



Digital marketing model innovation and Generation Z as consumer decision-making style. Making predictions with an artificial neural network, in Mexico

Modelo de innovación de mercadotecnia digital y la Generación Z como estilo de toma de decisiones de consumidor. Haciendo predicciones con una red neural artificial en México

Juan Mejía Trejo*

Universidad de Guadalajara, México

Received November 3, 2019; accepted February 25, 2021

Available online February 25, 2021

Abstract

This research aims to assess the predictive capabilities between the Digital Marketing Model Innovation (DMMI), based on the Oslo Manual 4th ed., and the Consumer Decision-Making Style (CDMS) model. The methodology involved an artificial neural network based on SPSS software to analyze data collected from 400 young Mexican students (Generation Z) belonging to ten local Guadalajara city universities from January to June 2019. The above mentioned are essential for several organizations interested in recognizing how to collect and measure innovation data of DMMI related to different CDMS internet behavior to increase competitiveness. The results suggest improvements on each one of the strategic relationships at the DMMI-CDMS model. Such improvements involving a high prediction level based on Multilayer Perceptron (MLP) as a predictive neural network on different variables compared with a Binary Logistic Regression (BLR) to assess and explain the scope of such predictions of the DMMI-CDMS model

JEL Code: C63, M31, O32

Keywords: Digital marketing model innovation; Generation Z; Consumer decision-making style; Artificial neural network; Binary logistic regression; Mexico

* Corresponding author.

E-mail address: juanmejiaatrejo@hotmail.com (J. Mejía Trejo).

Peer Review under the responsibility of Universidad Nacional Autónoma de México.

<http://dx.doi.org/10.22201/fca.24488410e.2021.3258>

0186- 1042/©2019 Universidad Nacional Autónoma de México, Facultad de Contaduría y Administración. This is an open access article under the CC BY-NC-SA (<https://creativecommons.org/licenses/by-nc-sa/4.0/>)

Resumen

El presente trabajo se orienta a evaluar las capacidades de predicción entre el Modelo de Innovación de Mercadotecnia Digital (DMMI), basado en el Manual de Oslo 4^a.ed. y el Modelo de Estilos para Toma de Decisiones del Consumidor (CDMS). La metodología implicó una red neural basada en el software SPSS para analizar los datos recolectados de 400 jóvenes estudiantes mexicanos (Generación Z) pertenecientes a diez universidades locales de la ciudad de Guadalajara, Jalisco, de Enero a Junio de 2019. Esto es muy importante para varias organizaciones interesadas en reconocer las condiciones de cómo coleccionar y medir los datos de innovación del DMMI relacionados con diferentes CDMS bajo el comportamiento de internet, para ser más competitivos. Los resultados sugieren mejoras en cada una de las relaciones estratégicas del modelo DMMI-CDMS con alto nivel de predicción en un Perceptrón Multicapa (MLP) como red neural predictiva sobre diferentes variables comparada con una regresión Binaria Logística (BLR) para evaluar y explicar el alcance de tales predicciones del modelo DMMI-CDMS.

Código JEL: C63, M31, O32

Palabras clave: Modelo de innovación de mercadotecnia digital; Generación Z; Estilos de toma de decisiones del consumidor; Red neural artificial; Regresión binaria logística; México

Introduction

It is a great challenge to identify the consumers' behavior when choosing alternative products and services. It perhaps, the most widely analyzed topic in consumer-interest studies since the 80s of the last century to the present day. Many factors influence consumer decision-making, either online or offline, so that consumers are thought to approach the market with specific basic Consumer Decision-Making Styles (CDMS) (Sproles & Kendall, 1986). Hence, identifying the essential characteristics of this is central to consumer-interest studies. This identification helps profile an individual's consumer-style, educate consumers about their specific decision-making characteristics to get several indicators to improve the marketing campaigns, etc. (Sproles & Kendall, 1986). The Marketing and Sales issue is considered one of the six business process innovations (OECD, 2018) concept. Hence, organizations need to make digital marketing activities to design an efficient digital campaign to improve their competitiveness. The recent worldwide competitiveness report ranked Mexico in place 46/140 (WEF, 2018). Since the firm's expectation of innovation is the potential to improve its competitiveness (OECD, 2018, par. 3.56, 3.63), one solution discussed in this paper is the Digital Marketing Model Innovation (DMMI, Mejía-Trejo, 2018). It represents a real innovation driver to improve such a place because it has several and innovative tools for planning and building a website, planning the content, blogging, vlogging, paying the advertisement, social media, emailing, video, web

analytics, etc. The DMMI includes several devices' digital marketing tools with access to the internet used mainly for Generation Z (people born from 1995 to 2010). Hence, it is worth asking: what about the criteria of a Digital Marketing Model (DMMI) Innovation design to be aligned with Consumer Decision-Making Style on Generation Z (CDMS)?

The paper aims to relate both concepts, DMMI and CDMS, to Generation Z in a proposed model to determine, analyze, and explain the interaction among the variables and predict such a relationship using and comparing the Binary Logistic Regression (BLR) vs. an artificial neural network based on Multilayer Perceptron (MLP). To achieve the proposed model, this work is divided into the explanation of 1) Context; 2) Problem, research questions, rationale for the study, objectives; 3) Literature review and hypotheses to obtain a final questionnaire design; 4) Methodology; 5) Results; 6) Discussion; 7) Conclusions.

Context

The CDMS on Generation Z is crucial to a successful digital marketing plan. A clear understanding of it makes the difference between the organizations that succeed and those that fail; it makes more informed business decisions that can raise, increase customer retention, bottom-line revenues, lower customer acquisition costs, and profitability. The study of CDMS on Generation Z tells why and what consumers buy, why the consumers buy from, whom the consumers buy from, and why they act the way they do. The CDMS on Generation Z considers the external and internal influences that affect consumers' purchasing decisions, showing the digital marketing influence that businesses have on consumers. The CDMS on Generation Z is a subjective topic, so there are no absolutes. The only absolute is that consumers are influenced by the environment of sociocultural and psychological factors, mostly on Generation Z.

However, not all consumers are affected by the same capacity (Lake, 2009). In this context, it is necessary to consider the new concepts and relationships about how innovation is working, mentioned in the Oslo Manual, 4th ed. (OECD, 2018). It is a guideline for collecting, reporting and using data on innovation. The concepts proposed in the third edition (product, process, organizational, and marketing) are in a new concept called the business innovation model. This concept concerns six different firm functions identified in the literature management (Ibid., p.20). One of them, the issue of Marketing and Sales (Ibid. p.73) or Marketing and Brand Equity Activities as one of the eight types of activities of relevance to innovation (Ibid., p.87). Fortunately, understanding previous efforts and results over the CDMS on Generation Z like Sproles & Kendall (1986) is possible to gain insight into consumers that helps the business market succeed and stand out from the competition. Nowadays, every organization's management depends on well-planned marketing campaigns through several probed procedures, just like the Digital Marketing Model Innovation (DMMI) (Mejía-Trejo, 2018)

that describes why a particular consumer acts, thinks, and responds in the way that he does.

Consequently, the organization can create an effective marketing strategy that accommodates those actions, feelings, and responses. Hence, this paper aims to describe how the CDMS on Generation Z will assess its influence on the DMMI, expecting results to show us how to predict and lead the digital marketing strategy. In the sense of predictions, we know how the Binary Logistic Regression (BLR) works. However, the latest artificial intelligence-based artificial neural networks (as the MLP) are robust, flexible, general-purpose techniques that make it necessary to compare them to predict digital marketing campaign actions better. These artificial neural network techniques are ready for prediction, estimation, and classification problems (McCormick, K. & Salcedo, J., 2017; Linoff & Berry, 2011), which justify its application in the relationship CDMS-DMMI for Generation Z in this research.

Problem, research questions, rationale for the study, objectives

Hence, the problem is described in a General Question (GQ): How is the prediction of the variables involved among Consumer Decision-Making Style (CDMS) for people belonging to Generation Z with Digital Marketing Model (DMMI) Innovation using BLR vs. MLP?

The study's rationale is the interest of several organizations to identify and predict the conditions to collect and measure innovation data related to the specific consumer generation described in such a relationship of factors (DMMI-CDMS) to determine better digital marketing strategies.

The Specific Objectives (SO) were: SO1. DMMI fulfills the requirements to measure in terms of the Oslo Manual 4th. Ed.; SO2. There is at least a factor that better describes the CDMS on Generation Z relationship. SO3. What are the most critical predictive variables of the CDMS-DMMI construct?

Literature review and hypotheses

This section addresses the importance of innovation concepts based on the Oslo Manual, 4th ed. (OECD, 2018). A description of the CDMS (Sproles & Kendall, 1986), the DMMI (Mejía-Trejo, 2018), and a brief description of how BLR and MLP as a prediction tool for marketing decisions proposals.

The Oslo Manual, the 4th edition

The Oslo Manual is an important reference for the analysis and collection of data on technological innovation. It is a guide that defines concepts and clarifies the activities that are part

of the innovation process, including its different types and the performance impact at the organization, thus advancing in the knowledge of the global process. The updating and use of the Oslo Manual contribute to the implementation of a technological culture currently under constant development. A key tenet of the Oslo Manual is that innovation can and should be measured. The first edition dates from 1992 and focuses on the manufacturing sector. In 1997 was the second and extended its application to the services sector. The third edition was in 2005 and included the definition of innovation in product, services, process, marketing, and organization. The last edition, published in 2018, describes the term innovation as an activity and the outcome of the activity, providing the following definition (OECD, 2018, p.20):

An innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).

