System (GIS) technique with ANN modeling. ANN system’s reasoning is difficult to ascertain, and results are often tentative. However, a trend toward the use of AI for property valuation has already begun (Taffese, 2016).

## Drones and Wearable Technologies

Drones described as “Paparazzi Aloft” capture images not attainable by a land-based camera, while “Panoptic Aloft” drones, which are operated by law enforcement agencies and potentially moral minorities within a community can transmit real-time voice (Clarke, 2014, 286–305). Clarke (2014, 286–305) shares concerns for privacy and individual rights in industry self-regulation of media, but these do not substantively contribute to regulating surveillance activities. For a real estate agency, there are advantages in obtaining drone images of a property, especially in augmented reality. However, given that community reaction to alleged abuse of the personal right to privacy would be very counterproductive, courteous deference to residents’ feelings is advisable.

Wearable wrist displays, wireless headsets, and technical lanyards allow ergonomic interaction in real-time. Przegalinska (2019), looking at the future of wearable technologies, considers the role of the smartphone in the business world. She sees noninvasive, holistic, and assistive devices as even displacing smartphones and tablets to sit unobtrusively on the person with definite economic value to business. One criterion for their future success might be that they enhance the value of concentration on tasks rather than relegating staff to routine but trivial work (Przegalinska, 2019).

## Augmented and Virtual Reality; 3D Scanning

Augmented reality (AR) enables access to a space where, through a camera or video, graphic visualization can increase the perception of reality around the operator in real-time (Rocha, 2016). AR combines real and virtual imagery; it is interactive in real-time and takes 3D form (Rocha, 2016). In business terms, augmented reality is considered any product that adds to a view of reality (van Kleef et al., 2010, 1–36).

With the concepts of AR and VR in mind, real estate circles have turned to available technologies – and even emerging technologies – that will be able to provide the content and processing necessary to bring their expectations into forms that appeal to consumers (Rocha, 2016). This is not only to attract sales but also to demonstrate the broader concern of the industry for proper solutions to problems that arise in real estate. When an online US survey conducted in 2017 asked respondents about any the choice of their current home, 51 percent admitted to having regrets (Trulia, 2017). This is not the result that a real estate practitioner wants to hear from clients. They are not only after gains from advertising and routine real estate tours of properties; they want to know that they are trusted for sincerity and expertise as they work on the client’s behalf (Trulia, 2017). Thus, out of a sense of responsibility to the client, attention to existing and developing resources is justified. Mobile AR advertising can

also take place in the viewer's environment, and mixed enhanced reality engages viewers with local information and instructions (Mathew, 2015). Aslan, Çetin, and Özbilgin (2019, 407–414) projecting hardware, software, and advertising opportunities to 2022 in the AR market, see giants such as Apple, Google, and Microsoft using augmented reality to boost traditional business and open doors to new markets.

AR and VR are developing technologies, where concepts run ahead of the actual adequacy of scanning and projection devices. In the case of VR, a practical documentary will not compare to the masterpieces of science fiction cinema (Rocha, 2016). VR, however, can be valuable in tracing the future development of high-rise dwellings through the stages of construction, so the client can see the gain from paying a deposit for an off-the-plan apartment after completion (van Kleef et al., 2010, 1–36). AR adds a designed 3D model or other sensory elements by a mobile device to the real-world (Rauschnabel & Ro, 2016, 123–148). Although it is expensive, a deposit can detect flaws in the way ducts and pipes are laid out in office ceilings. Clients can visualize a project without being on-site (Rauschnabel & Ro, 2016, 123–148). Biljecki et al. (2015, 2842–2889) explain that many 3D city models cannot be listed, not only because of the absence of technical information but because of fuzzy images, ambiguous terminology, and inadequate 3D environmental information. Their descriptive inventory of city models is intended for stakeholders in the geospatial industry, such as companies and national mapping agencies. This may serve as a reminder of the potentially broad nature of research supporting the real estate industry (Biljecki et al., 2015, 2842–2889). Urban planning is another area which touches on the real estate industry. Urban planning involves consultation and interaction, where geo-virtual environment visualization could serve as a spatial planning communication tool (Kibria et al., 2008, 379–395).

In stratified urban architecture, database management systems (DBMS) are important in GIS to ensure the consistency of spatial and alphanumeric data in one integrated environment (Zlatanova, & Stoter, 2006, 155–180). Wang et al. (2014, 453–476) use building information modeling (BIM) with an AR tool to enhance architectural visualization in a building life cycle. The system allows designers to place a virtual building scheme in a physical environment and provides owners and real estate agents with an interactive experience (Wang et al., 2014, 453–476). Felli et al. (2018) introduce 360° cameras and Mobile Laser Measurement systems that record building data during construction that occupants can use later. This study uses smart data collection technologies for an innovative field experiment where 360-degree cameras and mobile laser measurement (MLM) collect data from a case study building. Buyers were shown 3D videos, models, and visualizations of construction quality, workmanship, and defects in real-time to increase their purchase confidence (Felli et al., 2018). Poushneh (2018, 169–176) finds that as well as augmentation quality, customers value being able to control access to their personal information.

Putting augmented or virtual reality applications into practice quickly becomes a matter of finding and utilizing available technologies. Zlatanova et al. (2002, 71–80) notes that various software can cope with the description of spatial objects, complex analysis, and 3D visualization. However, more advanced tools to represent the 3D world are needed, and 3D geographic information system (GIS) warrants more research. They describe software packages and 3D case studies carried out in Oracle and MicroStation, 3D GIS research issues in 3D structure, and 3D topology (Zlatanova et al., 2002, 71–80).

Doctoral research by Kukko (2013) on mobile laser scanning is valuable as a resource on the background and potential of such topographical scanning tools. Urey et al. (2013) explain how the mobile pico-projector equipped with a microelectromechanical (MEMS) scanner can provide a stereoscopic display system with 3D and interactive AR. In addition, handheld and wearable smart devices enable AR hypermedia print advertisements which can superimpose virtual hyperlinked 2D images over traditional print advertisements. Consumer response found this informative and effective (Yaoyuneyong et al., 2016, 16–30).

## **A System Dynamic Model for Technology Adoption**

Ullah and Sepasgozar (2019) present a system dynamic model for technology adoption based on the quality of the systems, information, and service of real estate websites and their perceived ease of use. The model was based on a literature review on real estate management and information systems or websites (Ullah & Sepasgozar, 2019).

The real estate sector comprises 20 percent of the Australian construction industry, and with its IT orientation tends to a high rate of technological adoption (Despinola, 2018). Factors such as website perceived-usefulness, user-satisfaction and behavioral-intention-to-use have been included in a conceptual system dynamic model of customer appeal with various constituents derived from published literature along with suggestions for future improvements (Mahalaxmi & Ranjith, 2016, 332–338). The model may have value for website managers and real estate agents, suggesting new ideas for clients and incorporation of the latest technologies in the business. For example, using 360° cameras for photographs, video, and virtual reality (Ullah & Sepasgozar, 2019). The conceptual model is a growing synthesis of real estate technology adoption and customer perception, which can be validated using real-life data from clients and real estate agents (Ullah & Sepasgozar, 2019).

Wofford and Thrall (1997, 177–201) show how familiarity with GIS and other information technologies influence thinking on real estate issues and assist in real estate problem-solving. Applying this inductive logic to real estate will probably

impart professional skills and a definite competence in knowing how and where to apply the range of technological assets available (Wofford & Thrall, 1997, 177–201).

## Findings and Conceptual Model

Digital marketing has motivated the real estate industry to adopt alternative methods of handling data and new technologies. A mature marketing framework will allow both offline and online marketing approaches.

Social media has been a strong contributor to data acquisition, but big data is emerging as dominant.

Information and communications technology (ICT) has already made its mark in the real estate industry, changing the nature of real estate agents' work. At the same time, social media have improved client access to real estate information.

The following technologies are significant in relation to real estate marketing: drones, IoT, clouds, software as a service (SaaS), big data, 3D scanning, wearable technologies, VR and AR, AI, and robotics. New technologies can have either sustaining or disruptive effects on a firm, depending on the firm and its fortunes in marketing. Applying these technologies may provide information to real estate consumers that will avoid later regret over a decision to purchase.

Australia trails the US and the UK in global real estate technology adoption but is included in a picture of technological advance. The real estate sector comprises 20 percent of the Australian construction industry, and with its IT orientation tends to a high rate of technological adoption.

Australian network readiness is ranked 18 out of the 139 countries surveyed, accessibility of the latest technologies is ranked at 24, adoption of technology at the firm level at 22, capacity for innovation based on adoption capabilities at 25, and B2C successful transfer over internet use is ranked at 25.

Blockchain is likely to be an incremental innovation that can lead to substantial changes in marketing. It can make transactions shorter, transparent, and more reliable. But storing transactions is complicated and expensive, and cost and security burdens may outweigh the value of its marketing applications.

IoT is likely to raise real estate issues, especially if a property is already embedded in a series of arrangements for internet connection (IC). An IC cloud solution would have to be considered alongside blockchain. Network security and effectiveness of the network must be guaranteed by all agencies involved in its operation.

AI is new and complex, and leaders must learn how to operate effectively with AI in the overall business environment. AI is being tentatively tried in real estate valuations.

Augmented reality (AR) and virtual reality (VR) are developing technologies. The conceptual model is a growing synthesis of real estate technology adoption and



customer perception, which can be validated using real-life data from clients and real estate agents. VR in B2B marketing will interest consumers, but with the amount of preparation required, hard work is demanded to achieve quality. VR can trace the future development of off-the-plan high rise dwellings through all stages of construction. AR adds a designed 3D model or other sensory elements to the real world.

The global use of digital technology is growing every day (Çizmeçi & Ercan, 2015, 149–161). The adoption of these digital technology enables real estate companies to connect with a larger consumer base and to create new contacts to establish reliable relationships. Marketing is the real-time integration of strategy, through a particular method, having strong objectives using different channels, mechanism, content, and social media marketing (Lamberton & Stephen, 2016, 146–172). Due to digital technology in marketing and the use of digital technologies, businesses need to recognize consumers' needs to able to identify the correct digital channels to reach consumers. We now have the capacity to reach a world audience with a single click within milliseconds. The power of this is both exciting and overwhelming.

## Conclusion

The rate at which technology changes and the way marketing is regarded in changing societies is influenced by observation and participation. It is true to say that the development of marketing has been significantly influenced by the rise of the internet. Nevertheless, technological development is not limited to the internet, and the functions of technology also need to be assessed against the relative power of marketers and consumers in society, where principles of ethical conduct play a role. No one can be sure of the future, but a wise observer of historical events and recently influential factors can see trends that may continue in their present form, change significantly, or disappear. However, active trends such as social media analytics and big data analytics are very likely to continue for many years. It is our job to prepare for these changes, assert the importance of ethical principle, and continuously survey the world around us.

This is not the end of the story. Developments and adjustments will achieve balance in due course. Big data could flourish in some societies, but in Western societies, it appears unlikely that centuries-old traditions of scholarship will disappear for the sake of apparent efficiency in marketing. A final word about this review chapter might be that wisdom is more than knowledge, but wise action depends on accurate knowledge. A marketing manager would be well advised to ensure a coherent grasp of big data alongside a clear sense of critical realism.

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## Chapter 6

# Drivers of Bank Penetration: A Bankers' Perspective

## Introduction

Of late, deep penetration strategy has become crucial to the overall marketing strategy of Indian banks. Bank penetration has become an important component of mainstream thinking for Indian bankers, and most Indian banks have made headline market penetration commitments in the last few years. Indian banks are chasing ambitious targets and adopting a well-resourced approach to achieve market penetration (Singh & Singh, 2016).

India is the seat of the largest unbanked population in the world (CRISIL, 2015). Patterns of deposits and loans indicate that deposit and credit penetration in India are restricted (CRISIL, 2015). In fact, credit penetration in India is the lowest in the world (Bank for International Settlements, 2016). While regulators view these facts with concern, banks recognize opportunities in them (Bank for International Settlements, 2016). Banks are reaching out to the unbanked and under-banked with a bouquet of innovative and attractive offerings (KPMG, 2015).

Due to the recent focus on bank penetration, provision of banking services has gathered pace in India. Bank penetration in terms of ATM penetration, bank branch networks, and penetration of plastic money has tremendously improved in the last few years (Jakki, 2016). During 2015 and 2016 there was a significant increase in digital bank penetration. Bank account penetration increased from 35 percent in 2011 to 53 percent in 2014. In absolute numbers, this increase translates to 180 million new account holders (The Indian Express, 2015).

The sheer enormity of the increase in bank penetration in India makes its drivers an episode worthy of examination. This study adopts an interesting approach and captures the drivers of bank penetration from the viewpoint of senior bank employees engaged in the development and execution of strategies. This study categorically aims to (1) identify the factors that drive bank penetration, and (2) assess the impact of these factors on bank penetration.

The case of India is particularly suited to the study of drivers of bank penetration because in the recent past India has experienced significant bank penetration. It might be the right time to document what motivates Indian banks to pursue this strategy. The study is also important because despite the increase in bank penetration, India is still characterized by an overall low level of bank penetration, and a strong latent demand for banking services (CRISIL, 2015; Ernst and Young [EY], 2015). Consequently, the government and central bank are rigorously seeking deeper penetration of banking

services. Within the context, the results of this study are likely to have considerable policy implications. The evidence provided by this study is likely to push the bank penetration agenda of the policy makers. Lastly, this study also adds to the developing literature on bank penetration in emerging economies. Bank penetration in emerging economies has captured the interest of all stakeholders, and literature is replete with call for further research in this area (Singh, Singh, & Sandhu, 2017a; 2017b). This study answers this call for further research and compliments and builds upon the already existing evidence.

From a methodological perspective, the study is robust. First, the universe of the study was carefully defined. Only senior bank employees were approached for data collection. The intent was to ensure familiarity of respondents with design/implementation of strategies. Second, substantial rural representation was ensured in the sample. The problem of nonavailability of banking services is acute in the rural areas (Kodan, Garg, & Kaidan, 2011; Dupas, Green, Keats, & Robinson, 2012; Karlan, 2014). The mandates provided by the government call for rural bank penetration. Therefore, it was considered necessary to include the perspectives of bank employees deputed with rural bank branches.

The rest of the chapter is structured as follows. The next section elaborates the related theory and previous research. Subsequent sections describe the methodology, data, hypotheses, and results. The article ends with a discussion of the policy implications and limitations of the study.

## **Operational Definition and Previous Research**

This section presents the related theory and a critical review of the research that sheds light on the drivers of bank penetration. The operational definition of bank penetration as relevant to this study is also provided in this section. This section serves a two-fold purpose. First, it explains and orients the dependent variable of the study, that is, bank penetration. Second, it helps shortlist the variables that form the basis of the questionnaire.

Market penetration is the most popular marketing strategy adopted by banks around the world (Meidan, 1983). Traditionally, bank penetration was recognized as a growth strategy aimed at increasing the usage rate of bank branches and services by acquiring new customers from the existing market, or by bringing in more business from the existing customers (Meidan, 1983; Varadarajan & Berry, 1983). As competition in the banking industry reached new heights, more and more banks sought growth and increase in market share by cross selling to existing customers (Philp, Haynes, & Helms, 1992). Banks pursued penetration by introducing numerous ancillary products and services. This was viewed as a cost-effective and efficient strategy since access to the segment in question had already been established



(Philp et al., 1992). Critics have underscored the flip side of this policy. Though acknowledging the positive association between cross selling and bank growth, scholars fear that a heavy focus on this strategy would place more stress on peripheral activities rather than the actual purpose of a bank (Howley & Savage, 1980).

The term bank penetration has different connotations in banking literature. Howley and Savage (1980) suggest that bank penetration also includes transmission of banking services to the unbanked population. They further indicate that bank penetration is the percentage of adult population that has a bank account. Howley and Savage (1980) opine that there are two ways in which growth and profitability can be achieved through bank penetration. The first source is cross selling to existing customers. The second source is targeting the previously unbanked population and the ignored niches, especially the youth (Howley & Savage, 1980). Allen et al. (2012) use the term bank penetration to refer to the extent to which the population of a country has access to banking services. In the recent Indian context, Kumar and Mishra (2011) use the words banking penetration and banking outreach interchangeably and measure it as a function of number of deposit and credit accounts. Singh and Singh (2016) establish an increase in number of account holders, bank branches, aggregate deposits, and ATMs as the most important measures of bank penetration. Most policy documents and news articles estimate bank penetration in terms of increase in number of ATMs, debit and credit cards, bank branches, percentage of households with access to banking services, etc. (Jakki, 2016). In current literature, number of ATMs is accepted as the new proxy for bank penetration ("Banking Penetration a Major Challenge in India," 2016). Sharma (2016) uses two measures to estimate bank penetration: number of deposit and credit accounts, and demography of bank branches and ATMs. Some literature also measures bank penetration in terms of geographical expansion of banking services, especially in the previously unbanked/under banked rural areas (Vinayak, 2017).

The sense in which the term bank penetration is used in recent literature, especially in the Indian context, indicates that this strategy has characteristics of both growth and competitive strategies. Indian banks are seeking penetration by infiltrating virgin markets, opening new accounts, devising alternative low-cost channels of service delivery, and exhibiting greater efficiency in handling the business of individual clients (Singh & Singh, 2016). Therefore, the question is: what is bank penetration? Keeping in mind the way the term is used in current literature; the author has chosen to define it as *expanding the reach and range of banking services*. However, just like every other definition, the precincts of this definition are indistinct. Bank penetration as understood and practiced by Indian banks overlaps with numerous other marketing strategies.

Many social and economic changes have facilitated bank penetration. First, the ever-increasing population and integration of the population into the workforce has steadily increased the demand for banking services (EY, 2015). Second, demand for banking services has also increased because of a greater willingness to borrow

money. Removal of traditional taboos associated with taking loans and a greater confidence in ability to repay loans has facilitated this change (Howley & Savage, 1980). Third, improved literacy rate and economic affluence have driven bank penetration (Marin & Schwabe, 2013). Fourth, changing perception of risks associated with banking has proliferated the adoption of the banking habit (Capgemini Consulting, 2017). These demographic and perceptual changes have created new opportunities for banks. Banks are exploiting these opportunities through geographical expansion and new customer acquisition (EY, 2015).

Further, innovation in the form of new product development and alternative channels of delivery has also improved the reach and range of banking services (EY, 2015). Banks are seeking higher market shares through the development of customer-focused new products and partnerships with nonbanks (EY, 2015). Banks are also extensively leveraging technology to pursue market penetration (Singh et al., 2017a). Use of technology has helped explore the otherwise expensive new avenues of growth in a cost-effective manner (Chukumba, Oyewole, & Prabhakar, 2007). Interface with technology is the foremost strategic choice that has enabled bank penetration in the inclusive economies (Karlan, 2014). It may be of interest to point out that while both public and private banks in India are seeking to penetrate new markets, the strategies that they are using are significantly different. Public sector banks are seeking new market entry by augmenting the physical infrastructure and private sector banks are relying more on technology and innovation (Singh et al., 2017b).

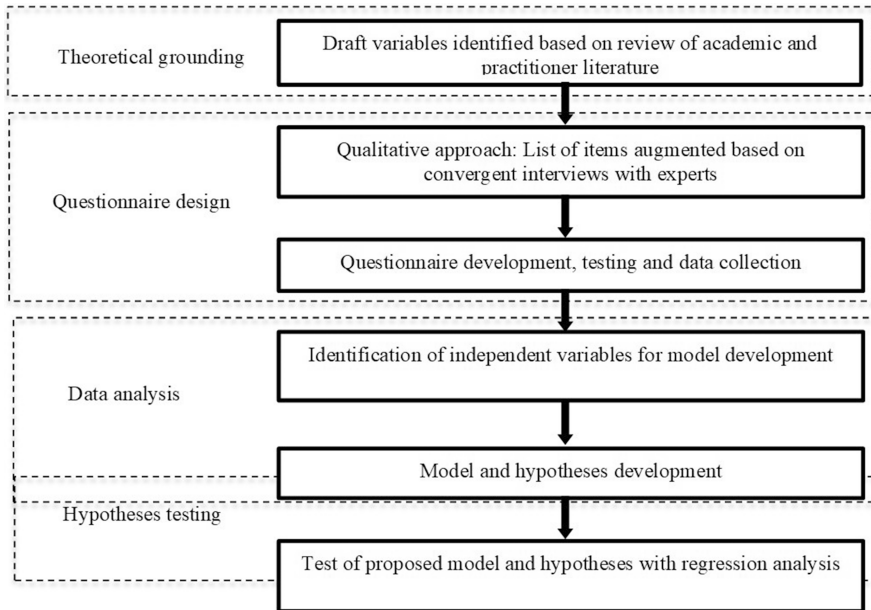
Some research also establishes a link between bank competition and bank penetration (Beck, Demirguc-Kunt, & Maksimovic, 2004; Beck, Demirguc-Kunt, & Martinez Peria, 2008). Evidence is available that suggests a robust positive correlation between the two constructs (Marin & Schwabe, 2013). Increase in bank competition causes banks to deepen the access to banking services. In the words of Marin and Schwabe (2013, p. 9): “competition affects banks” decisions to install branches, ATMs, and POS terminals. These measures impact bank penetration (Marin & Schwabe, 2013).

Extant literature suggests a correlation between bank penetration and inclusive growth (Sharma, 2016). Bank penetration is recognized as a precondition for social and economic development (Sandhu & Singh, 2016). Access to formal banking has the potential to uplift masses by creating economic opportunities that reduce poverty and promote social equality (Burgess & Pande, 2005; Burgess, Pande, & Wong, 2005). The welfare effects of bank penetration at the individual level include access to cheap credit, insulation from financial shocks, and better management of resources (Burgess, Pande, & Wong, 2005; Arora & Meenu, 2012; Sandhu & Singh, 2016). At the macro level, bank penetration helps reduce the size of the shadow economy and transfer resources to the deficit units leading to balanced and sustained development (Kumar & Mishra, 2011; Bansal & Behal, 2013; EY, 2015). The developmental gains of bank penetration explain why it is rigorously pursued as a policy agenda in a developing economy such as India (Singh & Sandhu, 2016).

However, empirical verification is required to assess if this social motive aspires banks to seek penetration.

## Methodology

Details of the methodology used are presented in this section (refer to Figure 6.1). This section consists of three subsections: questionnaire development, sample, and respondent demographics.



Source: Author's study

**Figure 6.1:** Study methodology Questionnaire development.

Attributes that formed the basis of the research instrument were identified through a broad review of academic and practitioner literature, as well as interviews conducted with senior bank officials. In all, eight interviews were conducted. The interviewees were employed as presidents/vice presidents/assistant vice presidents/zonal managers/ chief managers with different public and private sector Indian banks. Use of interviews is suggested to identify concerns and variables in under-researched and emerging areas (Rao & Perry, 2003), such as the present area of bank penetration in an emerging economy.

Detailed review of available literature ensured face and content validity of the questionnaire. The qualitative approach made the questionnaire context specific. The final questionnaire constituted 26 unduplicated variables anchored on a 5-point Likert scale. Table 6.1 exhibits the scale items.

**Table 6.1:** List of study variables.

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1.	Cheap technology solutions
2.	Profit motive
3.	Acquire additional volume growth
4.	Alleviate poverty and financial exclusion
5.	Increase market share
6.	Economies of scale
7.	Social welfare
8.	Dominant market presence
9.	Increased demand for banking services
10.	Improve customer service
11.	Serve the underserved/unbanked
12.	Universalize access to banking services
13.	Distribution channel innovations beyond traditional banking
14.	Product and service innovations
15.	Survival concerns in the face of attractive banking terms offered by competitors
16.	Greater willingness to borrow money
17.	Equitable distribution of resources
18.	Increased industry competition
19.	Self-service banking (internet banking, ATM, mobile banking, etc.)
20.	Reduced dependence on branch banking
21.	Increase in employment and personal affluence
22.	Increase in aggregate savings
23.	Targets provided by government
24.	Emerging digital ecosystem
25.	Regulatory and policy focus
26.	Increase in literacy rate

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Source: Author's study.

## Sample

To ensure rational responses, only senior bank employees engaged in the development and/or implementation of strategies were approached for data collection. It was the author's understanding that they would be familiar with bank strategies and ideally suited to provide information on the drives of bank penetration. Further, a conscious attempt was made to ensure substantial rural representation in the sample. This was done to capture the perspectives of the bank employees deputed in rural areas where the problem of nonavailability of banking services is gargantuan.

One hundred questionnaires were conveniently distributed to senior employees of two public sector (State Bank of India, and Punjab and Sind Bank) and two private sector banks (HDFC Bank and ICICI Bank) to test the questionnaire. Out of these 100 questionnaires, only 39 usable were obtained. Based on this pilot survey, the wordings of two variables used in the questionnaire were changed. Overall, the questionnaire was found to be error free.

After the pilot survey, 1,250 questionnaires were distributed to senior officials of various public and private sector Indian banks. The sampling technique used was convenience sampling. Out of the 1,250 questionnaires distributed, only 493 questionnaires were returned. Thus, the survey had a response rate of 39.44 percent. The respondents of the study were senior bank employees. It was difficult to approach them. This explains the low response rate of the survey.

Out of the 493 questionnaires returned, usable questionnaires were identified with the help of missing value analysis (Little & Rubin, 1987). This treatment recommends exclusion of questionnaires with over 25 percent missing values (Graham, Hofer, & Mackinnon, 1996). Based on this treatment, 89 data records were excluded from the data set. The final analysis was conducted based on 404 responses. The final sample included responses from employees of 34 Indian banks. Of these 34 banks, 22 were public sector banks, and the rest were private sector banks. Details of the sample, including a bank-wise break up are exhibited in Table 6.2. Designations of the respondents include president, vice president, assistant vice president, general manager, deputy general manager, assistant general manager, zonal manager, chief manager, senior manager, etc. It may be noted that employees below management level were not approached for data collection.

Further, a robust check for nonresponse bias was conducted. Nonresponse bias is the difference in the responses of the respondents and nonrespondents (Lambert & Harrington, 1990). The 404 usable questionnaires were divided into two groups. Group one consisted of questionnaires returned without a reminder ( $n = 318$ ) and group two consisted of questionnaires returned after a reminder was sent ( $n = 86$ ). Fifteen variables used in the questionnaire were randomly subjected to  $t$ -test. No significant difference (at 5 percent significance level) across the two groups was found. It is safe to say that in the present study nonresponse bias is not a matter of concern.

## Respondent Demographics

Table 6.3 exhibits the demographics of the respondents. Two variables, that is, gender and age were used to capture respondent demographics. Male respondents constituted 75.50 percent of the sample and the female respondents constituted the remaining 24.50 percent. The age of the respondents was classified into four categories: under 30 years, 31–40 years, 41–50 years, and over 51 years. Age categories were adopted from Sarros, Pirola-Merlo, and Baker (2012). The respondents who

**Table 6.2:** Details of the sample.

Number of questionnaires distributed	1,250
Number of usable responses after data cleaning	404
Number of usable responses from officials employed with public sector banks	239
Number of usable responses from officials employed with private sector banks	165
Number of usable responses from officials deputed with rural bank branches	109
Number of usable responses from officials deputed with semi-urban bank branches	94
Number of usable responses from officials deputed with urban and metropolitan bank branches	201
<b>Bank-Wise Details of Sample</b>	
<b>Bank Name</b>	<b>Number of Responses</b>
<b>Public Sector Banks</b>	
Allahabad Bank	5
Andhra Bank	13
Bank of Baroda	3
Bank of India	1
Bank of Maharashtra	2
Canara Bank	13
Central Bank of India	15
Corporation Bank	2
IDBI Bank	8
Indian Bank	2
Indian Overseas Bank	3
Oriental Bank of Commerce	10
Punjab and Sind Bank	79
Punjab National Bank	28
State Bank of India*	24
State Bank of Hyderabad*	1
State Bank of Patiala*	13
Syndicate Bank	2
UCO Bank	7
Union Bank of India	2
United Bank of India	2
Vijaya Bank	4
<b>Private Sector Banks</b>	
Axis Bank	18
City Union Bank	1
Federal Bank	7
HDFC Bank	58
ICICI Bank	18
IndusInd Bank	13
ING Vysya Bank	2**
J and K Bank	6

**Table 6.2** (continued)

Karnataka Bank	4
Kotak Mahindra Bank	16**
South Indian Bank	2
Yes Bank	20

**Notes:**

\*The State Bank of Hyderabad and the State Bank of Patiala have now merged with the State Bank of India.

\*\*The ING Vysya Bank has now merged with the Kotak Mahindra Bank.

Source: Author's study.

were under 30 years of age made up 27.48 percent, 21.78 percent were between 31 and 40 years of age, 14.11 percent were between 41 and 50 years of age, and those over 51 years of age made up 36.63 percent of the respondents.

**Table 6.3:** Respondent demographics.

Variable	Classification of variable	Frequency	Percentage (percent)
Gender	Male	305	75.50
	Female	99	24.50
Age	Under 30 years	111	27.48
	31–40 years	88	21.78
	41–50 years	57	14.11
	Over 51 years	148	36.63

Source: Author's study.

## Data Analysis

This section is divided into three sections: data reduction, model development and model test.

### Data Reduction

The collected data were reduced with the help of factor analysis. This was done with a view to extract fewer variables out of the initial 26 variables used in the questionnaire. The aim was to subject the fewer extracted variables to further treatment.

Before proceeding with factor analysis, it was assessed if it was appropriate to use the technique in the present case. For this, the Kaiser Meyer Oklin (KMO) and

Bartlett's test, and the correlation matrix were used. The results of the KMO and Bartlett's test are displayed in Table 6.4. This test assesses the suitability of data for structure detection. KMO is a measure of sampling adequacy for each separate variable and the overall data (Dziuban & Shirkey, 1974). A cut-off value of 0.5 is recommended (Yong & Pearce, 2013). In the present case the value of KMO is 0.849. This implies good partial correlation in the data and suggests that reliable factors can be extracted (Che et al., 2013). The Bartlett's test of sphericity assesses the presence of correlations among variables (Hair, Black, Babin, Anderson, & Tatham, 2006). Sufficient correlation between variables ensures that representative factors can be produced from the data (Hair et al., 2006). As can be seen from Table 6.4, the Bartlett's test of sphericity is significant ( $p = 0.000$ ). Therefore, patterned relationships exist in the data that make it suitable for subjection to factor analysis (Yong & Pearce, 2013). Further, the correlation matrix is exhibited in Table 6.5. The correlation matrix reveals sufficient correlations between variables to proceed with factor analysis.

**Table 6.4:** KMO and Bartlett's test.

Kaiser Meyer Oklin measure of sampling adequacy		0.849
Bartlett's test of sphericity	Approx. $\chi^2$	6062.748
	df	325
	Sig.	0.000

Source: Author's study.

After ensuring factorability of the data, it was subjected to factor analysis. Principal component method with Varimax rotation was employed. Factors with eigen values over 1.0 and variables which distinctly loaded on a particular factor with loadings over 0.5 were retained (Malhotra, 2008). At this stage, three variables were dropped since they did not qualify this criterion. In all, seven factors accounting for a cumulative variance of 70.95 percent were extracted. Factors were named based on the variables loaded on them. Care was taken to ensure nomological validity. The results of factor analysis are exhibited in Table 6.6. For rotated component matrix refer to Annexure 1.

Cronbach's coefficient  $\alpha$  was used to establish the reliability of the factors. A cut-off value of 0.7 is recommended (Cronbach, 1951; Nunnally & Bernstein, 1967). In the present case, this value worked out to 0.812. This value establishes adequate reliability of the factors.

Output of factor analysis reveals that the most important factor that drives bank penetration is supply side innovations, followed by growth and profit objective, social responsibility, competition, demographic dividend, regulatory mandates, and cost-effective solutions. These seven factors are subjected to further analysis in the next sub-section.



Table 6.5: Correlation matrix.

V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13	V14	V15
1														
V2	0.374**													
V3	0.316**	1												
V4	0.339**	0.491**	1											
V5	0.250**	0.506**	0.633**	1										
V6	0.263**	0.608**	0.647**	0.789**	1									
V7	0.219**	0.593**	0.603**	0.747**	0.878**	1								
V8	0.148**	0.535**	0.422**	0.543**	0.624**	0.644**	1							
V9	0.162**	0.488**	0.485**	0.611**	0.638**	0.677**	0.642**	1						
V10	0.116*	0.303**	0.181**	0.401**	0.494**	0.550**	0.414**	0.562**	1					
V11	-0.084	-0.073	-0.056	-0.008	-0.121*	0.172**	0.262**	0.222**	0.210**	0.347**	1			
V12	-0.141**	-0.164**	-0.224**	0.017	-0.254**	-0.039	0.004	-0.136**	0.290**	0.572**	0.573**	1		
V13	0.010	0.094	0.185**	0.282**	0.192**	0.284**	0.359**	0.099*	0.288**	0.377**	0.573**	0.473**	1	
V14	0.005	0.181**	-0.085	0.221**	0.051	0.264**	0.329**	0.222**	0.543**	0.336**	0.602**	0.493**	0.397**	1
V15	0.062	0.242**	0.312**	0.302**	0.320**	0.547**	0.502**	0.400**	0.310**	0.473**	0.552**	0.493**	0.397**	0.397**
V16	0.296**	0.439**	0.415**	0.422**	0.515**	0.437**	0.390**	0.488**	0.439**	-0.150**	-0.265**	-0.008	0.084	0.261**
V17	0.056	-0.023	0.142**	0.096	0.055	0.095	0.110*	0.057	0.018	0.048	0.104*	0.223**	0.355**	0.211**
V18	0.128*	0.046	0.275**	0.172**	0.159**	0.271**	0.264**	0.116*	0.068	0.116*	0.069	0.213**	0.066	0.325**
V19	0.153**	0.425**	0.311**	0.339**	0.451**	0.361**	0.335**	0.289**	0.207**	-0.115*	-0.078	0.168**	0.048	0.189**
V20	0.024	0.244**	0.119*	0.184**	0.276**	0.256**	0.251**	0.212**	0.163**	0.168**	-0.004	0.073	0.154**	0.092
V21	-0.074	-0.018	-0.176**	-0.123*	-0.109*	-0.022	0.022	0.094	-0.143**	0.024	0.382**	0.311**	0.236**	0.320**
V22	0.155**	0.010	0.280**	0.253**	0.185**	0.284**	0.248**	0.097	0.018	0.017	0.242**	0.213**	0.468**	0.486**
V23	0.033	-0.062	-0.181**	-0.031	-0.179**	-0.176**	-0.159**	-0.152**	-0.278**	0.037	0.033	0.270**	0.111*	0.263**
V24	0.083	0.012	-0.074	0.049	-0.088	-0.083	-0.071	-0.039*	0.117*	0.034	0.121*	0.020	0.162**	-0.038
V25	0.037	0.098*	0.101*	0.050	0.155**	0.071	0.036	0.098*	-0.038	-0.010	-0.115*	0.008	-0.012	-0.057
V26	-0.091	-0.151**	-0.194**	-0.126*	-0.232**	-0.172**	-0.183**	-0.108*	-0.062	0.085	0.047	-0.077	0.019	-0.043

(continued)

Table 6.5 (continued)

V16	V17	V18	V19	V20	V21	V22	V23	V24	V25	V26
1										
0.267**	1									
0.259**	0.543**	1								
0.301**	0.100*	0.098*	1							
0.118*	-0.027	0.046	0.431**	1						
-0.069	0.125*	0.039	0.118*	0.272**	1					
0.157**	0.494**	0.392**	0.194**	0.090	0.350**	1				
-0.087	0.008	-0.093	-0.005	0.074	0.243**	-0.014	1			
0.032	0.033	-0.031	0.057	0.149**	0.260**	0.037	0.505**	1		
0.009	-0.069	-0.094	0.184**	0.171**	0.052	0.009	0.322**	0.228**	1	
-0.142**	-0.056	-0.050	-0.018	0.024	0.252**	-0.043	0.426**	0.391**	0.189**	1

Notes:

\*Correlation is significant at the 0.05 level;

\*\*Correlation is significant at the 0.01 level.

