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Journal of Administrative Science

Biannual Publication, Vol. 4, No. 7 (2022) 6-11

ISSN: 2683-2119

E-commerce in the financial sector: transition to industry 4.0

E-commerce en el sector financiero: transición a la industria 4.0

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Abstract:

The aim of the work consists of: identifying the e-commerce activities implemented by the financial sector in Mexico, using quantitative methods, in order to perform a cluster analysis. Through a compilation of data from the Census on information and communication technologies (2019), sales in millions of pesos and sales methods through ecommerce (Company website, third-party website) are established as study variables. , social media, email). The results indicate that the financial sector that operates in Mexico City reflects the highest amount of sales revenue through e-commerce in: the company's website, third-party website and email, while the sector predominates in social networks financial institution of Nuevo León. Challenges are observed in the integration of technologies industry 4.0 that allow generating greater competitiveness in digital marketing

Keywords:

L-81 Electronic commerce, O-33 Industry 4.0, L-80 Financial services

Resumen:

El objetivo del trabajo consiste en:identificar las actividades de e-commerceimplementadas por el sector financiero en México,mediante métodos cuantitativos, con la finalidad derealizar un análisis clúster. Mediante una compilaciónde datos del Censo sobre tecnologías de la informacióny comunicación (2019), se establecen como variablesde estudio las ventas en millones de pesos y lasmodalidades de ventas mediante e-commerce (páginaweb de la empresa, página web de terceros, redessociales, correo electrónico). Los resultados indicanque el sector financiero que opera en la ciudad deMéxico refleja el mayor monto de ingresos por ventasmediante e-commerce en: página web de la empresa,página web de terceros y correo electrónico, mientrasque en redes sociales predomina el sector financiero deNuevo León. Se observan retos en la integración detecnologías de industria 4.0 que permitan generarmayor competitividad en la comercialización digital.

Palabras Clave:

L-81 Comercio Electrónico, O-33 Industria 4.0, L-80 Servicios financieros

Introducción

Currently, the economy is in a process of transition towards digitization, which is derived from the fourth industrial revolution and the covid-19 pandemic, which have generated effects in all economic sectors and the financial sector, it is not the exception.

Some years ago, companies began to use the internet for commercial purposes, this initiative is recognized as a source of sustainability and economic growth, and although it is important to note that the use of platforms has not replaced the traditional market, establishing the combination of both marketing channels [1].

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Received: 11/03/2022, Accepted: 23/03/2022, Published: 05/07/2022

The above implies rethinking the way of working and establishing strategies that allow the sales process to be carried out, that is, e-commerce or electronic commerce.

E-commerce refers to financial and information transactions carried out electronically between an organization and any third party with whom it has dealings [2].

Then, e-commerce brings with it the opening of new horizons that allows expansion to global markets and has drastically reduced the meaning of distance, in such a way that a fast service is provided and it is allowed to reach more market through the use of technology, generating a competitive advantage for the sector [3].

Thus, the use of e-commerce in the business environment makes it a very powerful digital marketing strategy, allowing the improvement of business conditions that are part of the activities carried out by an organization every day [4].

However, one of the problems identified in organizations is that they use technology in a limited way as a means of commercialization, which is why the challenge of not only establishing an e-commerce site is presented, on the contrary, generating strategic plans oriented to the transition to industry 4.0 that imply the use of digital tools in the different processes.

According to the Mexican Association for Online Sales (AMVO), electronic commerce grew by 81% in 2020, which stems from the covid-19 pandemic and the transition to industry 4.0, as well as It is established that 85% of Mexicans prefer to buy online using a mobile phone and 60% on laptops, which reflects the potential of e-commerce, however, it represents a challenge for organizations to promote electronic commerce and guarantee security in transactions, as well as diversifying payment options [5].

Therefore, the importance of carrying out this work is to know the situation at the national level, since the digital age is a reality, daily more than three million people use the internet, then, the digital economy transforms society, with this This work generates a diagnosis of the e-commerce process and the transition to industry 4.0, in such a way that in the near future financial sector organizations will see opportunities that involve more than the use of e-commerce, on the contrary , value propositions must be generated, from the product services they offer, to the way they are organized and operated. In addition, financial companies must diversify and modify their corporate cultures, acquiring new talents [6].

This is how the research question arises: What are the e-commerce activities implemented by the financial sector in the states and how are they grouped?

The objective of this work is to: identify the e-commerce activities implemented by the financial sector in Mexico, using quantitative methods, in order to perform a cluster analysis. The work is structured with this introduction, followed by a review of the literature on the financial sector, e-commerce and industry 4.0, and then the methodology, results and conclusions are presented.