This definition uses the generic term unit to describe the actor responsible for innovations. It refers to any institutional unit in any sector, including households and their individual members. Compared to the previous edition, the fourth edition is characterized by a cognitive testing work, in the complexity of the previous list-based definition of four types of innovation: product, process, organizational, and marketing, to two main types: product innovations and business process innovations with the following definitions (Ibid., p.21):

A product innovation is a new or improved good or service that differs significantly from the firm's previous goods or services, and that has been introduced on the market.

A business process innovation is a new or improved business process for one or more business functions that differ significantly from the firm's previous business processes, and that has been brought into use by the firm.

Business process innovations concern six different functions of a firm, as identified in the business management literature (Brown, 2008). Two functions relate to a firm's core activity of producing and delivering products for sale, while the other functions concern supporting operations. The taxonomy of business functions proposed in this manual maps reasonably well onto the previous edition's categories of process, marketing, and organizational innovations. Table 1, provides a list of six main business functions (Ibid., par. 3.40).

Table 1

Functional categories for identifying the type of business process innovation

Short term	Details and subcategories
1. Production of goods or services	Activities that transform inputs into goods or services, including engineering and related technical testing, analysis and certification activities to support production
2. Distribution and Logistics	This function includes: a) transportation and service delivery; b) warehousing; c) order processing.
3. Marketing and sales	This function includes: a) Marketing methods including advertising (product promotion and placement, packaging of products); direct marketing (telemarketing), exhibitions and fairs, market research and other activities to develop new markets; b) pricing strategies and methods; c) sales and after-sale activities, including help desks other customer support and customer relationship activities.
4. Information and Communications Systems	The maintenance and provision of information and communication systems including a) hardware and software; b) data processing and database; c) maintenance and repair; d) web-hosting and other computer-related information activities. These functions can be provided in a separate division or in divisions responsible for other functions
5. Administration and management	This function includes: a) strategic and general business management (cross-functional decision-making), including organizing work responsibilities; b) corporate governance (legal, planning and public relations); c) accounting, book keeping, auditing, payment and other financial or insurance activities; d) human resources management (training and education, staff recruitment, workplace organization, provision of temporary personnel, payroll management, health and medical support); e) procurement; f) managing external relationships with suppliers, alliances, etc.
6. Product and business process	Activities to scope, identify, develop, or adapt products or a firm's business processes. This function can be undertaken in a systematic fashion or on a development hoc basis, and be conducted within the firm or obtained from external sources. Responsibility for these activities can lie within a separate division or in division responsible for other functions, e.g. production of goods or services

Source: Brown (2008); Eurostat (2018)

Another critical issue is the economic activity or, in profitability terms, innovation requires resources that could be used for other purposes. The existence of opportunity costs

implies the likely intention to pursue some form of value creation (or value preservation) by the actors responsible for an innovation activity; value is, therefore, an implicit goal of innovation (Ibid., par. 2.22).

Besides, there are eight types of activities of relevance to pursuit innovations (Ibid., par. 4.8):

1). Research and experimental development (R&D) activities; 2). Engineering, design, and other creative work activities; 3). Marketing and brand equity activities; 4). IP-related activities; 5). employee training activities; 6). Software development and database activities; 7). Activities related to the acquisition or lease of tangible assets; 8). Innovation management activities.

Hence, this paper is of particular interest to analyze in one model, both: Marketing and Sales as a type of business process innovation and Marketing and Brand Equity Activities as a type of process of relevance to pursuit innovations gathered in the DMMI.

Digital Marketing Model Innovation (DMMI)

Digitalization entails applying digital technologies to a wide range of existing tasks and enables new tasks to be performed. It has the potential to transform business processes, the economy, and society in general. Digitalization is also a key driver of measurement opportunities (Ibid., par. 152, 1.53). Therefore, the implementation of business process innovations is often tied to the adoption and modification of digital technologies (Ibid., par. 3.38). A business model includes all core business processes such as the production, logistical, marketing, and co-operative arrangements in use and the main products that a firm sells, currently or in the future, to achieve its strategic goals and objectives. A firm can use a single business model or several business models simultaneously, for instance, for different product lines or markets. The innovation management literature notes that successful business models combine a method for better meeting users' needs relative to what competitors can deliver and a profit formula for earning income from delivering utility to customers (Johnson et al., 2008). There is no single recognized definition of a business model innovation. It can vary from partial business model innovations that only affect either a firm's products or business functions to comprehensive business model innovations that involve both products and business functions. It is challenging to distinguish partial business model innovations from product and business process innovations (Ibid., par. 3.52).

There are three types of comprehensive business model innovations in existing firms: (i) a firm extends its business to include completely new kinds of products and markets that require new business processes to deliver; (ii) a firm ceases its previous activities and enters into new types of products and markets that require new business processes; and (iii) a firm changes the business model for its existing products, for example, it switches to a digital

model with new business processes for production, and delivery and the product changes from a tangible good to a knowledge-capturing service (Ibid., par. 3.54). Identifying the third type of comprehensive business model innovation could require dedicated questions on changes to existing products. (Ibid., par. 3.55), because digital technologies and practices are pervasive across business processes. They are used to codify processes, and procedures, add functions to existing processes and enable the sale of processes as services. Digitalization provides a wealth of innovation opportunities for firms. The digital skills of the workforce are particularly relevant in this context. (Ibid., par. 5.102). Digital-based innovations include product or business process innovations that contain ICTs (Information and Communication Technologies) and innovations that rely to a significant degree on ICTs for their development or implementation. (Ibid., par. 5.107). All the above mentioned lead us to consider digital marketing as an innovation with the following definition in this research: to design the strategy and tactics in a planned implementation, selecting a set of digital marketing tools. These should be based on mission-vision, market segmentation, goal settings, and the firm's value proposition, with the performance monitoring and profitability of the digital campaign design, in a permanent way (Mejía-Trejo, 2018). See Table 2.

Table 2

DMMI variables description from customer point of view and electronic-firm (e-firm)

DMMI Variables	Indicator	Main question
Mission-Vision (MVS)	Mission. It is a written declaration of an organization's core purpose and focus that normally remains unchanged over time. It is the cause of the firm's campaign, day-to-day operational objectives Vision. It is the effect of the firm's campaign. It express' the high-level goals for the future	1.As a customer, do you make decisions up to the mission and vision of the e-firm?
Value Proposition (VAL)	It is the reason why customers turn to one company over another solving their problems or satisfying their needs. It consists of a selected bundle of products and/or services that caters to the requirements of a specific Customer Segment. In this sense, is an aggregation, or bundle, of benefits that a company offer customers.	2.As a customer, do you make decisions up to the value proposition of the e-firm?
Market (MKT)	It is all about of the market segmentation as target. It comprises the heart of any business model. Without (profitable) market, no company can survive for long. In order to better satisfy the market, a company may group them into distinct segments with common needs, common behaviors, or other attributes.	3.As a customer, do you perceive that a specific e-firm attends you in an specific customer segmentation?
Goal Settings (GST)	All digital marketing campaign requires objectives to be reached, for instance: -The branding positioning; -The number (real & potential) of customers database; -The sales; -The product & services (current and new ones) information	4.As a customer, do you perceive the goal settings of a specific e-firm?