**Table 6.6:** Factor analysis: Drivers of bank penetration.

Factor	Eigen value	Cumulative variance (percent)	Variables	Loadings
Factor 1: Supply side innovations	7.065	27.17	Self-service banking (internet banking, ATM, mobile banking, etc.)	0.901
			Emerging digital ecosystem	0.894
			Distribution channel innovations beyond traditional banking	0.827
			Product and service innovations	0.693
			Reduced dependence on branch banking	0.572
Factor 2: Growth and profit objective	3.655	41.23	Increase market share	0.830
			Acquire additional volume growth	0.656
			Profit motive	0.620
			Dominant market presence	0.616
Factor 3: Social responsibility	2.284	50.01	Universalize access to banking services	0.644
			Serve the underserved/unbanked	0.652
			Alleviate poverty and social exclusion	0.583
			Social welfare	0.530
Factor 4: Competition	1.961	57.56	Improve customer service	0.741
			Survival concerns in the face of attractive banking terms offered by competitors	0.727
			Increased industry competition	0.506
Factor 5: Demographic dividend	1.315	62.61	Increase in employment and personal affluence	0.715
			Increased demand for banking services	0.600
			Increase in aggregate savings	0.593
Factor 6: Regulatory mandates	1.150	67.04	Regulatory and policy focus	0.562
			Targets provided by government	0.512
Factor 7: Cost effective solutions	1.016	70.95	Cheap technology solutions	0.573
			Economies of scale	0.506

Source: Author's study.

## Model Development

A multivariate regression model was developed to assess the impact of the seven factors extracted from factor analysis on bank penetration. The seven variables extracted from factor analysis, that is, supply side innovations, growth and profit objective, social responsibility, competition, demographic dividend, regulatory mandates, and cost-effective solutions were assumed to be the independent predictors and bank penetration was assumed to be the dependent variable. To arrive at factor scores, the scores of all the variables loaded on particular factors were averaged (Comrey & Lee, 1992; DiStefano, Zhu, & Mindrila, 2009). For model development refer to Table 6.7. Presuming that the seven independent predictors impacted bank penetration, the set of hypotheses exhibited in Table 6.8 were proposed.

**Table 6.7:** Model development.

Dependent variable	Bank penetration
Independent variables	Supply side innovations, growth and profit objective, social responsibility, competition, demographic dividend, regulatory mandates, and cost-effective solutions

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7, \text{ where } \dots \dots \dots \text{ (Equation 1)}$$

Y = the dependent variable (bank penetration),

X<sub>1</sub> to X<sub>7</sub> = the seven independent variables extracted from factor analysis (supply side innovations, growth and profit objective, social responsibility, competition, demographic dividend, regulatory mandates, and cost-effective solutions),

a = the constant, and

β<sub>1</sub> to β<sub>7</sub> = slope coefficients

Source: Author’s study

**Table 6.8:** Hypotheses.

Null hypotheses	Alternate hypotheses
H <sub>01</sub> : There is no significant impact of supply side innovations on bank penetration.	H <sub>1</sub> : There is a significant impact of supply side innovations on bank penetration.
H <sub>02</sub> : There is no significant impact of growth and profit objective on bank penetration.	H <sub>2</sub> : There is a significant impact of growth and profit objective on bank penetration.
H <sub>03</sub> : There is no significant impact of social responsibility on bank penetration.	H <sub>3</sub> : There is a significant impact of social responsibility on bank penetration.
H <sub>04</sub> : There is no significant impact of competition on bank penetration.	H <sub>4</sub> : There is a significant impact of competition on bank penetration.

Table 6.8 (continued)

Null hypotheses	Alternate hypotheses
H <sub>05</sub> : There is no significant impact of demographic dividend on bank penetration.	H <sub>5</sub> : There is a significant impact of demographic dividend on bank penetration.
H <sub>06</sub> : There is no significant impact of regulatory mandates on bank penetration.	H <sub>6</sub> : There is a significant impact of regulatory mandates on bank penetration.
H <sub>07</sub> : There is no significant impact of cost-effective solutions on bank penetration.	H <sub>7</sub> : There is a significant impact of cost-effective solutions on bank penetration.

Source: Author's study.

## Model Test

Multiple regression analysis was used to test the developed model. Before the application of this technique, the appropriateness of its use in the present case was established. First, normal distribution of variables was ensured with the help of normal probability plot of regression standardized residual. Second, absence of multicollinearity among the predictor variables was established with the help of correlation matrix and by examining the values of the Variance Inflation Factor (VIF) of predictor variables. Multicollinearity is a situation in which the correlation between the independent variables is high enough to reduce the accuracy of regression analysis. If the pair-wise correlations between different pairs of predictor variables are greater than 0.75, or VIFs of variables exceed 10, then multicollinearity maybe a matter of concern (Kishton & Widaman, 1994; Gujarati, 2008). In the present case, the pair-wise correlation coefficients are less than 0.75 in all cases (refer to Table 6.9). Also, VIFs in case each are less than 10 (refer to Table 6.10). This provides evidence of discriminant validity and suggests absence of multicollinearity in the data. Third, the assumption of independent errors or autocorrelation was tested with the help of the Durbin-Watson statistic. A value of close to 2 is recommended (Gujarati, 2008). In the present case, the value of the Durbin-Watson statistic is 1.772. This value indicates that the assumption is almost satisfied. All the above diagnostics suggest that the model is valid and reliable, and the use of regression analysis is appropriate in the present case.

The output of regression analysis is displayed in Tables 6.10–6.12. As can be seen from Table 6.12, the overall model is significant ( $F = 99.175$ ;  $p = 0.000$ ). This establishes a significant correlation between the dependent variable and the independent variables. The value of  $R^2$  shows that the independent variables explain 63.7 percent of the variation in the dependent variable. Table 6.10 shows that the coefficients of six factors, that is, supply side innovations, growth and profit objective, competition, demographic dividend, regulatory mandates, and cost-effective

solutions are positive and significant at 95 percent confidence level. As such,  $H_{01}$ ,  $H_{02}$ ,  $H_{04}$ ,  $H_{05}$ ,  $H_{06}$ , and  $H_{07}$  are rejected. The coefficient of the third factor, social responsibility, is not significant. As such  $H_{03}$  is accepted. Based on this analysis equation 1 takes the shape of equation 2.

It may be of interest to note that an examination of the standardized  $\beta$  values of the six significant factors suggests that at the absolute level, demographic dividend has the maximum impact on bank penetration. In the hierarchy of impact, demographic dividend is followed by competition, supply side innovations, regulatory mandates, growth and profit objective, and cost-effective solutions.

**Table 6.9:** Pearson's correlation.

	F1	F2	F3	F4	F5	F6	F7	Y
F1	1							
F2	0.336**	1						
F3	0.116*	0.066	1					
F4	0.222**	0.222**	0.116*	1				
F5	-0.008	0.221**	0.172**	0.344**	1			
F6	0.473**	0.397**	0.325**	0.400**	0.302**	1		
F7	0.347**	0.543**	0.068	0.414**	0.401**	0.313**	1	
Y	-0.121*	0.051	0.159**	0.543**	0.671**	0.320**	0.319**	1

Notes:

\*Correlation is significant at the 0.05 level;

\*\*Correlation is significant at the 0.01 level.

Source: Author's study.

**Table 6.10:** Results of multiple regression analysis.

Factors	Unstandardized coefficients		Standardized coefficients	t	Significance ( $p$ value)	VIF
	B	SE	$\beta$			
Supply side innovations	0.388	0.054	0.264	7.133	0.000*	1.493
Growth and profit objective	0.219	0.046	0.184	4.787	0.000*	1.574
Social responsibility	-0.013	0.061	-0.007	-0.211	0.833	1.136
Competition	0.409	0.041	0.353	9.896	0.000*	1.387
Demographic dividend	0.553	0.041	0.484	13.518	0.000*	1.400
Regulatory mandates	0.250	0.053	0.193	4.753	0.000*	1.801
Cost effective solutions	0.142	0.054	0.108	2.615	0.009*	1.864

Notes: \*Significant at 5 percent level of significance; intercept (constant) = 0.595;  $R^2=0.637$ ; adjusted  $R^2=0.630$ .

Source: Author's study.

**Table 6.11:** Model summary.

Model	R <sup>2</sup>	Adjusted R <sup>2</sup>	SE of the estimate
1	0.637	0.630	0.96432

Source: Author's study

**Table 6.12:** ANOVA for regression.

Sources of variation	Sum of squares	df	Mean square	F	Significance
Regression	645.566	7	92.224	99.175	0.000
Residual	368.243	393	0.930		
Total	1013.809	403			

Source: Author's study.

$$Y = a + \beta_1X_1 + \beta_2X_2 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 \dots \dots \dots \text{(equation 2)}$$

$$Y = 0.595 + 0.338 + 0.219 + 0.409 + 0.553 + 0.250 + 0.142, \text{ where}$$

Y = bank penetration,

a = the constant,

X<sub>1</sub> = supply side innovations

X<sub>2</sub> = growth and profit objective

X<sub>4</sub> = competition

X<sub>5</sub> = demographic dividend

X<sub>6</sub> = regulatory mandates, and

X<sub>7</sub> = cost effective solutions

Each of the six significant factors is discussed separately in the following part of this subsection.

### Factor 1 – Supply Side Innovations

Many supply side innovations such as technology enabled service delivery; digital withdrawals, transfers, and payments; distribution partnerships; and customer driven products facilitate bank penetration. All these innovations leverage the potential of digital channels. Fortunately, data on many macroeconomic variables such as growth rate of e-commerce, penetration of the internet, adoption of mobile phones etc. indicate that the prerequisites for digital bank penetration are in place in India (KPMG, 2015). As such banks are rolling out digital offerings and reducing reliance on physical contact with customers. The promise held by digital channels

has made self-service banking popular in India and positively impacted bank penetration (PwC, 2012). Enforcing the other measures of digital bank penetration as outlined in the “Digital India” campaign of the Government of India can further increase bank penetration. India may also take cues from other supply side innovations such as use of next gen technologies, biometric apps, image-based banking etc. that have internationally facilitated bank penetration.

## **Factor 2 – Growth and Profit Objective**

The objectives of growth and profitability encourage banks to adopt market penetration strategy. This finding is in synchronization with existing literature. Available banking literature suggests that the revolutionary changes witnessed by the banking industry have forced banks to identify profitability and growth as strategic objectives (Carey, 1989; Singh & Sandhu, 2016), and market penetration is the most frequent response to these strategic objectives (Meidan, 1983). In the advanced countries growth through a penetration strategy has proven to be a profitable strategy (Philp et al., 1992). Banks commonly use this strategy to increase and sustain high growth rates in competitive markets (Philp et al., 1992).

## **Factor 3 – Competition**

Competitive pressures drive bank penetration. An increase in the number of banks in the market causes the profit of individual banks to decline (Marin & Schwabe, 2013). The ever-increasing number of players in the Indian banking industry is squeezing the profits of individual banks. Banks are seeking fresh avenues of growth through market penetration. This study replicates the work of previous researchers in the Indian context and confirms the previously established positive correlation between bank competition and bank penetration (Beck et al., 2004; Beck et al., 2008; Marin & Schwabe, 2013).

## **Factor 4 – Demographic Dividend**

Demand side changes are a significant driver of bank penetration. As more and more people get integrated into the workforce, economic affluence and savings rise. These macroeconomic changes increase the demand for banking services. Banks respond by penetrating previously unbanked and under-banked demographic niches and geographical territories (EY, 2015). Banks are continually reorienting themselves to the new customers and developing specialized products to cater to their specific needs.



## Factor 5 – Regulatory Mandates

Bank literature documents government participation and regulation as a crucial co-variant of bank penetration (Marin & Schwabe, 2013). The evidence provided by the current study also suggests the same.

In India, bank penetration is pursued as a policy agenda. Under the grandiose Prime Minister's People's Wealth Program, the government has envisaged 100 percent bank penetration. The government has created a regulatory and policy framework that facilitates bank penetration. Some of the recent initiatives of the government that deserve a mention in this context are increasing the number of rural bank branches, reducing the cost and documentary complications associated with opening accounts, introduction of the no frills account, payments banks, financial literacy campaigns, etc. All these initiatives along with the ambitious targets provided by the government to the banks are driving bank penetration.

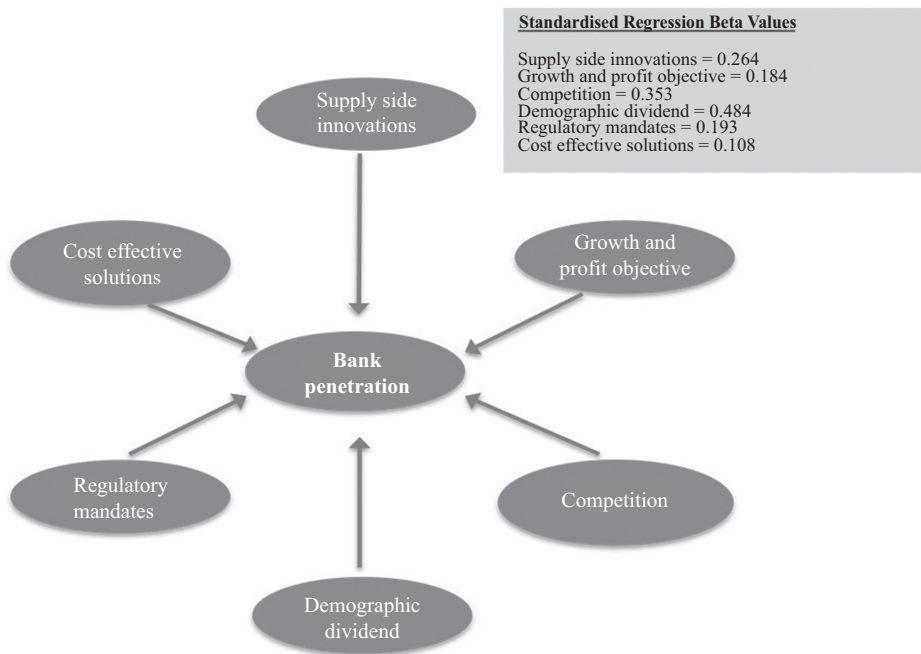
## Factor 6 – Cost Effective Solutions

Earlier banks considered market penetration as a high-cost strategy. Seeking bank penetration with the help of traditional banking models made this strategy uneconomical and hence financially unviable. However, technology solutions have substituted the need for physical infrastructure and the cost of bank penetration has reduced significantly (KPMG, 2015). As the cost of availing banking services reduces dramatically, banks respond by significantly increasing their penetration rates, especially in emerging economies such as India (EY, 2015).

The reduced cost of bank penetration not only helps drive bank penetration, but also provides a competitive advantage to banks. There exists an inverse correlation between the extent of market penetration and the cost of delivering services (Meyer & Tran, 2006). Bank penetration helps achieve economies of scale, reduces cost of service delivery, and provides an edge over the competition.

## Discussion

This study captured the drivers of bank penetration from the perspective of bank employees. The study found seven factors that impact bank penetration: supply side innovations, growth and profit objective, social responsibility, competition, demographic dividend, regulatory mandates, and cost-effective solutions. In the overall model, all these factors except social responsibility were statistically significant at a 95 percent confidence level. Figure 6.2 exhibits the findings of the study.



**Figure 6.2:** Proposed model: Drivers of bank penetration.

Though not specifically documented as drivers of bank penetration, previous literature recognizes a link between each of the above six significant factors and bank penetration (Howley & Savage, 1980; Meidan, 1983; Beck et al., 2004; Beck et al., 2008; PwC, 2012; Marin & Schwabe, 2013; EY, 2015). Therefore, it can be said that in its essence this study is a confirmatory study, and its value lies in its ability to document different drivers of bank penetration in the same study. Further, as indicated by the regression ( $\beta$ ) weights, this study also depicts the relative impact of each significant factor on bank penetration. This qualifies as another contribution of the current study.

The findings of this study have definite policy implications. From a policy viewpoint, four things are relevant. First, growth and profit motive are a significant driver of bank penetration. Growth opportunities are typically concentrated in developed districts (Allen et al., 2012). Demand for banking services, another significant driver of bank penetration is also the highest in these districts (Allen et al., 2012). Therefore, banks are likely to deepen their penetration in developed geographical pockets, defeating the government's agenda of providing banking services to the rural underserved/unbanked population of the country. On the other hand, if under-regulatory mandates (another significant driver of bank penetration), banks do penetrate rural markets/districts will poor growth potential; it is likely to harm their commercial interests. Considering the continuously deteriorating asset quality, liquidity, and

profitability of Indian banks (Pattnaik & Rattanani, 2017), the government needs to proceed with caution and rethink its lack of focus on growth of banks (Pattnaik & Rattanani, 2017). Second, regulatory mandates significantly impact bank penetration. With the regulatory focus on bank penetration, India has witnessed a surge in bank account penetration. However, it is estimated that over 40 percent of the new accounts opened are dormant (The Indian Express, 2015). This indicates that Indian banks are not making genuine efforts at market penetration; rather they are just chasing numbers to fulfill regulatory requirements. Experts believe that the objective of any bank penetration program is to ensure availability of formal banking to all (Karlan, 2014). However, the fear is that government policies aimed at bank penetration in India are misdirected and trying to generate demand for banking services through incentives. Once these incentives are withdrawn, banking may not offer any convenience to the poor population of the country. Thus, the current penetration strategies of the government may not be sustainable in the long run. This is another policy area that needs a rethink. Third, bank competition and bank penetration are positively correlated. Therefore, it is important to institute policies that directly address competition in the banking industry. Evidence is available that suggests that such policies tend to be cheap, easy to deploy, and show quick results (Marin & Schwabe, 2013). Use of bank correspondents and mobile banking are particularly effective in increasing competition in the banking industry (Marin & Schwabe, 2013). While both these channels are used to deliver banking services in India, their impact is limited because of restricted competition in these channels. Market-based policies that address these alternate channels of service delivery and favor new technologies can reduce barriers to entry and foster competition (Assuncao, 2013). Such policies can become an important tool in the government's quest for bank penetration. Fourth, in the recent past many researchers have attempted to examine the link between social responsibility and provision of banking services in India (Mukherjee, 2012; Dhingra & Mittal, 2014; Pushpam et al., 2015). The research undertaken by these researchers suggests that in the Indian banking industry, the expenditure head of CSR is unregulated (Mukherjee, 2012). CSR expenditures by banks are driven by the vested marketing interests of banks (Mukherjee, 2012) and do not significantly contribute toward government's agenda of bank penetration (Dhingra & Mittal, 2014). Past researchers have emphasized the need for government participation in this space (Mukherjee, 2012). The current study also did not find a significant link between social responsibility and bank penetration. Planned participation of the government through policies that address social responsibility of banks may encourage banks to seek market penetration as a social agenda.

The study suffers from some limitations. First, by exhibiting only within country evidence, the possibility of cross-country comparisons is forfeited. The structure and nature of emerging economies is very different from the advanced economies. There is considerable difference in the extent of bank penetration, policy and regulatory environment, and opportunities for further bank penetration offered by

emerging and advanced economies (EY, 2015). Hence, the results of this study may not be entirely generalizable in the context of advanced economies. Second, the data for the study was primarily collected from Northern Indian states: Punjab, Himachal Pradesh, Haryana, Delhi, Jammu and Kashmir, and the union territory of Chandigarh. Therefore, the data sample was not nationally representative. Third, this study suffers from all the inherent drawbacks of convenience sampling. Nonetheless, this study has definite policy implications and can help push the government's agenda of bank penetration.

Many issues remain unaddressed and provide scope for future research. Future researchers may examine the difference in the drivers of bank penetration for public and private sector banks. From a policy perspective, they may also examine how specific drivers of bank penetration can be activated to further bank penetration.

**Annexure 1: Rotated Component Matrix.**

	Component						
	1	2	3	4	5	6	7
V1							0.573
V2		0.620					
V3		0.656					
V4			0.583				
V5		0.830					
V6							0.506
V7			0.530				
V8		0.616					
V9					0.600		
V10				0.741			
V11			0.652				
V12			0.644				
V13	0.827						
V14	0.693						
V15				0.727			
V16							
V17							
V18				0.506			

## Annexure 1 (continued)

	Component						
	1	2	3	4	5	6	7
V19	0.901						
V20	0.572						
V21					0.715		
V22					0.593		
V23						0.512	
V24	0.894						
V25						0.562	
V26							

Source: Data Analysis using SPSS.

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## Chapter 7

# Elaborative Perceptions on Big Data and Social Media Analytics

## Introduction

Amid the development of the internet, social media have turned out to be part of the life of people. These platforms have not only been used by persons to join with other persons but also by businesses to arrive at their viewers. The explosion in big data creates an impact in both marketing and social media that has the pre-knowledge of what customers are fond of and contributes in setting up their promotion accordingly. The utilization of big data effectively creates a positive impact on social media by offering a quick assessment in the form of identifying the latest developments in the sector and facilitating marketers to take a sharp speedy decision to identify the likable brands of customers and the best platforms to reach them first. Secondly, through the personalization concept toward customers, the requirements of the customers can be fulfilled by sharing and caring through social media with the help of big data. Thirdly, being aware of the potential tendency and actions of customers for social advertisement development that might go beyond customer prospects. Fourthly, the investigation of big data helps marketers to follow the efficiency of their social media operation before, through and, later than their commencement. Lastly, big data studies can help marketers in understanding the strategies to adapt quickly by the experience that they gain from the immediate past. Hence, with the effective utilization of big data along in social media by proper analysis, marketers can have enhanced value their online group of people and envisage their activities to deliver personalized businesses as well as rapidly resolve every subject.

On the other hand, big data plays a vital role in productively administrating social media advertising operations. Because social media platforms have been present throughout our existence, the quantity of information substituted crossways has sharply increased. The simple communication and understanding terms are like preference, track, share, and pin that has been used in social media with the help of big data analysis by structured and unstructured data. The mood of social media users should be categorized based on their interest in the sectors, brands, styles, and characteristics to make intelligent decisions as quickly as possible with accuracy.

Big data can be described as enormous and difficult data sets, impractical or tough to hold with typical data tools. One of the necessary characteristics of big data initiated from social media is real-time calculations and decision-making by examining an extensive perception of happenings at present and past with the

parameters for quantitative, qualitative, and exploratory data. The two types of data that social media platforms need to collect are structured and unstructured for human to machine and machine to machine. Therefore, the volume of data allows the description of numerous classes, standards, and the refinement of examination divisions and subdivisions. Next, data formats differ from text credentials, charts to record statistics, acoustic facts, and more, which boosts the data analysis to a superior complication stage; therefore, it gets hold of practicable data.

Speed is a factor in tendency and real-life occurrence investigation; by analyzing the distribution velocity of a positive data set, one can extract the possible flow of the data as it occurs in an exact social collection in a distinct region. Finally, the data velocity should be able to assess the straightforwardness, precision, and truthfulness of the data or veracity. As the need of big data analysis is required for the effective utilization of social media in various angles, this chapter is divided into six major sections that include the need for big data in social media, social media tools, structured and unstructured data management, impacts on social media cum analysis on big data in social media, the challenge of working with big data, and the benefits leveraging big data for social media.

## Literature Survey

The preliminary studies from the previous papers on big data analytics, models, problems, and challenges in social analytics environments are displayed in this section.

Ghani et al. (2019) evaluated the quality attributes of various big data analytics techniques. Furthermore, we illustrate the state-of-the-art approaches, processes, and quality features of different studies to include a discussion on the applications of social media big data analytics. There are also open research challenges in big data analytics mentioned. Sebei et al. (2018) conducted a survey to assist interested researchers in identifying problems faced during the study phase, as well as big data solutions. A literature review was conducted to discuss the challenges of integrating big data technology, as well as some appropriate solutions.

Sivarajah et al. (2020) reviewed the research results, which are useful for researchers and managers who want to better understand and improve the business usage of participatory web resources to achieve business sustainability. As a result, this could be called a unique approach to achieving sustainability. Paul et al. (2017) addressed the model, theme, performance assessment, benefits, and drawbacks of using social media data for big data analytics. The challenges and opportunities in big data visualization were described by Agrawal et al. (2015), who also reviewed some existing approaches and visualization tools. Belcastro et al. (2019) suggested the amount of research and findings in the field of big data analysis, which is

increasing all the time, and new and powerful architectures, programming models, frameworks, and data mining algorithms are constantly being developed.

Bothos et al. (2010) developed the agent-based framework that can utilize user-generated content from social media to collect user sentiments and assessments, which in turn can be used to make informed market transactions. The state of the art in social media analytics and intelligence research that has direct relevance to the AI subfield from either a methodological or domain perspective was summarized by Zeng et al. (2010). Big data analytics techniques, processing methods, some published case studies from various vendors, some open research challenges, and the opportunities brought about by big data were addressed by Yaqoob et al. (2016). Wu et al. (2016) provided a comprehensive survey to describe this fast-growing field and summarize the state-of-the-art techniques for analyzing social media data, as well as a comprehensive survey to obtain a comprehensive picture of the area, recognize research challenges, and develop new techniques. Strohbach et al. (2016) gave a succinct overview of big data storage systems that can handle high velocity, high volume, and a high variety of data.

Vatrapu et al. (2016) proposed social set analysis as a new approach to big data analytics. A generative framework for quantitative social science philosophies, the theory of social data, conceptual and formal models of social data, and an empirical framework for integrating large social data sets with organizational and societal data sets make up social set analysis. Hu et al. (2014) published a literature review and framework tutorial for big data analytics systems to provide a broad overview for nonexpert readers and inspire experienced audiences to customize their big data solutions. The aim of the survey presented by Injadat et al. (2016) is to examine the data mining techniques used by social media networks between 2003 and 2015. Birjali et al. (2017) addressed the use of Twitter in a variety of proposed subjects. Twitter is the largest social networking website, and its data is growing at an exponential pace every day, making it a big data source. Birjali et al. also discussed, in depth, how big data technology, such as Info Sphere Big Insights, allows for the processing of this data, which was mainly obtained from social networks by Apache Flume and stored in Hadoop storage.

Olshannikova et al. (2017) proposed a synthesized description of the concept, as well as an overview of the types of data that big social data encompasses, intending to foster potential research activities around this fascinating, but underexplored form of big data. Power and Phillips-Wren (2011) discussed how a variety of hypotheses could be useful, as well as how social media could influence decision-making and its implications.

According to preliminary research, there is numerous big data social analytics available, each with its own set of benefits and drawbacks in terms of data volumes, types of data, reliability, and security concerns. As a result, there is a strong need to conduct a study comparing and analyzing general big data analytics for social media.

## Need for Big Data in Social Media Analytics

Approaching different metrics, such as expectations, post comments, post replies, etc., allows a company to better understand the actual idea of the relationship between their client base and their content. Social analytics, which is at the heart of the rapidly evolving advanced marketing scene, allows businesses to sharpen their advertisement message while also providing better support and transparency through relevant and accessible data. In any case, research is good and gone without an adequate method to compile and quickly encounter the available data, just as it is for any other issue associated with big data. Furthermore, devices such as our own personal Locowise (a device which is used for social media analysis) exist for this purpose.

Big data on social media analytics holds a lot of significance. On the off chance that you utilize big data analytics instruments on social media, it encourages you to grasp the indispensable measurements of your image execution when you approach a lot of measurements, such as remarks on the post, responses, answers, preferences, etc. Any business can understand the communication between their client base and their substance. In this way, all socioeconomics, outlines, and charts give you essential data about your image. As socioeconomics determines what your present crowd is, commitment outlines will furnish how your crowd engages with the substance and the crowd development diagram encourages you to discover how many likes are on your social media profile each day. Eventually, every bit of it gives you the best approach to pursue moving your targets or brand message with the goal that it can more readily fit the current client base.

Social media promoting takes the most extreme profit by big data on social media because advertisers can settle on the best choices for their business. It prompts better client experience and better benefit. Not just this, social media analytics will allow you to uncover the issues related to your image. As expected, an advertiser can't break down the issues regardless of how much of a master he is. He will require the correct apparatuses or analytics to discover legitimate data.

## Social Media Analytics Tools

Marks frequently have accounts on a few organizations, with web clients usually holding 6 billion social media site logins. You can use a devoted social media site analytics system for each account or a device that encompasses all of the organizations you're involved with. We have categorized the rundown into instruments that are created on stage and those that are shaped by the public exterior of the stage. The two types of social media analytics tools are shown in Table 7.1:

- Social media analytics tools for internal use
- Social media analytics tools for external use

**Table 7.1:** Social media analytics tool-types.

Social media analytics tools for internal use	Social media analytics tools for external use
– Facebook Insights	– Brand watch Consumer Research
– Pinterest Analytics	– Brand24
– Twitter Analytics	– BuzzSumo
– Instagram Insights	– Vizia
– YouTube Analytics	– SumAll
– Google Analytics	– Cyfe
	– Quintly

## Social Media Analytics Software for Internal Use

A few social media platforms allow you to dissect your efforts from inside the actual level. While the utility of these apparatuses can be limited when evaluated to a specific analytics device, they are a good place to start because they are free and open to all.

- **Facebook insights:** The Facebook Insights stage offers social media research. Once you have more than 30 followers, all the administrators of your organization page can use this tool. It provides detailed information about your posts and the level of contribution they get. Crowd analysis, which includes section and area breakdown, will help you understand who is drawing in with you. Every one of your posts has commitment metrics, which will help you figure out what kind of content works best. It displays a paid and natural breakdown so you can understand the value of your paid promotions. There are also metrics for video views, events on your website, and the length of your posts.
- **Pinterest analytics:** Pinterest has integrated advanced analytics. It is accessible to anybody with a company account who has enrolled on their Pinterest website. This enables Pinterest to actively monitor your website and the social media outlet. Pinterest Analytics helps in tracking a variety of metrics. It splits the research into three phases: the movement of the pin, the behavior of the crowd, and the explicit pins that drive traffic to your website. The indicators involve daily average perceptions and audiences, crowd numbers, gender, dialect, the overall amount of repines, the overall number of snapshots, and a maximum number of likes.
- **Twitter analytics:** Twitter has integrated advanced analytics that is accessible to both individuals and companies. Your overall number of tweets, tweet viewpoints, position visits, letters, and supporters are all monitored. Month after month, there are indications with your most popular tweets, advertisements, and supporters. You'll see the number of impressions; this needs to be shared,

re-tweeted, and you must show appreciation of every Tweet by clicking it. If your company uses Twitter Tokens, Twitter data analysis will show you the observations for the total number of times your tokens have been considered.

- **Instagram insights:** Instagram Insights is only available to businesses and large influencers who have many followers. You can also access this directly through the program. Even though it's not so much inside and outside, it's a convenient expansion and to the point. Here you will see different metrics, such as your overall scope and profile visits, as well as the following for each post.
- **YouTube analytics:** YouTube has an in-house analytics system that allows anyone who has transferred videos to understand how they are presented. The apparatus displays data on execution, data on engagement rate, and socio-economic data. It allows you to see how people found your recordings, how much time they spent watching them when they went to your website, and who they were.
- **Google analytics:** While Google Analytics is primarily a web analytics tool, it also plays a small but important role in social media research by providing a breakdown of the social media sites that drive traffic to your site. To see the social media sites that drive the most traffic to your site, click Acquisition, then Social. You might find that a particular organization isn't worth the time and money if it doesn't move traffic, or that a well-functioning network deserves more attention.

## Social Media Analytics Tools for External Use

You will use these devices to carry out social media site research through all your data. This utility, overall, means that these are paying machines. Many people have some spare highlights or testing time. You get what you pay for, just like anything else in life, except with a paid instrument, the level of detail and adaptability can be even higher. This indicates that the level of comprehension is higher and that it extends beyond checking notes and likes.

- **Brand watch consumer research:** In this section, we might start with ourselves. Brand watch consumer research is a fantastic analytics tool that devotes a lot of time to social listening and advanced customer knowledge. When all is said and done, we take data from social stages and the internet, which means you, can unite information from a diverse basis. All is set up with enormously flexible inquiries, and you can use the system to label and unexpectedly organize specifics. You can also create data impressions with ease, ranging from basic outlines to emoticons and point mists.

- **Brand24:** An interactive dashboard that displays continuous bits of information and provides granular insights into your substance and audience. While Brand24 lacks the breadth of the larger apparatuses, it does have some noteworthy features to brag about. You build your following by specifying explicit watchwords, such as your image’s name or a topic you’re interested in. Imagine being able to observe some estimate and authority ratings, as well as the ability to sort by source and request by celebrity. You can also drill down into specific dates using the time diagrams.
- **BuzzSumo** ([www.buzzsumo.com](http://www.buzzsumo.com)): BuzzSumo is an outstanding instrument for social media site research, tracking billions of bits of content through social networks and events such as Facebook, Reddit, Twitter, Pinterest, and YouTube. It’s especially impressive when it comes to content analysis.
- **Vizia:** Vizia is a visual analytics and broadcast system that is especially beneficial for social media data. It’s set up to share any information with people in your organization; it helps keep track of your social media activity. Vizia monitors have been used in workplaces all around the globe to show actual information as well as reports to the whole business.
- **SumAll:** SumAll is an inter-social media marketing tool that creates visually appealing diagrams to help better understand your social media platforms’ connections. Despite the lack of a defined screen spotlight or anything else, it is valuable for data delivery to your mailbox for a fast review. You can keep a close eye out again for elevated indicators with daily email refreshes; it also allows you to go much further.
- **Cyfe:** You can build a simple interface with Cyfe that monitors a variety of measurements, namely social networking sites. It could also gather data on offers, link building, comments, development, and research. A free version is open, but this only allows for five phones and thirty days of information.
- **Quintly:** Quintly is a service that provides free Facebook analytics. Quintly is a dashboard device that sits on top of it. It comes with a standard interface that you can configure with accessories to meet your specific needs and track the metrics that are essential to you.

## Structured and Unstructured Data Management in Social Media

The metadata is structured and the substance is unstructured, which is tabulated in Table 7.2. In social media research, the differentiation between the two isn’t always clear. While you can gather data from the structured data, examining the unstructured data is the best way to reveal bits of knowledge.

**Table 7.2:** Structured data and unstructured data.

Structured data in social media	Unstructured data in social media
<ul style="list-style-type: none"> <li>- <b>The annotations that appear when a connection is shared through social networks are known as social structured data.</b></li> </ul>	<ul style="list-style-type: none"> <li>- Quality and interaction measurements are just a small part of unstructured data. Unstructured data forms include files, pictures, video, recordings, messages, and comments. When a person shares anything on social media, they're giving the world a peek into their lives.</li> </ul>
<ul style="list-style-type: none"> <li>- <b>Databases and search algorithms are two of the most common places where structured data is created.</b></li> </ul>	<ul style="list-style-type: none"> <li>- Email addresses, word processing documents, audio or video files, collaboration tools, and instant messages are examples of unstructured data sources.</li> </ul>

- Structured data will tell you what happened, where it happened, and when it happened, but not how or why it happened.
- Regrettably, attempts to normalize the evaluation of social media often focuses on standardized data. Quantitative metrics such as retweets, pins, and likes. The kind of information that enables you to conduct an organizational analysis of who is conversing with whom, or to (attempt to) quantify “effect” and “commitment.” This is all fascinating, and it sets the stage for any subsequent study. However, when it comes to putting together a solitary system for moving toward the test, treating structured and unstructured data as if they were the same goes a long way toward providing a solitary system for running a center gathering and preparing a report.
- It likewise sells out a computerized dualism in survey social media as a solitary element, where an expendable tweet about a moving hash tag is dealt with equivalent to an Instagram med photograph or inside and outside the conversation on a message board.
- It further neglects to separate various perspectives from various individuals utilizing various destinations.
- There won't ever be one approach to decipher a discussion. It will consistently rely altogether upon the setting of how the conversation is being sorted and to what exactly reason.
- You can't generally make the unstructured data from social media do what you need it to do, which is the reason inspecting it in confinement doesn't generally work.
- Seeking a solitary system strikes me to be as incorrect as seeking a solitary measurement to gauge impact. Furthermore, you don't view as such a large number of tenable individuals proceeding to advocate the last mentioned.



