



# Estimating the level of digitalization of companies' sales channels in Bahía Blanca, Argentina, in the context of the pandemic

## *Estimación del nivel de digitalización de los canales de venta de empresas de Bahía Blanca, Argentina frente a la pandemia*

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### Abstract

This work determines the sales channels' level of digitalization of registered companies in the "DesdeCasa" directory in Bahía Blanca built by the Town Hall and others through the pandemic. From principal component analysis on the presence of these companies on different digital platforms such as Facebook, Instagram, WhatsApp, its own website and the level of e-commerce, a digitization index is built. The 1 284 registered companies are regrouped in 18 areas of activity. It is observed that the categories "Furniture and decoration", "IT-electronics and others", and "Healthy eating (without TACC)" are the ones with the greatest levels of digitalization; while "Pharmacy", "Food in general" and "Warehouse-self-service" are the ones with the least levels of digitalization. Regarding e-commerce, only 14.5% of companies are at an advanced level (transactional). While most of the companies (73%) do not have their own website, it is underlined that 80% are present on social networks.

JEL Code: D21; L86; O33

Keywords: electronic commerce; pandemic; ICT; social media; businesses

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## Resumen

Este trabajo mide el nivel de digitalización de los canales de venta de empresas de Bahía Blanca del directorio DesdeCasa, creado por el Municipio y otros actores durante la pandemia. Basado en un análisis de componentes principales sobre la presencia de estas empresas en diferentes plataformas digitales como Facebook, Instagram, WhatsApp, sitio web propio y nivel de comercio electrónico, se construye un índice de digitalización. Las 1 284 empresas son reagrupadas en 18 rubros de actividad. Se observa que los rubros “Muebles y decoración”, “Informática-electrónica y otras”, y “Alimentación saludable (sin TACC)” son los de mayor digitalización; mientras que “Farmacia”, “Alimentos en general” y “Almacén-autoservicio” son los de menor digitalización. Respecto del comercio electrónico, sólo 14.5% de las empresas alcanzó un nivel avanzado (transaccional). Si bien, la mayoría de las empresas (73%) no dispone de un sitio web propio, se destaca que 80% está presente en las redes sociales.

*Código JEL:* D21; L86; O33

*Palabras clave:* comercio electrónico; pandemia; TIC; redes sociales; empresas

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## Introduction

E-commerce adoption (ECA) in companies involves different degrees of using Information and Communication Technologies (ICT) to support management, business operations, and decision-making (Ghobakhloo et al., 2011; Aghamirian et al., 2015). E-commerce represented 10.2% of total retail sales worldwide in 2017, according to Nielsen data (2018). Nevertheless, in the COVID-19 pandemic, online commerce has been driven by more companies and consumers seeking appropriate digital technologies (WHO, 2020; Ungerer et al., 2020). The limitations and restrictions associated with lockdown and social distancing highlighted the value of digital solutions, no longer as alternatives but as the main option for buying, selling, and paying for goods and services.

Several studies point out that the massive application of digital technologies to marketing generates structural changes in consumption patterns (Cámara Argentina de Comercio Electrónico-CACE, 2021; Meltzer, 2018; World Economic Forum, 2017). In recent years, digital transformation in the Latin American region has been heterogeneous, not only when considering the country of origin but also the size of the companies (Correa et al., 2018). Nevertheless, the current pandemic requires immediate solutions to ensure the survival of many companies, especially SMEs (LACTLD, the Latin American and Caribbean Top Level Domain Organization, 2020). For example, in the aftermath of the pandemic, the testing of several emerging technologies has accelerated. Such technologies are increasingly expected to accelerate the business sector's recovery and drive new production and innovation cycles. The development of e-commerce and digital transformation are not only palliative solutions to the pandemic but offer significant opportunities to help countries in the region make up for the backwardness they have always suffered (LACTLD, 2020).

Nevertheless, the adoption of ICTs by companies has not been easy during the pandemic and in many cases requires government support. In the case of developed countries such as the United States, many company managers could adapt to this digital market transformation to recover from the decline in their physical sales in the face of the pandemic or even to encourage higher sales in general (Kim, 2020). For example, Walmart's electronic sales or those from e-commerce increased by 74% in April 2020, despite the drop in physical retail sales (Redman, 2020; Nassauer, 2020). Overall, in the US, e-commerce sales increased 141% each month of the first four months of 2020 versus an increase of less than 1% in physical commerce (Nassauer, 2020).

In Latin America, more than ten million citizens who had never shopped online have begun doing so regularly through the Mercado Libre platform. According to data from Mercado Libre Mexico, with a presence in 18 countries, the number of buyers after the pandemic increased by 45.2%. Nevertheless, there are several countries in the region where only a small portion of the population has access to credit cards or some type of online payment method, which constitutes an obstacle to the development of e-commerce (LACTLD, 2020). In turn, the main opportunity in the region to improve e-commerce lies in improving the delivery system. Postal delivery is the biggest infrastructure weakness of e-commerce in Latin America (UNCTAD, 2020). In the particular case of Argentina, the UPU<sup>1</sup> postal reliability index barely reaches a value of 10, below other countries in the region, such as Brazil and Uruguay, and far below more developed countries.