A. The financial sector, e-commerce and the transition to industry 4.0

The so-called Industry 4.0 emerged in developed countries in the second decade of 2000 as an industrial policy response to a new phase in the information and communication technology revolution [7].

Industry 4.0 represents a significant transformation of all industrial production through the unification of digital technologies and the internet with conventional industry [8].

In Mexico, industry 4.0 is still in its gestation stage; however, its effects are having a strong impact on the definition of corporate strategies in many industries and on the way in which the nature of competition is shaping [9].

The concept of industry 4.0 refers to: “the phenomenon that exists between various factors thanks to a transversal impact of information technologies, the Internet of things (IoT, Internet of things) in different industrial sectors” [10].

On the other hand, industry 4.0 is “a process of economic and social change within the organization, which results from the integration of digital technologies, to allow important improvements in performance, from the customer experience, innovation in processes and business models” [11].

For that reason, it is established that the concepts of industry 4.0 and smart manufacturing are relatively new and contemplate the introduction of digital technologies [12].

However, the definition for the financial sector refers to “the integration and digitization of all business processes through the conscious use of exponential or disruptive technologies that, leveraged by digital transformation, will allow rapid adaptation to changes generated by volatility and heterogeneity of the markets, ensuring that customers' needs for flexibility and personalization are satisfied through a unique, simple and memorable user experience” [13].

Regarding the financial sector, it is important to specify that currently some of these technologies have been used, however, there is no integration process that allows the generation of competitive advantages that contribute to operational efficiency and organizational performance, since they are used tools in isolation, considering B2C (Business to Consumer): which refers to the trade of products that is established between a company and a consumer [14].

In addition to the above, it can be reflected that electronic commerce can be understood as the process of buying and selling products and services through the transmission

of data over the Internet and the World Wide Web (www) [15].

Likewise, it is established that the digitization of organizational functions is carried out, such as sales, which are carried out through the internet and allows the commercial transaction to be carried out easily, quickly and efficiently; which provides advantages for the client or user such as: access to all kinds of information from the same physical location; selection and comparison of products and services quickly that facilitates decision making; eliminate additional search costs and carry out transactions in less time [16].

However, it is difficult to quantify the implications of industry 4.0; on that account, the incorporation of this type of technology will provide information in real time, through the Internet and various mobile devices, thereby facilitating the creation of cooperation networks and collaboration, as well as better decision-making [17].

Because of that, it is clear that other alternatives for consumption and sales transactions through electronic commerce have reappeared, due to the practicality and speed of web technology, which has allowed companies to better position themselves in the markets, bringing with it higher profits, customers and partners [18] [19].

Materials and methods

This research is a quantitative, exploratory and descriptive study. Through the data compilation method, the results of the Census on information and communication technologies (2019) are retaken, specifically from the section of sales through the use of technology (e-commerce) corresponding to the financial sector.

The study population considers the results of 26,593 economic units of the financial sector, distributed in 32 states of the Mexican Republic.

The study variables considered are: sales in millions of pesos and the methods of sale through e-commerce (company website, third party website, social networks, e-mail).

In the first place, the sales level comparison is generated in each modality by state and then by means of the cluster analysis statistical tool, the grouping by state is generated from the income from sales in each of the e-commerce modalities.

As part of the method, the information was concentrated in an excel database, then the variables with maximum values of one and minimum values of zero were normalized and exported to the SPSS software (Statistical Package for the Social Sciences) version 25.

Results and discussion

In Table I and Figure 1, the descriptive results of the study population are presented, the data shows that the states with the highest number of economic units in the financial sector are: Jalisco (7.40%), Mexico City (7.04%) and Mexico (6.29%), while the states with the lowest number of companies in the financial sector are: Tlaxcala (0.67%), Baja California Sur (0.78%) and Colima (0.79%).

TABLE I
ECONOMIC UNITS OF THE FINANCIAL SECTOR

Federal entity	Frequency	Percentage
01 AGS	307	1.15%
02 BC	1,265	4.76%
03 BCS	207	0.78%
04 CAM	241	0.91%
05 COA	871	3.28%
06 COL	210	0.79%
07 CHS	890	3.35%
08 CHI	1,006	3.78%
09 CMX	1,872	7.04%
10 DGO	355	1.33%
11 GTO	1,351	5.08%
12 GRO	472	1.77%
13 HGO	542	2.04%
14 JAL	1,969	7.40%
15 MEX	1,672	6.29%
16 MIC	981	3.69%
17 MOR	416	1.56%
18 NAY	341	1.28%
19 NLN	1,575	5.92%
20 OAX	904	3.40%
21 PUE	1,128	4.24%
22 QRO	614	2.31%
23 QTR	460	1.73%
24 SLP	515	1.94%
25 SIN	1,061	3.99%
26 SON	1,152	4.33%
27 TAB	447	1.68%
28 TAM	1,008	3.79%
29 TLA	178	0.67%
30 VER	1,479	5.56%
31 YUC	849	3.19%
32 ZAC	255	0.96%
Total	26,593	100.00%