- Instead of forcing unbending norms, we should mean to clarify unmistakably and straightforwardly how we approached gathering, coordinating, and deciphering the data such that sounds good to the first target each time.
- Making wide rules, instead of a normalized structure, will likewise empower us to react more rapidly to arising sorts of social media.

## Impacts on Social Media Analytics

Social media plays an important role in connecting people and building relationships, not only with key influencers and writers in your industry, but it also provides a fantastic opportunity to set up client care by gathering knowledge, answering questions, and listening to their feedback. Social media data analysis can help organizations better comprehend the requirements and assumptions for their clients, improve the effectiveness of client care and statistical surveying on social channels, be more astute in item advancement and advertising, increment their serious knowledge, and exhibit their social media. The advantages of social media analytics are shown in Figure 7.1.

**Increased brand awareness:** It's critical to align your substance and increase your perceivability at any opportunity. Your social media accounts are essentially new platforms for the Speech as well as parts of your brand. That's also essential since that is what allows you to be more normal and unmistakable for current customers while also making you easier and more accessible for new clients. For example, a daily Twitter user may be interested in learning more about your company after seeing it in a newsfeed. Alternatively, a normally unconcerned client may become more familiar through your picture after considering your essence on numerous organizations.

**Increased brand trustworthiness:** As per a study published by Texas Tech College, brands that rely on social media platforms achieve better client loyalty. The study is ending, "Organizations must use the tools offered by social to interact with everyone's potential customers. A critical and transparent social media strategy could be successful in turning purchasers into popular brands." According to research reported by Convince Convert, 60 percent of Americans that adopt social media brands are much more faithful to all these brand names.

**Increased conversion chances:** Each comment you publish on a social media network is a chance to attract consumers. When you put out comments, you will encounter new customers, early business partners, as well as outdated customers at the same time, and you'll have the opportunity to interact with any one of these. Also, all blog posts, images, multimedia, or comments users make offer a chance for others to react, and each reaction may lead to a visit to the website and, ultimately, to a conversion. Even one in every odd interaction with your picture will result in a reaction, and every



**Figure 7.1:** Advantages of social media analytics.

sure partnership will increase the chances of a conversion. Irrespective of how low the click-through rate is, the sheer lot of chances you have on social networking sites is essential.

**Increased conversion rates:** In a couple of different ways, social media marketing increases conversion rates. The adaptation aspect, in which brands become more refined through collaboration in social media channels, is perhaps the most important. Brands may behave as individuals on social media, which is important because people choose to collaborate with others rather than with organizations. Also, studies have indicated mainstream press has a 100 percent increase follow rate than outgoing advertisements and there is a higher number of online supporters that would increase the image's confidence and credibility in general, addressing social facts. In that capacity, essentially assembling your crowd on social media will increase your current traffic's change rates.

**Increased brand authority:** Regularly connecting with your clients demonstrates good intentions toward various clients, because once individuals have some critics of an item or brand, those who rely on social media should have an option to claim. Besides, when users comment on your picture, new members of the crowd will have to follow you for updates. The more things you speak about it on social media, the most important and credible your brand appears to potential customers. Also, if you can connect with key determinants on Twitter and perhaps other social networking sites, your visibility, as well as arrival, would skyrocket.

**An increase in inbound traffic:** Lacking social media, your traffic is restricted to people familiar with one's product who are scouring for search terms that you are presently overall rating. Each social media account you create is an additional link back to your website, and each piece of content you organize on these profiles is another opportunity for a new visitor. The higher the concentrations you distribute on social networking sites, the more incoming traffic you produce, which means the most clicks and prospects.

**Lower marketing costs:** For a medium as large as social media, six hours is anything but important. Indeed, paid social media promotion on Facebook and Twitter is usually modest (contingent upon your objectives, obviously). Take baby steps but you're never going to have to be concerned regarding exceeding the budget – as your sense of what's in store improves, you can increase your spending plan and your transformations accordingly.

**Improved search engine positioning:** Website optimization is the most excellent method to get pertinent interchange from web crawlers, however, the specifications for achievement still are evolving. That is not sufficient to refresh your blog. Regularly, ensure that your title labels and Meta descriptions are optimized and that you have appropriate links leading back to your website. Since solid brands also use social media, Google and other web search tools can measure their standings utilizing presence on social media as a significant element. As a result, being active on social media could serve as a “name signal” to web crawlers, indicating whose profile is true, trustworthy, and reliable. In other words, if you'd like to evaluate for a specific set of themes, you may need to have a strong presence in social media.

**Expensive customer experiences:** The core of social media is a communication medium similar to an email or phone calls. Each customer contact you engage in on social networks is also an incentive to explicitly illustrate their level of client provider and discuss your needs with them. Conversely, if you are congratulated by a consumer, users could even appreciate the others as well as suggest multiple items. It is a one-on-one interaction that shows clients what users know regarding each other.

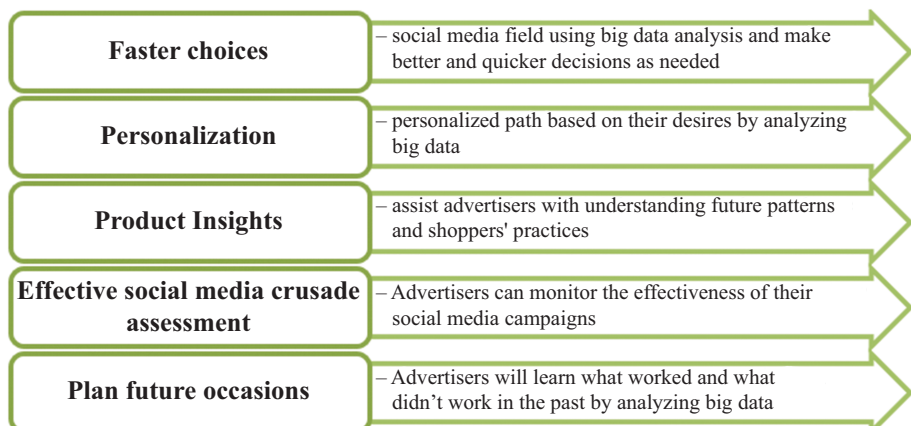
**Improved customer insights:** Social media also offers the opportunity to learn more about what your consumers have become involved in or how they have

started behaving. Users could even see which kinds of materials are most of benefit, and create more types of substances. You can cause fluctuations based on different notifications provided on various social media platforms and, at the end of the day, find the right mix to increase profits.

## How Might Big Data Help Social Media Advertisers and Entrepreneurs?

- Big data is a key for effectively overseeing social media showcase efforts. Big data considers personalization inside each mission to target new possibilities. Social media advertisers utilize the gathered data to observe clients that are really inspired by their brands. The advertisers abstain from overspending promoting financial plans on the individuals who don't coordinate with their intended interest group.
- Big data investigates an individual's social media use. What posts would they say they prefer and are sharing? What pages would they say they are following? This data creates a profile for advertisers on what items and administrations the client might be interested in.
- Big data is additionally valuable for crusade following purposes. The advertisers take a gander at past and current missions and investigate the profit from speculation for each. This permits the advertiser to calibrate a mission before dispatch and make changes once the mission goes live.
- Social media post arranging is another way advertisers bridle the force of big data. Commitment numbers allow you to see which posts the crowd is interfacing with and the posts that are dead on appearance.

The positive effects of big on social media including are shown in Figure 7.2.



**Figure 7.2:** Positive effects of big data.

- **Faster choices:** Advertisers can discern the most recent trends in the social media field using big data analysis and make better and quicker decisions as needed. Big data enables marketers to comprehend what concerns people have about a brand, as well as their preferred content and the best way to reach them.
- **Personalization:** Advertisers can travel toward their clients in a more personalized path based on the customers' desires by analyzing big data. In this case, they may create personalized ads based on what their customers like and then post them on social media.
- **Product insights:** Big data can assist advertisers with understanding future patterns and shoppers' practices, so they can create social posts that may surpass client assumptions.
- **Effective social media crusade assessment:** Advertisers can monitor the effectiveness of their social media campaigns before, during, and after they are launched using big data analyses. They will discover the slow changes in ROI this way, just as they can test crusades before distributing them.
- **Plan future occasions:** Advertisers will learn what worked and what didn't work in the past by analyzing big data and determining how to plan future projects.

## The Challenges of Working with Big Data

Today, no association can operate merely through access to information. With tremendous amounts of information, the findings need to be explained for each subsequent deal, marketing projection, client record, and partner; information is the motivation that keeps the organization going. This information gets accumulated in a tremendous information deposit that is alluded to as big data. This information should be dissected to upgrade the dynamic. However, there are a few difficulties of big data experienced by organizations as shown in Figure 7.3. These incorporate information stockpiling, absence of data science specialists, data approval, and gathering information from a variety of sources.

- 1) **Absence of appropriate comprehension of big data:** Organizations fall short in their big data initiatives due to a lack of planning. Legislators cannot understand which information gets stored, how it is stored and prepared, and where it comes from. Although data experts may have the knowledge, someone else may not have had a strong understanding of what is proceeding. For example, if legislators fail to recognize the importance of information storage, those who are doubtful to maintain the restoration of critical material are unlikely to make the best use of databases in terms of space. If this essential information is collected, it can be extracted without complexity.
- 2) **Data development issues:** One of the most challenging aspects of big data is properly storing most of these massive collections of information. The amount of information being stocked up in statistics groups and company information



**Figure 7.3:** Some of the challenges of working with big data.

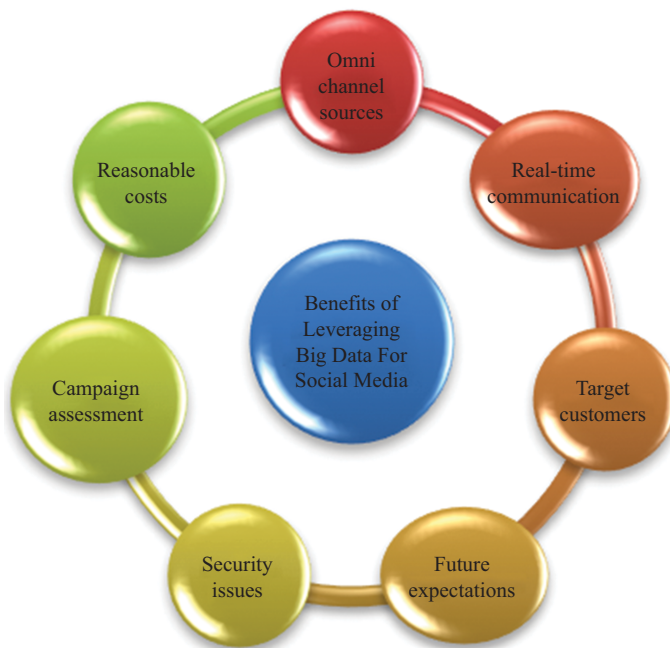
records is speedily growing. It becomes incredibly difficult to deal with these data sets as they grow exponentially over time. The bulk of the data is unstructured and comes from a variety of sources, including records, recordings, sounds, text documents, and other media. This means you won't be able to find them in databases.

- 3) **Disarray in big data apparatus choice:** Organizations are often perplexed when it comes to determining the best device for big data analysis and capability. Is Spark a better option? Organizations are troubled by these questions, and they don't always know how to respond. They end up making helpless decisions and picking the wrong innovation. As a result, money, resources, efforts, and working hours are squandered.
- 4) **Absence of data experts:** Organizations need talented data specialists to operate these innovative technologies and big data devices. These experts can consist of information analysts, data examiners, as well as data engineers who are experienced in acting with computers and deciphering large amounts of information. Organizations are dealing with a scarcity of big data experts. This is because data storage devices have advanced rapidly, but experts have not. To solve this problem, significant progress must be made.
- 5) **Getting data:** One of the most challenging aspects of big data is obtaining these massive data sets. Organizations are frequently preoccupied with comprehending, storing, and dissecting their data sets and data protection is pushed to the back burner. However, this is definitely not a wise decision, as insecure data vaults can easily become attractive targets for malicious programmers. A stolen record or a data breach will cost a company up to US\$4 million.
- 6) **Incorporating data from an assortment of supplies:** Information in a company originates from several sources of places, including social media accounts, Enterprise Resource Planning functions, client records, monetary information,

messages, introductions, and employee information. It's a challenging task to link this data to plan reports. This is an area that many businesses overlook. Data integration, on the other hand, is critical for research, detailing, and market insight, so it must be excellent.

## Benefits of Leveraging Big Data for Social Media

Social media advertising these days gets its importance more from business experiences than from simple methods for correspondence. Since being at first created for associating individuals, social media has advanced into a new substance. Furthermore, social media advertisers should consolidate significant elements of the two experts and financial specialists. This crude unstructured data carries no incentive to business structures and that is the point at which a big data technique hits the stage. The seven most normal advantages of big data analytics for social media advertising are shown in Figure 7.4.



**Figure 7.4:** Benefits of leveraging big data for social media.

- 1) **Omni channel sources:** Artificial intelligence technique permits handling data that comes from numerous channels, particularly with the actualizing of a very much spread sign in innovation and synchronization. Various business sites recommend recruits using Google or Facebook accounts, along these lines, this empowers advertisers to assemble data about clients from social media movement, program history, work area, and versatile applications, cloud stockpiles, etc.
- 2) **Real-time communication:** Clients' movement on social media, for example, promotions clicked, pages visited and followed, remarks posted, joins saved, companions added, is the main path to an effective market study. No other outlet can give a more refreshed and exact image of market interest. It changes so staggeringly quickly that the central issue is to use the circumstance sooner than contenders.
- 3) **Target customers:** Like some other business activities, social media showcasing is pointed toward expanding income; however, it is no utilization offering meat to a vegetarian. So, realizing you focused on the crowd means the world. ML arrangements reach a long way past and give the likelihood to separate significant experiences from individual data, a huge number of photographs, music inclinations, areas, and numerous other social organization exercises.
- 4) **Future expectations:** Big data systems and prescient analytics in media settle on it to get better dynamic stands on the previous history. The data-driven business will in common achieve something massively as personal computers can give approaching customer choices. Even though preferences and proclivities shift over time, they are generally associated. While a social organization client purchases something, there is an extraordinary chance of picking comparative items.
- 5) **Security issues:** With the prospering of social media and individual data being in plain view, security is everything for clients, bizarre however it may sound. Though this perspective fails to impress anyone, most of the ventures consider security issues to be of first concern. Data merchants inside and out with advertisers and entrepreneurs are obliged to give data wellbeing from holes to outsider's hands without clients' consent. Big data arrangements propose various methods of security, for instance, face and voice acknowledgment, approval, registration notices, and so on.
- 6) **Campaign assessment:** Big data analytics makes it possible to viably monitor the teeter-totter rudiments of measurements. Therefore, publicists should be able to acquire bits of knowledge on how fruitful a social media crusade was. Prescient logical apparatuses perform massively with regard to expecting what items and administrations clients need. Estimating client exercises across different social media channels, in particular, their connection and reaction to on-line advertisements can say a lot about a client's conduct and their shopping inclinations. All things considered, whether a mission will be gainful might be expressed on the ground of past clients' experience removed from social media



conduct analysis, sites' recorded data, email memberships, and different sorts of advanced communication.

- 7) **Reasonable costs:** Evaluating choices can be disappointing on occasion since loads of components should be remembered. Generally, it begins with item cost, rivalry issues, market interest, positive income, money, and expansion levels, and winds up with a by and large monetary circumstance on the planet. A vigorous big data procedure utilizing social media ought not just to incorporate paying heaps of cash to your Instagram influencers, but also speaking with your dependable clients, say, through A/B testing or online studies, to acknowledge the amount they are prepared to spend on your items. This can assist advertisers with changing costs in a more adaptable and precise manner to conform to client assumptions.

## Conclusion

The investigation on the challenges and benefits of leveraging big data for social media has been elaborately presented. This chapter also reviewed both structured and unstructured data for big data in social media, as well as their suitability by analyzing big data. The initial part of this chapter explains the need for big data in social media analysis. In addition to the above, social media analytics tools for internal use and external use has been discussed. From this chapter, it is inferred that big data has created a considerable transformation on how every industry activates, as well as a social media marketing organization. Social media approaches have been made based on the imminent establishment inside big data promotion administration. Further, big data keeps saving spending time and money because the analytics permit for enhanced ad targeting. Also, big data has left its outcome on numerous segments and is varying the method community effort from trade to healthcare, and advertising. Finally, the unstructured data is connected to the structured data by using customer details to obtain actionable perceptions through big data in social media to meet the most ambitious expectations of clients for their products.

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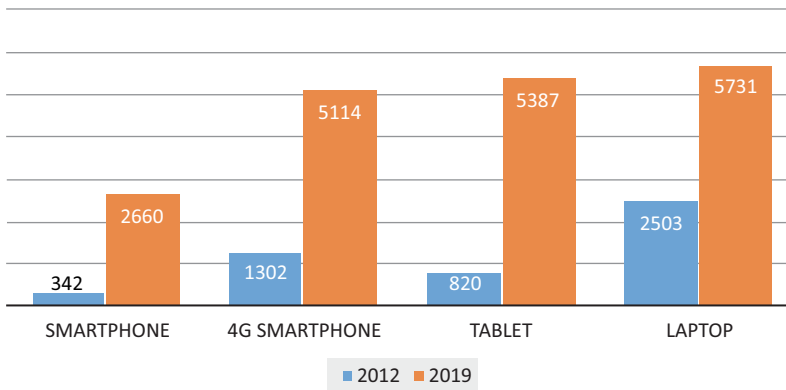
Harmanpreet Kaur

## Chapter 8

# Impacts of Big Data on Mobile Marketing (Big Data and Mobile Marketing)

## Introduction

The planet is filled with data, generated primarily by mobile devices, which can be used to create more useful services and ads for mobile users. CIBC, a Canadian bank, expects a 50-fold rise in information-generation growth over the next decade. Similarly, IDC, the industry consulting firm forecasted correctly that data volumes would increase 44 times between 2012 and 2019. Mobile plays an important part in driving this eruption (Figure 8.1).



**Figure 8.1:** Growth in average traffic per device.  
Source: I Intelligence Report 2019

Many mobile administrators are beginning to use mobile data to influence consumer retention and marketing decisions. Personalized strategies and hypertarget communications are crucial in mobile, personal, and private environments. And this can only be generated using big data. We describe big data; look at mobile access to it; evaluate its capacity, realistic uses, and falls; analyze how it is processed; and address six of the most often asked big data and smartphone questions.

Big data is usually defined as data sets that meet three attributes: “Vs.” However, “I want to remind you that there is a fourth V: meaning,” said Kipp Jones, Sky-product Hook’s vice president. To be useful, data must be collected and securely processed. Someone must then handle the results, interpret them, and derive meaning from them. Data, massive or not, does not add value if it has no value for anyone.

Mobile is suitable for a massive data lens in particular: Mobile big data is not just a function of smartphone adoption and consumer patterns. The data is often generated through background applications or other resources. Technically speaking, this is not so unlike conventional web-created results. The difference is to generate more consumers as we turn our activities into digital channels and leave a trail of information that records our actions and behaviors. And if we don't use our phones ostensibly, we still build sources of info.

These specifics can be used to improve and customize the experience of smartphones: Mobile big data may be used for a variety of purposes but is often used to optimize, customize, and sell mobile services strategies. For example, Flurry's analytics can be used by software developers to improve their applications. Retention is a key measure of success. In order to learn how they are stored and what they would have to do to improve their statistics, developers should match the consumer retention statistics for every other product and application with their own categories.

To help speed up mobile advertising and explosion in marketing: Location data is a central component of mobile big data, possibly the most important source of data that differentiates between mobile and web-based large data. The marketing and mobile advertising industry are supposed to adjust location info. The opportunity to deliver hyperlocal, custom advertising in real time represents a potentially important development in the ad industry. The social network data can also be used along with location data to carry out personalized campaigns.

## **Key Areas of Mobile Marketing with Big Data**

For business strategy and efficiency, big data is important. At a time where overpowering the amount of data allows us to make more data-driven choices and connectivity plays a crucial role in the data revolution, big data analysis is very likely to be the central process of mobile marketing. Any company knows the invincible role of mobile apps in the promotion and creation of a brand image. But to make the app discoverable, you probably need the latest data resources, big data analytics.

## **A Summary of Big Data's Position in Sales and Marketing**

What are big data analytics' major sales and marketing sectors? In accordance with the Forbes survey, 48 percent of big data cases are used for market analysis, while only 21 percent of big data cases are used in corporate analytics. The same report also shows that big data use in fraud and enforcement is 12 percent. New product

and business generation is 10 percent and the optimization of the industry data warehouse is 10 percent. According to this survey, many companies use big data for customer insights. Smartphone apps play a key role in the use of big data to promote sales and marketing.

## **Mobility and Big Data: A Connection**

The link between mobility and big data is more mutual and promotes joint production. First, to understand the length of this relationship, one requires basic principles. The invention of smartphone apps has led to the exponential growth of the volume and range of digital data and, in turn, mobile device analysis has helped to better understand customers. The same user information created from device sensors and analytics provides more practical insights into analytics and policy making. Therefore, handheld applications for the whole big data trajectory are so awesome. The essence of perpetual mobility allowed companies to gain greater insight into consumer behavior, habits of usage and user data dependent on feedback. This huge reserve of mobile user data can be used further to refine mobile user interfaces, create, and encourage mobile traffic, promote market conversion, and cultivate further effort and user engagement.

## **Get the Edge of Big Data in Real Time Analysis**

Recently, so-called management analysis has focused more on making it happen in real time. Mobile advertisers are now predisposed to their importance in real time. With the enormous volume of accurate data that analytics will track, real-time analytics offer businesses more advantages. In this respect, the promise of emerging big data technology would be critical. The Hardtop monitoring helps data get processed in real time. The corporations will now take fast decisions and adapt to shifts in immediate marketing campaigns through real-time monitoring. This real-time advantage allows an organization to respond to developments at the midst of every campaign.

## **Critical Elements of a Good Marketing Campaign based on Data**

Now that data-driven marketing has led several companies to use big-data approaches and analytics, few important items must be remembered. First, a data-driven marketing approach must be cross-disciplinary, while also improving teamwork across different divisions and team members. Secondly, focus on the right key performance indicators (KPIs) and prioritize insights between lines rather than numbers. Not all

numerical values will correctly lead you. Evaluate the customer from time to time based on evidence. Your company's customer must be assessed, and more detail must be added if possible.

## **Customized Mobile Marketing with Big Data**

Most administrators now use the words “big data” as a slogan. But unlike other hollow mottoes that make people sound intellectual, this word affects the way people do business. In reality, more facets of the market are now data-driven, including sales. After all, advanced big data entails identifying numerical development possibilities to make things more usable and competitive. Since revenues are the primary source of cash flow for businesses, investing in sophisticated analytics only helps to ensure that sales staff are at their best.

## **Coming up with the Best Price**

In a 2014 survey, McKinsey found that 30 percent of price decision-makers struggle to provide the right price for all the available data. One of the key points emphasized in the study is that B2B businesses prefer to handle data, but do not use it in decision-making. In addition, the automation of their goods and price forecasting can help them distinguish visible and unobvious variables, including product tastes, the duration of their sales period, and the larger economic situation, to demonstrate what affects pricing for each client segment. The right price will significantly boost company sales up so it is something that companies cannot take for granted.

## **Better Customer Analysis**

Aggregating data or what we all know as big data isn't new. Companies have long sought to gather more information from customers to provide more insight into their conduct and where their desires lay. It is just that the “big data” today is so much greater than before. In an earlier post I wrote about the potential effects of mobile hitting big data. With mobile data, we get more customer knowledge in real time than ever before. More systems are being digitized with the growth in cloud communications, which means more data. For example, RingCentral business telecommunications system vendors can provide businesses with insights where the bulk of their calls come from simply extracting data from the telephone numbers of

the organization. And if researchers can successfully gather mobile data as expected, it would have dramatic effects for how businesses advertise and distribute.

## **More Customized Selling and Marketing**

Eric Tobias, vice president of Predictive and Online Products at Salesforce Marketing Cloud, addressed the prospect of hyperpersonalized marketing. The concept is that marketers would be able to offer customized touchpoints not only on the internet, but also in retail stores with more data to determine how customers respond in the most exact way possible. Big data will, in the (near) future, lead into a world where publicity, email, and smartphone deals are tailored for each customer and not only one sector of the population, rather than applying macro marketing and distribution tactics for a wider public.

## **Better Overall Product**

When the product of the business is successful, it encourages the work of the sales staff. If it's fantastic, it's almost going to sell itself. But how do you go from decent to fantastic for your product or service? Simple, just listen to your clients. Feedback from clients is also data you can use. You get to know the pressure points and other areas for change by opening all available contact networks. Companies may grow their goods by understanding them. Data may lead to enhancing your product or service. Your business will present a stronger product or service with these changes. This means you will have more sales points and no pressure to justify your product or service, which is similar to more satisfied sales staff. This illustrates how big data will change the way businesses do things radically. It is just a matter of identifying and accurately using the right data.

## **Social Media and Big Data**

Businesses prosper with the best possible perception of their clients. Therefore, tracking people's online activity is vital for their progress. The company engages in the processing of big data analysis as a core component to track social media behaviors, in particular on platforms for social networking like Facebook, LinkedIn, & Twitter.

Social networking analysis was the synthesis of the behavior of internet users. The provision of statistics on online browsing, internet buying habits, user feedback, and social networks, and marketing research enables businesses to receive accurate

and detailed customer details. Therefore, companies should target their business analysis efforts on various targets, including advertisement and product launch, advertising and market strategy, consumer engagement marketing, customer tailored services, market dynamics, and rivals keeping track of risk minimization, cost reduction, and overall organizational growth.

## **Tools and Metrics**

### **Website Ranking**

Web pages may be categorized to estimate the success of any website for a given period compared to all other websites (for instance, six months or one year). Rankings are provided by tools such as [www.ranking.com](http://www.ranking.com) and [www.alex.com](http://www.alex.com). The lower the ranking, the better the website (for instance, the rank of [Google.com](http://Google.com) is 1 followed by [Facebook.com](http://Facebook.com) and [YouTube.com](http://YouTube.com)). The rankings can be used both by businesses and their competitors to assess the success of their websites in general.

### **Analytics of Online Traffic**

Online devices such as Google Analytics and [www.alex.com](http://www.alex.com) have website traffic metrics in tables and dynamic graphs that can be adapted to the needs of consumers. Some resources provide data collected in a tablet that can be used by businesses to generate their own graphs. Any of the measurements given are the total number of website visits over a certain period, the number of single visitors, the total number of visited spaces, the average number of website pages used during a visit, the average time and pace of visiting a website (i.e., visits in which a user left the website from the first page without continuing to view other pages within the site).

### **Social Media Mentoring**

On social media sites like Facebook, Twitter, LinkedIn, YouTube and blogs, organizations meet their customers every day. Organization like Yammer or a private social network that encourages team, local or industry collaboration may even connect with staff and other stakeholders (e.g., Students, clients, external advisors).



## **Engagement of Customer Via Mobile Marketing by using Big Data**

Companies have often focused on what their clients think to enhance their offerings and goods. Today, corporations don't have to wait until their clients talk to them directly. The use of broad data will let your consumers decide what they want before they know what they want, and understanding what the buyers need now is not enough. You also need to see what they are going to need in the future. Big data would allow advertisers to understand how consumers feel, who they are and whether they want to communicate with themselves. There is a problem where so much data is available that it cannot be handled. Data experts should encourage data collection, processing, and use.

### **Improved Customer Engagement**

The American Express and its loyalty partner Acxiom are an example of a company exploiting big data. This device boosted sales, improved brand awareness and fostered loyalty. Passengers are given points by using their American Express card and then can purchase flight tickets. The scheme required sophisticated technology and, while American Express initially planned to operate internally, the dynamic system had to be externalized. Pace and security are two of the most important problems in system management. Both companies use the amount of information present in the system to help understand their customers' tastes and lifestyles. The result is a dynamic loyalty program that matches.

### **Customer Records must be Maintained and Often Updated**

Customer data were quickly stalled. This means that you can't contact or customize your clients and not dedicated customers.

### **Use the Desired Contact form of a Client**

Customers should be able to use their feedback page for their preferences. You respect their wishes and just communicate in this way. It's needed. First, if American Express wishes to keep its members up to date, it will contact them by email, text message, or telephone as it pleases. If not, you can hit them through these three means, interrupt, and possibly losing your customers.

## Using Omnichannel

It is essential to your customers when they view your website, smartphone application, or print advertisements with the same brand experience. Similarly, anyone who has flights browsed on your platform must be able to pick up simultaneously using the app. If you have the information to let you know how people like to connect with your brand, you will be glad and loyal.

## Emphasize the Importance of Security

Confidence is part of the relationship between brands and their customers. All this big data must be kept private, and the customers must be assured that their information is safe when registering to handle their customer relations.

## Issues and Challenges faced during Mobile Marketing by using Big Data Customized Decisions

### Issues of Big Data in Mobile Marketing

- 1) **Issue of scalability and storage:** The data development rate is far greater than the new processing systems. Such data cannot be contained enough by storage devices (Chen et al., 2014; Li & Lu, 2014; Kaisler et al., 2013). A processing system that meets not only today's needs but also future needs must be developed.
- 2) **Timeliness of analysis:** The value of the data decreases with time. Many applications, such as telecoms, insurance, and financial crime, require transaction data to be interpreted in actual or nearly real-time (Chen et al., 2014; Li & Lu, 2014).
- 3) **Heterogeneous data representation:** Data gathered from different sources are designed heterogeneously. Unstructured data (e.g., photographs, videos, social media) are not captured or evaluated using conventional techniques like SQL.
- 4) **Missing pool of talent:** Talent is needed to increase the amount of (structured and unstructured) data generated. Demand for people with good analytical expertise in big data is growing. The analysis states the need for additional big data experts between 140,000 and 190,000 by 2018 (Brown et al., 2011).
- 5) **Privacy and security:** The connectivity and storing of information for the purpose of research was provided by modern devices and technologies such as cloud computing. This incorporation of IT architectures would improve data protection and intellectual property risks. Links to sensitive information such as purchasing habits and calling data would raise privacy issues (Kaisler et al., 2013; Benjamins, 2014). Researchers have technological facilities for accessing

data from any source, even social networking platforms, while users do not know what benefits may be obtained from information they share (Boyd & Crawford, 2012). The distinction between privacy and ease cannot be understood by big data researchers.

- 6) **Not necessarily better data:** Researchers have been drawn by social media mining. Twitter has been a common new source of knowledge. The world population is not measured by Twitter users. Big data researchers should understand the difference between large data and whole data. Pornography and spam comparisons tweets are removed, and the topical frequency is unreliable. Amount of Twitter users and Twitter profiles have several human and multiple users generated one-account redundancies.
- 7) **Out of context:** Data reduction is a common way of fitting into a mathematical model. During data abstraction, it is essential to keep the context. Focus information loses relevance and significance. The introduction of social networking sites as a “social graph” is fascinating. Big data introduces two types of social networks: “articulated networks” and “enforcement networks.” Contacts via mediation technologies are the product of articulated networks.
- 8) **Digital divide:** Big data access is one of the main restrictions. Data vendors and social media platforms have access to broad social data. Few organizations determine who and to what degree will access info. Few offer the right of view at high fees, although some researchers have a range of information sets. This leads to “internet division” in big data: rich big data and poor big data. There are three classes of people and organizations in this field of big data.
- 9) **Data errors:** The development of information technology produces vast volumes of data. Big data can be used for data storage and recovery by introducing cloud computing. Big internet data sets are vulnerable to and therefore inconsistent to errors and losses. The data source should be understood to minimize errors caused using various data sets. Before the analysis, the properties and deficiencies of the data set should be understood to avoid or explain the data representation distortion (Boyd & Crawford, 2011). Imagine, for example, reviewing social media websites from first parties and third parties, where the content of the first party accounts is examined while the other is not (Kaisler et al., 2013).

## Opportunities of Big Data in Mobile Marketing

Big data analytics are now attracting too much popularity, but there are still a lot of analysis issues to be solved:

- 1) **Photos, audio, and video storage and recovery:** Multidimensional data above and over large minimized data can be applied in computing to investigate in-memory model arrays. Multidimensional data models integrating big data calls

for changes in HiveQL query language by multidimensional extensions (Cuzzocrea et al., 2011). The creation of images, audio, and videos is unprecedented as smartphones appear. However, storing, compiling, and analyzing these unstructured data requires tremendous research in each aspect.

- 2) **Data lifecycle:** Most applications include big data analytics to run in real time. In order to make the computational process real time, the life cycle of the data, its significance, and the computation process must be defined (Chen et al., 2014). Big data is not always better, but appropriate filtering techniques should be developed to ensure data coherence (Boyd & Crawford, 2012). The availability of full and usable data is another important issue.
- 3) **High-dimensional data visualization:** At any point of data processing, visualization enables decision analysis. The complexities of visualization remain a part of data processing and online analytic processing (OLAP) science. There is space for large-scale data visualization tools.
- 4) **Algorithms for real time computing:** The pace at which the data is produced, and the optimal time delay is not achieved would not fulfill the criteria for these algorithms.
- 5) **Efficient storage equipment:** The need for digital data storage is rising. The purchase and use of available storage devices cannot meet this demand. Research in the development of suitable storage devices that will remove the need for fault-tolerant Hadoop Distributed File Systems (HDFS) can increase data processing and substitute the requirement for software layers.
- 6) **Dimensions of social perspectives:** It is important to remember, though, that any technology can provide faster efficiency, and policy makers must do it with experience. This research may have various social and cultural implications and cynically contribute to online forums. There are few concerns as to whether large search data can contribute to improved resources and services, or invasive privacy and advertisements will increase; whether it is used to track protests and limit free speech or whether data analytics can understand online behavior, communities, and political movements (Boyd & Crawford, 2012).

## Impacts of Big Data on Mobile Marketing

Millions of bytes of data that people use daily can be used by smartphone app developers to create and produce better applications. Users need prompt insights into their mobile life and times that a customer will order, settle on fuel, and deliver their brands or services in real time and context through a range of devices. However, developers need comprehensive knowledge from several sources to drive software growth by incorporating research and big data.

- 1) **Using and understanding of big data:** Big data is just larger than life itself, so it provides a complete rendering to the customer. The volume of data generated by users overtook the petabyte level; several zeta bytes of raw information or data have been clocked and this number is increasing exponentially. In the next few years, the volume of data stored globally will hit the yotta byte mark. The total amount of data collected years ago is lower than the unstructured data that were given before the data were produced. Therefore, it is only by using high-level analytics that the vast amount of these data can be minimized and translated into useful information. It's a lot to do, but it's worth it.
- 2) **Making customer-driven mobile apps:** Quick, bug-free, attractive, and critical of all, it should be easy to use and must be able to meet users' needs as much as possible. A comprehensive analysis of user engagement of big data analytics will also give enough insights into the development of broader, more open apps, and provides knowledge about what users want the applications to do. Moreover, user interface is the main source of the best possible concepts for making fresh and great applications.
- 3) **User experience analytics for big data fuels:** As previously stated, for app creation, a thorough review of user interactions is needed. Big data explains the full activity descriptions of users that can highlight vivid points when taking user experience into account in software development. The overall desires and expectations of users are then communicated by evaluating their cumulative actions in relation to the software. This will also allow the production of the latest app. Mobile app creators will learn fresh ideas for creating new applications by seeing how much the consumers like the app by the study of big data behind apps identical to the ones they make.
- 4) **New marketing age:** Business analytics and big data lead to the awareness-based mobile app design in which product marketers strive to connect email networks to mobile apps. In addition, other well-known advertisers include the Cloud Email Studio sales team, the Agility Harmony Network of Epsilon, the Powerful Selligent, and Cheetah Mail. For companies to address customers at a technological level, the ability of mobile apps to use big data analysis is critical. From business analysis to corporate intelligence and marketing, anything can be useful.
- 5) **Future app's main feature:** The mobile app market reached \$189 billion by 2020, shattering the \$100 billion quota thanks to many customers, who have almost fully converted to tablets and smartphones. Thus, the future of emerging technologies is simply the creation of better accessible smartphone applications. Mobile devices are much more volatile than computer applications. Thanks to their features and easy view, they are considered simpler to use. Users who display considerable interest in these unique characteristics are necessary. Big data processing is the most effective way to collect knowledge and to make it a big expense for companies.