Strategy (STG)	<p>This stage represents the how to do, to achieve the GST, just like: --Awareness. Acquisition strategy to build awareness off-site and in offline media to drive to web presences: -Engagement & Loyalty. Capture and retention as a growth strategy to build customer and fan relationships to encourage repeat visits and sales; -Desire & Experience. Strategy based on the sample and testing of a service or a product, with a novelty presentation to increase the sensations and emotions, in order to be acquired; -Effectiveness on Call to Action ; Conversion strategy to achieve marketing goals of leads & sales on web presences and offline.</p>	<p>5.As a customer, do you perceive clearly a kind of strategy/tactics to catch your attention of a specific e-firm, willing to get more: -Awareness (AWA) -Engagement&Loyalty (ELY) -Desire & Experience (DEX) -Effectiveness on Call to Action (ECA)</p>																																							
Tactics (TAC)	<p>This represents all the activities to be implemented to follow the strategies, involving mainly, the use of the digital marketing tools (DMT), for instance:</p> <table border="1" data-bbox="291 512 892 1062"> <thead> <tr> <th colspan="5">Strategy</th> </tr> <tr> <th></th> <th></th> <th>Awareness</th> <th>Engagement & Loyalty</th> <th>Desire & Experience</th> <th>Effectiveness on Call to Action</th> </tr> </thead> <tbody> <tr> <td rowspan="6">DMT</td> <td rowspan="6">DMT</td> <td>SEO/SEM</td> <td>Content Marketing</td> <td>Augmented Reality</td> <td>Home & Site-Wide Page</td> </tr> <tr> <td>Affiliate & Partner Marketing</td> <td>Newsletters & eMail Marketing</td> <td>Virtual Reality</td> <td>Landing page design</td> </tr> <tr> <td>Online Advertising</td> <td>e-Contact Strategy</td> <td>Wearable Marketing</td> <td>Search and Browse Page</td> </tr> <tr> <td>Online PR</td> <td>Customer Service & Support</td> <td>----</td> <td>Basket and Checkout</td> </tr> <tr> <td rowspan="3">Social Media</td> <td>Mobile Marketing</td> <td>----</td> <td>Social Commerce</td> </tr> <tr> <td>Social CRM</td> <td>----</td> <td>----</td> </tr> <tr> <td>Blogging</td> <td>----</td> <td>----</td> </tr> </tbody> </table>	Strategy							Awareness	Engagement & Loyalty	Desire & Experience	Effectiveness on Call to Action	DMT	DMT	SEO/SEM	Content Marketing	Augmented Reality	Home & Site-Wide Page	Affiliate & Partner Marketing	Newsletters & eMail Marketing	Virtual Reality	Landing page design	Online Advertising	e-Contact Strategy	Wearable Marketing	Search and Browse Page	Online PR	Customer Service & Support	----	Basket and Checkout	Social Media	Mobile Marketing	----	Social Commerce	Social CRM	----	----	Blogging	----	----	
Strategy																																									
		Awareness	Engagement & Loyalty	Desire & Experience	Effectiveness on Call to Action																																				
DMT	DMT	SEO/SEM	Content Marketing	Augmented Reality	Home & Site-Wide Page																																				
		Affiliate & Partner Marketing	Newsletters & eMail Marketing	Virtual Reality	Landing page design																																				
		Online Advertising	e-Contact Strategy	Wearable Marketing	Search and Browse Page																																				
		Online PR	Customer Service & Support	----	Basket and Checkout																																				
		Social Media	Mobile Marketing	----	Social Commerce																																				
			Social CRM	----	----																																				
Blogging	----		----																																						
Digital Marketing Tools (DMT)	<p>It involves all the digital marketing tools, like: Search Engine Optimization (SEO); Search Engine Marketing (SEM); Affiliate and Partner Marketing; Online advertising; Online Public Relations; Social Media Marketing; Home & Site-Wide Page Effectiveness; Landing Page Design Effectiveness; Search and Browse Page Efficiencies; Category and Product Page Efficiencies; Basket and Checkout Efficiency; Social Commerce; Content Marketing; Newsletters; eMail marketing; e-Contact Strategy; Customer and Service Support; Mobile Marketing; Augmented Reality; Virtual Reality; Wearable Marketing; Social CRM, etc.</p>																																								
Planning (PLN)	<p>This is the step where all the tools and techniques of the tactics is programmed logistically, to be implemented in the practice. This is your overall strategy for digital marketing. Defining a strategy to integrate communications across different customer touchpoints is often forgotten. Planning involves setting goals, creating a coherent strategy to achieve them and putting in place evaluation tools in place to make sure you're on track</p>	<p>6.As a customer, do you perceive that specific e-firm change and implement several digital marketing tools, for catching your attention?</p>																																							

Performance (PER)	It implies to know how well the digital campaign is working on. Practically, it involves the measurement and assessment of all the previous stages, it supports the web analytics to obtain a full control of the digital campaign	7.As a customer, do you perceive that specific e-firm got high performance for catching your attention.
Profitability (PRO)	It is expressed in terms of return on investment (ROI) about how the digital campaign is working on, at short, medium or long terms.	8.As a customer, do you perceive that specific e-firm got return of investment for catching your attention.

Source: Mejía-Trejo (2018)

Hypothesis 1 (H1): DMMI can be measured in terms of the Oslo Manual 4th. ed.

Customer Decision-Making Styles (CDMS)

Consumer decision-making includes research in several disciplines, such as sociology, psychology, consumer behavior, marketing, computer science, and artificial intelligence (Roosmand et al.,2011). The concept of value, shopping motivations, and CDMS are three different but related research streams (Jamal et al.,2006). The knowledge of CDMS is essential in several marketing efforts, such as marketing strategies, positioning, market segmentation (Anić et al.,2012), and market segmentation strategy (Anić et al.,2014). Whereas the current literature mostly focused on CDMS according to consumer demographic differences (Anić et al.,2012), research has been conducted to assess CDMS regarding marketing practices (Rezaei, 2015). Brick-and-mortar and online stores have some control over how, when, and where consumers search for information and purchase (Heitz-Spahn, 2013). The efforts for understanding CDMS are a significant issue for businesses aiming to deliver the best value in shopping malls that have become important retail venues (Wagner & Rudolph, 2010) and in the online and off-line markets (Ching-Fen, 2009). Every decision involves several results that might be measured relative to cost-saving or value (Alba & Hutchinson, 2007). The CDMS is becoming complex (Hanzaee & Lotfizadeh, 2011) because it is inevitable in implementing electronic shopping that helps consumers in their purchase decision process (Häubl & Trifts, 2000). Hence, for retailers in understanding consumer behavior, a multichannel environment is one of the key factors. Additionally, to the traditional retailing formats, such as the internet, catalogs, shopping mall stores, new technology models are involving tablets, smartphones, and internet-connected television retail (Heitz-Spahn, 2013). Since humans can adapt their decision-making styles to specific situations or environments (Häub & Trifts,2000), explanation and prediction of CDMS are important to marketing and retailing (Shocker et al.,1991). Nowadays, the way consumers make decisions across online and off-line channels according to their perceptions of retailers' marketing practices is not well understood in the current literature. A few empirical

studies have examined CDMS and marketing practices online (Rezaei, 2015).

One pervasive method since the middle of the '80s (Sproles & Kendall, 1986) employs a Consumer Styles Inventory (CSI) and a Profile of Consumer Style (PCS). The PCS, designed for use by consumer interest professionals, is a format for reporting an individual's characteristics; the CSI measures eight aspects of decision-making. According to Sproles & Kendall (1986), the CDMS is defined as a: mental orientation characterizing a consumer's approach to making choices. It has cognitive and affective characteristics (for example, quality and fashion consciousness); in essence, it is a basic consumer personality analogous to the concept of personality in psychology (Ibid., 1986).

Some relevant authors of consumer literature (Sproles & Kendall, 1986; Khan 2006; Lake 2009) assume three basic ways to characterize consumer styles: the psychographic lifestyle approach, the consumer typology approach, and the consumer characteristics approach. The psychographic approach identifies over 100 characteristics relevant to consumer behavior (Lastovicka 1982). Some are closely related to consumer choices; others tap general lifestyle activities or interests. The consumer typology approach attempts to define general consumer types (Hyu-Hwa & Jihyun, 2008). The consumer characteristics approach focuses on cognitive and affective orientations related explicitly to consumer decision-making (Sproles & Kendall, 1986).

There is a range from rational shopping and quality consciousness to impulsiveness and information overload and several approaches to characterize the specialized literature's consumer styles. However, none approach is specifically designed to serve consumer-interest professionals (virtually all previous work is on marketing-business needs). Therefore, this research develops and tests a method for filling this void using the CDMS model proposed initially by Sproles & Kendall (1986). It considers four criteria: (a) It contains mental characteristics of a consumer's decision-making that are among the most important real-world consumer characteristics. Here they distinguish between fundamental and tangential characteristics. Quality consciousness is fundamental because it is directly related to consumer decisions. Characteristics like altruism are tangential, with only indirect links to consumer choices; (b) The characterization is as complete as possible, identifying a small number of basic and independent consumer decision-making characteristics; (c) the method measures how a consumer rates on each characteristic. Several measurable characteristics may make up a consumer's style. The consumer should be profiled accordingly, and (d) the method includes measures important to consumer-interest professionals in their varied roles as consumer educators, researchers, and financial counselors. To formulate a measurement of CDMS Sproles & Kendall (1986) listed the significant consumer characteristics decision-making identified in the literature. After examining those characteristics according to the four criteria, they identified the following as among the most eight essential mental components of CDMS:

1.Perfectionism or high-quality consciousness; 2.Brand consciousness; 3.Novelty-fashion consciousness; 4.Recreational, hedonistic shopping consciousness; 5.Price and value for money shopping consciousness; 6.Impulsiveness; 7.Confusion from over choice (from a proliferation of brands, stores, and consumer information, for example); and 8.Habitual, brand-loyal orientation toward consumption. Each of them is a fundamental consumer decision-making characteristic important to consumer-interest studies and independently, representing important mental approaches to consumption and consistent with the definition of consumer-style as a mental orientation characterizing a consumer's approach to choosing. Sproles & Kendall (1986) acknowledge that other characteristics might be equally valuable for specific applications. However, the characteristics chosen are among the most frequently discussed in consumer literature involving the XXI century electronic consumer behavior.

Generation Z as the subject of study

The name Generation Z was suggested by an online contest sponsored by a journalist, Bruce Horovitz of USA Today in 2012. The contest consisted of readers choosing the name of the next generation after the Millennials. Some other names that were proposed included: iGeneration, Gen Tech, Gen Wii, Net Gen, Digital Natives, and Plurals (Horovitz, 2012). Generation Z is the first cohort to have Internet technology readily available at a young age (Prensky, 2001). Generations are shaped by the context in which they emerged. Several authors address Generation Z between 1995 and 1997 until 2009 or 2010 (Álvarez-Ramos et al., 2019). In this research, we considered the range of 1995 to 2010. See Table 3.

Table 3

Classification of different generations.