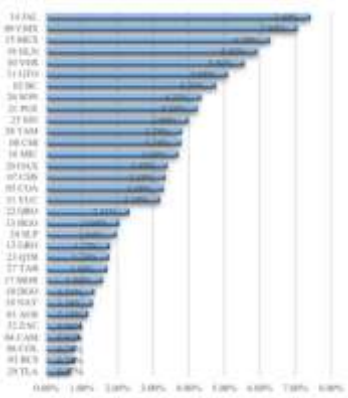

Fig. 1 Distribution of economic units in the financial sector.

Next, in Table II and Figure 2, the results of the economic units of the financial sector that made or did not make online sales (e-commerce) are presented using digital tools such as: company website, third-party website, email and social networks during the year 2019.

The data shows that of the total 87.38% did not make sales over the internet, while 12.62% did make sales over the internet.

TABLE IIIII
TYPE OF SALES OF ECONOMIC UNITS

Federal entity	They did not sell online		They made internet sales		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
01 AGS	266	1.00	41	0.15	307	1.15
02 BC	1,139	4.28	126	0.47	1,265	4.76
03 BCS	185	0.70	22	0.08	207	0.78
04 CAM	217	0.82	24	0.09	241	0.91
05 COA	772	2.90	99	0.37	871	3.28
06 COL	178	0.67	32	0.12	210	0.79
07 CHS	824	3.10	66	0.25	890	3.35
08 CHI	888	3.34	118	0.44	1,006	3.78
09 CMX	1,536	5.78	336	1.26	1,872	7.04
10 DGO	326	1.23	29	0.11	355	1.33
11 GTO	1,342	4.29	209	0.79	1,351	5.08
12 GRO	406	1.53	66	0.25	472	1.77
13 HGO	488	1.84	54	0.20	542	2.04
14 JAL	1,749	6.58	220	0.83	1,969	7.40
15 MEX	1,508	5.67	164	0.62	1,672	6.29
16 MIC	882	3.32	99	0.37	981	3.69
17 MOR	354	1.33	62	0.23	416	1.56
18 NAY	280	1.05	61	0.23	341	1.28
19 NLN	1,327	4.99	248	0.93	1,575	5.92
20 OAX	750	2.82	154	0.58	904	3.40
21 PUE	1,026	3.86	102	0.38	1,128	4.24
22 QRO	319	1.95	95	0.36	614	2.31
23 QTR	405	1.52	55	0.21	460	1.73
24 SLP	453	1.70	62	0.23	515	1.94
25 SIN	920	3.46	141	0.53	1,061	3.99
26 SON	1,002	3.77	150	0.56	1,152	4.33
27 TAB	399	1.50	48	0.18	447	1.68
28 TAM	881	3.31	127	0.48	1,008	3.79
29 TLA	161	0.61	17	0.06	178	0.67
30 VER	1,277	4.80	202	0.76	1,479	5.56
31 YUC	765	2.88	84	0.32	849	3.19
32 ZAC	211	0.79	44	0.17	255	0.96
Total	23,296	87.58	3,337	12.62	26,593	100

In Table III and Figure 2, the different types of sales through ecommerce in the financial sector are presented by federal entity, it is observed that Mexico City presents the results of greater use in: the company's website, third-party website and email, while Nuevo León is located on social networks.

As for the states that reflect to a lesser extent the use of technological tools to commercialize, Colima and Nayarit stand out on the company's website. Regarding the third-party website, Campeche is identified, in Nayarit social networks, referring to Aguascalientes and Tabasco email, as well as Baja California Sur in another computer mode.