## Conclusion

This chapter offered an outline of big data and explored different big data methods and approaches in mobile marketing. We have also attempted to compare various frameworks for the management of large-scale data collection, big data management tools, various libraries, and bundles. This chapter has summarized the effect of big data on mobile marketing along with different big data opportunities and threats in mobile marketing.

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## Chapter 9

# Implications of Big Data in Execution of Social CRM Techniques: Cases from Developed and Emerging Economies

## Introduction

Technology adoption and integration are creating huge volumes of data about consumers, their purchase patterns, tracking history, etc., that are leading to improved understanding of the consumers and their buying intentions. Big data of consumers thus helps in the development and dissemination of flow of information that converts into better decision-making (Ahani et al., 2017). This information needs to be systematically developed to form a coherent set of information helping the managers serving the consumers better. Thus, the use of big data has increased manifold in countries and in many sectors like automobile, fast food, e-commerce, etc. Even the most complex of data can be managed and meaningfully analyzed thereby providing improved managerial implications in many sectors.

Each organization aims at developing strong and meaningful relationships with the customer segments with the adoption of technology-led methods. In recent times, these include digital marketing and branding efforts, customer services, customized offers, personalized analysis of each consumer, etc. In this line, undertaking social CRM based on big data collected about consumers and their preferences is highly successful marketing strategy (Orenga-Roglá & Chalmeta, 2016). Social CRM is the adoption of social media platforms to connect, attract and retain the consumers through relationship building activities and tools. These further differ in various sectors and various nations that need a deeper understanding to develop the most appropriate conceptual framework in the use of big data for social CRM. The chapter has focused on understanding the importance of big data in the current technology age and on how social CRM has evolved from just simple CRM.

A comparative analysis of sectors and nations would be an important analysis of the chapter thus helping both academicians and managers further implement the same in their purview and working. Different case studies would be analyzed to discuss the common areas and concerns of how social CRM was adopted with the help of big data (Malthouse et al., 2013). It would also enhance how the understanding of big data can be used in other CRM tools and techniques. For a long time, CRM has been understood as the subsidiary wing of marketing, coming into place only after the sale had happened. As it is purely based on a developing relationship with the existing and potential customers, the flow of the chapter would be determined

through that. Real learning can be acquired with the help of understanding real life cases from the market, which are based on both developed nations and developing nations' brands taking up social CRM in an important way.

## Big Data

Big data is the management and development of a large volume of data, which may exist in both structured and unstructured form but needs to be developed into a more systematized understanding using complex tools. On a daily basis, millions of organizations and consumers are generating large volumes of data about themselves that would further aid in strategic decision-making of the future. The management of such data sets require statistical and technical tools to work on complex data and numbers for drawing meaningful implications for managers. It also involves storing, analyzing, disseminating, visualizing, transferring, queuing, and the evaluation of the data (Woodcock et al., 2011). The large volumes of data are built upon market data, consumer data and many internal tasks that can be used more meaningfully for better decision making. Big data analytics works on the predictive analytics, user analytics, behavior analysis, etc. that helps in drawing meaningful conclusion from the data leading to better managerial decisions. The big data analytics need to be built upon both in volume of data and value of the data that is developed to develop more critical decision making for various functions (Lobato et al., 2016). This analysis of data can find various trends, spot new opportunities, prevent disease and crisis, and even reduce crime. The application of big data has become pertinent and imperative in all the industries in this world including healthcare, medical practitioners, advertising, research, government agencies, fintech, geographic information systems, urban informatics, complex physics and geological studies, and even environmental research. The creation of data and usage of data has exponentially increased to such levels where this explosion would further lead to the creation of more data in the coming years.

The source of such huge volumes of data are the multiple devices and accounts that people hold such as smart phone, laptops, computing, radio-frequency identification (RFID) devices, sensory devices, cameras, storage devices, etc. As each consumer today is well connected and generates large amount of data, this management and assimilation has further become very complex (Lobato et al., 2016). The huge data that is getting created also needs to be converted into business intelligence so that the decision making can be improved further. This is achieved with the help of many technologies and data architecture platforms like OLAP, MPP, DARPA's topological tools, and many other cloud computing tools along with data base management software. The competitive advantage has been achieved by the information technology giants like SAP, Oracle, IBM, Microsoft, etc., that have developed software



and data analytics platforms to serve their clients on big data issues (Amelina et al., 2016). This has become more pertinent in developing economies where technology and mobile penetration has seen an upsurge in the last few years, along with its adoption in many government processes and tasks to reduce cost and increase productivity while adopting more innovation.

The biggest use of big data has been in marketing and advertising where the large-scale data developed by consumers and their social media accounts can be put to great use for undertaking targeted marketing methods. With social media platforms like Facebook, Instagram, LinkedIn, and Twitter generating huge amounts of data about the consumers, making meaningful analysis about consumers from these platforms has become an important aspect for organizations. Beginning from marketing, releasing of ad campaigns, developing customer engagement, promoting certain offers, and long-term relationship building, marketers are utilizing the data created on these platforms to the best possible use (Chen et al., 2016). Gradually, these platforms have been utilized for CRM as the old traditional methods of connecting with the customers have become obsolete. As consumers are spending more time on the social media platforms, it makes more sense to attract and connect with them there. With the help of the big data and analytics tools, detailed information and understanding about consumers can be obtained that helps in developing more targeted marketing communication. Social media and CRM have been deeply integrated over the last many years leading to more meaningful use of consumer data. Researchers, marketers, advertisers, brand owners, brand users, and social media bodies also have accepted the application of big data in developing the marketing campaigns and CRM strategies for the consumers (Anshari et al., 2019).

## Social CRM

Social CRM is the adoption of social media platforms, services, tools, techniques, and technology to enable organizations for engaging consumers more meaningfully while aiming to develop long-term relationships. The adoption of the same is not only witnessed in CRM but also in marketing, services, customer services, sales, and branding. This is undertaken through social media engagement with current and new customers by engaging with them and allowing them to share their likes, preferences, sentiments about the products or the brands. It also builds upon developing stronger social media customer service by aiding customers to get the customer services through social media channels (Phillips-Wren & Hoskisson, 2015). The channels are not only used for outbound marketing communications but also for inbound customer services issues that are resolved with the help of technology tools thereby building brand advocacy. Social media also promotes personalized marketing strategies and communication that leads to the creation of custom content that is increasingly dependent on access to

reliable, qualitative social user data to facilitate precise audience segmentation. Furthermore, dynamic audience segments, built on both social data and demographic data, allow for a more accurate measurement of campaign KPIs (Ennaji et al., 2015).

CRM as such has changed over time where earlier it used to be more traditional and based on collecting and managing data about the consumers, past purchase information, contact details and history, customer demographics, communication details, etc. Based on this, certain communication used to be done with the consumers and offers used to be promoted for building long-term loyalty. But as the world became more digital and social media driven, a deeper layer of social CRM has been created where the consumer data analytics driven CRM is undertaken through the social media platforms (Harrigan et al., 2020). This layer is comprised of other social networks that provide much needed deeper data about consumer activities on Facebook, Instagram, Twitter, Linked In, etc. As consumers share information publicly on such platforms, these can be used to build future communication and relationship building activities with them. Companies operate in multichannel environments in the current era and they have to develop multiple ways of communicating with the customers which are meaningful and relevant for them. Social CRM enables companies to track a customer's social influence and source data from conversations occurring outside of formal, direct communication (Harrigan & Miles, 2014). Social CRM also allows companies to keep a full audit history of all customer interactions, regardless of the social channel they choose to use, available to all customer care employees.

Critical social CRM metrics need to be understood if the right decision about consumers needs to be taken. The key metrics for building awareness among the consumers involve web traffic, search volume trends, followers, social mentions, etc. that can help in building the right level of consumer awareness (Harrigan et al., 2015). Similarly, the metrics that can be adopted for increasing sales are related to website traffic, social mentions that are positive, volume and kind of followers, repeat visits, social content acceptance rate of consumers, etc. For measuring and assessing the changes in the environment in an industry so that it can be put into right use, the share of voice or how much overall voice a single brand consumes, is based on its presence on all the platforms. With the help of such evaluation and usage of consumer data, many other social CRM activities can be taken further in customer experience management, sentiment analysis, social analytics, social selling, text and data mining, etc. Even social CRM is not static and is evolving along with the transformation of these platforms based on the consumer engagement of these platforms.

## Big Data in Social CRM

Integrating big data analytics into social CRM has given a new face and meaning to how CRM is undertaken with consumers today. It needs to be understood that it may not be a disruptive way of doing CRM but provides a new and improved dimension to adopting more social media driven CRM strategies where the data about consumers, their usage, their demographics, user analytics, interaction with the brands can be put to better use while maintaining the long-term relationship with them. This collection of data about consumers provides a better way to monitor, track and benchmark the consumer behavior online on social communities while developing a better understanding about tools, metrics, and dashboards (Woodcock et al., 2011). With the explosion of huge amount of consumer data on the internet based on the social media activities they do; big data analytics is providing guided direction to build more specific messages that lead to the right results. The use of this data for understanding consumers better uses the predictive analytics modeling for gaining a much deeper understanding of how consumers would behave and react. Big data helps in making more accurate and informed decision-making about the consumers and how they interact online (Ibrahim & Adetya, 2017).

Big data technology analytics is used by organizations for many purposes in social CRM. Most of them include core customer services and developing stronger, more engaging relationships. Some key uses include:

- 1) *Commercial recommendation*, which relates to suggesting the product or service with greater probability of success for each customer
- 2) *Competitive intelligence*, which builds upon showing real-time automated information customized to the situation created by the customer, thereby allowing the company to maintain a contextualized dialogue and to obtain real-time information needed to make suitable decisions (Daif et al., 2015)
- 3) *Debt recovery for customers* from public information sources and aiding them in subscribing and renewing
- 4) *Automated categorization and routing of customer interactions* over any channel along with shifting between various platforms
- 5) *Predictive models* of trends (purchase, abandonment, nonpayment, etc.) and clustering of customers that helps community building
- 6) *360° customer view*, showing the relevant customer information provided through any channel and format.

The above tools are utilized in collaboration with each other for providing the right amount of leverage to the marketers for building up the strong social CRM network (Chan, 2014). Consumers in the online space may be entirely heterogeneous and poles apart yet must be approached with similar kinds of marketing and communication efforts. The role of web technologies in collating the different aspects of consumers thus becomes very important. Therefore, big data and Web 2.0 technologies

have undertaken a complete change in developing social CRM objectives and also in achieving the connection with the “social customers” who are difficult to approach but have bigger business opportunities. It has also helped in building the superior competitive advantage of brands in the market.

Big data application is not only providing more accuracy in approaching the right target audience but also developing more personalized and customized messages and offers to help consumers in easy converting (Sigala, 2016). The technology-based tools develop the right service offer and customer service through more targeted consumer profiling which is a hybrid mix of demographic and psychographic features. A big data enabled CRM strategy is more based on the benefits that can accrue due to the integrated nature of multiple outcomes. As the profiling of the consumer is done more accurately and precisely with the help of data analytics, predicting trends in future customer reactions to marketing and product messages can be made more effective. Many other usages of the big data have been adopted through customer value chain management, in producing accurate assessment measures, campaign-based strategies, digital marketing effectiveness, etc. The tools can be used by the data (Greenberg, 2010).

## Cases and Implications

Big data has been the epic solution to many organizations adopting social CRM for their brands over the social media platforms. The data is generated from multiple sources such as social media platforms, server logs, web click streams, mobile apps, database stores, business records, etc. Interestingly, limitless data can be generated using real-time sensors embedded in devices that can be connected to the internet through a technology that is known as “Internet of Things.” Many global organizations are utilizing the technology platforms of big data for understanding the consumer psychology better on the social media platforms thereby undertaking more effective social CRM campaigns. This has been impacted by many IT companies building such software and data analytics tools that help brands undertake social CRM. A discussion on the brand usage of big data and how these comparisons can be done would provide meaningful data for the study. Most of the organizations are working on the 5 V model, which is volume, velocity, variety, value, and veracity (Guha et al., 2018). Big data has generated endless opportunities for the brands for better integrating the customer data into software management systems.

1) **Netflix:** being the leader in the OTT industry and having disrupted the movie viewing experience, the company has been a big user of big data of consumers and how to reach out to them on the social media platforms to connect. As Netflix has now entered many emerging economies like India, CRM methods have been

adopted to undertake market analysis. This has been based on the huge data of the Indian consumers and what content they create on their online platforms. That has helped the company streamline consumer psychology and the preferences of the consumers toward the kind of content that is desired. The market analysis data has helped in undertaking predictive modeling for targeting the Indian consumer better (Delanoy & Kasztelnik, 2020). The ever-changing mindset of the consumers is clearly visible through the online activity and presence of the consumers. It provides huge data and understanding of how the consumers would behave and react to CRM campaigns to determine their effectiveness. The past and present behavior of the consumers on Facebook, Instagram, and even Twitter helps in developing a deeper understanding in modeling their future behavior. This has helped Netflix develop superior customer experience both before and after usage of Netflix. Better handling has led to a higher level of retention of the consumers that belong to the right target audience for the entertainment provider (Zerbino et al., 2018). Conjoining historic interactions with provable statistics crosswise over the two platforms will be able to provide real-time centralized perspective of clients. This is collaborated with CRM innovation that is largely dependent on a hidden social or enterprise information catalogue that increases the accuracy of customer understanding while reducing the shortcomings. The automation of offers being floated and conversion clicks has brought about another wave of success for the platform. CRM will be able to pick up many requests more meritoriously and will not require any substantial human oversight. This consumer understanding has helped the platform in gaining immense knowledge about Indian consumers for Netflix and in transforming their content and method of communication (Chen et al., 2016).

2) **Amazon:** The true value of big data has been utilized by Amazon, which is the biggest e-commerce platform catering to the multiple needs of the world. From a humble beginning of being an online book seller, the platform has come to include almost anything on earth. Millions of consumers shop on Amazon thus creating huge volumes of data about themselves and their purchasing patterns. At all the touch points of the consumer, while browsing, searching, reading, or seeing the product, adding to cart, not buying, checking out and purchasing, CRM methods are adopted for overall improved customer experience (Chen et al., 2017). Using the big data technologies and customer information, the company has been developing customized solutions for the consumers for many years that they also promote on the social media platforms. The data about the consumers not only help in CRM but also in customer servicing while transactions are being done. But only big data technologies would not help the companies in developing strong systems, the integration of technology with strategy would have to be adopted that was done by Amazon. Amazon has adopted a very professional and systematic approach to building up of big data acting upon social CRM. This begins with knowing the consumers, managing their data and choices, interacting with customers on various platforms

with the help of technologies, and analyzing the customer choices through the clicks, bounce rate, etc., that helps in real time information. In a more systematized approach, the platform has been able to improve the conversion rate of global consumers who now visit the platform for all their needs motivated by the social CRM clicks (Kunz et al., 2017). Amazon has been responsible for taking the CRM and more so social CRM to the next level of consumer analytics there by building a more collaborative knowledge set about consumers. With the help of big data analytics, the company undertakes pattern analysis of consumer buying history in a more structured manner thus leading to more appropriate answers to what they consider right for the consumer's future behavior. The company also uses it for sentiment analysis by looking at consumer responses to social media campaigns that bring the consumers to the level of purchase and loyalty. This also helps in optimizing the marketing decisions and messages that are sent to consumers on a regular basis for conversion to take place thus converting into long-term CRM base (Cheng & Shiu, 2019). The social CRM has also been effective and meaningful for recommendation analysis of consumers that would convert into higher level of sales in the future. When consumers post their satisfied experiences on the social media platforms, it not only helps in recommending their own choice of products but also communicates in their social media connections and communities. This further builds the basis for both the consumer specific CRM but extending the CRM to other new and existing consumers (Chang, 2018). The social CRM platform has further been used by Amazon for influence analysis also where the current satisfied consumers are being built into the bigger system of big data for better future decision-making about marketing to them.

3) **Taco Bell:** One of the most preferred fast-food joints in the world undertakes CRM on the social media in a very engaging manner. Being the world's best taco maker, creating relationships with customers while incorporating fun into it has been the core strategy of the retail brand (Amado et al., 2018). The company undertakes many kinds of witty and fun posts on their social media to generate interest and likeability among consumers. They also invite and solicit complaints and problems of consumers to openly provide solutions to them on the public forums. This helps the brand build a much higher level of engagement and commitment while developing long-term consumers. Consumers find it rewarding to connect with the company on the open platforms that provides all the options of shoutouts for both positives and negatives linked to the brand. The company has built upon active social listening on social media in order to provide meaningful conversations to consumers (Tiruwa & Yadav, 2015). Sometimes, the pace of social CRM is too quick for the company to manage as many kinds of communications by the customers may get viral leading to a negative impact on the brand's image. But to solve this, the social media managers at Taco Bell undertake meaningful work for managing positive outcomes for the consumers. The brand has had an open line of communication

with the customers on both negative and positive remarks thereby building in more credibility with both mistakes and good experiences. Being in the public domain of the consumers, the brand has extensively used Twitter, Facebook, and Instagram for the promotion at various ends while dealing with the problems with equal ease (Amelina et al, 2016). Even when the problems of the consumers are solved, the satisfied responses are also promoted on the social media to prove their undying loyalty toward customers and their long-term relationship. This has helped the company gain quite a lot of credibility in the social spheres, which is very important in the current times.

3) **Zomato:** Being India's largest food delivery service is no joke; catering to such a large number of consumers and their complaints. The food delivery aggregator uses the social media platforms aggressively to promote the offers and schemes thereby enticing the consumers to act on it while aiming to build higher levels of engagement. The company completely understands that as they serve millions of orders per day, issues pertaining to food and deliveries may arise even after the best of efforts are made by the platform with the use of big data. The company has devoted a complete platform for solving the complaints as Zomato @ care and have it an important part of the CRM strategy. With the help of regular updates on their Twitter and Instagram accounts, the company actively engages the Indian consumer who seeks to order from Zomato; the adoption of such methods of food ordering along with the reliability of the quality of food being delivered is a new service for the customers (Ghazaleh & Zabadi, 2020). Many irritated consumers have complained regularly on the platform for social CRM that has always been taken up by the company in a meaningful manner. As the social platforms are public forums, developing the solutions there provides widespread trust or mistrust about the brand. As quoting communication and reviews has become very easy for consumers today, developing social media CRM strategy can help the brand survive many crises by solving them online so that every consumer can observe and develop an image about the brand. It also builds a higher level of trust and credibility in the eyes of the consumers that the company is eager to solve the problems of the consumers (Perera et al., 2018). Social media has become an important tool for communicating with the large-scale audience for companies who may be seeking to develop long-term relationships with the consumers.

4) **Adoption of AI and big data cases:** Each company builds upon its own requirements of adopting AI into the working of the business process. Many of the businesses use live assistance on their platforms for better social media engagement like the Aberdeen group that has posted an 83 percent enhancement in revenues due to the live assistance provided by the company for the consumers. This helps in a big part of the customer journey as consumers face live problems while dealing with the brand on the social media platform. Without visiting the branch, the bank can provide all the services through the online assistance that develops into a much higher

level of social engagement (Chierici et al., 2019). The video chat and co-browsing options provided to consumers help in more personalized services and a seamless experience. Such kind of omnichannel presence helps for better bonding between the consumer and company. The collaboration of both online and offline platforms develops strongly into an integration of text and services. Oasis, a leading woman's clothing brand provides much better customer experience to the customers while browsing and placing the order online. The social media platforms have developed customer touch points to create a seamless customer journey for the process to be smooth and relevant (Hallikainen et al, 2020). This is collaborated with Instagram content and Facebook posting. Knowing the customer preferred channels is thus critical for creating a much more conclusive long-term relationship. Availability of the chat bots on the social platforms help in better connectivity leading to enhanced customer experience. Many of the platforms are being utilized by brands to send messages, thank you mails for the purchases made by them, asking for reviews as they provide authenticity, cross-sell and up-sell the products, customer loyalty programs and offers, and also requesting referrals while building a much deeper social connection (Goldenberg, 2015). Sephora, the beauty brand is highly appreciated for its loyalty program covering around 17 million consumers. These accounts for almost 80 percent of sales of the company as a majority of the consumers build upon the loyalty programs that are given to them through the social media coverage. The traditional point system works but with the collaboration of the social media platforms to make it livelier and more connected. These brands, as researched by Gartner are also delivering superior customer service through the social media CRM methods (Askool & Nakata, 2011). Popular social channels like Instagram, Facebook, LinkedIn, and Twitter are not just for business promotion. They can be used to connect with your customers. Almost 78 percent of customers want brands to help people connect through social media. Framing good customer relationships on social media helps businesses to improve relationships with customers by making them feel connected to your brand. Nike undertakes engagement with customers even when they fix their issues through active engagement on the platforms where the consumers are not able to solve the problems themselves (Hofacker et al., 2016). Similar efforts are made by Airbnb through the referral program which brings in around 25 percent of their sales and revenue by connecting people through the social media platforms. The stories and journeys of consumers are posted on their social media handles leading to a much higher level of customer reach and segment building. Many older brands like Colgate have also learned the art of responding to the customers by rekindling the relationship through reminding them of their relationship with Colgate and advertising that they are using the best product for dental care (Faase et al., 2011). This re-emphasizing of the core benefits and value proposition of the brand with the consumers provides an opportunity to them to interact and communicate.



Many of the top brands of the world like Apple, Coca-Cola, Tesco, LinkedIn, Spotify, and many others continuously develop means and ways of regular interaction with their consumers to build the connect and focus on long-term sustainability. Upon comparison of the brands and how they operate in developed and developing nations, it has been observed that in developed nations, the social media engagement is based more on reconnecting and also developing referral marketing programs. While in the developing nations, the brands must still focus on problem solving, customer services, and complaints resolution that in the long run develop into referrals and loyal consumer base (Syed et al., 2013).

## Conclusion and Future Areas of Research

The understanding of use of big data in CRM and now social CRM has been growing with new opportunities becoming important with the development of many new technologies. Big data technologies like Hadoop, SQL, etc., have played an important role in the development of data that is helping the companies in building much more meaningful CRM concerns. In the chapter, it has been understood in detail as to what the concept of big data is in the current scenario and how huge amounts of structured and unstructured information about consumers can be helpful in developing better socially engaged campaigns (Kong & Song, 2013). Big data has been used for many key marketing and strategy decisions for companies and brands and now also has usage in CRM strategies. Earlier CRM was based on traditional methods of building relationships but with the advent of social media platforms, its use for building social CRM methods has further increased. Social CRM is deeply based on adopting the relationship building approach with consumers through social media platforms and their engagement through the same.

Global organizations having a presence in many nations have now adopted big data about consumers and their buying patterns to approach them in the right manner on social media platforms. As consumers are spending more time online and other social media platforms, attracting and retaining them on these platforms have become very critical for the future profitability of the company (Jimenez-Marquez et al., 2019). Big data about the consumers helps in pattern understanding, influence marketing, recommendations to be made, purchase sentiment analysis, referral analysis, etc. Social CRM theory building and application for brands has led to much deeper consumer understanding that is helping the marketers in building higher levels of social engagement. Each brand, both in the developed and developing market, is innovating their own ways of developing the CRM strategies while aiming to enhance the overall social brand for the company. These platforms are being used for both marketing and solving consumer problems so that a credible social image can be created.

While considering the future course of action and research need in the adoption of big data in Social CRM, many areas of future research can be identified. Firstly, as social media is ever evolving, new big data technologies may need to be developed for particularly enhancing the social CRM. This puts the onus on IT and software companies that should understand the requirements of the brands for developing such platforms that can serve multiple objectives. The second area of research would be developing certain theoretical models and conceptual frameworks particularly pertaining to social CRM as this is still in the infancy stages of being developed as an academic field. Many models do exist for CRM and its study that can be adopted by academicians and researchers but work still needs to be done on social CRM as it is a new area of development. With the exponential rise of social media, it would be meaningful to develop how each of them can be used for the same.

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## Chapter 10

# Leveraging Big Data for Digital Marketing

### Introduction

This chapter examines how capacities with respect to using large information and big data can help make important associations with clients. In the era of modern transformation (Industry 4.0) big data significantly affects business, since the unrest of organizations, stages, individuals, and digital technology, have changed organizations' development and intensity. Big data analytics prompts important information and advancement of innovative movement of endeavors and associations, changing economics at the public and worldwide level.

Big data helps and shapes the decisions on pricing, especially in the business-to-business (B2B) area, as each deal is different from the next. It examines various part of pricing strategy; consider what items a specific client has bought in a specific period? What is their disposable income? How much will they pay for an item? The manager can consider the GDP development rate, inflation rate, exchange rate, interest rate, etc. Then the manager can incorporate all these insights to make better pricing choices. Big data helps to design a website—what visitors are interested in based on the browsing history. So, the website will rely on who is looking at it. Companies can compete with digital marketing in today's market. Accordingly, big data has acquired extensive significance as a powerful device for digital advertisers. It empowers organizations to be super-focused on communications with the purchasers they are looking for, in view of web client profiles and interests. Big data offers organizations limitless prospects to improve their advertising productivity. This methodology offers 250 percent more prominent proficiency than current practices and using big data for digital marketing is a good thought. The digital marketers can make the most powerful moves by turning data into a story. The company can gain an advantage over competitors by enhancing a pricing strategy, using forecasting, adjusting customer segmentation, and optimizing marketing campaigns in real time. The accessibility of big data opens doors to improve digital marketing through an expanded comprehension of client inclinations and conduct to customize communication and to improve the closeness of associations. The accessibility of big data makes it necessary for the organization to create interior abilities to ensure its upper hand (Eisenhardt & Martin, 2000; Winter 2003). Along these lines we ask the accompanying research issue: How should associations create digital marketing capacities to use big data for important associations with their clients? Today the enormous amount of data through the Internet of Things has added to the ascent of an "information driven period" where big data analytics are utilized in

an energy area (agribusiness, wellbeing, etc.) and throughout the economy. In that context, the bulk of companies are assembling, putting away, and analyzing data for key business choices prompting significant information.

Big data is a trendy expression in business and financial fields, since it assumes a fundamental part in monetary movement and has fortified its roke in making economic value by empowering better approaches to spur innovation and profitability development. Enterprises plan to use data produced in organizations through their tasks to acquire important customer experiences to help them make better, quicker decisions and that's just the beginning of the story of how big data can help promote definite choices in urgent business matters.

The significance of big data is demonstrating the various ways that can be utilized, from supply chains to customer loyalty, to the advantage of companies.

## Digital Marketing Objectives

Digital marketing objectives focus on customer acquisition, engagement, and retention. In 2006 two consultants working in Finland, Xavier Blanc and Leevi Kokko, fostered a model to use with clients which they named Reach, Engage, Active, and Nurture, abbreviated to REAN (Jackson, 2009). It states that all businesses need to arrive at possible client's commitment; engagement begins a discussion; activation organizes the sale; and nurturing looks after the customer, encouraging them to return.

It improves the capacity to separate online a specific crowd from the traditional section, comprehend their requirements and how they approach purchasing a similar brand on the web. It assists with understanding audience segments which includes an investigation to follow and comprehend purchaser segments as a piece of customer research. When the brand elements have been created, brand informing and promoting strategies become essential to get online clients to try the item and get hooked to buying it on the web. Depending on business targets and how firmly the brand is as of now situated in the minds of the intended online clients, the advertisers can go all out for a huge explosion of communication technique to launch or create a specific multiple burst methodology on powerful channels that the audience visits consistently.

The stronger and clearer the objectives, the easier it is to build a digital marketing plan (Figure 10.1).



**Figure 10.1:** Process of leveraging big data.

## Importance of Big Data

Big data helps you learn as much as you can to acquire a competitive advantage, and before every other person gets on the bandwagon. Information and data are advantageous and one can expect them to have a significant role in distinguishing winners from losers in our super aggressive worldwide economy. Also, indeed, there will be definite sales and obstacles to clear. From a business point of view, we'll need to figure out how to:

- Use big data analytics to increase an incentive for our endeavor that lines up with our core competencies and gives the company an upper hand.
- Capitalize on new innovation capacities and influence our current innovation resources.
- Enable the proper progressive modification to move toward truth-based conclusions, select up-to-date innovations, and join individuals from various groups into a solitary versatile group.
- Deliver quicker and predominant outcomes by embracing and exploiting on the ever- growing pace of progress, which is happening in the worldwide market area.

Big data analytics will at the same time limit operational expenses while driving top line wages to net considerable overall revenues for the venture into new deals (Table 10.1).

Big data broadens the extent of existing scientific capacities with an assortment of extra information sources that may lie with company limits. The idea of big data impacts the skill to decide about information and subsequently introduce modifications, “to the overall practices of data collection, generation, and use.” Hence, big data abilities allude to the exercise to store, supervise, and separate this huge size of coordinated and irregular data that are persistently produced (Chen et al., 2012).

**Table 10.1:** Big data Business Models.

<b>Improve Operational Planning</b>	<b>Increase Income</b>	<b>Achieve Competitive Differentiation</b>
Lessen dangers	Set to micro-trends	Offer new administrations
Save time	Empower self-service	Seize market size
Lower difficulty	Increase client adventure	Incubate new ventures
Empower self-service	Detect misrepresentation	

Source: Brett Sheppard “Putting Big Data to Work: Opportunities for Enterprise” Gigaom pro, March 2011.

Through the use of big data and change comparisons of the company, we would anticipate an expansion in digital marketing performance. Consequently, we anticipate that big data straightforwardly and emphatically impacts data about clients, which thus decidedly impacts the organization’s closeness with its clients by applying this data and eventually impacts advertising execution through making value, respectively.

## Big Data Analytics Application

There are various logical instruments that can be used to perform BDA and statistical examination. These methodologies and devices are effective and quick in preventing misuse of big data. Enterprises that figure out how to exploit big data using real-time information that we get from different sources like sensors, associated gadgets, and so on, can comprehend their current circumstance and assign new patterns, make fresh and creative items/administrations, react rapidly to changes, and enhance their advertising activities. The influence of big data can add to effective resource distribution and management, waste reduction, assistance for new experiences and a more significant degree of straightforwardness in various areas of enterprises from creation to deals. Subsequently these applications are present in almost every business territory.

Subsequently, it may be used very well in all areas like receiving an order and delivering the items and applications of marketing, while it assists ventures to examine client conduct in a 360° client picture for execution of improved advertising activity to affect client procurement and fulfillment. It gives new appreciation of client conduct and inclinations and accordingly improves customer administration.

Google, Amazon, Apple, and Facebook are advanced and data-driven enterprises. Amazon was conceived as a computerized platform; it utilized enormous amounts of information, and succeeded in upsetting the traditional book market



and thus transformed into the pioneer in advanced shopping. Another framework of an eminently conceived computerized firm is Google that tackled information step by step to give and modify search capabilities for its clients while also collecting information that helps to create possibilities for altered promotional strategies.

## Conclusion

This chapter explored the application of big data by listing those limits that are pertinent to use big data to enhance the execution of digital marketing. We tracked down numerous ventures, from beginners to large companies, endeavoring to acquire an information-driven culture battling for an upper hand against opponents.

The utilization of big data needs individuals with capacities and fitness who will be ready to interpret data insights giving critical information to administrators and leaders.

Big data isn't just about information volume, it's also about variety and velocity. Big data analytics can help organizations understand their environmental factors, their clients' conduct, and their rivals' exercises. It assumes a significant role in digital marketing. The enterprise can form their products and activities to satisfy clients' requirements and enhance against rivals through better expectations and more intelligent choices on the premise of proof rather than instinct. As more organizations get familiar with the fundamental abilities of utilizing big data and how to attract clients with the current advancements in the field, they will stand out from their opponents and enjoy an unequivocal competitive advantage.

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Ram Krishan

## Chapter 11

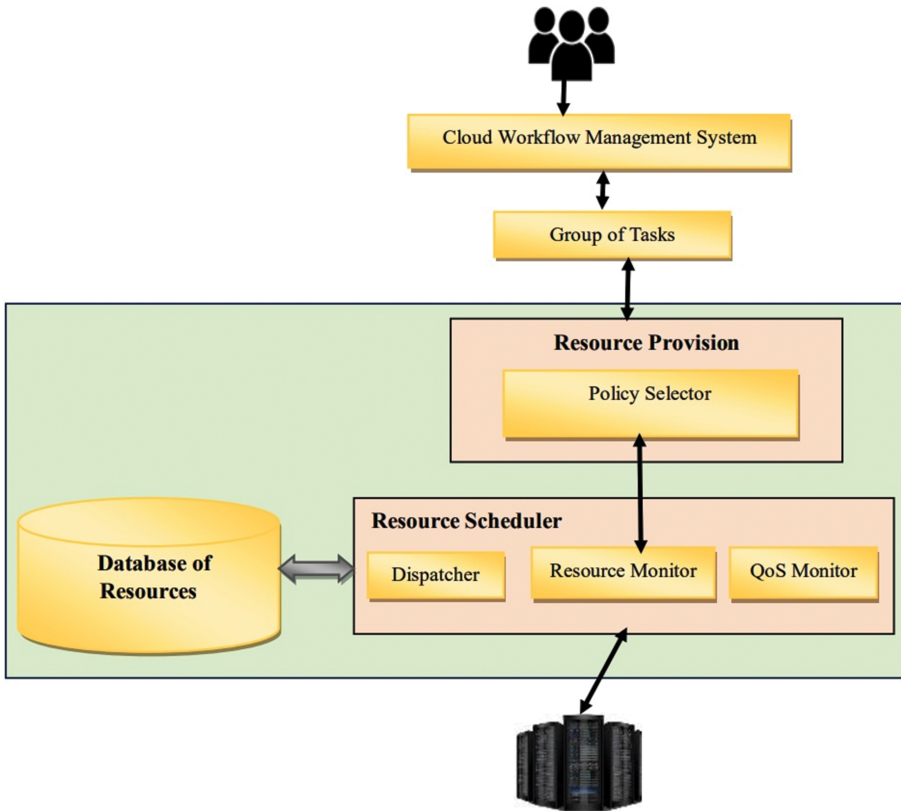
# Performance Analysis of Algorithms Used for Workflow Scheduling in Cloud Environment

## Introduction

Cloud computing is a very common technology, which has a lot of work opportunities in diverse fields such as resource management, job scheduling, protection, and privacy, etc. Scheduling is among the major problems that can boost the presentation of all cloud-based resources (Kim et al., 2016). Task allocation is often used in cloud infrastructure to delegate the work for implementation. There are various forms of algorithms available to coordinate such activities. Many problems such as time required for implementation, implementation cost, and complexity etc., have been addressed in task scheduling.

## Task Scheduling in Cloud

This process involves two of the following stages: The first is resource provisioning and another is the process of task scheduling (Arunarani et al., 2019). Task scheduling is mainly defined for the identification of suitable resources for a task based on quality of service (QoS) (Kaur et al., 2019) needs usually demanded by the consumers of the cloud. The process of resource scheduling represents the execution and mapping of cloud customer workloads based on chosen resources with the help of resource-based provisioning. Here, firstly, the cloud customer submits the request for the execution of a workload/task with task details. Based on task details, the broker observes and finds the appropriate resource(s) for a known task as well as further establishes the reliability of resource provisioning that depends on QoS needs. The broker forwards the requests to the scheduler of resources to schedule after outstanding resource provisioning. Other types of broker responsibilities include additional resources to the resource pool, which includes the information of provisioned (protected) resources as well as monitoring performance to remove or add a distinct type of resource. After the procedure of resource provisioning, the arrangement of resources is completed in the 2nd stage. In such a stage, the agents of scheduling perform mapping of the provisioned resources to the known (given) tasks, perform task execution and further release the resources in turn to the pool of resources after successful task completion process. Based on the requirement of QoS, resources scheduling for adequate tasks represents a challenging problem (Kaur et al., 2019). Figure 11.1 shows the basic architecture of scheduling in cloud computing.