	Baby Boomer 1940-59	The Generation X 1960-79	The Generation Y (Millennial) 1980-94	The Generation Z 1995-2010*
Context	-Postwar -Dictatorship in several countries	-Political transition -Capitalism and meritocracy dominate	-Globalization -Economic stability -Emergence of internet	-Mobility and multiple realities -Social networks -Digital natives -Particularly vulnerable to job loss -Uncertain future -On track to be the best- educated generation yet - High sense of independence and self-reliance -Undefined ID -Communalholic
Behavior	-Idealism -Revolutionary -Collectivist	-Materialistic -Competitive -Individualistic	-Globalist -Questioning -Oriented to self	-Dialoger -Realistic -Ability to find answers quickly -Digital natives -Racially and ethnically diverse than previous generations
Consumption	-Ideology -Vinyl movies	-Status -Brands and cars -Luxury articles	-Experience -Festivals and travels -Flagships	-Uniqueness -Unlimited -Ethical -Keeness for saving

Source: McKinsey (2018); PRC (2020); Lexington (2021); *Álvarez-Ramos et al. 2019.

We conclude about Generation Z's essential behavior characteristics, and they are: expressing individual truth, connecting through different truth, understanding different truth, unveiling the truth behind all things. Notwithstanding, there are some significant differences between countries; for instance: young people between 13 to 17 years old have access to a smartphone in the USA (PRC 2020), while in Mexico, it is only the 14% (AMX,2019); despite these differences, the behavior trend is the same, just because the Z consumers in both countries have become increasingly technology-dependent (Zhitomirsky-Geffet & Blau, 2016). Hence, we appreciate five forces are emerging in a powerful confluence of technology and behavior for Generation Z as consumption characteristics. Its briefing is shown in Table 4.

Table 4

Generation Z consumption characteristics briefing

1. Consumption-based on possession of access

Gen. Z has a high sense of independence and self-reliance because of the digital world in which they grew up. Many received their first mobile device by the age of 10 (Lexington, 2021). They are spending around four and a half hours on their mobile devices per day; besides, they paid for a purchase, browsed an online retail store, searched for an item they wanted to buy (GWI, 2020), and they planned their holiday shopping (Wal-Morris, 2019), mostly using their mobile phone. As access becomes the new form of consumption, unlimited access to goods and services creates value. It involves consumers who take advantage of their existing relationships with companies to generate additional income by working temporarily for them. (McKinsey, 2018).

2. Consumption-based on social media

Gen. Z said they'd more readily purchase brands they followed on social media in 2019. Besides, they'd more readily purchase brands they follow on social media in 2020 (NRF, 2019). For instance, they feel that they are represented in the brand advertisements; brands should be young to buy it and be trendy or cool; brands should make the customer feel valued by customizing products or services supporting charities (GWI, 2020). They like to follow their social media recommendations from friends considered their most trusted source for learning about products and brands (McKinsey, 2018). They feel in control of their data online in 2020 using social media to make a purchase (NRF, 2019) and prefer to keep their data over exchanging it for free services in 2020. Besides, they report free delivery as a significant purchase driver in 2020 (GWI, 2020). Gen. Z said that peer reviews were critical to them when shopping online and that personalized recommendations based on social media were significant when shopping online in 2019 (Álvarez-Ramos, 2019; Kearney, 2019).

3. Consumption-based on individual identity

The Gen. Z is also much savvier with online shopping channels than their predecessors. They aren't easily swayed by gimmicks or celebrity influencers; they are also skeptical about giving away their information since they have grown up in an age of high-profile data breaches for major brands. They care far more about the value and quality of their purchases than their loyalty to the brand that makes them, so brands need to work extra hard to keep Gen Z's business around (Lexington, 2021). They are more likely to unfollow a brand online with high engagement with brands on Instagram (GWI, 2020). Gen Z had an average of \$115 usd in spending money each month in 2020 (YPulse, 2020). Gen Z is willing to pay more for personalized offerings, such as premium for products from brands that embrace causes those consumers to identify with. They value brands that don't classify items as male or female (McKinsey, 2018). For instance, in Mexico, Gen. Z seeks to develop their identity by managing their professional and personal brand and prefer to follow them (Ruiz-Duarte et al. 2018). Although personalization expectations are high, consumers across generations are not yet totally comfortable sharing their data with companies (Ruiz Duarte et al., 2018). Therefore, leading companies should have a data strategy that will prepare them to develop business insights by collecting and interpreting information about individual consumers while protecting data privacy (Mejía-Trejo, 2019b).

4. Consumption-based on ethics

Members of Gen. Z expect brands to be transparent, ethical, and responsible in all aspects of their business. Neglecting to do so can result in a lost opportunity to collect information or lost business altogether from this generation (Lexington, 2021). Gen. Z said they want their purchases to be environmentally sustainable; they are after locally sourced products (Kearney, 2019). The health and wellness benefits are as important to them when choosing what to buy; Also, they prefer natural or organic ingredients as important to them when choosing what to buy (IBM, 2020). Gen Z cited purchasing "clean" products as important to them and the firms' ethics to achieve it; also, they cited purchasing products that support recycling as important to them (IBM, 2020). Gen. Z tries to learn the origins of anything they buy; to buy purchase products from companies they consider ethical, they refuse to buy goods from companies involved in scandals, but they are tolerant about mistake's firms when they are corrected. Gen. Z believes that major brands are less ethical than small ones; marketing and work ethics are converging. Marketing in the digital age is posing increasingly complex challenges as channels become more fragmented and ever-changing. (McKinsey, 2018).

5. Consumption-based on trust

Gen. Z said no matter what level of trust they hold for a brand, they still do their research before purchasing (IBM, 2020). Gen Z trust in 36 percent of the 2020 workforce was projected to be made up by Gen Z employees (FEI, 2019). Gen. Z reported trusting to work in interactive work environments that provide flexibility and work-life balance in 2019 (WFI, 2019). Some mistrust exists: Gen. Z said they were the hardest working generation in 2019, but they are feeling hopeful about their future of work in 2019 (WFI, 2019). Gen. Z expects when making a purchase and how the supplier uses these to build trust in web and email marketing. These savvy shoppers say they truly trust product information provided by influencers. User-generated social proof does not just build trust: customers view it as a key part of the decision-making process (Ricards, 2019)

Source: Several authors with own adaptation

Therefore, our CDMS on Generation Z adapted questionnaire as proposed is shown in Table 5.

Table 5

CDMS on Generation Z adapted questionnaire

Factor 1-Perfectionistic, High-Quality Conscious Consumer (PHQ)
-Getting very good quality is very important to me
-When it comes to purchasing products, I try to get the very best or perfect
-In general, I usually try to buy the best overall quality.
-I make special effort to choose the very best quality products.
-I really don't give my purchases much thought or care.
-My standards and expectations for products I buy are very high.
-I shop quickly, buying the first product or brand I find that seems good
-A product doesn't have to be perfect, or the best, to satisfy me.

Factor 2-Brand Conscious, Price Equals Quality Consumer (BCP)
-The well-known national brands are best for me.
-The more expensive brands are usually my choices.
-The higher the price of a product, the better its quality.
-Nice department and specialty stores offer me the best products.
-I prefer buying the best-selling brands.
-The most advertised brands are usually very good choices.
-A product doesn't have to be perfect, or the best, to satisfy me.

Factor 3-Novelty-Fashion Conscious Consumer (NFC)
-I usually have one or more outfits of the very newest style.
-I keep my wardrobe up-to-date with the changing fashions.
-Fashionable, attractive styling is very important to me.
-To get variety, I shop different stores and choose different brands.
-It's fun to buy something new and exciting.

Factor 4-Recreational, Hedonistic Consumer (RHC)
-Shopping is not a pleasant activity to me.
-Going shopping is one of the enjoyable activities of my life.
-Shopping the stores wastes my time.
-I enjoy shopping just for the fun of it.
-I make my shopping trips fast.

Factor 5-Price Conscious, Value for Money Consumer (PCV)
-I buy as much as possible at sale prices.
-The lower price products are usually my choice.
-I look carefully to find the best value for the money.

Factor 6-Impulsive, Careless Consumer (ICC)
-I should plan my shopping more carefully than I do.
-I am impulsive when purchasing.
-Often I make careless purchases I later wish I had not.
-I take the time to shop carefully for best buys.
-I carefully watch how much I spend.

Factor 7-Confused by Over-choice Consumer (COC)

- There are so many brands to choose from that often I feel confused.
- Sometimes it's hard to choose which stores to shop.
- The more I learn about products, the harder it seems to choose the best.
- All the information I get on different products confuses me.

Factor 8-Habitual, Brand-Loyal Consumer (HBC)

- I have favorite brands I buy over and over.
- Once I find a product or brand I like, I stick with it.
- I go to the same stores each time I shop.
- I change brands I buy regularly.