TABLE IVVVI
SALES REVENUE THROUGH E-COMMERCE

Federal entity	Company website	Through third-party websites	In Social Networks	E-mail	Other computing modality
01 AGS	0.001	0.024	0.005	0.000	0.060
02 BC	0.011	0.235	0.033	0.056	0.035
03 BCS	0.002	0.004	0.028	0.004	0.000
04 CAM	0.012	0.000	0.057	0.020	0.019
05 COA	0.025	0.056	0.132	0.581	0.176
06 COL	0.000	0.002	0.019	0.006	0.058
07 CHS	0.007	0.007	0.075	0.099	0.014
08 CHI	0.030	0.165	0.585	0.651	0.174
09 CMX	1.000	1.000	0.453	1.000	0.109
10 DGO	0.006	0.006	0.014	0.002	0.059
11 GTO	0.008	0.040	0.189	0.270	1.000
12 GRO	0.003	0.008	0.085	0.006	0.009
13 HGO	0.002	0.003	0.019	0.010	0.005
14 JAL	0.231	0.333	0.991	0.347	0.480
15 MEX	0.008	0.009	0.066	0.123	0.075
16 MIC	0.007	0.044	0.123	0.010	0.208
17 MOR	0.002	0.005	0.005	0.016	0.116
18 NAY	0.000	0.137	0.000	0.012	0.167
19 NLN	0.042	0.132	1.000	0.069	0.587
20 OAX	0.005	0.013	0.052	0.008	0.474
21 PUE	0.008	0.050	0.123	0.016	0.152
22 QRO	0.004	0.071	0.075	0.052	0.196
23 QTR	0.004	0.002	0.033	0.016	0.028
24 SLP	0.026	0.020	0.104	0.012	0.088
25 SIN	0.026	0.028	0.038	0.058	0.053
26 SON	0.021	0.045	0.080	0.028	0.082
27 TAB	0.006	0.002	0.009	0.000	0.012
28 TAM	0.017	0.046	0.217	0.028	0.074
29 TLA	0.001	0.003	0.019	0.002	0.016
30 VER	0.018	0.025	0.250	0.081	0.247
31 YUC	0.007	0.016	0.071	0.012	0.065
32 ZAC	0.002	0.002	0.019	0.004	0.117

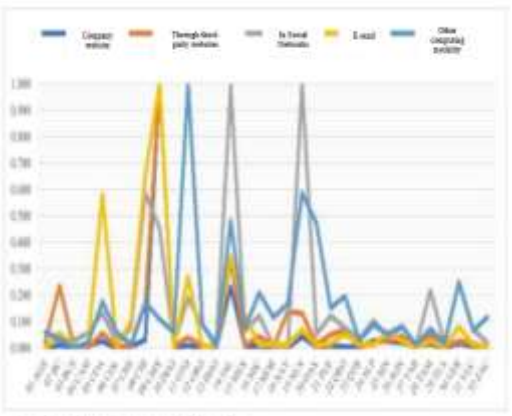

Fig. 2 Sales revenue through *e-commerce*.

On the other hand, Figure 3 shows the e-commerce cluster analysis through the company's website, which reflects the integration of three clusters, the first one integrates: Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila, Colima, Chiapas, Chihuahua, Durango, Guanajuato, Guerrero, Hidalgo, Mexico, Michoacán, Morelia, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Tlaxcala, Veracruz, Yucatan and Zacatecas. On the other hand, Jalisco and Mexico City are located individually, that is, they have a different behavior in terms of sales by this modality compared to the rest.

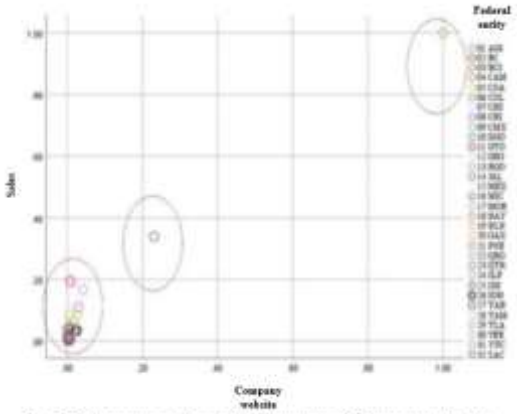

Fig. 3 Sales revenue through *e-commerce* (Company website).

In Figure 4, the integration of six clusters is observed, of which three reflect individual behavior, as is the case of: Guanajuato, Chihuahua and Mexico City. The second cluster groups Veracruz and Tamaulipas, while the third groups Jalisco and Nuevo León. Consequently, most of the states are integrated into the group with the lowest use of social networks, considering: Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila, Colima, Chiapas, Durango, Guerrero, Hidalgo, Mexico, Michoacán , Morelia, Nayarit, Oaxaca, Puebla, Querétaro, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tlaxcala, Yucatán and Zacatecas.