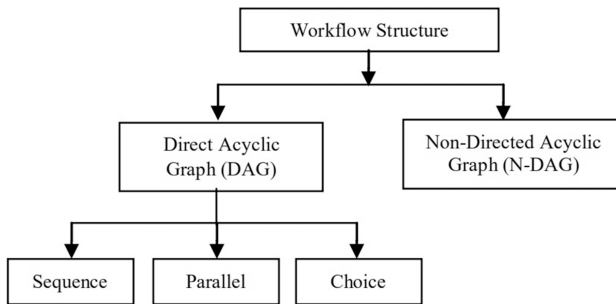
**Figure 11.1:** Scheduling architecture in cloud computing.

For efficient and effective task scheduling, it is very significant to consider the requirements of QoS. An effective form of algorithms based on task scheduling helps to reduce the cost of implementation, time of execution, consumption of energy and considering other requirements of QoS such as security, availability, scalability, and reliability. The consumer of the cloud and the service provider of the cloud represent the two major entities. The consumer submits the tasks while the service provider gives various resources for task execution. Both entities have distinct needs – the provider wants to make a large profit with the lowest investment and have maximized resources-based utilization, while the consumer of the cloud thinks of performing their task execution process with minimum time and cost. The resources of the cloud may create task interference that can show the way to the unfortunate response of the performance and reduce the satisfaction of customers. To maintain the QoS, providers of the cloud must perform the task rejection that results in an unexpected environment. Task scheduling to suitable resources becomes more challenging as both the providers and the user do not willingly share

the information. The scheduling challenges in cloud environment involve the resource security as well as distribution of resources, which are not determined with conventional algorithms. So, there is a need to execute the tasks efficiently for captivating cloud computing property.

## Workflow Scheduling

Workflow scheduling (Devi et al., 2018) in cloud computing, aims at the execution of workflows by considering their requirements of the constraints. In workflow scheduling, a task is further segregated into subtasks. Resources are distributed to a subtask in such a way that predefined standards are met. The applications of the workflow are executed in steps. A task in the workflow structure follows the sequence of task execution depicted in Figure 11.2. In sequence structure, a new task is executed only after the end of the past task. Simultaneous task execution is performed in a parallel structure. In a choice-based structure, execution of a task is performed in a series.



**Figure 11.2:** Workflow structure classification.

A workflow is a Directed Acyclic Graph (DAG) such as  $G(V, E)$  where  $V$  is the task's quantity and  $E$  is the order among the tasks. In a Directed Acyclic Graph (DAG), there are two types of tasks: the first is named entry task and the second is the exit task. An entry task is also known as a root task and the task that has no further task is called an exit task. Figure 11.3 depicts A as the entry task and it will execute prior to other tasks such as B, C, and D. Task E will be executed in the end after the completion of all other tasks.

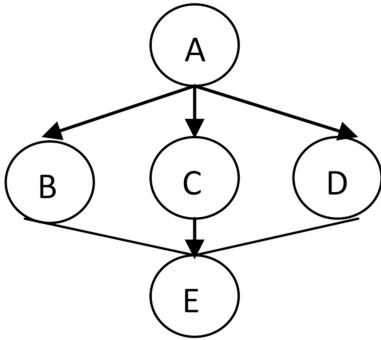


Figure 11.3: DAG representation of workflow.

## Performance Parameters

It has been observed from different development of workflow scheduling strategies (Krishan & Kumar, 2020) that there is a need to improve them to fulfill the client's requirements. Performance and quality of service (Kaur et al., 2019) limitations in workflow scheduling are determined by the clients according to their requirements. The performance parameters (Devi et al., 2018) listed in Table 11.1 are used to examine the workflow scheduling algorithms.

Table 11.1: Performance parameters for workflow scheduling.

Parameter	Description
Make span	Upper limit of time needed for the finishing of an activity
Execution Time	This is the specific time taken to execute the given assignment
Cost	Utilizations cost of resources
Energy Consumption	Measure of energy devoured by the entire nodes
Throughput	Total number of processes completed in a given time
Resource Consumption	Maximum usage of processing resources
Migration time	Time needed to move one task starting with one node then onto the next node
Budget	The cost approved by the user to hold the cloud resources for a particular time

Table 11.2: Analysis of performance parameters used in workflow scheduling.

Parameters	Algorithms							
	Hybrid Optimization Algorithm (Zhang, et al. 2020)	Optimization Using BAT Approach (Kaur & Singh, 2016)	Optimization Budget and Deadline Constraints (Amalarethinam & Beena, 2016)	Cost-Aware Security Approach (Devi et al. 2018)	Execution, Computation Time-Based Algorithm (Zheng, Wang, & Zhang, 2016)	Max-Min Approach (Singh and Rao 2015)	Genetic, List Scheduling Algorithm (Kumar & Verma, 2012)	Hybrid Heuristic Algorithm (Mirzavi & Rafe, 2015)
Make span	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Execution Time	Yes	Yes	Yes	No	No	Yes	Yes	No
Cost	Yes	Yes	Yes	Yes	No	No	No	Yes
Energy Consumption	No	No	No	No	Yes	No	No	No
Throughput	No	No	No	No	Yes	Yes	No	Yes
Resource Consumption	Yes	No	No	No	Yes	Yes	No	No
Migration Time	No	No	Yes	Yes	No	No	No	No
Budget	No	Yes	Yes	No	No	No	No	No

## Review and Analysis of Scheduling Algorithms

The algorithms which are developed for scheduling various workflows in the cloud domain are restricted to various constraints and parameters like makespan, budget cost and consumption of resources, execution time, reliability, and throughput, etc.

Table 11.2 presents the review of various performance parameters used in algorithms of workflow scheduling with their strengths and limitations. This review is attempted on the most cited research done in the field of workflow scheduling. Parametric analyses of data show the algorithms are considering some of the performance parameters like makespan, execution time and cost while others are not focused. It is observed that algorithms can be developed which can perform for all parameters effectively.

## Conclusion

In cloud computing, workflow scheduling is the basic issue that is focused on by the researchers. This chapter reviewed and analyzed the various algorithms used for workflow scheduling. The workflows differ in the number of tasks and complexity in terms of dependencies of tasks. The author presented the various performance parameters of workflow scheduling and analyzed their strengths and limitations. It has been analyzed that only makespan, execution time and cost parameters are focused on the various algorithms and there is a scope to examine other parameters. In the future researchers can focus on other parameters of the workflow scheduling to enhance the performance of the algorithms.

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## Chapter 12

# Role and Impact of Big Data Analytics Determinants in Improving Supply Chain Agility

## Introduction

In the current scenario supply chain (SC) has been recognized as a competitive advantage for any firm. It is a very challenging task to handle SCs (Lee, 2002). Due to continuous advancement, outsourcing, globalization, etc., SC managing has become a very challenging job (Lee, 2004). Fisher (2011) tried matching SC strategies (for instance, responsive vs efficient) to characteristics of goods (for instance, innovative vs. functional). Lee (2002) had proposed strategies (like agile/hedging risk/responsive/efficient) to provide solutions to supply and demand uncertainty. The firms' SC agility (SCA) can have a direct impact on its capability to deliver and produce ingenious goods for their clients at the correct place, correct cost, and the right time (Khan & Pillania, 2008). In spite of high popularity of SCA little is understood about it (Braunscheidel & Suresh, 2009). As per Liu et al. (2013), firms are becoming reliant on IT advancements due to environmental uncertainties. As per Brusset (2016), there is huge pressure for improving cost of inventory turnover on SC managers. As a result, there is a need to build SC agility for surviving in the market place (Gligor et al., 2016). SCA has appeared as a investigating area that is different from flexibility (Dubey et al., 2018).

As per Choi et al. (2018), there is a significant impact of big data in practices of operations management. Srinivasan and Swink (2018) stated that big data analytics (BDA) has been utilized for understanding client behaviors/intentions. However, for SC operational decision-making is less understood. There is a positive impact of predictive analytics and big data on firm and SC performance (Gunasekaran et al., 2017). A few prior studies (Frisk & Bannister, 2017; Gunasekaran et al., 2017; Ji-fan Ren et al., 2017) stated there is a connection between competitive advantage and BDA and competitive advantage and SCA (Blome et al., 2013; Gligor et al., 2016).

As per Boyd et al. (2012), SC management performance impacts environmental perspectives (Sousa & Voss, 2008). This research contingency theory (CT) has been utilized for examining factors impacting BDA. Organizational flexibility (OF) has been discussed in prior literature. The objective of the current study is to find the impact of the competitive advantage, organizational flexibility, and knowledge

management along with mediating variable BDA on SCA, which is the dependent variable.

The next sections of the chapter are as follows: Section 2 discusses the background of the study, Section 3 discusses the theoretical framework and hypothesis development, methodology of research has been discussed in Section 4, which includes sampling techniques and respondents' demographics; data analysis has been discussed in Section 5, Section 6 contains discussion, managerial implications and practice and research contribution and Section 7 contains the conclusion, scope and future research guidelines.

## Background of the Study

### Dynamic Capabilities View (DCV)

As per prior studies conducted DCV gave explanation for firms' competitive advantage in these environment changing circumstances (Eisenhardt & Martin, 2000; Singh et al., 2013; Sirmon et al., 2010). Teece et al. (1997), stated, "firms' ability to build, integrate and reconfigure external and internal competencies for addressing changing environment." It adds competence to shape and sense opportunity, and maintaining competency through reconfiguring, protecting, combining, and enhancing resources of a firm. Dynamic capabilities are unstable, simple, experimental processes that enable renewal, transformation, or combinations of competencies and assets that are critical for markets that are uncertain (Eckstein et al., 2015). Based on these debates researchers have decided to adopt BDA, which will be resulting in firms' ability for reconfiguring firm-level assets.

### BDAC

Arguments are going on about BDA essentialness in fulfilling objectives of a firm (Jabbour et al., 2019; Prescott, 2014), but until now there is no general accord on how this BDA should support them (Galbraith, 2014). BD are those data that have variety, velocity, and volume which makes it hard for traditional methods to manage analyses. Analytics means "from data extracting valuable information, building statistical models, visualizing and exploring information . . . and helps in planning, execution and taking decisions" (Srinivasan & Swink, 2018). BDA helps firms investigate alternatives for demand and supply uncertainties (Wang et al., 2016).

**SCA**

As per Lee (2004), firms have been investing a lot in developing SC agility to fulfill unexpected and sudden advancements in the market place. As per Swafford et al. (2006), SCA impacts the ability of firms to make and deliver innovative goods to their clients at the right price and time. As per Braunscheidel & Suresh (2009), due to highly competitive pressure and turbulence firms need agility in SCs. As per Dubey et al. (2018), SC visibility increases SCA by combining firm assets. As a result, agility is craving assets of SC that enables it to manage changes in supply and demand instantaneously and handle outside disruptions smoothly.

**OF**

As per Volberda (1996), OF means a firm should have operational control. Hence, this helps in operating firms in an uncertain environment (Srinivasan & Swink, 2018). As per Sanchez (1993), in a dynamic environment a firm can have competitive advantage by making strategic flexibility. As per Sanchez (1995), flexibility is restrained not only by assets but also by the approaches a firm adopts to utilize assets (Y. Liu et al., 2009).

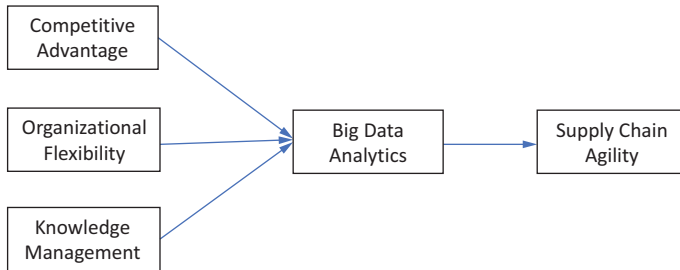
**Competitive Advantage**

As per Hinterhuber (2013), associations can obtain a competitive advantage by determining and enforcing different game plans for differentiation of the firm from its peers. As per Mellat-Parast and Spillan (2014), competitive advantage is the potential of a firm to sustain or maintain more than average returns. Chen (2019) stated that competitive advantage will be borrowed from various points. For example, expertise within a firm's control can be achieved to develop competitive advantage for high accomplishment (Eidizadeh et al., 2017; Nayak et al., 2021)

## **Theoretical Framework and Development of Hypotheses**

CT and DCV had been utilized to propose the research model for the current study. DCV had been utilized for investigating and combining a firm's competencies and assets in this uncertain environment. Advancement in technology had been argued as a solution to uncertain environments. BDA will help in future decision-making and planning in this environmental uncertainty. Also, OF are proven to be more

valuable in this time of uncertainty (Pagell & Krause, 1999; Swamidass & Newell, 1987). Four research hypotheses had been proposed to check the impact through SEM approach (Figure 12.1).



**Figure 12.1:** Proposed framework.

## Competitive Advantage (CA)

CA means having any benefits one firm has over its peer firms (Porter, 1985). As per LaValle et al. (2012), analytics are utilized five times more by a high performing firm than other firms that are below average. Raffoni et al. (2018), stated that if BD is utilized properly then it will help in achieving better outputs. BDA is still in its infant stage, but it will be offering high opportunities. As per Zhang et al. (2017), BD is being exploited to develop CA in a firm. Thus,

*H1: CA influences BDA*

## Organizational Flexibility (OF)

As per Galbraith (1973; 1974), firms require flexibility to apply decisions efficiently and quickly. It had been identified as a critical element for decreasing SC risk (Braunscheidel & Suresh, 2009). As a result, OF has the potential to manage with supplies and demand uncertainties (Swafford et al., 2006) and achieve excellence. Thus,

*H2: OF influences BDA*

## Knowledge Management (KM)

It helps in achieving a firm's objectives by sharing, creating, and managing information and knowledge of a firm. As per Lugmayr et al. (2017), BD is an incremental

or disruptive innovation. Also, a framework for KM and BD was to dig up information from social media and compare it with peers in the marketplace. Thus,

*H3: KM influences BDA*

## **BDA and SCA**

IT potential had a positive impact on SCA (Swafford et al., 2006). SC visibility is a fundamental need for developing data analytics potential. As per Srinivasan and Swink (2018) firms investing in developing SC visibility are also willing to spend in BDA. Dubey et al. (2018) determined a positive impact of BDA in SCA. As a result, utilizing BDA will help management to understand various changing circumstances for developing strategies for trade. Thus,

*H4: BDA influences SCA*

## **Research Methodology**

Information was gathered by different sources like primary and secondary. Secondary sources incorporate literature audit and different articles, and essential documents incorporate assortments of information through organized questionnaires. The questionnaire's reliability test was conducted. The different Indian industries were considered as the target population. Manufacturing companies and listed companies on the stock exchange were set as target population. IT service providers were excluded from the targeted population. The respondents from the selected firms were IT workforce and officers who have IT information of future and present tasks of their individual firms. The sampling method utilized here is simple random sampling (Hair et al., 2010). Finally, 269 responses were utilized for data analysis after cleaning of data in SPSS 20.0. Established scales had been adopted from prior literature here (Malhotra & Grover, 1998).

By keeping away from common methods, the examination group has avoided potential risk amid preinformation assortment level. In the beginning of the questionnaire there was a note that mentioned the information will be utilized only for academic study and privacy of information will be kept up. Case screening was directed in the gained dataset followed by factor screening so explanations can be given for assortment in the data. Data cleaning methods were used to keep data free from bias; for instance, there were very few instances of missing data and so this was not seen as a significant factor. No cases had been eliminated. Notwithstanding, after the information is gathered into the exploration group Harman's single factor test was conducted. EFA was conducted and outcomes displayed that an initial factor clarifies most extreme covariance (40.184 percent). This value is below

50 percent, which is the suggested value and lies within the acceptance range (Podsakoff et al., 2003).

SEM had been utilized for analysis of data. This was performed in four different phases using firm demographics, validity and reliability test, exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and structural equation modeling (SEM). EFA was done to check the cumulative contrast revealed to recognize and bundle the items utilizing a rotated component matrix table. EFA and the reliability test were conducted using SPSS 20.0 on information gathered. Thereafter, CFA was carried out for testing and supporting the model. CFA was carried out utilizing AMOS 22.0 for assessing model outcomes (Byrne, 2010; Hair et al., 2010). Finally, SEM was conducted for checking model fit and supporting hypotheses (Table 12.1).

**Table 12.1:** Scales used for the study.

Construct	Reference	Item	Description
BDA	(Akter et al., 2016; Srinivasan & Swink, 2018)	BDA1	Advanced tools need to be used for data analysis.
		BDA2	Multiple sources have been used for collection of data.
		BDA3	Data visualization is used for getting complicated information from big data sets.
		BDA4	It helps in increasing accuracy.
SCA	(Gligor et al., 2016)	SCA1	Firm can identify changes in the environment.
		SCA2	Firm can recognize opportunities in the environment.
		SCA3	Firm collects information from clients.
		SCA4	Firm can make fast decisions to manage changes in the environment.
OF	Sethi and Sethi (1990), Upton (1994)	OF1	Our firm can adopt change for changing supply and demand uncertainties.
		OF2	Our firm is more flexible than our peers.
		OF3	We can adopt changes in firm structure.
		OF4	It helps in achieving excellence.
KM		KM1	It helps in managing information.
		KM2	It is a database of information.
		KM3	It helps in enhancing accuracy in outputs.



## Results

### Demographics of Firms Surveyed

A questionnaire-based survey method was used. Table 12.1 shows the distribution of respondents based on different industries. The response was taken from manufacturing and retail firms which involved SC and IT officials. The data is a representation of population. Table 12.2 shows the population representation.

**Table 12.2:** Respondents' demographics.

Item	Percentage
Managers	78 percent
IT Managers	22 percent

### Reliability and Validity

#### Cronbach's Alpha ( $\alpha$ )

Assessment of reliability helps in examining the level of inner consistency between factor estimation and its freedom of error at any point in time (Kline, 2015). Constructs' reliability was checked utilizing  $\alpha$ -value as its most common method for measurement (Hair, et al. 2013). Constructs'  $\alpha$ -value has an over endorsed mark of 0.70 (Nunnally and Bernstein, 1994). The 7-point Likert scale has been utilized for creating the questionnaire. SPSS 20.0 and AMOS 22.0 had been utilized for analyzing the information gathered. The latent variable CA has four indicators CA1, CA2, CA3, and CA4 and its  $\alpha$ -value is 0.860; OF has four indicators OF1, OF2, OF3, and OF4 and its  $\alpha$ -value is 0.889; KM has three indicators KM1, KM2, and KM3 and its  $\alpha$ -value is 0.850; BDA has four indicators BDA1, BDA2, BDA3, and BDA4 and its  $\alpha$ -value is 0.845. Consequently, all values are inside the edge level and the 15 elements are used in further examination.

### Exploratory Factor Analysis

Fittingness of sample size is the fundamental step for EFA. SPSS 20.0 had been utilized conducting EFA. Factors' correlation was investigated by Bartlett's test of sphericity (Hair et al., 2010). Principal component analysis (PCA) was conducted to recognize significant predisposition and explicit similar characteristics. Varimax rotation was utilized for the explanation of initial results, it is hypothesized (established

from the relevant literature) that there is no correlation within the factors (Hair et al., 2010).

Therefore, Kaiser-Meyer-Olkin (KMO) was calculated to evaluate whether those things adequately correspond and to decide if EFA can be conducted. The KMO value for this study is 0.788, which is greater than 0.60, the acceptance level (Hair, et al., 2010). Significance value is 0.000, which is below 0.05, the likelihood value. Table 12.3 displays the KMO and Bartlett's test output.

**Table 12.3:** KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.788
Bartlett's Test of Sphericity	Approx. Chi-Square	2517.435
	Df	105
	Sig.	0.000

PCA had been used for method of extraction. The extraction is done for those eigen values that are more than one, which describes maximum variance. For the components, the percentage of total variance is explained by component 1 (20.367 percent), component 2 (19.099 percent), component 3 (18.187 percent), and component 4 (15.671 percent). The total variance explained (cumulatively) is 73.324 percent.

The Rotated Component Matrix is important for deciphering outputs of examination. It organizes the factors, and each gathering encompasses multiple factors at any rate, which helps in structure simplification. Thus, this is the point of the objective of rotation. In this study, we have accomplished this point. This assists with distinguishing the cross-loadings on more than one gathering, and afterward it very well may be adjusted by eliminating those things that are cross-loaded. Here, loadings under  $|.40|$  are suppressed because loadings more than  $|.40|$  are commonly viewed as high. Eventually, we accomplish a simple structure. There are 11 factors that were gathered under three distinct parts. Varimax was utilized as a rotation technique. OF1, OF2, OF3, and OF4 are assembled under the primary segment with upsides of 0.842, 0.826, 0.877, and 0.828. CA1, CA2, CA3, and CA4 are gathered under the subsequent segment having values 0.823, 0.831, 0.798, and 0.683. BDA1, BDA2, BDA3, and BDA4 are assembled under the third segment with values 0.683, 0.752, 0.810 and 0.748. KM1, KM2, and KM3 are assembled under the fourth part with values 0.849, 0.890, and 0.786. Table 12.4 shows the Rotated Component Matrix output.

CFA was led in the accompanying stage, which creates recognition from composing an outline that can be attempted and determine how well the components address forms. For model validating purpose SEM was used in the research model

**Table 12.4:** Rotated Component Matrix.

	Component			
	1	2	3	4
CA1		.823		
CA2		.831		
CA3		.798		
CA4		.683		
OF1	.842			
OF2	.826			
OF3	.877			
OF4	.828			
KM1				.849
KM2				.890
KM3				.786
BDA1			.683	
BDA2			.752	
BDA3			.810	
BDA4			.748	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

that is proposed (Byrne, 2010). By then when their instrument shows the ordinary plans inside, this may have been distinct to construct validity (CV) (Moerdyk, 2009) and, especially, factorial validity.

### Model Validity Measures

#### Composite Reliability (CR)

CR was additionally estimated for every one of the parts. It is assessed for internal consistency dependability considering its capability to give improved outputs (Henseler et al., 2009). CR values for CA is 0.864; OF is 0.887; KM is 0.851; BDA is 0.871. CR values of all constructs are >0.7, this shows that values of CR are reliable (Hair et al. 2010). Table 12.5 displays the CR values.

### Convergent Validity

This is assessed with the average variance extracted (AVE). As per Fornell and Larcker (1981),  $AVE > 0.5$  for satisfying this validity concern. Table 12.4 displays the AVE values. All AVE values are more than 0.5 which fulfils this effectiveness conditions for every construct (Hair, et al. 2013).

### Divergent Validity

To ascertain this validity, Fornell and Larcker (1981) recommended that constructs' AVE should be more than a square of the correlation between constructs (Hair, et al. 2013). Table 12.5 represents values for divergent validity output ( $MSV < AVE$ ) and it was obtained using the master validity plugin in AMOS 22.0.

**Table 12.5:** Model validity.

	CR	AVE	MSV	MaxR(H)	CA	OF	KM	BDA
<b>CA</b>	0.864	0.616	0.455	0.88	<b>0.785</b>			
<b>OF</b>	0.887	0.664	0.249	0.903	0.343***	<b>0.815</b>		
<b>KM</b>	0.851	0.656	0.24	0.855	0.428***	0.261***	<b>0.81</b>	
<b>BDA</b>	0.848	0.584	0.455	0.854	0.675***	0.499***	0.490***	<b>0.764</b>

Significance of Correlations:  
 †  $p < 0.100$   
 \*  $p < 0.050$   
 \*\*  $p < 0.010$   
 \*\*\*  $p < 0.001$

## Structural Model and Testing of Hypothesis

The model fit measures for model 1 (CFA) which has the latent variables is shown in Table 12.5. Latent variables along with its indicators are CA: competitive advantage along with four indicators: CA1, CA2, CA3, and CA4; OF: organizational flexibility has four indicators OF1, OF2, OF3, and OF4; KM: knowledge management has three indicators KM1, KM2, and KM3; and BDA: big data analytics has four indicators BDA1, BDA2, BDA3, and BDA4. The  $CMIN/Df$  is 5.354; goodness of fit indices (GFI) is 0.845 (Forza & Filippini, 1998; Greenspoon & Saklofske, 1998); incremental fit index (IFI) is 0.894, Tucker-Lewis's coefficient (TLI) is 0.883; comparative fit index (CFI) is 0.889; parsimony comparative fit index (PCFI) is 0.681; parsimony normed fit index (PNFI) is 0.660. All the items' loadings were greater than 0.5 and  $SE < \pm 2.5$ , which is acceptable.

SEM was used to check the hypotheses (Byrne, 2010). AMOS 22.0 was used for this assessment due to its astounding practical portrayals and easy to use coalition. Figure 12.2 displays last model and dependent variable, their latent variable, and their indicators. The indicators along with the latent variables are KS: knowledge sharing along with three indicators: KS1, KS2, KS3, and KS4; BPP: business partners' pressure has four indicators BPP1, BPP2, BPP3, and BPP4; HAS: higher authority support has three indicators HAS1, HAS2, and HAS3; BTA: blockchain technology analytics has four indicators BTA1, BTA2, BTA3, and BTA4. The dependent variable is SCP: supply chain performance with four indicators SCP1, SCP2, SCP3, and SCP4.

**Table 12.6:** Final goodness of fit indices for the CFA and structural model.

<b>Goodness-of-fit Indices</b>	<b>Model 1</b>	<b>Final model</b>	<b>Benchmark</b>
CMIN/Df	5.354	4.059	Lower Limit:1.0; Upper Limit 2.0/3.0 or 5.0
GFI	0.845	0.834	>0.80
<i>Absolute badness of fit measure</i>			
RMSEA	0.089	0.08	≤0.08
<i>Incremental fit measure</i>			
CFI	0.889	0.901	≥0.90
IFI	0.894	0.914	≥0.90
TLI	0.883	0.90	≥0.90
<i>Parsimony fit measure</i>			
PCFI	0.681	0.734	≥0.50
PNFI	0.660	0.704	≥0.50

Table 12.6 shows the fit indices. For the final model, the value of CMIN is 588.592, and df is 145. Estimations of absolute fit indices are: CMIN/Df 4.059, which is lower than 5, it is an accepted value (McIver & Carmines, 1981). The GFI value is 0.834 (Forza & Filippini, 1998; Greenspoon & Saklofske, 1998) and RMSEA value is 0.08 that is within acceptable value of 0.08. TLI is 0.901, IFI is 0.914, and CFI is 0.90; PCFI is 0.734; PNFI is 0.704, which are acceptable and within accepted level (Byrne 2010). Figure 12.2 displays final structural model achieved in AMOS 22.0.

Hence, we can see that the model fit values of the final model are better than model 1. The mediating variable (BTA) and dependent variable plays a significant contribution along with the three latent variables in establishing the model fit.

The path estimates analysis results had been displayed in Table 12.6. Output displays four hypotheses which are accepted with by P-value (Hair, et al. 2010). The three factors, KM, OF, and CA along with mediating variable BDA have positive

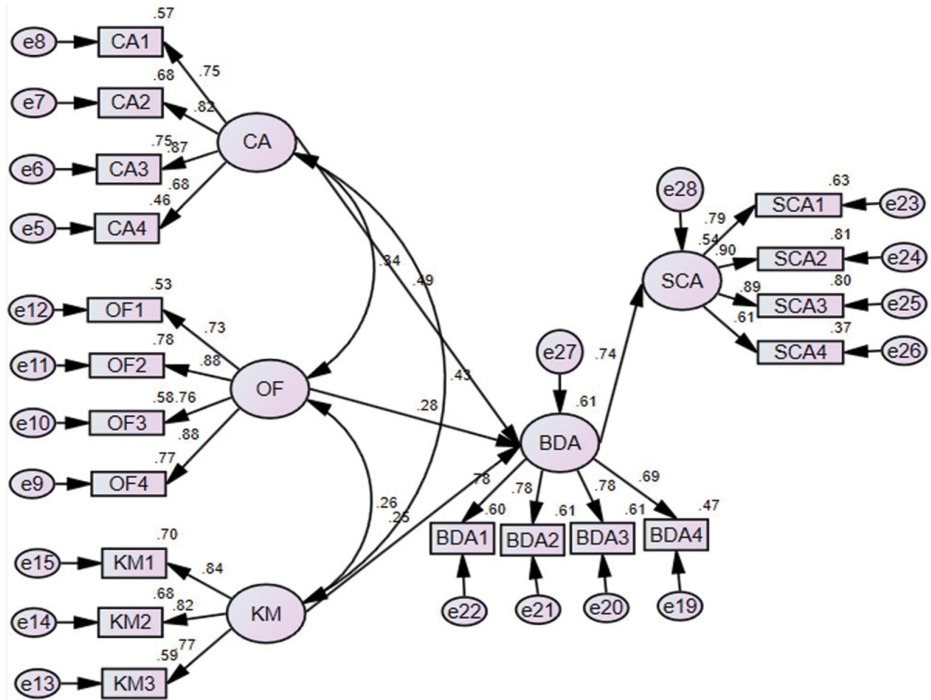


Figure 12.2: Final structural model.

impacts on SCA. The square multiple correlation (R<sup>2</sup>) assists with estimating how well a relapse line gauges the genuine information focuses somewhere in the range of 0 and 1, which adds how adequately a variable is anticipating another (Hair, et al., 2010). The more the worth is more like 1, the better is the model’s capacity to foresee that innovation (Kline, 2015). Model proposed defined variance of 61 percent in BDA and variance of 54 percent in SCA (Table 12.7).

Table 12.7: Path estimate results.

	Estimate	S.E.	C.R.	P
BDA←KM	0.245	0.049	5.000	***
BDA←OF	0.280	0.048	5.833	***
BDA←CA	0.487	0.083	5.867	***
SCA←BDA	0.737	0.127	5.803	***

## Discussion

The objective of the research is to find out the utilization of big data in the achievement of supply chain agility for the firms. Earlier research by various researchers also supports the BDA in SCA (Chen, 2019; Dubey et al., 2018; Gligor et al., 2016; H. Liu et al., 2013; Y. Liu et al., 2009; Nayak et al., 2021; Zhang et al., 2017). This research is further extended and added KM as one of the independent variables to achieve SCA in the adoption of BDA. The  $\alpha$ -worth and CR values for all four variables were more than 0.7, that is, acceptance level (Nunnally 1978; Hair et al. 2010). The KMO is more than 0.6 which allows for performing EFA (Hair et al., 2010). Total variance explained was 73.324 percent, and rotated component matrix, factors were assembled under three gatherings. Just loadings with values above  $|\cdot 40|$  are kept in this exploration because those are viewed as normally high and subsequently are more critical (Hair et al., 2010).

Latent variables along with their indicators are KS: knowledge sharing along with three indicators: KS1, KS2, KS3, and KS4; BPP: business partners' pressure has four indicators BPP1, BPP2, BPP3, and BPP4; HAS: higher authority support has three indicators HAS1, HAS2, and HAS3; BTA: blockchain technology analytics has four indicators BTA1, BTA2, BTA3, and BTA4. The dependent variable is SCP: supply chain performance with four indicators SCP1, SCP2, SCP3, and SCP4. There are 11 total indicators that were categorized under three different components. Varimax was utilized as a rotation technique. OF1, OF2, OF3, and OF4 are assembled under the primary segment with upsides of 0.842, 0.826, 0.877, and 0.828. CA1, CA2, CA3, and CA4 are gathered under the subsequent segment having values 0.823, 0.831, 0.798, and 0.683. BDA1, BDA2, BDA3, and BDA4 are assembled under the third segment with values 0.683, 0.752, 0.810 and 0.748. KM1, KM2, and KM3 are assembled under the fourth part with values 0.849, 0.890, and 0.786. This shows that it has very high loadings ( $>|\cdot 40|$ ).

For final model, the value of CMIN is 588.592, and df is 145. Absolute fit indices estimations are CMIN/Df 4.059, which is lower than 5, its accepted value (McIver & Carmines, 1981). The GFI value is 0.834 (Forza & Filippini, 1998; Greenspoon & Saklofske, 1998) and RMSEA value is 0.08, which is within the acceptable value of 0.08. TLI is 0.901, IFI is 0.914, and CFI is 0.90; PCFI is 0.734; PNFI is 0.704, which are acceptable and within accepted levels (Byrne, 2010). Here, the elements are described and substantial with assistance of SEM approach, its most proper strategy to state evidence. This method has not been used in earlier studies, which is why it is unique.

## Conclusion

The aim of this chapter is to investigate how various organizations use big data in the system to achieve supply chain agility. Three independent variables were identified from the literature—competitive advantages, organizational flexibility, and knowledge management. Two more variables were found, one mediating variable, big data analytics, and one dependent variable, supply chain agility. A questionnaire was prepared for survey-based research. The target population were mainly IT employees working in various manufacturing companies in India. After the collection of information was inspected, it was determined that the information was not biased. For further analysis EFA and SEM approaches were being used. The software being used was SPSS 20.0 and AMOS 22.0. A model being developed that showed a good fit and proposed hypothesis was accepted. Further study can be extended to various other industries like healthcare, retail, and many others.

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## Chapter 13

# Role of Big Data in Growth of Digital Marketing

## Introduction to Digital Marketing

Digital marketing has changed the structure of markets today in the modern era of digitalization, which has also resulted in the fourth industrial revolution. Digital marketing is a component of marketing technique that uses technology to influence consumer behavior. It utilizes the internet to create an online platform for communication services (Avery et al., 2012, 96–111). Digital marketing also relies upon digital social computing platforms to advertise products and gauge customer reactions. The major revolution in digital marketing came in the 1990s and 2000s (Mahajan, 2020). Today, the rise of internet enabled marketing applications has led to the advent of a digital ecosystem. Digital marketing has connected various market services across the world. It has also helped in transforming user behavior and habitats (Naimi et al., 2014, 1143–1144).

Digital marketing has changed today's market scenario. In contrast to traditional marketing, digital marketing has led to major growth of the industry in terms of profitability and use (Tiago et al., 2014, 703–708). Today, even third world countries like India, Bangladesh, Sri Lanka, etc., have become supporters of digital marketing strategies due to their advantages. Some of the major advantages of digital marketing are:

- 1) **Creation of an online community and 24/7 services:** Digital marketing has led to creation of a close-knit online community. Consumers, companies, as well as suppliers work together rationally (Tiago et al., 2014, 703–708). Most internet communities today provide a place for customers to keep up to date with the companies regarding their goods or services. One can easily visit company websites to get customer support, give feedback, purchase products, and maintain the purchase and return details. In other words, they get comprehensive information with regard to various products or services (Karp, 2014). Digital marketing has allowed 24-hour service to people wherein prices are transparent (Eri et al., 2011).
- 2) **Monitoring and measuring of results:** Digital marketing has enabled companies to monitor their internet marketing with the help of web analytics and other online metric tools. This makes it easy to determine how effectiveness of the brand campaigns can also help in extracting extensive information about how customers interact with products and company advertising.

- 3) **Improved return of investments:** The popularity of digital marketing has led to a substantial research interest among various data scientists and scholars (Kannan et al., 2017, 22–45). Many researchers (D. Rogers et al., 2012, 1–17) have tried to identify and understand the methods to improve market profitability. They have researched ways to increase ROI (Return of Investment) in digital marketing.
- 4) **Precise targeting:** Traditional marketing employs the spray and pray strategy, in which an ad is spread across a large platform in the hopes that a few individuals who like what they see, hear, or read will take action. Marketing via digital platforms, on the other hand, enables targeted marketing where advertisements are offered to clients based on their preferences or first action. Consider transactional emails that will only be sent to customers after they have taken action with the company. In other words, clients only get what they request.
- 5) **Search engine optimization:** Search Engine Optimization (SEO) which is one of the most important digital marketing techniques also uses data to operate. SEO is a technique wherein search results from the popular search engines are optimized to increase company reach. This strategy not only helps in programmatic advertising or search engine marketing but also provides a way to get a company known across the world.

Although digital marketing has various advantages, most of the techniques depend upon collection, analysis, and usage of valuable data. In the context of digital marketing, valuable data refers to the data collected in relation to a customer's preferences and other relevant details. Thus, improved data management has the potential to change and influence the digital market. Hence, a major change in research strategy came when people began giving importance to data. Scholars like Kumar et al. (2014) have successfully analyzed the influence of data in digital marketing. Data is also one of the major metrics to measure the efficiency of companies. This metric comparison to calculate company efficiency has been done by Mahajan (2020). Big data analytics has resulted in the identification of valuable knowledge, as well as the promotion of market-leading activities. It has allowed market transformation at both local and global levels.