Factor 9- Social Media, Possession, Individuality, Ethics, Truth Issues (SPE)

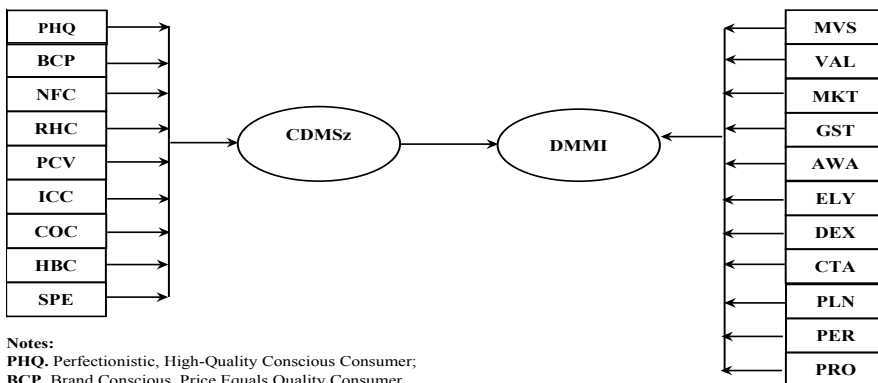
- I support my decisions based on social media
- I am more interested in rent than in acquiring
- I prefer to buy more personalized products that highlight my individuality
- I prefer to purchase products from companies that I consider ethical
- It is important for me, the reputation of a firm
- I need to know the origins of what I buy (where is it made, what is it made from, and how is made?)
- I like to follow recommendations from friends because they're a trusted source for learning on products and brands
- I believe that major brands are less ethical than small ones
- I believe that marketing and work ethics are converging
- I value brands that don't classify items as male or female

Source: Sproles & Kendall (1986) and own adaptation including Factor 9, SPE

Hypothesis 2 (H2): The SPE is the factor that better describes the CDMS on Generation Z

See scheme 1 about the final model proposal.

Scheme 1. CDMS -DMMI



Notes:
PHQ. Perfectionistic, High-Quality Conscious Consumer;
BCP. Brand Conscious, Price Equals Quality Consumer
NFC. Novelty-Fashion Conscious Consumer; **RHC.** Recreational, Hedonistic Consumer;
PCV. Price Conscious, Value for Money Consumer; **ICC.** Impulsive, Careless Consumer;
COC. Confused by Over-choice Consumer; **HBC.** Habitual, Brand-Loyal Consumer; **SPE.** Social Media, Possession, Individuality, Ethics, Truth Issues; **MVS.** Mission-Vision; **VAL.** Values; **MKT.** Market; **GST.** Goal Settings; **AWA.** Awareness; **ELY.** Engagement & Loyalty. **PLN** Planning; **DEX.** Desire & Experience; **CTA.** Effectiveness on Call to Action; **PER.** Performance; **PRO.** Profitability

Source: own

Prediction tools

In this research, we apply two predictive tools: the MLR and the MLP, to be compared with their accurate results, shown in Table 6.

Table 6

Describing the MLR vs. MLP

Linear correlation and multiple line regression (MLR). According to Hinton et al. (2004) and Mejía-Trejo (2019a) when we examine more than two variables we can extend our correlation and regression analysis to take account of these variables but we still assume that *the relationship between the variables is linear*. The MLR can be seen as a more complex model *as it employs more than one independent variable as a predictor of the dependent variable*, and also we can examine the contribution of each independent variable to the prediction.

What is Binary Logistic Regression (BLR)? It is special case of MLR is when the dependent variable is *dichotomous* called logistic regression models, well known as logit analysis. This method is a combination of multiple regression and multiple discriminant analysis. This technique is similar to multiple regression analysis in that one or more independent variables are used to predict a single dependent variable. What distinguishes BLR model from MLR is that dependent variable is non-metric, as in discriminant analysis. BLR models are distinguished from discriminant analysis primarily in that they accommodate all types of independent variables (metric and non-metric) and do not require the assumption of multivariate normality. However, in many instances, particularly with more than two levels of the dependent variable, discriminant analysis is the more appropriate technique.

Artificial Neural Networks (ANN). According to IBM (2017), neural networks are the preferred tool for many predictive data mining applications because of their power, flexibility, and ease of use. Neural networks are used in predictive applications, such as the multilayer perceptron (MLP) networks, are supervised in the sense that the model-predicted results can be compared against known values of the target variables. A neural network can approximate a wide range of statistical models without requiring that you hypothesize in advance certain relationships between the dependent and independent variables. Instead, the form of the relationships is determined during the learning process. If a linear relationship between the dependent and independent variables is appropriate, the results of the neural network should closely approximate those of the linear regression model. If a nonlinear relationship is more appropriate, the neural network will automatically approximate the correct model structure. *The trade-off for this flexibility is that the synaptic weights of a neural network are not easily interpretable. Thus, if you are trying to explain an underlying process that produces the relationships between the dependent and independent variables, it would be better to use a more traditional statistical model. However, if model interpretability is not important, you can often obtain good model results more quickly using a neural network.*

How to run the MLP? To run any data in SPSS the MLP neural net is suggested to follow the next steps: a) Preparing the data for analysis, where setting the random seed allows you to replicate the analysis exactly, starting with 9191972 a fixed value of the active generator initialization. Also, it is necessary to declare the sample partition as training/test/holdout (70/30/0) This sets the values of *partition* to be randomly generated *Bernoulli* variates with a probability parameter of 0.7, modified so that it takes values 1 or -1, instead of 1 or 0; b) Running the analysis where you activate the MLP option with selection fields as dependent variables, factors, and covariates and confirm the partition of the variables in training/test/holdout. In this stage you can select several options of neural network performance such as diagram in the network structure, ROC curve, Cumulative gains chart, Lift chart and Predicted by observed chart, according to the Independent variable importance analysis; c) Case processing summary with a general report of partition cases; that finally were selected; d) The Network information that the results table, displays information about the neural network and is useful for ensuring that the specifications are correct. e) The Model summary that displays information about the results of training and applying the final network to the holdout sample; f) Classification showing the practical results of using the network. For each case, the predicted response is Yes if that cases' predicted pseudo-probability is greater than 0.5; g) Correcting over-training, this is obtained if you adjust the partitions and run again.

Source: Hinton et al. (2004); Mejía-Trejo (2019a) and IBM (2017) with own adaptation

Hypothesis 3 (H3): The relationship of DMMI- CDMS on Generation Z can be predicted with the same accurate between MLP and BLR techniques

Methodology

Considering our GQ: How is the prediction of the variables involved among Consumer Decision-Making Style (CDMS) for people belonging to Generation Z with Digital Marketing Model (DMMI) Innovation using BLR vs. MLP?

This research aims to assess the predictive capabilities between the Digital Marketing Model Innovation (DMMI), based on the Oslo Manual 4th ed., and the Consumer Decision-Making Style (CDMS) model. To achieve this, we propose to use a Multilayer Perceptron (MLP) as a predictive neural network on different variables compared with a Binary Logistic Regression (BLR). The use of MLP vs. BLR let us contrast, assess, and explain the scope of such predictions of DMMI-CDMS model. The sample is over 400 young Mexican students (Generation Z) belonging to ten local Guadalajara city universities, from January to June 2019.

The methodology followed in this research is:

1. After the literature review about DMMI (Mejía-Trejo, 2018) showing its relationship with the Oslo Manual, 4th ed. (OECD, 2018) concepts and the description of the variables of both: DMMI and the CDMS (Sproles & Kendall, 1986), especially aimed to Generation Z consumers.
2. Using the equation of finite and known population, the sample representative size here is 400 young Mexican students (Generation Z) belonging to ten local universities of Guadalajara city, from January to June 2019. They are belonging to Generation Z (people born from 1995 to 2010) living in Guadalajara with 1'495,189 inhabitants (INEGI,2015), Mexico, to apply the final design of the questionnaire featured in people with intensive use of internet applications. Test of content validity and reliability (Cronbach's Alpha) were applied in 5% of the sample).
3. Finally, it was used as a Multilayer Perceptron (MLP) as a predictive neural network on different variables involved and a Binary Logistic Regression (BLR) to contrast, assess, and explain the scope of such predictions.

Results

So far, according to the methodology mentioned above, we analyzed the results based on the final questionnaire applied on 400 young Mexican students (Generation Z) belonging to ten local universities of Guadalajara city and characterized by the high use of internet applications. The test of the construct reliability based on Cronbach's Alpha is shown in Table 7.

Table 7

Cronbach's Alpha of each construct and combined

Construct	Cronbach's Alpha	No. of Items
CDMS	.737	9
DMMI	.848	11
CDMS-DMMI	.779	20

Source: Own adaptation based on SPSS 25 IBM

Finally, a Multilayer Perceptron (MLP) was applied as a predictive neural network on different variables involved and a Binary Logistic Regression (BLR). These results were compared through the Classification Table report to assess and explain the scope of such predictions. See Table 8.