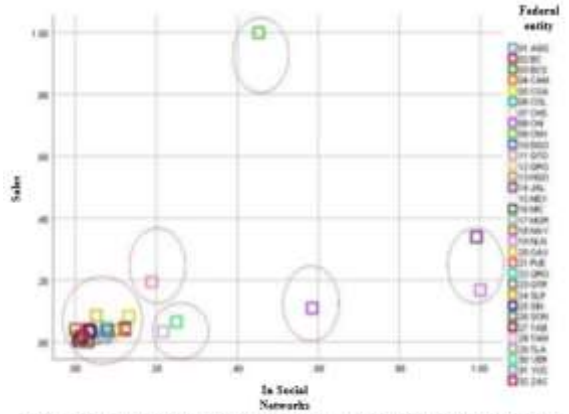

Fig. 4 Sales revenue through *e-commerce (Social Networks)*.

In Figure 5, the e-commerce cluster analysis is presented through a third-party website, showing the grouping of three clusters, the first grouping: Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila, Colima, Chiapas, Chihuahua, Durango, Guanajuato, Guerrero, Hidalgo, Mexico, Michoacán, Morelia, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Tlaxcala, Veracruz, Yucatán and Zacatecas. The second group considers Jalisco and Baja California, while Mexico City is located in isolation, reflecting the highest revenue in sales through third-party websites.

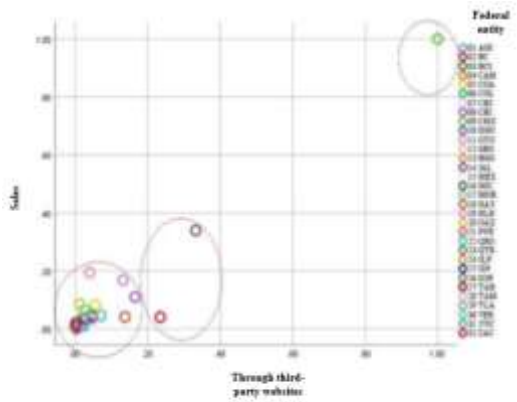

Fig. 5 Sales revenue through *e-commerce (third party website)*.

Figure 6 shows the results of the e-commerce cluster analysis through email, visualizing the integration of four groups, in the first one they are integrated: Aguascalientes, Baja California, Baja California Sur, Campeche, Coahuila, Colima, Chiapas, Chihuahua, Durango, Guerrero, Hidalgo, Michoacán, Morelia, Nayarit, Nuevo León, Oaxaca, Puebla, Querétaro, Quintana Roo, San Luis Potosí, Sinaloa, Sonora, Tabasco, Tamaulipas, Tlaxcala, Yucatán and Zacatecas. The second group considers Jalisco and Guanajuato. Group three groups Mexico and Veracruz, while Mexico City is located in isolation, reflecting the highest revenue in sales via email page.

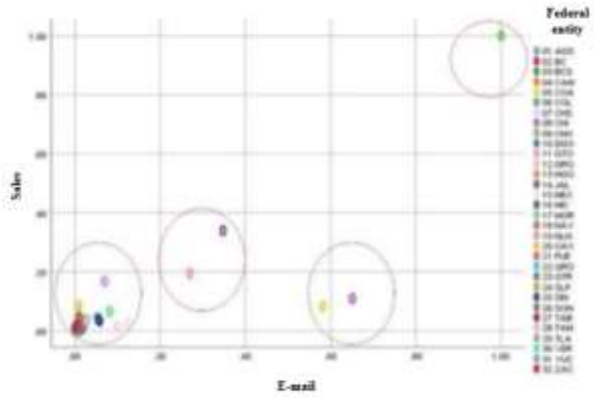

Fig. 6 Sales revenue through *e-commerce (e-mail)*.

Conclusions

It can be seen that the economic units of the financial sector are migrating to digital marketing, although there is progress in the marketing process through digital technology, the results of this exploratory study allow identifying that Mexico City is where a higher sales income derived from the application of these tools such as the company's website, third-party website, email and social networks, not so in the rest of the states. Regarding social networks, a greater amount of income is identified for this technological tool in Nuevo León.

Likewise, as part of the integration of the clusters, with respect to the company's website, three groups are generated, while in social networks atypical behavior of: Guanajuato, Chihuahua and Mexico City is shown. Regarding third-party web pages, three groups are also generated, observing an atypical behavior in Mexico City. Finally, four groups are generated in e-mail, also showing a difference in Mexico City.

The main limitation of the work is that the data correspond to the year 2019, so it is interesting to carry out the current analysis, also, the scope of the work is exploratory, of a first phase of a comprehensive project that will analyze technologies that guide the transition Industry 4.0, such as: big data, IoT and cybersecurity that enhance organizational capabilities and operational and organizational performance, however, it is an advance to know the situation regarding the use of e-commerce technological tools at the national level and how they potentiate sales in the states, likewise, perform the grouping by states that by means of the cluster tool allows to visually compare the results.

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