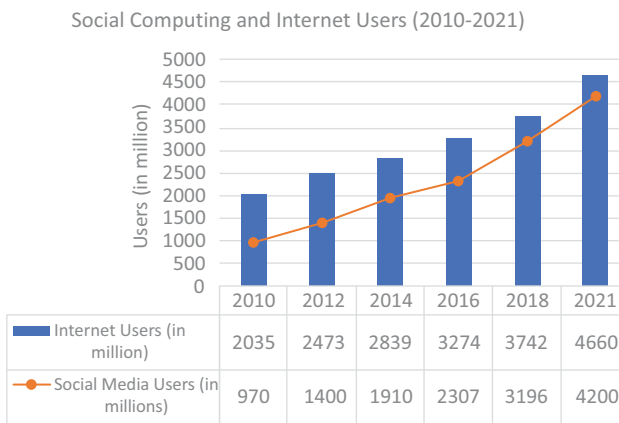
The further sections of this chapter describe the importance of big data and its application in digital marketing. Section 2 analyzes the growth of digital marketing in India while Section 3 introduces the concept of data and big data in digital marketing in more detail. The last section defines the role and application of big data in digital marketing.

## Growth of Digital Marketing and Popular Options

Digital marketing has witnessed a major increase over the past few years. According to Gandhi (2020) a 26 percent increase in digital advertising alone was witnessed from 2018 to 2019. One of the major factors for the growth of digital marketing is the increase in the number of internet users. In 2020, India reported approximately 700 million internet users.

The number is further expected to increase in 2021. According to internetworldstats.com, India is among the top 4 global internet users with at least 391.2 million active internet users from a total of 4.21 billion users (Kemp, 2021). Although the internet has been a primary factor for the growth of digital marketing, Indian digital marketing has flourished with an increase in the number of mobile users.

Another factor related to the rise in digital marketing is the emergence of social computing. Social computing is the new computing paradigm that starts with the study of human behavior and their interaction with the environment and computational systems, that is, human-computer interaction (HCI). It was developed with the goal of creation or recreation of social conventions and social context using computer science fields like networking, data analysis and social software technologies like blog posts, social media sites, instant messaging applications, and many more. Hence, social computing has provided a large platform for digital marketing and advertising. An increase in the number of internet and social media users from the 2010 to 2021 is depicted in Figure 13.1 (Dean, 2021).



**Figure 13.1:** Number of social media and internet users (in millions) from 2010 to 2021.  
Source: Dean, 2021

As shown in Figure 13.1, the number of social media users has been steadily increasing every year in relation to internet users. While in 2010, only 970 million users out of the 2,035 million total internet users were active on social media platforms, the

number of social media users became almost proportional in 2021 with 4,200 million active social media users out of the 4,600 million internet users (Dean, 2021).

The scope of digital marketing in India has become even more broad and prominent due to the advent of COVID-19. The digital marketing scope for the Indian industry is expected to grow by 160 billion dollars by 2025 (Dash, 2019). This is approximately three times the current value. Due to the pandemic, a work from home culture has started which has led to people shifting toward freelancing and online business ventures. Over time, many such business ideas emerged, which helped promote digital marketing among the masses. Some of the popular digital marketing options that have gained huge popularity among digital marketing amateurs as well as professionals are:

- 1) **Influencing customers through social media:** With the rise of social media, it has now become a major platform for brand promotions and customer reviews. Many digital marketing professionals today use social media platforms to influence customers. Companies provide funding to influence on various platforms like YouTube and Instagram to promote their products via strategic advertisements. Blogging is also one of the ways where people affiliate with companies to generate income. Due to its success, professional bloggers can now earn 1,000 dollars a month, while celebrity bloggers even earn more than 10,000 dollars per month (Sam, 2021).
- 2) **Freelancing:** The concept of freelancing has become a major source of employment today. Freelancing has further led to an increase in digital marketing. It provides a way for people to choose their product and decide its price according to the quality and quantity. Moreover, since these services are online, they can be accessed by people across the country.
- 3) **Augmented and virtual reality:** This is a fairly new technology that is starting to change the digital market strategy in 2021. It can help in increasing brand awareness and can also help to satisfy customer demand. Many multinational corporations, including Nivea, Starbucks, and Volkswagen, have already launched successful AR and VR campaigns.
- 4) **Omni-channel marketing:** While the present purchaser anticipates that every business should, at any rate, have an online presence, utilizing an assortment of media to draw in your objective market in a consistent way is ideal. Omni-channel computerized promoting is characterized as giving consistent client experience across all channels. These incorporate both web-based promoting channels like web-based media, versatile publicizing, online business sites, and disconnected channels like print-based ads, sends, customer facing facade, bulletins, actual connections, and so on.
- 5) **Data analytics:** Digital analytics or data analytics is one of the primary aspects of marketing. It refers to the use of tools and techniques to analyze and report on marketing data. Companies employ data analysts to work on the data collected through digital channels and social media forums. This not only helps to



evaluate brand presence but also helps identify flaws and strengths. Thus, to summarize, it helps in

- a. understanding the customers
- b. analyzing and tracking market behavior
- c. making data-driven predictions
- d. optimizing search results

Since the amount of data is huge, data analytics takes the help of data science techniques like big data to help with systematic information extraction and analysis. The current chapter focuses on the role and application of big data in digital marketing data management.

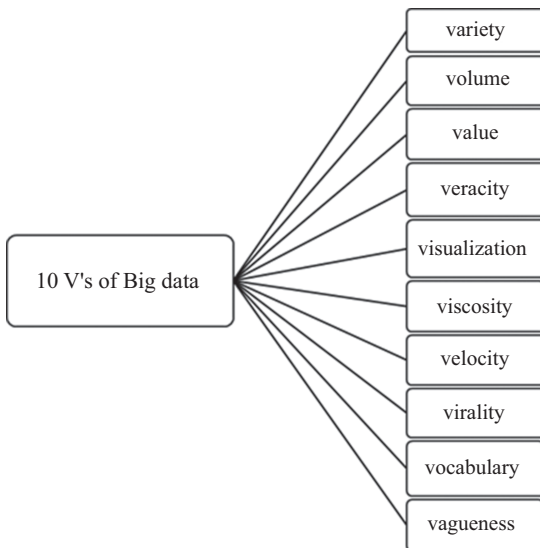
## Big Data Evolution and Parameters for Data Evaluation

Today, most digital marketing strategies are dependent upon analysis and collection of data. This data can range from consumers and their behaviors in the market system to recent trends and customer feedback. The increase in the number of devices has indirectly resulted in an increase in the size and the number of data sets. Today, these data sets are collected using not only mobile devices but many other remote and online information devices, that is, Internet of Things enabled applications, sensor devices, software logs, RFID readers, CCTV's, and wireless sensor networks (Jia et al., 2012, 1282–1285). As per IDC report prediction, the rise in global data volume has substantially increased from 4.4 zettabytes to 44 zettabytes between 2013 and 2020. As a result, they predict that by 2025, the world will have collected at least 163 zettabytes of data (Seagate, 2017). Since most of digital marketing depends upon data analytics, relational database management systems prove efficient to meet the demands of these companies. Processing and analysis of this huge and complex dataset may need high performance parallel software that runs across many servers (Jacobs, 2009, 10–19).

Big data has emerged because of an increase in the amount of data. Although the notion of big data is relatively new, the concept of handling large datasets began in the 1960s and 1970s. This was the time when the world of data was just getting started with the first data centers and the invention of the relational database. In 1990, a computer scientist named John Mashey officially introduced the notion of big data in the United States, igniting the interest of several marketing experts. Due to this, he is even referred to as the creator of the term “big data” (Lohr, 2013). Although several definitions of big data have emerged over the years, big data primarily refers to data that is so massive, fast, or complicated that traditional methods are difficult or impossible to process.

In other words, big data is a field of computing which works with large data sets that are not only complex but also difficult to handle using traditional techniques (Elgendy, et al., 2014, 214–227). Big data hence finds ways to analyze and extract information systematically from these large and complex data sets. It classifies data based on two main parameters, which are the number of fields and complexity. Both go hand in hand. While data with multiple fields generates a lot of statistical power, it complicates data analysis. This can result in a higher false discovery rate (Rouam, 2013). Big data analysis challenges often deal with gathering data and its conversion to valuable information. It includes a wide range of steps, from searching and capturing data to data visualization, storing and analysis, data querying, information privacy and updating etc.

The concept of big data became even more prominent in the early 2000s when industry analyst Doug Laney defined big data in terms of three factors referred to as the 3 Vs of big data. The three key concepts were variety, volume, and velocity. Furthermore, many researchers have hence redefined big data. While researchers like Camacho et al. (2014, 500–505) defined big data in terms of 4 Vs (variety, veracity, volume, and velocity), some scholars (Andreu-Perez, et al., 2015, 1193–1208) even defined 6 Vs of big data as value, volume, velocity, variety, veracity, and variability. In addition, 10 Vs of big data (Borne, 2014) has been discussed in context in Figure 13.2.



**Figure 13.2:** Ten Vs of big data.

- 1) **Variety:** Before the computation can take place, heterogeneous data sources must be identified and homogenized. Because it includes all the prework required to set up the high-performance computation, this procedure is frequently the most labor-intensive. The great majority of data mistakes and faults are discovered here, and this is the primary bottleneck in high-performance computing.
- 2) **Volume:** The measure of information waiting to be prepared at a given time. This can show either a sum over the long run or a sum that should be handled at one time; finding the most popular Twitter hashtags, for example, or categorizing customer opinions about a product via various social media platforms.
- 3) **Value:** This term is characterized as whatever is critical to the client. Another approach to characterize esteem is the expulsion of deterrents in their way to permit them to get to their expressed objective.
- 4) **Veracity:** This is one of the unfavorable aspects of big data. The veracity (belief or trust in the data) decreases as any or all the above qualities increase. This is comparable to, but not identical to, the concepts of validity and volatility. The term “veracity” refers to the data source’s provenance or dependability, as well as its context and how relevant it is to the study based on it.
- 5) **Visualization:** Due to the constraints of in-memory technologies, as well as insufficient scalability, functionality, and reaction time, current big data visualization solutions suffer from technological hurdles.
- 6) **Viscosity:** The ease or difficulty with which data can be flowed to various use cases that might benefit from its adaptability is referred to as viscosity. Internal friction in highly viscous data stems from custom, albeit preferably internally consistent, representations that, at the very least, necessitate high-touch interpretation, transformation, and integration.
- 7) **Velocity:** Similar to volume, this has to do with the speed of the information coming in and the speed of the changed information leaving the figure. An illustration of a high-speed prerequisite is telemetry that should be investigated continuously for a self-driving vehicle.
- 8) **Variability:** In the context of big data, the term “variability” can apply to a variety of things. One is the number of data discrepancies. Anomaly and outlier detection methods must be used to find these before any useful analytics can be performed.
- 9) **Vocabulary:** Data science provides a lexicon for tackling a wide range of issues. Different modeling approaches are used to tackle different problem domains, and different validation procedures are used to harden these approaches in various applications.
- 10) **Vagueness:** Regardless of how much data is accessible, the significance of found data is frequently obscure.

Big data's contribution to the market toward trade, operation, and data can prove to be valuable and diverse. It can not only help in discovering hidden relationships but also help in identifying new opportunities for business. Valuable data captured through big data can help companies to redefine their organizational structure and make changes in their way of communication (Sharma, et al., 2014, 433–441). Thus, it improves both the performance and competitiveness of the digital market and helps the market to respond to customer demands in a much faster and more efficient way.

## Role of Big Data in Digital Marketing

As seen in the previous section, big data deals with handling large and complex data. Hence, it plays an important role in the field of digital marketing, which is highly demand dependent. It helps the market analyzers determine customer behaviors and business insights. It provides all the required information related to a market. It can range from customer preferences, their highs and lows to business and their profits and losses in particular situations.

Big data is something that all digital marketing companies are interested in and look up to. The goal of digital marketing is to increase revenues and attract as many clients as possible. It aids marketers in growing traffic by generating fresh strategies and ideas for enticing customers. And none of this would be feasible without the use of big data.

Because of their objectives, big data and digital marketing are inextricably linked (Writer, 2020). By focusing on the proper people, big data helps to increase traffic. It also aids in the planning of marketing for the intended demographic, allowing them to come and stay. The same may be said for digital marketing. The fundamental goal of digital marketing is to use innovative marketing techniques and methods to boost revenues and the number of customers. Both are linked by their goals, which are primarily to engage as many people as possible.

Application of big data in digital marketing and big data techniques used in digital marketing is discussed in the following sections:

### Application of Big Data in Digital Marketing

The application of big data for digital marketing is briefly explained in the following points as shown in Figure 13.3.

- 1) **Improving competitiveness:** When it comes to gaining a technological competitive advantage, big data adoption allows businesses to create and capture value (Zeng & Glaister, 2017, 105–140). By extracting value insights from data,



**Figure 13.3:** Six Major applications of big data for digital marketing.

it allows businesses to make better decisions, improve processes, and improve goods (Kitchen, et al., 2018, 540–574). Businesses can gain in-depth knowledge about their customer segments and their perceptions of product and service quality by exploiting consumer reviews. Big data capabilities include the creation of new business models in which customers receive a free service in exchange for delivering a revenue-generating data stream (Trabucchi & Buganza, 2019, 23–40). By providing dynamic pricing, competitive options, and better campaign management based on the customer’s previous spending and preferences, big data even helps businesses stay competitive. The use of technology for price optimization will go to a new level, with analysis of data at a finer resolution based on pricing and sales (Sanders, 2016, 26–48).

- 2) **Enhanced website navigation:** Navigation and browsing experience are critical elements for any online company. These have a direct impact on sales while also directing customers to the checkout. With millions of visits, big data is the only method to quantify all interactions. Every day, data is being generated all around the world at a rate of 40 percent each year, and each single piece of this data is critical for organizations (Schultz, 2019). Even though it may appear to be a nuisance, big data has been developed to make things more relevant and convert analytics into a treasure of knowledge. The sooner organizations utilize big data, the better their chances of competing in this increasingly competitive market.
- 3) **Calculation of rate of rate of interest:** According to certain surveys, half of B2B marketing executives find it challenging to properly correlate marketing

efforts to revenue results to justify budgets. Big data solves this challenge by accounting for all marketing channels, activities, and investments and performing a cost-benefit analysis on each one. This makes it nearly impossible to misinterpret your marketing actions and budget.

- 4) **Sales increase:** Several firms around the world have already been transformed by big data. Big data technology has aided marketing and sales professionals in better defining products and services as well as managing sales networks. According to Forbes, big data has had a 48 percent influence on new age consumer analytics, a 21 percent impact on operational analytics, a 12 percent impact on compliance/fraud, a 10 percent impact on new product/service innovation, and a 10 percent impact on corporate data (Columbus, 2016). Furthermore, it has been a key instrument in influencing how marketing managers assess customer value analytics (CVA), allowing them to provide a highly consistent and better customer experience across all channels.
- 5) **Price optimization:** Big data provides the best options for product pricing. It also assists businesses in determining their profit and loss. It helps marketers choose rates for their items and suggests pricing that will increase their profit. According to a study, new and innovative pricing has created more than a quarter of firm sales (Sneader & Singhal, 2021). Pricing flexibility has the potential to improve sales, and big data has been a critical instrument in the development and implementation of innovative pricing strategies. Developing the optimum pricing plan is an analytical process, especially for large corporations and brands. Big data aids in the automation of price analysis and product development. Uber is a wonderful example of this, as it has been developing different pricing tactics in real-time to maximize impact.
- 6) **Service customization:** Because customer self-service and product modification are potential sources of customer data, the capabilities of big data and business analytics enable and facilitate product or service personalization (Huang & Rust, 2013, 251–258). The development of strategic marketing goals, as well as the design of individualized products and contextual messages, begins with a more personalized customers and the market. Firms can obtain real-time data on their customers' perceptions, product assessments, and recommendations (Xu et al., 2016, 1562–1566.). Big data applications improve the firm's ability to access consumer demands and perspectives, raise performance, and ultimately improve customer service (Richey et al., 2016, 710–739). Furthermore, a company that uses big data to capture real-time consumer data might have a better grasp of any unmet consumer needs. Firms can then turn these insights into actions, increasing the efficacy of digital advertising while also improving the organization's dynamic capability (Erevelles, 2016, 897–904). Big data enables retailers to deploy marketing efforts through targeted marketing interventions and get higher returns on marketing investments (Bradlow et al., 2017, 79–95). Big data leads to the creation of well-focused organizations that

focus on the delivery of individualized products and marketing equipment and increase their capital performance by investing enough in customization techniques.

## Big Data Techniques used in Digital Marketing

Today, various big data techniques are used to boost digital marketing. Some of the big data techniques that are used today to support all the applications defined in Section 4.1 are defined below. These technologies include artificial intelligence (AI), NoSQL database, voice search, blockchain, micro-moment marketing (Kh, 2020; Tyagi, 2020).

- 1) **Artificial intelligence (AI):** Understanding the target population is the major application of big data in marketing. Knowing client characteristics, interests, and habits in the digital environment enables organizations to design more efficient marketing efforts. This increases their chances of turning clicks into real sales. For these reasons, artificial intelligence has today become an important technique in big data to improve existing digital marketing strategy. AI based big data techniques are capable of successfully analyzing consumer behavior to provide a more personalized and interactive buying experience. SEO businesses may increase the effectiveness of their services by using specialized analytics solutions that leverage artificial intelligence to deliver rapid and meaningful information.
- 2) **NoSQL database:** NoSQL encompasses a wide range of distinct database systems that are evolving to construct contemporary applications. They are used in real-time online applications as well as large data analytics. It saves unstructured data and provides speedier performance, as well as flexibility when working with a wide range of datatypes on a large scale. It addresses design integrity, simpler horizontal scaling to a variety of devices, and improved control over possibilities. It employs data structures that differ from those used by default in relational databases, resulting in faster computations in NoSQL. Every day, corporations like Google, Facebook, and Instagram keep gigabytes of consumer data.
- 3) **Voice search:** Voice search is an AI enabled big data technology that has become increasingly popular among customers in the past few years. Not only has it helped remove language barriers to some levels, but it has also enabled people to easily express themselves. As customers become more accustomed to these AI-powered assistants, marketers must include the appropriate voice search speech recognition aspects into their brand-building strategy. Personal assistants are expected to improve further and eventually evolve to the point where they can provide more services depending on user behavior.

- 4) **Blockchain:** Blockchain is the designated database technology that contains electronic currency (Bitcoins) with a unique property of protected data, which means that once it is written, it cannot be removed or modified later. It is a highly secure environment and an excellent solution for many large datasets in banking, finance, insurance, healthcare, commerce, and other industries. Although blockchain technology is still in its early stages, many merchants from various businesses like as AWS, IBM, and Microsoft, as well as start-ups, have performed a series of experiments to propose potential solutions for constructing blockchains.
- 5) **Micro-moment marketing:** The majority of customers conduct their research on smartphones, tablets, iPads, and other mobile devices. And most customers dislike advertisements. Online marketers should keep an eye out for this little window where the consumer will make a purchase. Micro-moments occur when consumers instinctively turn to a technology – increasingly a smartphone – to fulfill a need to learn, do, explore, watch, or buy something. They are intent-filled moments in which decisions are made and preferences are formed. This marketing concept is based on customer purchasing behavior, thus big data leverages the market by capturing and analyzing these micro-moments to find profitable business cases.

## Conclusion

Digital marketing is a marketing technique that uses technology to influence consumer behavior. Over the last few years, there has been a significant surge in digital marketing. With the introduction of COVID-19, the scope of digital marketing in India has expanded and grown more significant. Because most of digital marketing relies on data analytics, with the rise of digital marketing, the amount of data generated has also increased. Big data emerged because of an increase in data volume. Big data analysis problems frequently include obtaining data and converting it into useful knowledge. The present chapter discussed the concept of big data and evaluated data based on 10 Vs. The role of big data in improving digital marketing, especially in developing countries like India, Bangladesh, etc., was also discussed. This chapter reviewed some of the recent applications of big data in digital marketing and some of the most popular big data techniques. Due to the advantages provided using big data in digital marketing, especially in the times where work from home culture has been popularized, big data holds a vast scope for changing the marketing world.



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## **Chapter 14**

# **Text Mining Applied as Business Intelligence in the Tourism Industry**

## **Introduction**

The constant technological evolution of which we are a part has demonstrated the importance of studying and analyzing data to obtain information that supports day-to-day decisions. For businesses, social media, referral sites, and opinion-gathering tools have played a key role in this information gathering process. Now, customer opinions can be analyzed through text mining, allowing them to know and measure the level of customer satisfaction or dissatisfaction with a product or service.

In the same way, this information from texts allows one to know the general experience that one has with companies, recognizing possible points of improvement and anticipating future situations that may compromise the proper functioning of the businesses. There is no place for business decisions based on loose guesswork in a highly competitive market. Different data must be gathered and managed to help develop future strategies. Only in this way can products and services be personalized, and the opinion of customers will influence this because it is an extremely important resource that should be used to improve their experience and, at the same time, will serve to adjust the actions of the company.

The tips will help you pinpoint exactly where the budget should be allocated to get the best ROI. At the same time, this will help create a better user experience beyond the tangible, since the customer not only buys a product, but also thinks about obtaining comfort, security, status, affinity, style, etc. Therefore, if companies focus on delivering the best experience in every moment of truth, their customers will remain loyal to the brand (Smilers, n.d.). There is no doubt that the best way to deliver a memorable experience is by asking customers what they like and how the company can improve. Likewise, it is text analysis that helps measure customer satisfaction and is directly related to many benefits, such as higher market share, lower costs, or higher revenue.

It is important to know that there is a close relationship between customer satisfaction and business performance. Therefore, ensuring that customers are happy with the product or service offered is essential, and the best way to achieve this is by knowing their opinion. Using questions based on ratings, you can estimate the level of satisfaction and, consequently, predict the performance of your company. Text analytics is a reliable source of information and today, thanks to social networks, the

customer now relies less on commercials and advertisements in general; instead, the opinions and comments of a customer who has already used the product and service are a much more reliable source of information (Alaei & Stantic, 2019).

It is for this reason that it is important to analyze all those comments, opinions, and reviews, which allow us to identify trends and behaviors. In recent years there have been many changes, some of them due to information and communication technologies and others to environmental factors that, jointly or in parallel, have set new trends and consumption patterns such as new lifestyles, habits of consumption, places of purchase and globalization, among others (Barrullas, 2016).

Today, it is essential to know the behavior of customers when acquiring products or services, the purchase decision process and the internal or external variables that shape their behavior. We are facing a society where information and knowledge influence consumer behavior, so it is important to focus on knowing the interaction variables. The interest of a customer no longer lies in the mere act of purchase but goes further. You should never ignore or underestimate the voice of customers, so you must learn to collect data using different tools and resources, because their opinion at all levels (corporate and in all departments of the company) will help develop products to improve the service and to manage their satisfaction.

## General Objective

Develop a sentiment analysis using text mining to measure customer satisfaction for an American hotel chain.

## Specific Objectives

The first concerns the collection of feedback from customers. The second refers to ordering and cleaning the database obtained to avoid errors in the analysis. The third refers to using SAS Enterprise Miner® software to perform sentiment analysis. And the fourth refers to the analysis of the results obtained, their description and discussion.

## Theoretical Framework

### **What do Hotels do with Guest Reviews when the Room is delivered, and how has that Review been Measured?**

Knowing your customer is just as important anywhere in the world as it is at home. This is a relevant principle to consider in the tourism industry. Each culture has its

logic, and within that logic are real, sensible reasons for the way travelers do things. Tourism is currently one of the most important economic and cultural activities that a country or a region can count on. We understand tourism as all those activities that have to do with knowing or enjoying regions or spaces in which one does not live permanently. Tourism can present many variants since there are different types of tourism: cultural tourism, adventure, entertainment, relaxation. In the same way, there are also different people who carry out different types of tourism: tourism for young people, families, the elderly, couples, friends, etc. According to the World Tourism Organization, the volume of this industry is equal to or even greater than that of exports of oil, food products, or automobiles. Tourism has become one of the main actors in international trade and represents at the same time one of the main sources of income for many developing countries. This growth goes hand in hand with an increase in diversification and competition between destinations.

In the age of the internet, the activity of a company depends directly on the opinions of customers, so the comments and reviews of users represent a type of evaluation of the activity of a company. Potential customers look at reviews to rate a brand. This means that customer opinions influence a company's sales (Soleymani et al., 2017).

Today, thanks to various tools such as the internet, smartphones, social networks, among many more it is possible to know in a matter of minutes if the services offered are excellent, good, fair, or bad, even if the place is on the other side of the world. It is easy to know if the business is a store, a restaurant, a hotel, etc. It is enough to "google it" to obtain thousands of reviews from people who have visited them, narrating their experiences. When choosing a lodging, the first thing you want to know is if the place is a good choice. In most cases, certain factors are more important than others, depending on the guest, such as, the cleanliness of the room, if the bed is comfortable, if there is hot water in the bathrooms, the attention of the staff, if there is good Wi-Fi network, the area in which it is located, among several other factors.

A few years ago, hotels analyzed the experience of their guests only through the questionnaires that they answered at the end of their stay. It is very different today, as social media came to change this process the popularity of online reviews and the importance of people's opinion on these platforms is changing the way hotels handle their feedback.

According to Weed (2013), hotels want to know the opinion of their customers about their stay. They no longer consider that it is enough to leave a questionnaire in the room and wait for a response, because of sites like TripAdvisor, specialized in rating, publish customer satisfaction, or dissatisfaction on the web. Therefore, hotels must further consider customer satisfaction as the most important part of their business. The data that hotels collect affects both the way they treat their guests in general and the way they interact with individual travelers. Some questionnaires are now shorter, allowing guests to complete them quickly and send

them to mobile devices to be completed by customers traveling in taxis or waiting at the airport.

New methodologies have made use of emails to question clients about their stay; however, they can seem annoying as an additional email is usually sent if they don't reply the first time. In this way, hotels control what is said about them on social media and travel websites.

SiteMinder (2019) has published eight recommendations for handling customer reviews that hotels can rely on to prevent these reviews from being a detriment rather than a benefit. These points are the following:

- 1) Capture guest complaints before they are made public. For example, having a feedback system in place will give you access to real-time feedback, allowing you to respond to issues as they arise.
- 2) Use social listening tools or a hotel reputation management system with real-time alerts to keep up with what guests are saying on review sites, blogs, and social media.
- 3) In responding to a complaint, you must acknowledge the bad experience, and follow up with the customer as necessary.
- 4) Respond to problems as quickly as possible. The longer they remain unattended, the more they could potentially be out of control.
- 5) Act on promises to clients and move conversations off the internet when necessary to provide a higher level of personalized service.
- 6) Limit the number of different staff who respond to reviews.
- 7) Share customer feedback across the company. Company staff are the front-line brand ambassadors, but only if they understand the challenges and are incentivized to create the best possible customer experience.
- 8) Never assume a defensive posture.

## **Text Analysis Applications and Effectiveness in Results**

The technological development that has been achieved in the last decade has generated an accelerated production of digital information that can be processed, to solve problems and challenges in any situation. Exploring and exploiting the contents of digital textual documents is the work of text mining, with the goal of obtaining relevant information and, in this case, taking future actions to always be improving.

Also, in the last decade there has been a growing interest in the study of customer opinion regarding the services or products provided to offer a better business strategy focused on the experience generated to customers. Opinions are important to almost all human activities because they influence our behavior. When a person

decides, he usually considers the opinion of third parties, to ensure that the decision is adequate or correct. The following table shows examples of how industries in some sectors have taken advantage of the customer opinion study (see Table 14.1).

**Table 14.1:** Examples of customer opinion study.

Sector	Description
Hotel	<p>Case 1: Hyatt Hotels uses text boxes for open questions, numerical scales and check boxes to tabulate and analyze the final opinions of customers in the surveys they take at the end of their stay, where they classify how positive or negative the comments are depending on the words they use, the exclamation points, etc. They also extract comments from Facebook, Twitter, and other social networks, since the first thing other people who want information about the hotel will do is go to the web and the comments. By analyzing reviews, staff can assign them a room away from an elevator based on feedback from a previous questionnaire.</p> <p>Case 2: An urban hotel that heard noise complaints added earplugs to its guest amenity kits.</p> <p>Case 3.: A hotel restaurant that heard complaints about delays in deliveries, decided to increase the number of employees working that area.</p>
Airlines	Based on customer survey feedback on overnight flights, Israel Airlines (El Al) combined food and beverage service so that passengers could finish meals more quickly and sleep earlier.
Cruise ships	The most common customer complaint at Crystal Cruises centered on costly and confusing pricing for internet access, so pricing was simplified.
Computers	Dell Technologies, through open-ended questions, analyzes customer feedback on product and service satisfaction, customer service, and marketing. This company collects, almost in real time, messages, and comments from customers to later carry out a biannual analysis of social networks to detect eventual changes in satisfaction, analyzing more than 30,000 customers on average. In this way, the organization can quickly connect with a customer and offer solutions to the problems detected, avoiding the generation of a “wave of dissatisfaction” that is more difficult to control and correct.
Footwear	The Grasshoppers company incorporated the assessment of texts written by customers into its analytical strategies to provide a better shopping experience and identify areas of opportunity. For this, it was decided to launch a mobile application where customers could register, search for products, buy products and give their opinion on them. The launch of the mobile application aims to record the information used by customers, as well as to integrate a series of innovative tools to position Grasshoppers in the new business technology environment.

Source: Own elaboration with information from Weed (2013), Trujillo (2017), and Panico (2018).

The previous examples show the particular interest that is beginning to be had in certain companies to take advantage of the information generated in business. In the hotel industry, the comments made by customers are much more noticeable

because the services and products offered are highly competitive, so each hotel must distinguish itself. Customer satisfaction has become a key factor in measuring the competitiveness and success of a company; thus, the analysis of raw data from individual consumers can lead to completely new ways of understanding consumer behavior and formulating marketing strategies. Unlike a uniform method, big data takes advantage of various types of analytical tools to use big data to predict trends and obtain commercial value (Ang, Seng, Zungeru, & Ijamaru, 2017).

## **Methodology**

### **Transformations and Assumptions Carried out to Develop the Text Analysis in the Hotel Chain**

In recent years, companies such as Google, Facebook, Amazon, and Netflix have had exponential growth due to the strategic use of technological and digital tools, such as web pages, software, social networks, but above all the use of data. A good data analysis allows the company to know the situation of a company, helps to make correct decisions based on the information found in the data, allows to know which processes are less efficient than others and an infinity of needs that are not noticed at first glance.

The objective of this project was to carry out a sentiment analysis to measure customer satisfaction of an American hotel chain. Comments from the TripAdvisor.com website were used, which were originally extracted by the Information Systems and Databases Laboratory of the University of Illinois at Urbana-Champaign and later presented as a case study (Van der Aalst, Iriondo & Van Zelst, 2018). These opinions were provided by guests after their visit. To fulfill this purpose, all comments contained in the text files, which were provided to us in a notepad format, were compiled into a single database in Microsoft Excel®.

## **Methodological Development**

In total 14,421 comments were collected, which were categorized according to the rating provided by customers on a scale of 0 to 5, with the interval from 4 to 5 being positive comments, the interval from 2 to 3 corresponding to neutral comments and finally from 0 to 1 were considered negative comments. To finalize the data cleaning process, comments in languages other than English or with input errors that made them impossible to understand were eliminated.

Finally, the reviews were ordered according to the date and the place they came from, this was to ensure the quality of the information and avoid errors when



generating a value proposition with the information derived from the data. The comments collected from 2014 to 2017 were analyzed, comprising a total of 9,332 comments made from hotels in three cities, San Francisco, Seattle, and Los Angeles. Since the database was clean and orderly, the SAS Enterprise Miner® software was used to perform a sentiment analysis. Nodes were used that allowed ordering the comments, eliminating words without relevant contribution to the analysis, highlighting the topics that were mentioned most frequently by the guests, categorizing, and identifying the existing relationships between the words used by the clients according to the type of comment (positive, neutral, or negative) and have a complete identification of the causes of these. This process was carried out individually with the three categories of comments.

The main elements of the process are described below:

- 1) **Import file:** Allow loading the clean database and begin the analysis.
- 2) **Analysis of the text (parsing of the text):** Fulfill the function of eliminating words that do not add value to the analysis and allows separating them by category, be it verbs, nouns, adverb, etc.; in the same way, it allows to ignore auxiliaries, conjunctions, interjections, prepositions, pronouns, numbers, punctuation marks, etc. Add a list of stop words in English for more accurate information.
- 3) **Text filter:** Apply filters to reduce the number of terms or documents, this allows you to check spelling, add dictionaries and with the results you can perform a deeper analysis, allowing you to see the link between concepts or even search all documents for a single word, filtering the texts only where it appears (see Figure 14.1).

..	Propiedad	Valor
	Ortografía	
	Revisar Ortografía	Si
	Diccionario	LIB_CHA.ENGDICT
	Pesos	
	Peso de frecuencia	Predeterminado
	Peso de termino	Predeterminado
	Filtros del termino	
	Numero mínimo de documentos	6
	Numero máximo de términos	.
	Importar sinónimos	

**Figure 14.1:** Text filter node properties.

Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version

- 4) **Text cluster:** Allow grouping by similarity between words, in the same way by trial and error it can be adjusted, so that the topics become more and more

specific. As shown in Figure 14.2, it was decided to leave eight clusters with 15 descriptive terms each, in which you can see what the guests talk about the most.

ID del Clúster	Términos descriptivos
1	front +desk +check +valet +shower +bathroom +bed +floor +park +business +free +street +review +toilet +small
2	lodge +chelsea +toilet +subway york +share +nyc +shower +clean + place +small +street +review +recommend +little
3	hotel +staff +location +san +francisco + friendly + helpful union +square hotel + recommend +stay +small +price +clean
4	shuttle +airport +minute +universal lax +flight +free +hollywood +night +pool +breakfast +service +bed +check +los
5	car +cable +wharf +distance +walking +'cable car' +walk +park +fransisco +street +restaurant +san +location union +'great location'
6	location +hollywood +value +kitchen +'great location' +subway +nyc +great +universal +pool +clean +place +helpful york +recommend
7	view +service + pool +floor +beautiful +wonderful +love +time +business +great +stay +nice +room +place great
8	omni +downtown +angeles +los +valet +service +business +park +hollywood +excellent +comfortable +beautiful +bathroom +bed +wonderful

**Figure 14.2:** Clusters resulting from the analysis.

Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version

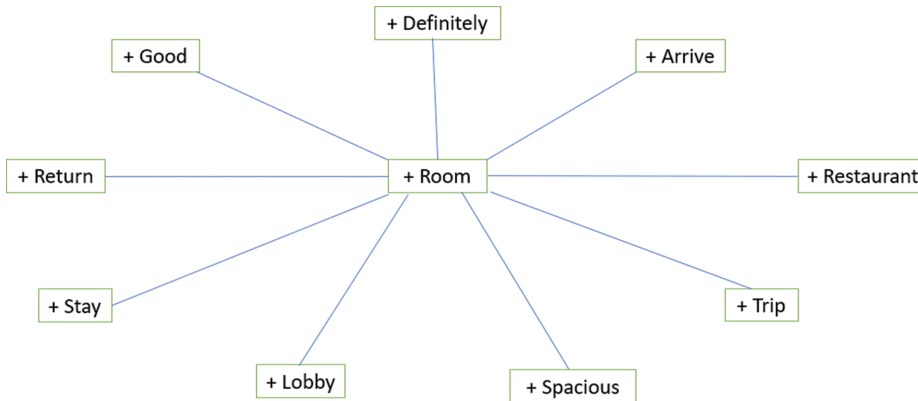
- 5) **Text theme:** Create themes in a group of documents. Depending on the database used, by trial and error it can be adjusted so that the topics are more specific each time providing a more precise analysis.