Table 8

MLP vs. BLR using the Classification Table report

MLP					BLR using forward stepwise								
Predicted					Predicted								
					Selected Cases ^b			Unselected Cases ^c					
					Previously defaulted	Percentage Correct	Previously Defaulted	Percentage Correct					
					0	1	0	1					
Sample	Observed	No	Yes	Percent Correct	Step 1	Previously Defaulted	0	82	2	97.6	28	0	100.0
Training	No	82	2	97.6%	Defaulted	1	0	195	100.0	0	93	100.0	
	Yes	0	195	100%	Overall Percent	99.3%			100.0				
	Overall Percent	29.4%	70.6%	99.3%									
Holdout	No	28	0	100%	Notes:								
	Yes	0	93	100%	a. The cute value is .500								
	Overall Percent	23.1%	76.9%	100%	b. Selected cases validate EQ 1 c. Unselected cases validate NE								

Source: Own adaptation based on SPSS 25 IBM

MLP. The Classification Table shows the practical results of using both the MLP and BLR models. For each case, the predicted response is Yes if that cases' predicted pseudo-probability is more significant than 0.5 (case of neural network). Alternatively, for the case of the logistic regression model, the expected response is Yes if that cases' model-predicted probability is higher than the cutoff value specified in the dialogs (in this case, the default of 0.5). Also, for each sample: Cells on the diagonal of the cross-classification of cases are correct predictions. Cells off the diagonal of the cross-classification of cases are incorrect predictions. For MLP and BLR, The Classification Table shows the practical results of using both instances. For each example, the predicted response is Yes if that cases' model-predicted probability is higher than the cutoff value specified in the dialogs (in this case, the default of 0.5). Cells on

the diagonal are correct predictions; Cells off the diagonal are incorrect predictions. If we see the facts used to create the model, 195 of the 195 people who previously defaulted are classified correctly. On the other hand, 82 of the 84 non-defaulters are classified correctly. Overall, 99.3% of the cases are classified correctly. In MLP case, we see an approach of 70% of the sample in training and 30%, in hold out. If we analyze the BLR, each step to step indicates the improvement in classification. In other words, how well the model performs. A better model should correctly identify a higher percentage of the cases. Ratings based upon the cases used to create the model tend to be too optimistic because their classification rate is inflated. Subset validation is obtained by classifying past customers who were not used to create the model. These results are shown in the Unselected Cases section of the table, where the model correctly classified 100% of these cases. This suggests that, overall, the model is, in fact, correct about one out of one time. Finally, based on MLP we obtained the importance of an independent variable to measure how much the network's model-predicted value changes for different values of the independent variable. Normalized importance is simply the importance values divided by the most significant importance values and expressed as percentages.

The importance chart is simply a bar chart of the importance table values, sorted in a descending amount of importance. It appears that variables related to CDMS on Generation Z, such as SPE, NFC, and PCV, including the CTA of the DMMI, have the greatest effect on how they are perceived by the young people of Generation Z. in Mexico. See Figure 1.

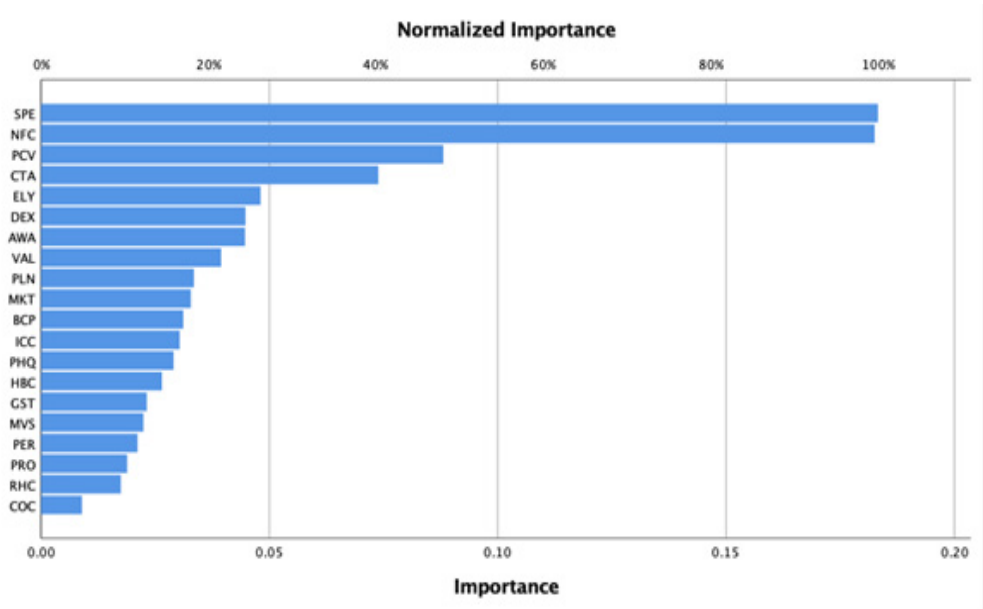


Figure 1. Independent variable importance in graphics

Source: Own adaptation based on SPSS 25 IBM

Discussion

About H1: DMMI can be measured in terms of the Oslo Manual 4th. ed. due to the features shown in Table 2, describing the scope of the main DMMI variables, the answer is positive because it fulfills the following requirements: The DMMI has a scope, a jurisdiction or geographic area where data will be collected, a set of relevant phenomena of interest for understanding innovation, and measurement strategies. (OECD, 2018 par. 2.36). The DMMI phenomena are of interest and are measurable, which requires instruments that can reliably capture intended concepts. For example, the survey respondents are able to understand a question as intended and provide valid responses (meeting one among various validity criteria). The definitions of innovation meet basic validity requirements as a result of extensive cognitive testing with potential respondents. (Ibid., par. 2.37). The DMMI is shown with valid statistical data and is representative of the target population. (Ibid., par. 2.38). The DMMI can handle a statistical unit as an entity about which information is sought and for which statistics are ultimately compiled. In other words, it is the institutional unit of interest for the intended purpose of collecting innovation statistics. Whether it is created by splitting or combining observation units with the help of estimations or imputations in order to supply more detailed or homogeneous data than would otherwise be possible (Ibid., par. 9.16). The DMMI as a measurement framework can focus on the phenomena of interest (the object approach) or the actors responsible for the phenomena (the subject approach). It is also possible to combine both approaches: a survey questionnaire can include general questions about strategies and innovation practices (subject), followed by detailed questions focused on a single innovation (object). (Ibid., par. 2.79). The DMMI fulfills the functional categories for identifying the type of business process innovation (Ibid., par. 3.40), especially the short term 3. Marketing and sales (see Table 1).

The differences among consumer generations (see Table 3) are critical to design and implement strategic planning based on the DMMI. With all the above mentioned, we reached to solve SO1. DMMI fulfills the requirements to be measured in terms of the Oslo Manual 4th. ed.

Regarding (H2): The SPE is the factor that better describes the CDMS on Generation Z and considers the main features of such generation (see Table 4) is positive. The SPE factor is an update of the Sproles & Kendall (1986) CDMS (see Table 5) because it includes several important consumer habits based on internet skills. According to McKinsey (2018), this factor explains Generation Z a new consumption re-signified: from the possession of access. Generation Z analyzes not only what they buy but also the very act of consuming. Consumption has also gained a new meaning. This more pragmatic and realistic generation of consumers expects to access and evaluate a broad range of information before purchases. Generation Z analyzes not only what they buy but also the very act of consuming.

Consumption has also gained a new meaning: Products become services, and services connect consumers. Also, the SPE factor explains Generation Z's meaning of singularity, as consumption as an expression of individual identity. The core of Generation Z is the idea of manifesting personal identity. Consumption, therefore, becomes a means of self-expression (as opposed, for example, to buying or wearing brands to fit in with the norms of groups). Led by Generation Z and Millennials, consumers across generations are eager for more personalized products and willing to pay a premium for products that highlight their individuality. Finally, the SPE factor explains Generation Z a relevant feature, the consumption anchored on ethics; this means consumers increasingly expect brands to take a stand. The point is not to have a politically correct position on a broad range of topics. It is to choose the specific issues (or causes) that make sense for a brand and its consumers and to have something definite to say about those particular issues. In a transparent world, younger consumers do not distinguish between a brand's ethics, the company that owns it, and its network of partners and suppliers. A company's actions must match its ideals, and those ideals must permeate the entire stakeholder system. Generation Z consumers are mostly well educated about brands and the realities behind them. Hence, SPE fulfills the SO2. There is at least a factor that better describes the CDMS on Generation Z relationship, SPE

About (H3): The relationship of DMMI- CDMS on Generation Z can be predicted with the same accurate between MLP and BLR techniques. The main features of MLP and BLR as predictive tools (see Table 6) have shown be effective and sufficiently descriptive based on the different Cronbach's Alpha (see Table 7) of each construct (DMMI and CDMS). It implies the entire model (DMMI-CDMS) with results of MLP vs. BLR shown in Table 8. Both techniques are equivalent to describe the capability of prediction, for instance, in our case: 100% in BLR and 99.3% in the training sample mode of MLP. Hence, based on MLP, we obtained the independent variable importance (see Figure1) tha t shows quantitatively how the normalized variable is important in percentage among all the 20 factors involved in the entire DMMI-CDMS model on Generation Z (see Figure 1). According to those data, we can see that the Social Media, Possession, Individuality, Ethics, Truth Issues indicators (SPE) conform to the real factor considered as the main ax (100%) where the others have been based their measurements. Thereby, we obtained a second importance variable indicated as a Novelty-Fashion Conscious Consumer (NFC), representing the second descriptor factor (99.6%). Between 25%-55% normalized variable importance are Price Conscious, Value for Money Consumer (PCV) with 48.1%, and Effectiveness on Call to Action (CTA) as a part of the DMMI with 40.3%. It is important to mention that we cannot tell the direction of the relationship between these variables. The predicted probability must be calculated with other techniques such as MLR. The other 16 variables are placed into the range of 0-20% of normalized variable importance, describing Generation Z consumers in Mexico. Hence,

besides SPE, the variables NFC, PCV, and CTA solve the SO3. What are the most critical predictive variables of the CDMS-DMMI construct?