Finally, the interactive filter viewer was used, which allowed identifying the relationships of each word and determining the following information for each city:

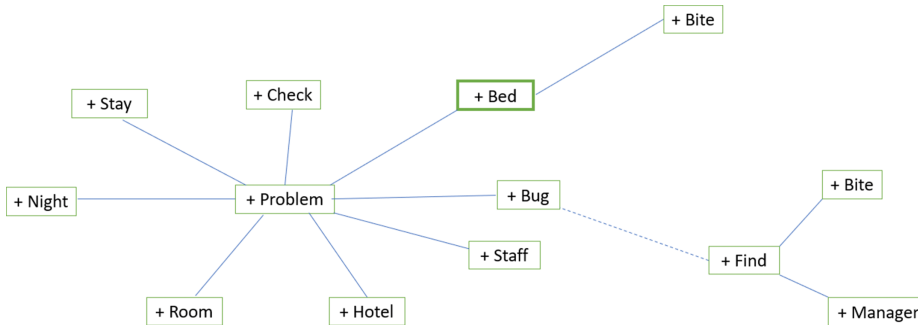
## Los Angeles

The positive comments about the Los Angeles hotel were mainly derived from the good condition of the rooms. Guests mentioned as positive points the comfortable bed found in most of the rooms, the large closet, the marble bathroom and, in general, the decoration of the entire room. They also highlighted the amazing room service provided by the always friendly and helpful staff, the fabulous food from the hotel's well-rated restaurant which guests note has an incredible pool view. Finally, they highlighted the spacious and comfortable hotel, the free parking, and the location, since the hotel is in the heart of Hollywood, obtaining a spectacular view (see Figure 14.3).

As neutral comments, the small size of the pool, the high prices for the SPA service, and the lack of a Jacuzzi and a quiet area where you can study or meditate were mentioned. The negative comments came from unpleasant experiences due to lack of water pressure in the showers, little hot water, and bed bugs. Likewise, customers reported having problems with reservations and the check-in process, as well as bad experiences with the smell and cigarette smoke in the corridors and rooms, even though smoking is prohibited within the hotel's facilities. Likewise, guests emphasize that too much noise is filtered into the rooms from the corridors and neighboring rooms (see Figure 14.4).



**Figure 14.3:** Relationships of the positive terms in the Los Angeles hotel.  
Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version

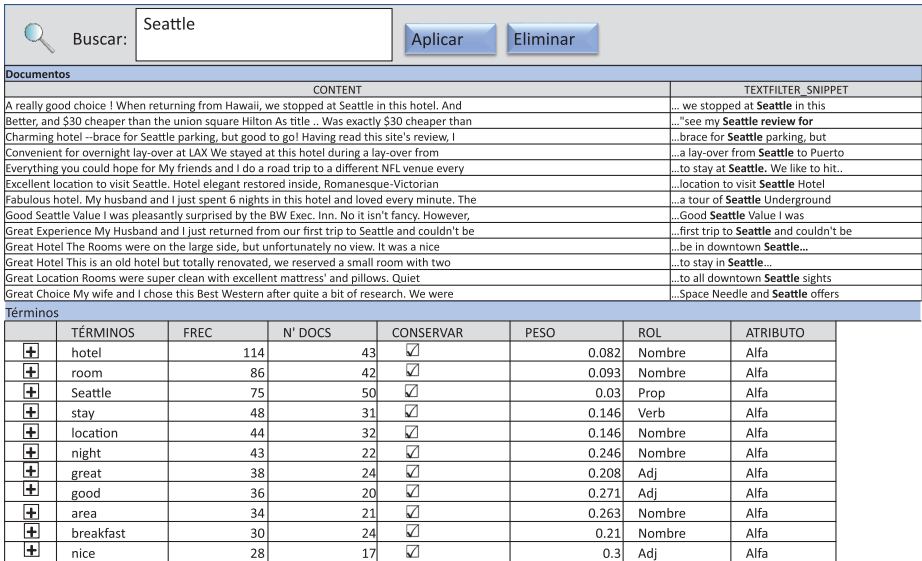


**Figure 14.4:** Relationships of the negative terms in the Los Angeles hotel.  
Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version

## Seattle

As seen in Figure 14.5, the hotel located in the city of Seattle was praised for the cleanliness of the rooms, their comfort and spaciousness, as well as the design and function of the showers. Guests applaud the hotel's excellent breakfast, referring to it as varied and incredibly delicious. The location was constantly highlighted, being an important factor due to the number of restaurants and activities to be carried out near the hotel, in addition to emphasizing the colorful area of the city in which it is located. Finally, the guests appreciated the friendly and helpful treatment of the staff, the beautiful decoration and the great atmosphere that exists within the hotel.

Neutral comments mentioned the lack of cleaning carried out in the common areas and that, even though the hotel is somewhat old, it is kept in sufficient condition

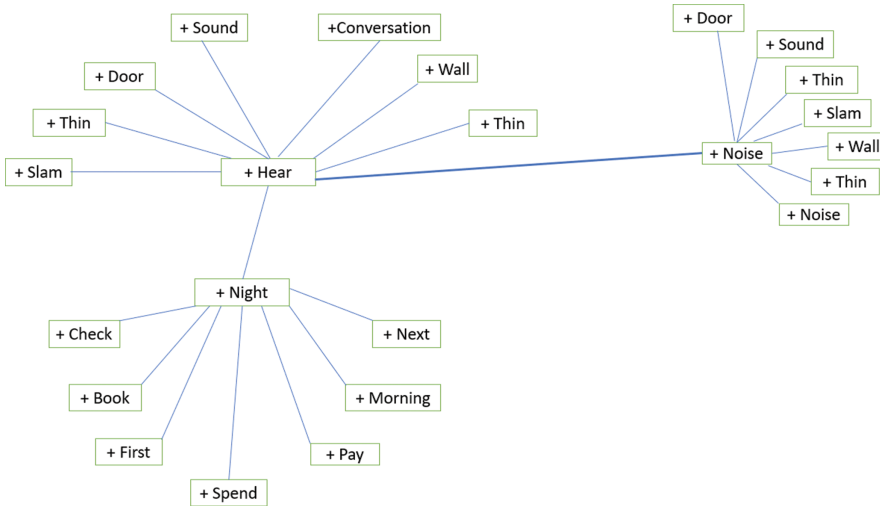


**Figure 14.5:** Most frequent positive hotel comments in Seattle.  
 Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version

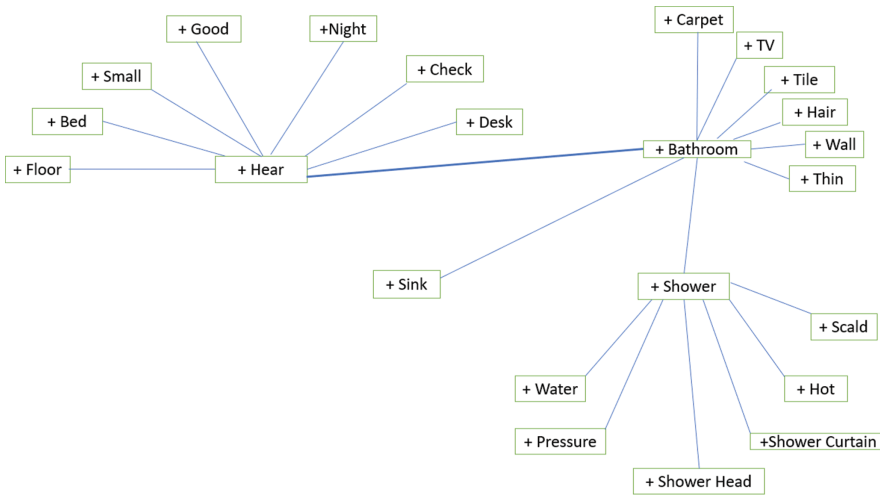
to continue operating. As a negative comment they mentioned the constant noise coming from the nearby highway, the garbage trucks, the police sirens and, above all, the large number of homeless people who are on the outskirts of the hotel that, despite being harmless, can end up being annoying to guests and affect the hotel image. Extra costs for internet and gym services were also a recurring theme. The restaurant was also listed as very small and cluttered, as most of the guests want to take advantage of the previously mentioned excellent breakfast (see Figure 14.6).

### San Francisco

At the San Francisco hotel, most guests highlighted the exceptional attention of the lobby staff, the excellent and central location near most of the tourist spots and a variety of restaurants around, but above all, the city and its fantastic streets with innumerable places to visit and with many attractions. Generally, neutral reviews mention that the hotel was only suitable for short stays, preferably one night. Most guests who provided neutral feedback mentioned that they were visiting the hotel for the first time. It is noteworthy that many guests mentioned the rooms as terribly small, with many failures to maintain the shower and with old and uncomfortable furniture. Despite being central, the location was classified as bad because it is dirty and full of people in the street, which is noteworthy since guests mention that the hotel is in a rather expensive area (see Figure 14.7).



**Figure 14.6:** Relationships of the negative terms in the Seattle hotel.  
 Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version



**Figure 14.7:** Relationships of negative terms in the San Francisco hotel.  
 Source: Own elaboration with SAS Enterprise Miner® software, Spanish Version

**Specific Recommendations for Each Case**

Since a specific analysis was carried out for each of the cities, the following recommendations are proposed to each of the hotels to improve these negative comments.

**Los Angeles**

The main recommendation for the Los Angeles hotel is to verify that the maintenance and cleaning process is being carried out correctly, the constant spraying for pests. Being in constant vigilance to prevent guests from not abiding by the rules and smoking inside the hotel and, verifying the correct functioning of the reservation systems and the ability of the people in charge of checking-in.

**Seattle**

In the Seattle hotel, the recommendations would be to eliminate the cost for Wi-Fi and gym services; create a more business hotel concept where guests only must spend one or a maximum of two nights in it; due to the continuous noise outside the rooms, provide free ear plugs; be in constant vigilance of cleanliness in common areas; expand the restaurant due to the success of the breakfasts it includes, but as guests mentioned, space is limited.

**San Francisco**

The recommendation that is given to the hotel located in San Francisco is a constant maintenance in the showers because it is a complaint with a lot of weight on the part of the guests; remodel the hotel property for one that is warmer and cooler; hire a cleaning company for public spaces to keep the area where the hotel is located clean, because for the cost the guests are paying, they deserve to have a clean space.

## **Conclusions and General Recommendations to Improve the Measurement of Customer Opinion Through Text Analysis**

As a general recommendation, it is suggested that for future occasions in all hotels, a follow-up is carried out with each of the clients mainly with those who leave negative comments, letting them know that their opinion was and is very important for the company and that the necessary actions will be taken to solve the problems that may have arisen during your stay.

On the other hand, it is important to have all the updated guest data, so it is recommended to include sections in the satisfaction survey that request the guest's name, age, and email, always letting them know that the company considers the laws of data protection. These surveys must be carried out electronically at the time the client performs the check-out process if it is intended to reduce the time of data capture and cleaning. An electronic form connected to a database that requests all

this information would be sufficient, if the customer is identified with a unique code. This database could be connected to the reservation database to find out more information about your stay and thus offer even more personalized attention, so it is also suggested to properly identify which hotel each comment comes from to facilitate decision-making in the future.

Through this analysis, many happy clients can be identified, but also many were dissatisfied with their stay; but what if the client can present their complaints before checking out? Hotels are recommended to install a tool that allows guests to always express their opinion. When connecting to the Wi-Fi, and with their reservation number, the client will be able to connect to the network. If they accept, provide their data to a form that will request the software automatically, allowing the client's profile to be identified and subsequently segment them to creating marketing campaigns and improving strategies when it comes to building customer loyalty, always complying with the general data protection regulations. In this way, if the client has a problem when checking-in, with this tool the guest's problem could be solved in a matter of minutes, which would avoid bad reviews when checking-out.

Additionally, in any case it is important to keep in mind the Global Code of Ethics for Tourism, which is a set of principles designed to guide governments, tourism companies, communities and tourists in general, to maximize the benefits of the sector while minimizing possible negative consequences for the environment, cultural heritage and societies. The 10 principles of the code cover the economic, social, cultural, and environmental aspects of the travel and tourism sector worldwide (World Tourism Organization, 2017):

- Article 1: Contribution of tourism to mutual understanding and respect between men and societies.
- Article 2: Tourism, an instrument of personal and collective development.
- Article 3: Tourism, a factor of sustainable development.
- Article 4: Tourism, factor of use and enrichment of the cultural heritage of humanity.
- Article 5: Tourism, beneficial activity for the countries and communities of destination.
- Article 6: Obligations of tourism development agents.
- Article 7: Right to tourism.
- Article 8: Freedom of tourist travel.
- Article 9: Rights of workers and entrepreneurs in the tourism sector.
- Article 10: Application of the principles of the Global Code of Ethics for Tourism.

In recent years, tourism has experienced continuous growth and profound diversification, which has made it one of the fastest growing economic sectors in the world. In addition, tourism is closely related to the development of communities, which is why it has become a key driver of economic progress. Despite the recent economic crises in the United States, Europe and emerging countries, tourism has registered

virtually uninterrupted growth in the last five years. Currently, tourism contributes 10 percent of world GDP (Isik, Dogru, & Turk, 2018).

As a conclusion to the text mining process, it is important to note that this analysis, and the information from it, demonstrate the importance of collecting opinions and reviews from customers. This compilation is not only useful for the hotel industry, but for all businesses that seek to avoid or correct errors, as well as identify possible points for improvement in all their processes, allowing them to better know their consumers and offer products or services that meet all their expectations and needs.

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Alock Gupta, Tanvi Kaushik, Vipin Mittal

# Chapter 15

## Big Data: Impact on Digital Era of Twenty-First Century

### Introduction

In the twenty-first century as digitalization has increased, almost everything is online. Today we use various online platforms, sites, and when we use them, the data is generated, which is in the form of text, audio, video, images, graphics, etc. (Memon et al., 2017). In the COVID-19 situation we have seen or are very aware that everything depends or relies on the internet whether it is about studies, work for office employees, shopping, transaction of money, etc. We also use various social media sites so that we can connect to the outer world like WhatsApp, Facebook, Twitter, and Instagram and when we use them, we generate data in various forms such as photo, video, audio, text, etc. (Khan et al., 2014). Before 2002 there was minimal use of the internet and the data that was generated in a structured form and small in amount did not grow so rapidly (Mukherjee & Shaw, 2016). We could store and process them with the help of databases and MYSQL. But when we talk about current situation without the help of the internet nothing will be able to work. So, when we use the internet for various purposes the data generated is very large, complex, and complicated. For example let's talk of how this data is different from the previous one. Flipkart is an e-commerce website that is very popular today and everyone knows about it. We can do our shopping by using this website. When we explore the site and set a filter for purchasing the desired thing which we want, at the same time millions or billions of users also use this website and a very large amount of data is generated by all of us, and the data is in the form of terabytes, petabytes, and zettabytes (Khan et al., 2014; Ularu et al., 2012). Since this data is very large as well as complex, we cannot store it in the database and the data is growing so rapidly (i.e., within a second or so) we cannot process and access it by using MYSQL. MYSQL and database principles function with structured data, which can be in the form of structured, semi-structured, or unstructured data. The data that is generated today is 90 percent unstructured, which is in any form like text, video, audio, images, etc. (Mukherjee & Shaw, 2016). For instance, when we select some product to purchase and it is in stock, but when we click the payment option then an error screen appears, and we are not able to buy the product: that is because at the same time many users are accessing it. So, we leave this website. We go to another shopping website like Amazon, and we find the same product here and we are able to purchase the same product.

From this example we can see how this large and complex data affects a company or business organization, For example, on Flipkart the data is not managed properly but in the case of Amazon it is better (Khan et al., 2014). Users are shifting from one website to another website, because they dislike the previous one. So, to prevent that we need to arrange, organize, and manage this large and complex data. Because of all these issues a new term is introduced: which is known as “big data,” which is the representation of this large and complicated data.

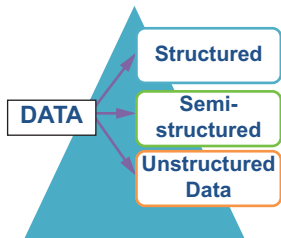
## What is Data?

Data is defined as raw facts, statistics, or figures. It can be in many formats such as text documents, images, audio, or videos. Raw data that is the most basic format of data is processed to produce useful information. Data processing and analysis helps organizations increase their productivity and make business decisions.

## Classification of Data

Data is classified into three categories (see Figure 15.1):

- 1) Structured
- 2) Semi-structured
- 3) Unstructured



**Figure 15.1:** Classification of data.

- 1) **Structured data:** The data that has some predefined data model and can be analyzed. It is in tabular form in which there is a combination of different rows and columns like: SQL Database, Excel file. In these there is a structure of rows and columns on which the data can be stored. It is a model-based data where there is a model that tells how data can be stored, processed, and accessed. It is also known as traditional form of data as the Database Management System (DBMS) was used to store, process, and access the organized data.

- 2) **Semi-structured data:** As the name itself says, “semi-structured”; that is, the data is not completely in the structured form, only half of the data is in structured form. This data does not have any data model like relational database model as in the structured one. The data contain tags and markers so that they can separate the semantic elements.
- 3) **Self-descriptive structure** is another name for it. JSON (Java-Script Object Notation) and XML are two examples (Extensible Markup Language). When opposed to unstructured data, semi-structured data is easier to analyze.
- 4) **Unstructured data:** Unstructured data is data that lacks a predefined data model and is disorganized. Unstructured data is text-heavy, with dates, numbers, and details thrown in for good measure. As opposed to structured data such as audio, video, and NO-SQL databases, this makes it difficult to interpret this data using conventional systems. When it comes to storing and processing this form of data, new technologies such as Apache Graph for storing node relationships and MongoDB for storing documents have emerged.

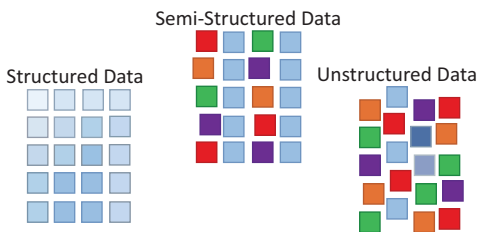


Figure 15.2: Traditional and Big Data.

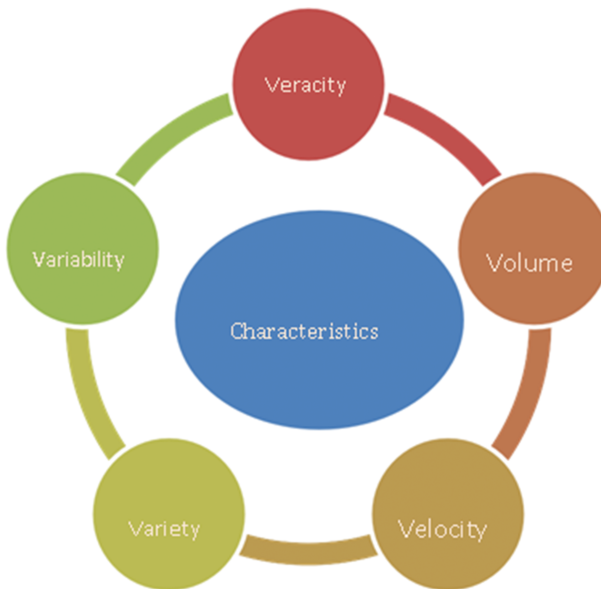
## Traditional Data

Other names for this type of data are small data or structured data. This type of data can be maintained by business organizations using Database Management System (DBMS). In this we use a centralized database for storing and maintaining data in a fixed format or in a file. For managing and accessing the data we use SQL, that is, Structured Query Language. It is generated at enterprise level. The size of data is in gigabytes or terabytes. The data size is very small. It contains only structured data. So, it is easy to integrate the data. We can manipulate data as well in this. The data is in manageable volume that means we can manage our data easily. It is stable as well. The data model is based on strict schema.

## Big Data

This is a term that combines the words “big” and “data.” Big is a word that denotes a broad quantity (Mukherjee & Shaw, 2016). Data is any knowledge that comes in a variety of formats. So, when these two concepts are combined, we get the term “big data,” which refers to data in large quantities and in any form. It refers to data that is massive, fast, and complex, and that can’t be processed using conventional methods. It is the ability to analyze unstructured data, which makes up a huge portion of data in organizations. One of the most important factors driving the growth of big data is the ability to derive value from unstructured data. According to Gartner, big data is data in large quantities that is rapidly increasing, and the data comes from a variety of sources that require cost-effective, new data processing techniques to produce enhanced insight and decision-making (Memon et al., 2017) (see Figure 15.2).

## Characteristics of Big Data



**Figure 15.3:** Characteristics.

Doug Laney, a market analyst, coined the term “big data” in the early 2000s with the idea of the “5 V’s” (Riahi & Riahi, 2018) (see Figure 15.3):

- 1) **Volume:** The large scale of information processed is referred to as volume. The data is larger than conventional data, necessitating more computing and storage capacity at each point of the lifecycle. As the workload grows beyond the capabilities, it becomes a challenge to pool, allocate, and coordinate resources from other Cluster management, and the algorithms can break the task down into smaller pieces.
- 2) **Velocity:** It refers to the rate at which data passes through the device. With the rise of the Internet of Things (IoT), data is moving at a breakneck pace and must be processed quickly. The amount of data flowing is enormous, and it is constant in nature.
- 3) **Variety:** The form of data is varied. Data is available in a variety of formats, including structured, semi-structured, and unstructured data, as well as text, audio, and video.
- 4) **Variability:** It is the volatile flow of data, which means it changes constantly and varies greatly. It's complicated, but businesses need to know when something is trending on social media and how to handle the resulting spikes in data. Essentially, data inconsistency obstructs the process of efficiently handling and maintaining data.
- 5) **Veracity:** It has to do with the data's accuracy. Since data comes from a variety of places, it's difficult to link them, fit them, keep them clean, and convert them between systems. As a result, businesses must link and correlate relationships. Otherwise, the data could become uncontrollable.

## How Big Data came into Existence

There were methods of gathering and storing a large volume of data before acting on it. In 1970, the US Census Bureau began using punch cards to record population data. The invention of the “tabulating machine” processed punch card information much faster than humans could (Memon et al., 2017). We needed a better way to store and access vast amounts of data in the 1940s because there was an outbreak of information. IBM Research Labs published a paper on Relational Databases in 1970, which explains how to find data in large databases more efficiently (Ularu et al., 2012). It's like Excel. The **internet's** development in 1995 paved the way for Web 2.0. Initially, the internet was mostly used for information, and static websites were prominent, resulting in a disappointing user experience. (Riahi & Riahi, 2018) Since the introduction of Web 2.0 in 2004, users have been able to create, distribute, and store their own data in a virtual environment (Riahi & Riahi, 2018). In the mid-2000s, internet users overflowed social media sites such as Facebook and Twitter, resulting in the dissemination of even more data (Khan et al., 2014). Today, YouTube and Netflix have forever changed the way we watch and download video content. HADOOP, a popular open-source platform for storing data and running

applications, was released in 2011. In 2014, the Internet of Things (IoT) would change big data. (Nandhini, 2018) As the world becomes more linked across the internet, businesses are turning to big data to minimize operating costs, increase productivity, and create new products and services.

## Why is Big Data Important?

As we all can see, the development of apps is increasing day by day and everyone is shifting online, including social media, people, and businesses. So, there is a huge amount of data is increasing day by day (Khan et.al., 2014). Take, for example, social media sites, which draw over a million users on a regular basis, allowing them to scale data faster than ever before. So, how is this massive volume of data treated, analyzed, and stored? (Ularu et.al. 2012). This is where big data becomes useful.

## From where does it come? Or Sources of Big Data

- 1) **Black Box Data:** Information provided by planes, such as jets and helicopters. It contains the voices of the flight crew, microphone recordings, and details about the aircraft's performance (Al-Shiakhli 2019).
- 2) **Social Media Data:** Information gathered from sites like Twitter, Facebook, Instagram, Pinterest, and Google+.
- 3) **Stock Exchange Data:** This is information from stock exchanges regarding customer share selling and purchasing decisions.
- 4) **Power Grid Data:** This is information from power grids. It stores information about specific nodes, such as consumption statistics.
- 5) **Transport Data:** This includes a vehicle's size, model, availability, and distance traveled
- 6) **Search Engine Data:** One of the most important sources of big data is search engine data. Search engines rely on large databases for their information.

## Pros of Big Data

- 1) **Better decision-making:** It has aided the decision-making process in a more significant way. Companies are using big data analytics before making any decisions, rather than making them anonymously (Ularu et al., 2012). For a better decision-making process, a number of user-based considerations are taken into account, such as what the consumers want, the solution to their issues, analyzing their needs according to business patterns, and so on. The level

of satisfaction and loyalty of a company's customers can be used to gauge its performance. Nothing will stop them from expanding if they give their customers what they want.

- 2) **Greater innovations:** They are important for success of any organization. For innovation we need data in bulk. big data gives us the freedom to achieve what we want. Companies use big data to evaluate various consumer perspectives on their goods and how they are perceived. It tells them exactly what they're missing and what the most important considerations are when creating a new product. This aids them in designing innovative products that meet the needs of their customers. Big data serves as a backbone to the Internet of Things (IoT). Take, as an analogy, self-driving vehicles, which are currently in progress and will become a reality in the not-too-distant future. As the name implies, this is a car that does not need a driver and is capable of driving us to our destination on its own. These vehicles are outfitted with several equipment, including sensors, cameras, cloud architecture, and so on. It recognizes a large amount of traffic data, road conditions such as speed breakers, sharp turns, and so on, and then processes the data and makes driving decisions.
- 3) **Education sector:** It is unbelievable how it handles data relevant to students at an educational institute. It is not currently in use, but it should be. Teachers find it difficult to handle the data because it is so big. Analysis can be used to quantify the skills of students based on data, allowing teachers to better build their students' futures. Teachers become very conscious of their students' strengths and weaknesses and can help them.
- 4) **Product price optimization:** Big data is used by businesses to refine the prices they charge their customers (Memon et al., 2017). Their main aim is to set the prices in such a way that their profit is maximized with the use of big data. They set their product's price according to the customer's willingness to pay under different installments or circumstances. They want the customer to get value for his money.
- 5) **Recommendation engines:** Consider the possibility of receiving recommendations based on our past and current choices made on different online platforms. Isn't it much easier to live when we have the choice of choosing from things we enjoy? People's attitudes toward different online outlets have shifted because of this. We're all more at ease being involved on these channels now. Various online shopping sites are the best example of this. What exactly do they do? They examine each customer's data and make recommendations based on it. These suggestions are based on the behaviors we engaged in the last time we visited the website, and they are also based on consumer comparisons. Who searched for or bought similar stuff? Online networks have broken down physical walls between us and them in this way. Flipkart is the most well-known example.

- 6) **Lifesaving application in healthcare industry:** Centered on the electronic health record of patients, it assists physicians in providing advanced and high-quality treatment to patients. It improves healthcare organizations' operating performance and encourages them to make improvements. By identifying unknown associations and invisible patterns, it enables doctors to find a better cure for disease. It can also be used to find a cure for a disease like cancer (Memon et al., 2017; Mukherjee & Shaw, 2016).

## Cons of Big Data

- 1) **Data quality:** Since most big data is semi-structured or unstructured, quality isn't always consistent. For this reason, data analysts must ensure that the information gathered is reliable. Its format should be suitable. If these issues are effective, they will cause a problem (Nandhini, 2018; Acharjya & Ahmed, 2016).
- 2) **Rapid change:** As technology advances, it improves and becomes more advanced than previous iterations. As a result, many businesses are unable to meet the demands of developing these resources. It may often result in a business disaster (Khan et al., 2014).
- 3) **Lack of professionals:** Big data analysts are people who evaluate big data to find useful information for growing a company's productivity. However, people with this expertise are not always accessible (Ularu et al., 2012). The number of people capable of working on big data analytics is decreasing. As a result, it is one of the major drawbacks.
- 4) **Cyber security risks:** There is a lack of security. Big data necessitates a lot of storage, and data that isn't properly stored can be hacked. Data security is disrupted due to a lack of facilities (Acharjya & Ahmed, 2016).
- 5) **Cost factor:** Big data analytics is a costly procedure. Hardware, storage, and servicing, infrastructure, tool implementation, and recruiting talented workers are just a few of the extra costs. Working on big data research needs a significant investment of time and effort (Riahi & Riahi, 2018).

## Applications of Big Data

Over the past few years, big data has acted as a major game changer in a variety of industries. Big data applications are designed to assist businesses in making more informed business decisions by analyzing vast amounts of data. It has a major impact on a variety of areas, as follows:

- 1) **Finance:** The financial organization is reliant on its data, and protecting it is one of the most difficult tasks facing any financial institution. After income,



data is the second most important thing to them. Financial institutions were among the first to use big data and analytics. Financial companies use big data for fraud prevention, risk analysis, and other purposes. Instead of focusing on security issues, they are now focusing on delivering quality services to their customers. MasterCard, for example, uses a lot of big data. They have saved billions of dollars thanks to their big data fraud detection technique (Mukherjee & Shaw, 2016; Tarekegn & Munaye, 2016).

- 2) **Telecom:** It is at the heart of every digital transformation taking place anywhere on the planet. As the use of smart phones grows, the telecom industry is being overburdened with large amounts of data. Companies can provide strong access to customers by using big data and analytics, as well as eliminate all network obstacles that customers face. Companies can now monitor the areas with the lowest and highest network traffic and adjust network access accordingly. Big data has aided the telecom industry in gaining a better understanding of its customers (Mukherjee & Shaw, 2016; Tarekegn & Munaye, 2016).
- 3) **Travel industry:** For many people, getting a stress-free travel experience is a pipe dream. Travel companies can now have more personalized travel experiences thanks to big data and analytics. They now have a much better understanding of our specifications. From supplying them with the latest deals to being able to make real-time recommendations. For any traveler, big data serves as a reference.
- 4) **Media and entertainment industry:** It's all about creativity and career opportunities. It's like a work of art when it comes to big data. The aim of this industry is to keep customers happy. To do so, they must provide new content to their customers to keep them engaged with their company. The recommendation engine plays a significant role in this. Today, audiences expect content that is tailored to their preferences (Ularu et al., 2012), content that is different from what they've seen before. Companies used to distribute advertisements at random, without any research. However, they are now providing advertisements that draw customers and broadcasting them at times when they are most likely to be seen. Netflix, the world's most popular internet streaming service, uses big data in its recommendation systems. Let's say we've finished watching a Netflix series and then get recommendations for other shows of the same genre that we like. This occurs because of big data's recommendation engine.

## Big Data Analytics

### What does this imply?

This is a concept that combines the words “big data” and “analytics.” Big data is a concept used to describe a set of data that is massive, increasingly increasing, and

complex in nature. The amount of data in this is enormous. Using mathematics, statistics, predictive modeling, and Machine Learning Techniques, analytics is used to derive relevant patterns in data and find hidden patterns, consumer preferences, and another useful knowledge (Al-Shiakhli, 2019). As these two words are combined, the result is big data analytics. It collects through a vast volume of data to uncover secret trends and other insights. With today's technology, we can analyze our data and get answers or facts from it almost instantly. In other words, we can conclude that by applying advanced analytical techniques to very broad, complex big data sets that include structured, semi-structured, and unstructured data from a variety of sources and sizes ranging from Tera bytes to Zeta bytes, we can achieve this. We can make smarter and quicker decisions, model future outcomes, and forecast future outcomes with big data analytics. Companies implement it as they want to make more informed business decisions (Riahi & Riahi, 2018). It provides various advantages for better decision making, preventing fraudulent activities, among other things as well.

## What is the Aim of Big Data Analytics?

It is important for all industries. Take Spotify as an example of a music streaming site. Our definition is clarified because of this illustration. Every day, the company's millions of users produce a vast amount of data. The cloud-based platform uses this to create a recommended song list using a smart recommendation engine based on our likes, shares, and search history, among other factors. The outcome of big data analytics is this. If we use Spotify, we have the top recommendation section, which is based on our preferences, experience, and other factors. We use a recommendation engine that employs data filtering tools to gather data and then filter it when operating on an algorithm.

## Types of Analytics

- 1) **Descriptive analytics:** It explains or summarizes current data using existing business tools to gain a clearer understanding of what is happening or has occurred (Riahi & Riahi, 2018).
- 2) **Diagnostic analytics:** It reflects on past results to figure out what went wrong and why.
- 3) **Predictive analytics:** It uses mathematical models and machine learning techniques to forecast potential outcomes.
- 4) **Prescriptive analytics:** It recommends one or more course of action to analyze the data.

## Tools for Analyzing the Data

- 1) **HADOOP**—It allows in the storage and analysis of data.
- 2) **MONGODB**—This database is used for constantly changing datasets.
- 3) **Talend**—Talend is a data integration and management tool.
- 4) **Spark**—This program is used to process and analyze vast volumes of data in real time (Khan et al., 2014).

## HADOOP: What exactly is HADOOP?

Apache Hadoop is a Java-based open-source software platform for data processing and storage in big data applications (Yaqoob et al., 2016). Hadoop works by distributing large data sets and analytics workloads across nodes in a computing cluster and breaking them down into smaller workloads that can run concurrently (Ularu et al., 2012). It can handle structured and unstructured data, and it can scale from a single server to thousands of machines.

## What is Hadoop's Evolution?

Hadoop grew from the need to process vast amounts of data. It is based on Google's MapReduce programming model, which divides an application into small chunks or sections that can run on different nodes. When Doug Cutting and Mike Cafarella were working on the Apache Nutch Project in 2002, they came up with the idea for Hadoop. (Khan et al., 2014) Doug called Hadoop after a toy elephant his son had. Yahoo released Hadoop as an open-source project in 2008, after a few years of development. In November 2012, the Apache Software Foundation made Hadoop available to us.

## What is the Significance of this for Big Data Analytics?

It allowed businesses to analyze and query large data sets in a scalable and cost-effective manner using free, open-source software (Riahi & Riahi, 2018). It's a replacement for data warehouse solutions and closed data formats, which dominated in previous years. As a result, HADOOP paved the way for potential big data analytics advancements.

## Core HADOOP Modules

- 1) **(HDFS)**: HDFS refers to Hadoop Distributed File System. Huge datasets can be shared across nodes in a cluster using HDFS (Ularu et al., 2012).

- 2) **YARN:** YARN refers for Yet Another Resource Negotiator. It's used to control cluster resources, organize activities, and schedule work (Riahi & Riahi, 2018).
- 3) **MapReduce:** This is a programming model and large data processing engine that is used to process data sets in parallel. In HADOOP, it was the only execution engine available (Ularu et al., 2012).
- 4) **Hadoop common:** This module offers a collection of resources to help the other modules work together (Memon et al., 2017).

## Benefits of using HADOOP

- 1) **Scalability:** Traditional systems have a data limit at the end. Hadoop is scalable because it operates in a distributed environment. This allows data creators to make their own data pools. First data lakes are a form of centralized data repository that can store both structured and unstructured data. It is a low-cost object storage system with an open format that allows a wide range of applications to access data.
- 2) **Resilience:** HDFS is a resilient file system. To compensate for the possibility of hardware or software failures, data stored on any node of a Hadoop cluster is duplicated on other nodes of the cluster. This satisfies the fault tolerance requirement. There is always a backup of data available in the cluster if one node fails (Riahi & Riahi, 2018).
- 3) **Flexibility:** Hadoop allows us to store data in a variety of formats, including semi-structured and unstructured data. It enables companies to gain access to new data sources (Ularu et al., 2012).

## Challenges in HADOOP

- 1) **Complexity:** HADOOP is a low-level, JAVA-based technology that can be tough to work with for users. HADOOP architectures necessitate physical activity and facilities to set up, manage, and improve.
- 2) **Performance:** Hadoop performs computations by performing repeated reads and writes to disc, which is time consuming and inefficient as compared to frameworks that want to store and process data in memory as often as possible.

## Conclusion

We began by studying about data, its types that are structured, semi-structured, and unstructured. Then we looked at traditional data. To overcome the drawback of this traditional data, big data comes into play. Big data is characterized as a large collection of complex data that is structured, semi-structured, or unstructured and is rapidly increasing. We explored how it came into existence and its importance, also its concept of 5v's (i.e., volume, velocity, variety, variability, and veracity); its advantages and disadvantages, and about its applications in various places such as in entertainment, healthcare, education sector, etc. We also discussed the term big data analytics, which is used to capture, process, clean, and analyze massive datasets to help businesses operationalize their big data. We learned about the significance and value of analytics, as well as the different forms of analytics such as Descriptive, Diagnostic, Predictive, and Prescriptive. Various data analysis tools, such as Hadoop and Spark, are available. We looked at the Hadoop tool which is used for storing and processing large data sets in any format. We've seen what it does, how it has evolved, how important it is, what benefits it has, and what problems it has.

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## Chapter 16

# Enhanced Customer Experience through Reasoned Big Data Analytics Strategies

## Introduction

The term customer experience was first coined by Holbrook and Hirschman (1982) and refers to a “subjective state of consciousness” that takes customers’ cognitive and behavioral processes into account. Later, Gronroos (1988) simplified the concept of customer experience (CX) by stating that customer experience is a phenomenon that forms in them depending on their perception of service quality when they interact with sellers at different stages of the buying process. From the marketing perspective, CX considers customers’ every encounter with an organization that includes the prepurchase, consumption, and post-purchase phases (Codeluppi, 2001; LaSalle & Britton, 2003). In order to provide the desired CX or improve CX, organizations usually focus on multiple touchpoints, rather than the whole customer journey, for direct or indirect interactions with their potential and existing customers (Kuehnl et al., 2019). It has been established in previous studies that CX notably influences customers’ cognitive and affective buying behavior (Berry et al., 2002; Cetin and Dincer, 2014). In addition, the concept of CX has been studied from a variety of perspectives, namely, extraordinary experience (Arnould and Price, 1993), relationship experience (Payne et al., 2008) and prepurchase and actual service experience (Edvardsson et al., 2005; Winsted, 1997). Effective CX has been found to be a source of competitive advantage over an organization’s competitors (Lemon & Verhoef, 2016).

Big data refers to large sets of data that could be structured, unstructured or semi-structured (Oussous et al., 2018). BDA requires sophisticated technologies and complex data analytical skills to produce meaningful information that traditional business analysis tools can’t deliver (Kietzmann et al., 2018; Sivarajah et al., 2017). BDA allows organizations to extract meaningful insights from a huge amount of data that further assist them to adopt better and more effective customer-centric strategies (Gupta & George, 2016), by utilizing a wide range of industry, competitor and market trend-specific data to make better customer-centric managerial decisions (O’Brien & Marakas, 2005; Said et al., 2015). BDA scholars have characterized big data into seven main categories, namely, volume, velocity, variety, veracity, variability, visualization, and value (Kietzmann et al., 2018; Sivarajah et al., 2017; Wedel & Kannan, 2016). Previous studies on CX and BDA reported somewhat mixed findings. While Wedel and Kannan (2016) and McColl-Kennedy et al. (2019) found BDA benefitted organizations to a great extent in enriching their CX, Said et al.

(2015) and Villarroel Ordenes & Zhang (2019) reported that organizations still found it challenging to utilize BDA to generate meaningful customer insights to better handle their CX.

In an effort to further enrich the literature on CX and BDA, we have summarized some key existing literature to give marketers and practitioners a clear indication about how to manage and deal with BDA effectively to extract the most meaningful customer insights to improve or update their CX. At the end, we have put together a few exciting research areas for future CX and BDA research.

## **Brief Theoretical Background**

### ***Customer Experience (CX)***

In the context of the business world, CX refers to the touchpoints that a customer encounters when dealing with an organization, which eventually form an overall experience in the customer's mind about the organization (Homburg et al., 2017; Payne et al., 2008). Meyer and Schwager (2007) viewed CX as organizations' direct or indirect contact with their existing or potential customers that turns into an overall experience in customers' minds.

In a relatively new study by Molinillo et al. (2020), CX has been viewed from the perspective of customers' affective and cognitive processes. It has been found that positive CX makes customers satisfied, increases their revisit and repurchase intentions and makes them loyal to an organization (Edvardsson, 2005; Homburg et al., 2017; Verhoef et al., 2009).

In the current literature, it has been established that positive CX is crucial for every organization's success; however, scholars haven't managed to reach a consensus regarding what forms CX (Mahr et al., 2019). Some scholars conceptualized CX based on only one dimension (Siqueira et al., 2020), whereas other scholars conceptualized CX from multiple dimensions, namely, physical, social, cognitive, sensory, and emotional (Keiningham et al., 2017; Keiningham et al., 2020; Mahr et al., 2019). Regardless of the lack of consensus about what forms CX, most of the scholars agreed on the fact that positive CX increases revenues, customer satisfaction and brand image (Homburg et al., 2017; Keiningham et al., 2020; Mahr et al., 2019).

### **Big Data Analytics (BDA)**

The seven big data characteristics, as we mentioned earlier, have enabled BDA to play an important role in the effectiveness of organizations in terms of meeting the requirements of customers, understanding market trends, and increasing their revenues (Kietzmann et al., 2018; Sivarajah et al., 2017). In the context of CX, it is important for



organizations to become aware of their customers' insights. BDA has made that possible by transforming raw data into meaningful information by following a set of complex algorithms (Said et al., 2015). Organizations use CX insights that they have extracted from their raw data through BDA for decision-making on various aspects, especially to ensure positive CX. Organizations across a variety of industries, namely, retail, health, and tourism, have been using BDA for meeting their customers' expectations. Despite the importance of BDA in ensuring positive CX for organizations, there are no clear strategies that organizations can always follow for guaranteed success. In the next section, we will briefly discuss some effective strategies in this regard.

## Effective BDA Strategies for Enhanced CX

It has emerged from the literature that BDA provides many possibilities to practitioners to unlock clear customer insights for enhanced CX, but, at the same time, it imposes challenges on practitioners (McColl-Kennedy et al., 2019). Therefore, it is imperative to have some clear strategies about how to use BDA effectively to enhance CX to increase organizational capabilities (Homburg et al., 2017). Holmlund et al. (2020) came up with a framework of six stages, namely, strategize, assess, examine, decide, implement, and learn, to make effective use of BDA for enhanced CX, which is congruent to Alharthi et al.'s (2017) study in which they stated the importance of BDA for offering better or improved customer experience to ultimately improve an organization's profit margin and competitiveness over others. These stages have been briefly discussed below, along with our propositions that have been further supported by the existing literature:

- Whether an organization wants a short-term or long-term strategy for their enhanced CX through effective BDA, and whether the entire customer journey is going to be dealt with or just a few touchpoints, should be carefully decided. We propose that organizations identify the key touchpoints first that need immediate attention, rather than dealing with the entire customer journey in one go, as this might make the entire process slower and somewhat inefficient (Homburg et al., 2017; Ransbotham et al., 2015).
- What kind of CX insights (e.g., attitudinal or behavioral) and BDA (e.g., descriptive or inquisitive) would be required to improve an organization's CX, needs careful consideration. It should also be considered whether an organization has the in-house expertise to extract insights through BDA and whether the management is skilled enough to interpret the big data insights for the desired CX improvement. We propose a benchmarking audit in the relevant industry for organizations to identify the best practice regarding the type of CX insights, BDA, and the required management skill sets (Ransbotham et al., 2015).

- It must be decided what kind of CX data (e.g., structured or unstructured) would be required for the BDA for an organization. Ownership of the CX data must be carefully determined, as well, at this stage. Importantly, any privacy, ethical, or legal concerns also must be addressed here in relation to the data acquisition and data uses. We propose that organizations monitor these areas on a regular basis to ensure regularity compliance and avoid any ethical or legal consequences (Martin 2015; Martin 2018).
- Whether the captured CX data is sufficient to extract the aimed CX insights is an important area of focus. If not, will the organization require external expertise? Or can the in-house expertise still be used? Regardless of the decision, the associated cost and benefits need to be measured before moving further. When seeking assistance from an external expert entity that is instrumental and cost-efficient, we propose that an organization chooses the most suitable one from the available options (Popovic et al., 2018).
- The people necessary to be involved in implementing enhanced CX for an organization need careful scrutiny. It is crucial to decide here how to measure the success or failure of the enhanced CX of an organization once the solution has been implemented and how to troubleshoot any technical issues if they arise. We propose that to measure the performance in this regard, an organization should take data related to total sales, total revenue, market share and customer satisfaction into account and compare them with the same data of the past couple of years (Mela & Moorman, 2018; Mikalef et al., 2019).
- Reflection connected with a feedback loop is critical here on the positive or negative outcomes of the BDA-actuated CX insights. All the relevant organizational stakeholders should be informed about the insights of the reflection and the relevant challenges, thereby enabling challenges to be better handled or avoided in future. We propose that intra-team involvement is required in the learning process to further improve the CX through BDA (Jacobs & Moore, 2017).

While the above strategies could enhance organizations' CX, organizations still need to deal with some BDA-related challenges to draw out the desired CX insights from the data sets available to them. Some of those key challenges and the relevant possible remedies have been briefly discussed below:

## **Overcoming the Challenges of BDA For Enhanced Cx**

To fully embrace BDA to deliver the desired CX to customers, Alharthi et al. (2017) identified some relevant challenges, namely, infrastructure readiness, the complexity of data, lack of skills, privacy and cultural barriers that hinder organizations' ability to do so. In other studies, as well, BDA's significance in enhancing customer

experience has been implied along with the relevant challenges, namely, quality of data, availability of data and systematic challenges (Ghani et al., 2019; Gupta & George, 2016; Wang et al., 2016). To address the challenges, some proposed strategies are outlined below (Alharthi et al., 2017; Ghani et al., 2019; Gupta & George, 2016; Wang et al., 2016):

- Widely available hardware devices that are competitively priced and somewhat interchangeable with other devices should be used by organizations (Trelles et al., 2011).
- Organizations should use established software tools (e.g., Hadoop) that are reliable, efficient, and price-competitive to extract CX insights from the complex data sets (Douglas, 2013).
- Hands-on training of employees who will be dealing with BDA to extract CX insights needs to be ensured. In this regard, organizations can collaborate with external training providers who are familiar with the industry requirements (Miller, 2014).
- The protection of the sensitive data of customers should be carefully handled by organizations; therefore, they need to incorporate the relevant legislation into their policies and practices (Schadt, 2012).
- The incorporation of BDA and CX into an organization’s vision is critical to ensure a smooth cultural change (McAfee & Brynjolfsson, 2012).
- Data quality-related challenges often make an organization’s BDA process somewhat inefficient when extracting the desired information mainly from user-generated data as they are commonly unstructured and qualitative in nature (Ghani et al., 2019). Organizations should spend more time cleaning and structuring the gathered data, using a relevant machine language, before conducting the analysis (Wang et al., 2016).
- To deal with the issue of data availability, organizations should gather an entire dataset before the BDA starts (Ghani et al., 2019). It is worth noting that adding new data during or after the BDA process is acceptable on a small scale. To better manage the availability of data, organizations should proactively integrate internal and external data (Gupta & George, 2016).
- To deal with systematic challenges of BDA that involve system architecture, data processing platforms and energy efficiency, organizations can take cluster computing into consideration (Wang et al., 2016).

While dealing with BDA-related challenges in extracting the desired insights into customer experience or expectation, we need to consider that there is no flawless solution and there is always room for improvement. We propose that organizations consider information from other sources as well to crosscheck the CX insights that have been extracted through BDA for better and effective customer CX.

## Future Research Directions

To further strengthen the concepts of CX and BDA in the literature, as well as for practitioners, we have put together some key future research directions based on the explicit and implied insights from current literature.

- The concept of CX should be redefined, considering it can be viewed from a variety of perspectives (Holmlund et al., 2020). Ideally, the ecosystem of customers should be considered, which will provide organizations with extended scope to gather more meaningful CX insights (Jain et al., 2017).
- It is also important to come up with more ways to generate CX insights (Holmlund et al., 2020). Especially in the context of BDA, it is not yet clearly stated how to generate a variety of CX insights from the relevant data sets. Further attention should also be paid to explaining how CX insights could be meaningfully interpreted.
- It is known that customer experience varies from channel to channel when dealing with a particular organization (Verhoef et al., 2009). A comparative study for a variety of channels in the context of measuring the effectiveness of CX through BDA would be useful (Brun et al., 2017; Fernandes & Pinto, 2019; Shi et al., 2020).
- Customers from different countries could be somewhat different, based on a variety of social dimensions. Therefore, it warrants further studies in the context of CX and BDA to see how people define and perceive CX in different countries (Brun et al., 2017; Rather, 2019; Roy, 2018).
- In the context of BDA, across industries, there is a need for further research to develop a framework to manage organizations' total CX (Holmlund et al., 2020; Jain et al., 2017). In doing so, resources available to organizations, such as skills, work experience and technologies, should also be taken into account.
- In line with the concern for global sustainable development, dimensions of social causes and societal well-being could be considered in future when developing a framework to deal with organizations' CX through BDA (Jain et al., 2017).
- While a few studies have been conducted on the concepts of CX and BDA in the B2C setting, the same for the B2B setting is yet to be explored, especially as an individual customer could be somewhat different from a business customer (Mclean, 2017; Zolkiewski et al., 2017).

## Conclusion

In this chapter, we focused on putting together all the relevant strategies in the context of CX and BDA based on the available literature. In addition, we also discussed how to overcome the relevant challenges while implementing those strategies.

Finally, we discussed some interesting future research directions for CX and BDA research. It is believed that the discussed information will enrich the current literature on CX and BDA and greatly benefit practitioners from a variety of industries.

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Rohit Malhotra

## Chapter 17

# Asymmetries in Concepts of Digital Asset Pricing Sustainability Literature

## Introduction and Conceptual Overview

It is well established that the gross domestic product (GDP) at real prices is not the right measure of economic growth. The welfare component is measured by consumer and producer surplus, together, with the advent of digital information, more interesting and innovative measures of user-driven satisfaction can be derived (Coyle, 2017).

Digital platforms as an aggregate resource in improving the overall performance of the economy are not appraised fully in the form of a national indicator since GDP considers factor costs at market prices (considering complete markets), which is not realistic (Simon, 1991). Similarly, the component of the digital economy in the overall welfare cannot be measured with the assumption of symmetric information and complete market assumptions.

Hence, the underlying philosophy of dynamic pricing for digital platforms is a reasonable preposition since prices are driven by idiosyncratic and time-inconsistent factors. The present work is going to discuss the literature attempting to understand and analyze the possibility of providing a comprehensive conceptual digital platform pricing framework for its sustainability and growth.

Brenner (2018) explained how digital imperatives, the digital ecosystems where the customer-centric approach of providing single window solutions and products, is the need of time. This according to the author is achieved by integrating theoretical postulates from contingency theory, transaction cost theory, resource-based approach, and shared-value logic. Another important view is that often balance sheet assets need to include data and customers as they bring value and revenue to businesses in the digital age.

Chicago Gazzola, Colombo, Pezzetti, and Nicolescu (2017) described the three hypotheses about the competition and consumer skills enhancement, about his/her skills about sustainability product laws, and later improving his/her engagement with the product/service. However, the responses collected were not dynamically acknowledged and no phenomenological study was conducted to support the seven hypotheses mentioned in the article.

## Theoretical Constructs

### DA Pricing and Static Versus Dynamic Pricing Framework

The article demonstrates the digital platform theory where firms use digital technology infrastructure for matchmaking, that is, complex resource allocation to match demand and supply between the economic actors in the system. The article empirically explains the principles of the digital platforms pricing process as predetermined pricing where the products are usually static, versus, dynamic pricing, where the prices are decided in real-time based on demand and supply matching among the economic actors as stated above. Digital platforms provide extensive direct and indirect or crossover network effects and thus help organizations reduce their marginal costs substantially. The article uses four theoretical principles of digital platform theory namely relationship building, governing transactions, motivating innovation, and curating matches using the case study.

Hence, theoretically, the digital platform can command high prices (both through licensing and through dynamic pricing) only when they ensure a highly positive coupling in the relationships among actors, providing freedom for generative exploration, curating matching through the sophistication of algorithmic architecture, have orchestration symbolizing proper incentives for ecosystem players in the digital space.

## The Methodology used in this Study

Before delving further into the subject, an important point on the choice of unique methodology needs to be highlighted.

The methodology chosen in this essay does not either proliferate to pure quantitative or pure “explications,” it is the middle path in which the author’s amalgamated “diverse viewpoints” expressed in the earlier empirical studies on DA, digital economics, and its sustainability issues.

To give more scientific parlance, one can imagine this study resembling “asymmetric discourse studies” although unlike the use of “language” and its phenomenological justifications, the author limits his understanding to developing a simple yet meaningful time-invariant conceptual model of digital asset (DA) sustainability. The model is thus a manifestation of one of the dimensions in which the author has tried to summarize his views after “converging” diverse literature about the complexity of DA sustainability.

## The Terminologies used in the Study

- 1) **Digital asset:** In this essay, a DA essentially means a long-term content (usually more than 12 calendar months from the date of creation and its commercial launch). The essay specifically excludes bitcoins or cryptocurrencies as they are purposefully used for short-term speculative trading.
- 2) **Complex digital asset:** The complex DA essentially means digital content that has a significant investment and a comparatively “complex” front-end and back-end development process involved.
- 3) **Static digital asset:** Static DA essentially means that digital content or digital platform on which essentially one-time investment was desired for its long-term sustainability and only a static or reasonable lower maintenance cost is targeted for its upkeep.
- 4) **Dynamic digital asset:** In this essay, dynamic digital asset refers to any digital content on a digital platform that has time-variant requirements of price changes due to R&D and innovation required to ramp up the features for users.
- 5) **Digital consumption:** Essentially specifies any form of digital content consumption.
- 6) **Sustainability of digital asset:** This is unlike bitcoin prices that have unlimited or undefined periods, unless trading ceases and such bitcoin traders delist them from terminals. The sustainability of digital content (as used as a DA in this essay) is concerning the content that is curated with a purpose in which the digital platform creator is essentially looking for a dynamic pricing process that matches with customers and reduces completion significantly.
- 7) **DA sustainability:** To improve the longevity or sustainability of a digital asset, using the strategies (1–4) described later, sustainability can be achieved by a “hybrid” combination.

## Asymmetric Literature Review

Developing and sustaining a DA strategically never remains in control of a single entity. The platform developers, the advertisers, and other technology or digital entrepreneurs and consumers share the space of deciding the sustainability or useful life of the digital asset.

For DA, the pricing process is cumbersome since it is important to justify how the price translates into the optimal distribution of margin. Essentially, this seems a complex discussion since for an end consumer, the entire approach is application usability, its usage, comfort, and leisure appeal, and so on. For an end-consumer defining a technical viewpoint is not possible. And thus, who brought the maximum user

experience in terms of revenues or margins becomes a never ending challenge. Thus, pricing a DA at the optimal time of its life becomes a tedious task.

Morton et al. (2019) had explicitly described a concept of tipping in the digital platform markets. Tipping means that digital platforms essentially are highly concentrated markets with the ability to provide “complements” (in the form of innovative apps). These complements attract and retain customers thereby increasing the economies of scale and scope for digital players.

Goldfarb and Tucker (2019) described an intriguing situation where digital consumption of a leisure product could sustain a longer life cycle even without technological breakthroughs. So, under such circumstances pricing issues dominate in terms of context and appearance which become core aspects of brand consciousness. Now, scaling up such brand-loyal DA or product is not advisable unlike what happens in the case of the physical goods industry. You can see this in the example that consumers who visit online grocery stores would not like to see the same format in their mobile or web app and a creative appearance like a banking site.

DA generate enormous data, and due to compatible analytics data software, today it is far easier for economists studying DA to examine the end-user experience and other key participants in sustaining and nurturing the DA. Data science empowers economists to assimilate and classify the digital stakes of each participant in the user-experience journey. This also to an extent solves the mystery of shared responsibility of the continuity of DA. However, needless to say, the authenticity of such data and noise factors are to be calibrated to make it more decision-oriented.

Of far-reaching importance for an economist while studying the longevity of a DA is examining the choice of lower cost of distribution vis-à-vis the investment in the creative content and the up-gradation of cutting-edge technology. How to balance the sustainability of such DA for such choice sets requires a sophisticated optimal mechanism that needs to be dynamically studied under different scales of market penetration. Certainly, as traditional market context goes, highly creative content incurs considerable research costs (may not be development costs) and thus a premium price should be commended due to the market principle. Whether such phenomena work in DA, is extremely doubtful.

The source of conflict further mounts when the stakeholders in the DA sustainability journey are geographically differentiated. Several studies concluded that despite the ease of hiring and offering work with lower costs to global workers, the real choice depends solely on skill-differentials and the trust factors lying with the employers. What matters additionally is that while selecting the candidates or stakeholders when deciding to extend the sustainability of a DA, an understanding stakeholder and the principal-agent relationship resonating the same ideas or work on the same principle are extremely important which, at times, are not governed by traditional supply and demand mechanisms.

Are the stakeholders truly understanding the softer issues of usability status of consumers of digital content across the globe more clearly and visibly? Such

disproportionate knowledge or information asymmetry can lead to biased decisions that permeate through adverse selection. This can either happen at the end-user level or perhaps also at the producer level. Since any markets where both buyers and sellers are ill-informed can never lead to market corrections in the short term, to that extent, it is usually seen that digital consumers have some sort of “stickiness” toward a particular digital platform.

Now let us dig a little deeper and take up the aspect of sustainable yet complex digital platform pricing into consideration. Aartsen, Peeters, Wagers, and Williams-Jones (2018) forwarded their empirical work explaining “Drug-discovery platforms” (these can be considered as highly complex digital platforms) which are backed by funding to support proof-of-concept. But as observed the sustainable economic protection about such assets cannot be guaranteed due to limited funding. Problems come up when the partners in the making of DA do not always have economic motives per se. In the case of drug discovery platforms sustaining beyond the initial funding period requires a continuous sponsorship, demanding accelerators who may be in the form of impact organizations (non-profits) that can constantly strive to expand the user base and possibly assist in sustaining the sustainability of such assets. But this is a formidable task, since, unlike static DA, drug discovery platforms are complex digital products and therefore constant funding is usually marred with a concept called “foundation fatigue.” To overcome such “foundation fatigue” the agency in terms of nonprofits must constantly engage a wider market spectrum.

It is evident that, unlike natural resources that have the risk of depletion due to over-consumption, in the case of DA, over-consumption is the only savior for its survival and growth (Stuermer, Abu-Tayeh, & Myrach, 2017). Hence, a wider user network can only bring in the economic aspect of monetization. This defines higher marginal returns to scale and almost zero distribution costs to the digital platform sellers.

Stuermer, Abu-Tayeh, and Myrach (2017) justified that although traditional definitions of knowledge or DA or artifacts only act as supporting elements, it is rather ill-defined since knowledge or DA must be preserved, nurtured, and has to be made sustainable. The digital knowledge, ecosystem, and its management depends upon the interactive networks or communities, as against knowledge preserved tacitly in the brain which is of no use (Nonaka and von Krogh, 2009).

Further, to stretch this dimension of indestructibility associated with digital knowledge resources (assets) the concept “cap and floor” as a wider distinction of natural and digital resource consumption makes an interesting point. Important conditions for the sustainability of DA include transmutability for their usage under various contexts.

Jain and Vazirani (2010) explained whether the fundamental two theorems of welfare economics can be applied to both conventional and digital goods. The discussion on partial Pareto-optimal theorem (leaving the production and allocation of digital goods fixed), and the second theorem of welfare economics in terms of

categorization of semantically substitute digital goods in terms of cardinal and ordinal parts is far more difficult in conventional goods (for instance, perishable goods); but in the case of digital goods, there is no such condition. Hence as per the author, the traditional fundamental theorem of welfare economics can be made applicable in the mixed economy (where an optimal combination of conventional and digital goods coexists) to reach equilibrium.

While natural resources are seldom created their depletion due to overconsumption needs to be closely monitored (a cap is a strategy required for environmental sustainability) and the floor essentially denotes investments incurred in creating, preserving, and improving digital resources. Sustainability of DA thus is a question of mainly “floors” and not “caps.”

Graham (2019), in his well-written text titled *Digital Economics at Global Margin*, explained supporting reasons which add a useful dimension to the aspect of DA and their sustainability from a sociological point of view. He commented on several examples where the communities who previously have been vulnerable for such ICT or technological infrastructure have seen the possibility of using them by removing political resistances. Such support also came from the initiative of local authorities but what is surprising is that such ICT resources eventually had not eradicated the problem of economic dependence as it was previously conceived by many policy makers. The problem lies in not establishing the right connection between existing skill levels which may be required to make the best use of such resources. Nevertheless, ICT and digital disruptions at the grassroots have brought some inclusiveness at least in terms of removing the information asymmetries. As in certain developing economies, marginal farmers are now able to get the right price for their produce through mobile connectivity at the village level. These measures of bringing DA to the larger strata of society to harness their effective use are certainly a laudable extension of the idea of improving sustainability from a social perspective. For such DA’s sustainability at the grassroots level again local machinery in the form of nonprofits or public-private support cannot be undermined.

Dolgin (2008) had provided an excellent context in his work in *Economics of Symbolic Exchange* where he described how the music industry over the years had been severely impacted by the advent of internet-based distribution innovations. He quoted the Compact diskettes industry stiff competition from internet-based music distributors who disrupted the music distribution markets. However, such massive exploitation from such disruptors in this industry was not completely free from several challenges. Firstly, even though such online distributors had scaled up their distribution and managed to expand this market by giving free-of-cost music platforms to consumers, the content delivered needed to be completely improved and curated which requires engaging creative talent which at times are not economically cheaper. Such disruptors who entered the distribution markets, selling at a much cheaper price than their physical counterparts, also face the illegitimate logic of piracy and copyrights invasions. Not only this, but even legal machinery imposes stricter restrictions for end-

users who fail to adhere to piracy acts laid down by the state. Well, how far such policies work to protect some sections of industry and not others, is again a debatable issue. How far such legal structure can stop these digital disruptions where consumers are charmed by free-content, is again contravening the process of a free-will approach of entrepreneurial spirit. These are tough questions under the banner of economist lenses and promising solutions are not imaginable in the short term. In the same book, a concept of uniform prices was also depicted, but as the author analyzed correctly, making the price as a unit of control is against the market forces, such measures from an economic point of view will only increase mispricing and asymmetries in the long run. Any effort to reduce the differentiation will severely dampen the growth of creative platforms in the future. The prices of such DA must be decided based on the principle of end-user experience and the size of the segment being served.

## Pricing Strategies for DA – A Literature Survey

Academic literature on DA pricing is very scarce. Bertani, Ponta, Raberto, Teglio, and Cincotti (2021) in their recent paper discussed that the DA landscape is prone to complexity. The authors coined the term intangible or “DA developer” as an agent in the existing macroeconomic heterogeneous agent model framework. The paper used the production function where the knowledge component of the labor force accelerates the process of total productivity. For DA pricing dynamics, the paper used the mix of collusive and competitive pricing strategies, where according to the author, only in the competitive pricing model, a variation in the mark-up was exhibited. This concept closely resembles the idea used in my research of hybrid pricing since depending upon the type of product, and its state (static or dynamic), and time spent in the market, the pricing dynamics need to be altered for sustainability of DA.

Concerning pricing of cloud computing Laatikainen, Ojala, and Mazhelis (2013) depicted an interesting SBIFT model (Scope, Base, Influence, Formula, Temporal Rights). There has been discussion on hybrid pricing in the context of a combination of elements of penetration and skimming pricing concepts. (I used reasonable pricing and competitive pricing in the same sense.) The authors also in the same article reported on free or follow-the-free pricing approaches. The study also explained that almost 90 percent of PaaS cloud products command a free trial version strategy. In a similar vein of research work, the service renting model was explained as a pricing strategy by Ojala (2016) and several others.

Abrams, Cruse, Kunze, and Mundrane (2012) used the concept of total cost preservation (TCP) which closely resembles the idea of identifying the key components in preserving the digital asset. This paper talked about static DA and suggested a hybrid pricing model. Hybrid pricing under this model depends upon what components are predictable in the future and what are not. What it means is that paid-up

costs constitute a one-time component. But certain fixed components, like future inflation rates, rate of investment, can be made flexible. For this, the author proposed the use of stochastic modes like Monte-Carlo simulation in calibrating the optimal pricing process for the long-term preservation of static DA. Keiser, Nielsen, and Thirifays (2011) also talked in similar lines in terms of static. Warren (2010) used a similar example of a hybrid model of the university where the physical and digital access of books was utilized dynamically by the students.

Harmaala (2016) explained that in the age of digital consumption, the end-user acts as a collaborator in the production, maintenance, and development of DA. There are networks of collaborators who can have a blurred distinction of consumer and producer. DA (platforms) have reduced the scope for implementing old pricing and revenue models and there is the scope of extending the sustainability by the concept of distributed power law. The platforms can sustain profitability in the long-term tailed curve. There will be a core interaction through participants which include producers and consumers both assisting in the scalability of the DA. The core interactions or collaborative approach also helps in rationalizing the pricing since now the value of digital products resonates more closely with the dynamic user experience. Under the phase of such dynamic user experience, the DA cannot command a static price mechanism, they must reconfigure their pricing strategies involving elements of homogenous mass market (reasonable price) and heterogeneous or dynamic component of the DA (competitive price). The dynamic interplay of the pricing method will only ensure a smooth trajectory of long-tailed profitability (Ciccone, 2017). Ciccone (2017) in their work also questioned that there must be an extent toward restricting DA exclusion. Such regulatory exclusions will disturb the economic justification of hybrid pricing utilized under the collaborative model. In the expansionary phase with a complex digital product, a free-pricing approach can be justified only when the two-sided network externalities are available.

Lightcap, Peeo, and Fullenkamp (2012) explained that oligopolistic pricing models by traditional advertisers have been replaced by click-through models. Thanks to DA, the media consumption through the internet is less differentiated since all the available digital content is now accessible through a single app or digital platform.

Few empirical ideas on hybrid pricing were found in electricity markets. Chase (2014) explained demand response (DR) model in terms of the smart grid framework where the hybrid pricing model incentivizes the customer through the DR channel promoting the efficient use of electricity (demand side electricity management). The Chase (2014) paper explained three prevalent forms of electricity pricing namely time of use (TOU), critical-peak (CP), and customer-baseline load (CBL) pricing methods in US markets for both residential and industrial consumer segments.



## **Sustainable Pricing Strategies for Digital Assets (Spsda) Matrix for Improving the Digital Assets**

Before proposing the four strategies for sustainability of DA/platforms, it is important to understand the process of auction, under which the winners curse can be significantly reduced when the product and service characteristics and features are explicitly told to the bidder (Janssen, 2020). Hence, the asymmetries for a particular product/service are reduced, the pricing of that product/service provides more consumer surplus and thus generates a welfare perspective.

I propose the following four important DA pricing strategies under the SPSDA Matrix approach:

### **Strategy A**

A more complex and dynamic DA for mass consumption requires initial funding but can sustain on its own at a reasonable price. The differentiation strategy may not be required since it is expected that such digital assets may not require reinvestment in terms of constant innovation after some point of time in the future.

### **Strategy B**

A more static DA for mass consumption requires initial funding and can survive or sustain by increasing the user base by reducing the price over the period.

### **Strategy C**

A more complex and dynamic DA for a particular consumer segment requires initial funding beyond which there are two possibilities, either take this product to the masses with a reasonable price, or insure bringing an element of innovation and disrupt the same consumer segment by charging competitive prices.

### **Strategy D**

A static DA for a particular consumer segment, again with initial funding over some time may see a limitation its terms of saturation and early maturity of the market, and to sustain, it has to be freely distributed to the mass market with the active support of backbone organizations for its sustainability and growth.

Let us observe the above strategies for better comparison (see Table 17.1).

**Table 17.1:** SPSDA Matrix – Sustainability-oriented pricing strategies for digital assets.

<b>Complex and dynamic DA for Mass market (Strategy A)</b>	<b>complex and dynamic DA for the limited end-user market (Strategy C)</b>
After Initial Funding	After Initial Funding
(Sustain it by charging “reasonable price<<competitive price”)	(Sustain it by either charging “reasonable price” for mass markets or, charge “competitive prices>>reasonable prices” after making major innovative disruption for same consumer segment)
<b>Static DA for the mass market (Strategy B)</b>	<b>Static DA for the limited end-user market (Strategy D)</b>
After Initial Funding	After Initial Funding
(Sustain it by reducing the price over sometime)	(Sustain it by “freely” distributing into the mass market, backbone agency support)

## Explanation of the SPSDA Matrix

The pricing dynamics in the case of static or dynamic DA acts as “hybrid” in nature.

We observe that any “new product” at the initial stages, because of its limited existence, tends to resemble the characteristics of a closed or opaque market with information asymmetries. We can substitute the art market concept for such DA. But, as DA penetrates wider segments, or starts maturing, it follows the rules of pure markets in the true economic sense. Although, in my SPSDA matrix, for a digital asset, the journey is not always from class “to mass markets.”

Sometimes, it must be sustained at a certain market segment, where the logic of pure-market where arbitrage-free transaction prevails does not exist. This, however, requires extensive funding of the R&D capital.

Hence, my proposed “hybrid” pricing model best explains this phenomenon, where sustaining in the same market does not necessarily fit the rules of either market, that is, a DA may still retain its information asymmetries despite spending reasonable time in the consumption space, and to the contrary may sometimes, as the matrix explains, behave in the conventional way of entering into the expansionary phase with reasonable price moderation due to substantial reduction in the information asymmetry.

The economist will understand reasonable price as “minimum” optimal price, which may be required for upkeep, wider distribution, and maintenance of DA, which is different from competitive prices (which are external or market-driven). Here in the case of competitive prices, after initial funding, a reinvestment in DA innovation is required at various stages of extended sustainability. In the case of

static DA for mass market, price reduction over some time will ensure its sustainability. However, for a complex and dynamic DA, it is important to charge the reasonable price over the entire life of the DA. Now, it is important to understand that the reasonable price in the case of a mass market for a complex and dynamic DA will be definitely higher in comparison to the reasonable price of a static product for the mass market.

For the class (limited user-segment market), as mentioned in the above SPSDA matrix, for a static DA, after the saturation stage, such DA needs to be set free since, without any innovation, such static products only need to be used for reducing the digital inequalities in the communities.

For complex and dynamic products for the class market, after the initial funding, and churning the premium elements out of such limited end-user segments in the first phase of consumption, either ensure to reduce the price to the reasonable rates for mass markets, or reinvest in the second wave of disruption in the same DA and same end-user segment by charging the competitive or premium prices.

Hence, depending upon the characteristics of the market, type (mass or class market segment) of the product, length of time of the product use (short term or long term), and sustainability objective in place, a suitable DA pricing portfolio can be developed by the stakeholders.

## Conclusion and Future Scope

Understanding the pricing of DA or platforms demands a nontraditional economic pricing approach. The digital-asset mix will have DA for serving different time-dependent or event-dependent markets. The pricing process therefore also needs to be dynamically optimized. As understood through extant literature, the stakeholders in the space of DA or infrastructure do not work in silos, they work collaboratively in a two-way network space.

The prices are decided by the consumer liking in the value network and to ensure the sustainability of such assets, pricing requires gauging the real needs of digital consumers, and his or her constant engagement in the life cycle of asset curation and sustainability.

As understood through the proposed framework for the DA portfolio pricing model (SPSDA matrix), no single-point strategy can lead to optimal results. It is a path-dependent optimal matrix, since, as any digital platform (asset) matures, the pricing process has to accommodate the user experience and calibrate the monetizing threshold to generate smooth transitions resisting the market forces. The hybrid pricing model of the type explained in the previous paragraphs serves the purpose of redistributing optimal economic incentives to various stakeholders in the DA journey.

In the end, after reading a few pages of Mokyry, Vickers, and Ziebarth (2015), it can be safely argued that economists should foresee whether digital technology anxiety is one way economic instinct fulfills the need of consumer, society, government, and human institutions in the coming time, or dehumanizes them, making the entire workforce vulnerable to this man-made economic order.

The pandemic will surely put this expression to its real test.

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