Conclusions

The results of this study are significant because:

1. The interest of several organizations to identify the conditions to collect and measure innovation data, according to the Oslo Manual (OECD, 2018), mainly based on DMMI.
2. The measurement of such an innovation model is potentialized with the relationship of Customer Decision-Making Styles variables for a specific generation and product or service (DMMI-CDMS on Generation Z), to increase competitiveness. Understanding customer behavior and providing an excellent quality product or service are very vital factors for a new product that has been launched in a new market (Tayangkanon & Karnsomdee, 2019)
3. The DMMI-CDMS has 20 variables confirming: the Social Media, Possession, Individuality, Ethics, Truth (SPE) as the most crucial variable. The Novelty-Fashion Conscious Consumer (NFC); The Price Conscious, Value for Money Consumer (PCV) and Effectiveness on Call to Action (CTA) are the most representative variables that influence the DMMI-CDMS model.
4. Knowledge of decision-making styles and their active use in a management structure contributes directly to building the digital marketing strategies, hence the opportunity to explore several techniques to predict the actions based on decisions (Remenova & Jankelova, 2019).
5. The set of resulting variables proposed in this work is following IBM (2017) suggestions about how to adjust and use the Binary Logistic Regression (BLR) and Multilayer Perceptron (MLP) predictive tools as a comparison of accurate. The mentioned above was ready to get a better consumer habits description of Generation Z in Mexico. It involves the willingness to rent more than acquiring their possessions, novelty of fashions, remarkable individuality, ethics sense, true sense but very careful of the price and the value for money.
6. It is suggested for future studies to make an Exploratory Factor Analysis (EFA). This is necessary to confirm the grouping of indicators described by Social Media, Possession, Individuality, Ethics, Truth (SPE). It is suggested a Confirmatory Factor Analysis (CFA) via Structural Equation Modeling (SEM) to validate the proposed model of CDMS-DMMI.
7. It is essential to mention that we cannot tell the relationship between these variables. The predicted probability must be calculated with other techniques such as Multiple Linear Regression (MLR) or other multivariate methods.
8. The efficiency of decision-making styles lies in telling us something about the decision-maker (Nohrazen et al., 2019). However, we had several limitations; for instance,

Generation Z's concept corresponds more to an American profile description, not Mexican. Besides that, the survey's location and people were only from Guadalajara city, Jalisco, Mexico.

9. Another interesting study would be to determine how much is the Customer Decision-Making Styles (CDMS) dependent up is on tangible (product) or intangible (services). Some studies suggested that the Customer Decision-Making Styles (CDMS) are influenced by product type and supported that decision-making styles are not consistent when used across contexts and decision situations (Saleh, et al., 2017).

10. For future studies, it is necessary to consider other essential topics like the country's regions, scholarship level, gender studies, the Millennials generation, kind of employment and wage, rural or urban lifestyle.

11. One interesting topic is technology accessibility and the perception of mobile technologies, in which businesses are increasingly impacted by the consumer's usage of mobile technologies. Businesses and consumers are able to interconnect anytime, from pretty much anywhere. By embracing mobile technologies, businesses and consumers have more access to relevant information. As a result, the customer experience during the decision-making process is changed (Schurink, 2019).

12. In order to assess the range of rational, intuitive, and emotional influences on decision making, prominent psychologists and marketers have developed several dual-process or dual-system theories of decision processes (Levine, 2019) that would be tested using neural networks tools to predict the CDMS-DMMI behavior.

13. Finally, it would be interesting to make more applications about how neural networks work as a predictive tool in different modes. For instance: Custom Architecture (we used Automatic Architecture) or different activation functions: Hyperbolic Tangent or Sigmoid or in the type of training mode: Mini-Batch or in optimization algorithm in mode: Gradient Descent, etc.

References

- Alba, J.W.& Hutchinson, J.W (2007). *Consumer Psychology. Handbook of Applied Cognition*. USA: John Wiley & Sons
<https://onlinelibrary.wiley.com/doi/abs/10.1002/9780470713181.ch26>
- Álvarez-Ramos, E.; Heredia-Ponce, H.; Romero-Oliva, M.F. (2019). Generation Z and Social Networks. A vision from the teenagers in Spain. *Revista Espacios*, 40, (20): 9-22. Disponible en:
<https://rodin.uca.es/bitstream/handle/10498/21358/Revista%20espacios.pdf?sequence=1&isAllowed=y>, consultado: 22/10/2019
- Anić,I.; Rajh, E.; Bevanda A. (2012). Decision-making styles of young consumers in Bosnia and Herzegovina. *Young Consumers*, 13 (1), 86-98
<https://doi.org/10.1108/17473611211203966>
- Anić, I., Piri Rajh, S., & Rajh, E. (2014). Antecedents of food-related consumer decision- making styles. *British Food Journal*, 116 (3), 431-450. <https://doi.org/10.1108/BFJ-10-2011-0250>

- AMX (2019). Estudio de los Hábitos de los Usuarios de Internet en México 2018. Asociación de Internet México. Disponible en: <https://www.asociaciondeinternet.mx/estudios/habitos-de-internet>, consultado: 22/10/2019
- Brown, S.P. (2008) Business Processes and Business Functions: a new way of looking at employment. *Monthly Labor Review*. December, 51-70. Disponible en: <https://www.bls.gov/mlr/2008/12/art3full.pdf>, consultado: 12/10/2019
- Ching-Fen, L. (2009). Systematic Behavior Research for Understanding Consumer Decision. *Making Behavior Research Methods*, 41(2), 405-413. <https://doi.org/10.3758/brm.41.2.405>
- EUROSTAT (2018). *Glossary of Statistical Terms*. Disponible en: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Business_functions, consultado: 02/09/2019.
- FEI (2019). How generation Z transforming the workplace. Financial Executives International. Disponible en: <https://www.financialexecutives.org/FEI-Daily/August-2019/How-Generation-Z-Is-Transforming-the-Workplace.aspx>, consultado: 10/09/2019
- GWJ (2020). Gen Z. Observing the latest trends on Gen Zs. Audience report 2020. Global Web Index. Disponible en: https://www.globalwebindex.com/hubfs/Downloads/Gen%20Z%20-%20GWJ.pdf?utm_campaign=Generic%20nurture%202019&utm_medium=email&_hsmi=98894404&_hsenc=p2ANqtz-_OPQznWzHaDu4IR_KqI-PluPdL6PRAIkKMvqQoDG63UtoPtB11AH4i0M19DMScvKNMdhbdt5wCDR9rxuHeiO_rWbdw&utm_content=98894404&utm_source=hs_automation, consultado: 21/09/2019
- Häub, G. & Trifts, V. (2000) Consumer decision making in online shopping environments: the effects of interactive decision aids. *Marketing Science*, 19 (1), 4-21. <https://doi.org/10.1287/mksc.19.1.4.15178>
- Hanzaee, K.H. & Lotfizadeh, F. (2011). Influence of family structure on consumer decision-making style in Iran. *International Journal of Business Management*, 6 (11), 297-304. <https://doi.org/10.5539/ijbm.v6n11p297>
- Heitz-Spahn, S. (2013). Cross-channel free-riding consumer behavior in a multichannel environment: An investigation of shopping motives, sociodemographics and product categories. *Journal of Retailing and Consumer Services*, 20 (6), 570-578. <https://doi.org/10.1016/j.jretconser.2013.07.006>
- Hinton, P.R.; Brownlow, Ch.; McMurray, L.; Cozen, B. (2004). *SPSS Explained*. New York: Routledge <https://www.routledge.com/SPSS-Explained/Hinton-McMurray-Brownlow/p/book/9780415616027>
- Horowitz, B. (2012). After Gen X, Millennials, what should next generation be?. *USA Today*. Disponible en: <https://abcnews.go.com/Business/gen-millennials-generation/story?id=16275187>, consultado: 21/08/2019
- Hyu-Hwa, L., & Jihyun, K. (2008). The effects of shopping orientations on consumers' satisfaction with product search and purchase in a multi-channel environment. *Journal of Fashion Marketing and Management*, 12(2), 193-216. DOI:10.1108/13612020810874881
- IBM (2017). IBM 25. Neural Networks. Industrial Business Machines. Disponible en: <https://www.ibm.com/mx-es/products/spss-neural-networks>, consultado: 28/08/2019
- IBM (2020). Meet the 2020 consumers driving change. Disponible en: <https://www.ibm.com/thought-leadership/institute-business-value/report/consumer-2020>, consultado: 19/08/2019
- INEGI (2015). *Encuesta Intercensal 2015*. Instituto Nacional de Estadística y Geografía. Disponible en: <https://www.inegi.org.mx/app/areasgeograficas/default.aspx>, consultado: 09/08/2019
- Jamal, A.; Davies, F.; Chudry, F.; Al-Marri, M. (2006). Profiling consumers: A study of Qatari consumers' shopping motivations. *Journal of Retailing and Consumer Services*, 3 (1), 67-80. <https://doi.org/10.1016/j.jretconser.2005.08.002>
- Johnson, M.; Christensen C.; Kagermann H. (2008). *Reinventing your business model*. Harvard Business Review. Disponible en: <https://hbr.org/product/reinventing-your-business-model/an/R0812C-PDF-ENG>, consultado: 01/07/2019

- Kearney (2019). *How Gen Zs concern with emotional health fuels retail growth and failure* – Disponible en: https://www.kenearney.com/consumer-retail/article?/a/how-gen-z-s-concern-with-emotional-health-fuels-retail-growth-and-failure&utm_medium=pr&utm_source=prnewswire&utm_campaign=2019AmericasGenZ, consultado: 09/08/2019
- Khan, M. (2006). *Consumer Behavior and Advertising Management*. New Delhi: New Age International Publishers. <https://www.amazon.com/Consumer-Behaviour-Advertising-Management-Matin/dp/812241947X>
- Levine, D.S.(2019) One or two minds? Neural network modeling of decision making by the unified self. *Neural Networks*. 120, 74-85. <https://doi.org/10.1016/j.neunet.2019.08.008>
- Linoff, G.S.& Berry M.J.A. (2011). *Data Mining Techniques. For Marketing, Sales and Customer Relationship Management*. 3rd ed. Indianapolis, Ind.: Wiley Publishing, Inc. <https://www.wiley.com/en-us/Data+Mining+Techniques%3A+For+Marketing%2C+Sales%2C+and+Customer+Relationship+Management%2C+3rd+Edition-p-9781118087459>
- Lake, L. (2009). *Consumer Behavior for Dummies*. Indianapolis, Ind.: Wiley Publishing, Inc. <https://www.amazon.com/-/es/Laura-Lake/dp/0470449837>
- Lastovicka, L. J. (1982). On the Validation of Lifestyle Traits: A Review and Illustration. *Journal of Marketing Research* 19, (1), 126-138. <https://doi.org/10.2307/3151537>
- McKinsey(2018). True Gen: Generation Z and its implications for companies. McKinsey & Company. Disponible en: <https://www.mckinsey.com/industries/consumer-packaged-goods/our-insights/true-gen-generation-z-and-its-implications-for-companies>, consultado: 09/09/2019.
- McCormick, K. & Salcedo, J. (2017). *SPSS® Statistics for Data Analysis and Visualization Indianapolis*, Indiana: John Wiley & Sons, Inc. <https://www.amazon.com.mx/SPSS-Statistics-Data-Analysis-Visualization/dp/1119003555>
- Mejía-Trejo, J. (2018). Designing a Digital Marketing Model Innovation to increase the Competitiveness. First insights in Mexico. *Nova Scientia* 20, 10 (1), 569 – 591. Disponible en: <http://novascientia.delasalle.edu.mx/ojs/index.php/Nova/article/view/1160/517> , consultado: 09/09/2019.
- Mejía-Trejo, J. (2019a). *Análisis Estadístico Multivariante con SPSS para las Ciencias Económico Administrativas. Teoría y Práctica de las Técnicas Dependientes*. México: BUK. Disponible en: <https://buk.com.mx/BUKA0008/description>, consultado: 09/09/2019.
- Mejía-Trejo, J. (2019b). *Fundamentos de Negocios Electrónicos. Teoría y Práctica*. México: Alfaomega. Disponible en: <https://www.alfaomega.com.mx/default/fundamentos-de-negocios-electronicos-teoria-y-practica-9470.html> , consultado: 19/09/2019
- NRF (2019). How brands can use social to connect with Gen Z. National Retail Federation. Disponible en: <https://nrf.com/blog/how-brands-can-use-social-connect-gen-z> consultado: 10/09/2019.
- Nohrazen, I.M.; Kherun, N.A.; Shirin,Sh.,E.; Ahmad,F.A.A.F. (2019). Understanding the Level of Self-Directed Learning and Decision-Making Style of Construction. *International Journal of Interactive Mobile Technologies*, 13 (7), 44-53. <https://online-journals.org/index.php/i-jim/article/view/10749/5775>
- OECD (2018). *Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Ed*. París, France. Organisation for Economic Cooperation and Development (OECD). Disponible en: <https://www.oecd-ilibrary.org/docserver/9789264304604-en.pdf?expires=1569822203&id=id&acname=guest&checksum=41982EA3E-BE6060AEC51870D0888A774>, consultado: 17/09/2019.
- PRC (2020). On the Cusp of Adulthood and facing an Uncertain Future: What We Know About Gen Z so Far.Pew Research Center. Disponible en: <https://www.pewresearch.org/social-trends/2020/05/14/on-the-cusp-of-adulthood-and-facing-an-uncertain-future-what-we-know-about-gen-z-so-far-2/> , consultado: 11/09/2019.
- Premsky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the Horizon*. MCB University Press, 9 (5), October. Disponible en: <https://www.marcprensky.com/writing/Premsky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf> , consultado: 24/09/2019.

- Remenova, K. & Jankelova, N. (2019). How Successfully can Decision-Making Style Predict the Orientation toward Well- or Ill-Structured Decision-Making Problems. *Journal of Competitiveness*, 11 (1), 99–115. <https://doi.org/10.7441/joc.2019.01.07>
- Rezaei, S. (2015). Segmenting consumer decision-making styles (CDMS) toward marketing practice: A partial least squares (PLS) path modeling approach. *Journal of Retailing and Consumer Services* 22, 1–15. <http://doi.org/10.1016/j.jretconser.2014.09.001>
- Ricards, T. (2019). Social proof tactics to build trust with Generation Z. Disponible en: <https://www.freshrelevance.com/blog/social-proof-tactics-to-build-trust-with-generation-z>, consultado: 01/11/2019
- Roosmand, O.; Ghasem. A. N.; Hostede, G.J.; Nematbakhsh, M.A.; Baraani, A.; Verwaart, T. (2011). Agent-based modeling of consumer decision making process based on power distance and personality. *Knowledge-Based Systems*, 24 (7), 1075–1095. <https://doi.org/10.1016/j.knosys.2011.05.001>
- Ruiz-Duarte, A.C.; Sánchez-Baltazar, L.B. and Mayett-Moreno, Y. (2018). Características de compra en línea de la generación z. Un estudio exploratorio en Sinaloa, México. *XXIII Congreso Internacional de Contaduría, Administración e Informática*, 3-16. Disponible en: <http://congreso.investiga.fca.unam.mx/docs/xxiii/docs/14.01.pdf>, consultado: 13/10/2019.
- Saleh, M.; Alhosseini S. E.; Slambolchi A. (2017). A Review of Consumer Decision Making Styles: Existing Styles and Proposed Additional Styles. *International Journal of Research in IT, Management and Engineering*, 07 (1), 33-44. Disponible en: https://www.academia.edu/31511691/A_Review_of_Consumer_Decision-Making_Styles_Existing_Styles_and_Proposed_Additional_Styles, consultado: 13/10/2019.
- Schurink, A.E.; Constanidides, E.; De Vries, S.A.; (2019) Trends in mobile customer journeys: Are you ready for mobile customer decision-making? *18th International Marketing Trends Conference 2019 - Venice, Italy*. Disponible en: <https://research.utwente.nl/en/publications/trends-in-mobile-customer-journeys-are-you-ready-for-mobile-custo>, consultado: 18/10/2019
- Shocker, A.D.; Ben-Akiva, M.; Boccara, B.; Nedungandi, P. (1991). consideration set influences on consumer decision making and choice: issues, models and suggestions. *Marketing Letters*, 2 (3), 181-197. <https://doi.org/10.1007/bf02404071>
- Sproles, G.B. & Kendall, E.L. (1986). A Methodology for Profiling Consumers' Decision-Making Styles, *The Journal of Consumer Affairs*, 20 (2), 267-279. <https://doi.org/10.1111/j.1745-6606.1986.tb00382.x>
- Tayangkanon, N. & Karnsomdee, P. (2019) Factors Influencing Customer Decision-Making on purchasing King Lee Brand in Pathumtani Province. *International Academic Multidisciplines Research Conference in Switzerland 135*. Disponible en: <http://icbtsproceeding.ssruc.ac.th/index.php/ICBTSSWITZERLAND/article/view/351/347>, consultado: 19/10/2019.
- Wagner, T. & Rudolph, T. (2010). Towards a hierarchical theory of shopping motivation. *Journal of Retailing and Consumer Services*, 17 (5), 415-429. <https://doi.org/10.1016/j.jretconser.2010.04.003>
- Wal-Morris, T. (2019). Genz to shop in-store for the holidays. Disponible en: <https://www.retaildive.com/news/gen-z-to-shop-in-store-for-the-holidays/559921/>, consultado: 18/10/2019.
- WEF (2018). The Global Competitiveness Report 2018. Geneve. World Economic Forum. Disponible en: <http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf>, consultado: 27/10/2019.
- WFI (2019). *Part One: Meet Gen Z*. Workforce Institute. Disponible en: <https://workforceinstitute.org/wp-content/uploads/2019/05/Meet-Gen-Z-Hopeful-Anxious-Hardworking-and-Searching-for-Inspiration.pdf>, consultado: 29/10/2019.
- Ypulse (2020). *Millennials & Gen Z Teens' Combined Spending Power Is Nearly \$3 Trillion in 2020*. Disponible en: <https://www.ypulse.com/article/2020/01/09/millennials-gen-z-teens-combined-spending-power-is-nearly-3-trillion-in-2020/>, consultado: 08/11/2019.

Zhitomirsky-Geffet, M., & Blau, M. (2016). Cross-generational analysis of predictive factors of addictive behavior in smartphone usage. *Computers in Human Behavior*, 64:682-693. <https://psycnet.apa.org/record/2016-45315-068>