In Brazil, data from the Brazilian E-Commerce Association indicate a 56.8% growth in online sales in 2020. Although large platforms such as Mercado Libre are the winners in this context, small businesses also manage to keep their clients or get new clients with more informal digital channels such as WhatsApp. For this retail sector, creating new business models driven by e-commerce in the Latin American region is not a viable option, and for many others, it remains an unknown option (Siemens, 2019).

The digital gaps associated with organizational size continue to be evidenced by measurements of the quality of access to broadband connections and the availability of websites globally and in the Latin American region. While most SMEs in the region are connected, these are generally low- or medium-speed connections, in contrast to larger companies and advanced economies.

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<sup>1</sup>The UPU is a composite index that measures the performance of countries in four key aspects of postal development: reliability, accessibility, relevance, and resilience. It is published by UNCTAD based on different sources of information: postal macro data, statistics, and surveys. The country that achieves the best results in postal development gets a standardized score of 100 and the country that achieves the worst results gets a minimum score of 0. Countries can use the results of the UPU index to shape strategies to increase the contribution of postal services to their socio-economic infrastructure (UNCTAD, 2020).

In Latin America, according to a study published by the International Labor Organization (ILO, 2020), based on surveys conducted by the World Bank in 2018 among companies in the manufacturing and services sectors with more than 5 employees, 53% of small companies in the region do not have their own website, while this is the case for 32% of medium-sized companies. In addition, it is observed that 20% of small businesses in Latin America and the Caribbean do not have email, while this is the case for 5% of medium-sized companies.

By 2017, the percentage of companies with a website in Argentina was 89% for companies with more than 100 employees, 83% for companies with 20 to 99 employees, and 61% for companies with less than 20 employees (Dini et al., 2021). On the other hand, according to data from Correa et al. (2018), the percentage of companies with their own website in 2017 was 60%, 80%, and 90%, depending on whether they were small, medium, or large. In Argentina, over 95% of companies use email (ILO, 2020). According to CACE data, 9 out of 10 Argentines have shopped online at least once, reflecting that confidence is growing and the market is more mature (CACE, 2022). It is observed that 8 out of 10 sessions are carried out through mobile devices and that the category with the highest online sales in the face of the pandemic is food and beverages, followed by home, furniture, and gardening (CACE, 2020). Mercado Pago stands out in payment methods, being chosen by 90.1% of Argentines who have purchased through this channel.

In Argentina, this increase in online shopping is also explained by the level of ICT adoption by the population. According to the 2017 National Survey of Cultural Consumption (ENCC) of the Cultural Information System of Argentina (SinCA), in Argentina 80% of the population is connected to the Internet, above the global average of 53%. Of those connected to the Internet, 93% do so through mobile phones. Facebook is the most popular social network in the country, with 64.4% of the population having an account, followed by Instagram and Twitter (with 27.3% and 13.2%, respectively). On the other hand, according to the Business to Consumer<sup>2</sup> (B2C) Index for 2019 published by the United Nations Conference on Trade and Development (UNCTAD), Argentina ranks 85th in the world, with an index value of 50 (50% of the population conducts B2C), slightly above the average for Latin America, which was 48 for that year. Nevertheless, the value of this index for the country is below the world average (55) and significantly lower than that of developed countries (87).

After a review of the literature, no studies have been found in Argentina that explore the level of companies' adoption of different digital channels in the context of the pandemic or that analyze the role of local governments in assisting the business sector during health and economic crises. Accordingly, this

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<sup>2</sup>UNCTAD's Business-to-Consumer (B2C) E-Commerce Index 2020 ranks 152 nations based on their readiness for online shopping. Countries are scored based on access to secure Internet servers, reliability of postal services and infrastructure as measured by the Universal Postal Union (UPU), and the share of their population that uses the Internet and has an account with a financial institution or mobile money service provider (UNCTAD, 2020).

work makes an empirical contribution to comprehending the reality of local and national companies in a critical context.

From the data obtained from the DesdeCasa platform, an index is constructed that measures the level of the digital readiness of some companies in Bahía Blanca to face the pandemic through e-commerce based on the availability and use of different digital channels. It is not an ex-post index since the data collected was at the beginning of the pandemic, which is still ongoing and has not been eradicated.

The paper is structured as follows. First, a review of the literature is conducted to find background information on technological adoption by companies, e-commerce adoption, digital platforms, and an analysis of the situation in Latin American countries in the context of the pandemic. Next, the applied methodology of Principal Component Analysis (CPA) is described and framed within the objectives of the study. Then, the results obtained by constructing the digitalization index by factor analysis are presented. Finally, the work's conclusions, limitations, and implications are presented.

## **The case of the DesdeCasa platform in Bahía Blanca**

In the case of the Municipality of Bahía Blanca, measures have also been carried out to provide solutions to the economic activity of merchants, entrepreneurs, SMEs, and local companies in the context of the COVID-19 pandemic. Bahía Blanca is one of the five cities in Argentina with the highest percentage of households connected to the Internet. In this city, 62% of the population has access to a computer at home, and the percentage of the population with Internet access at home is 84%, according to data from the National Institute of Statistics and Census of Argentina (INDEC) for the third quarter of 2020. In particular, the Innovation Laboratory LAB BAHIA GOB, together with the business consulting firm NexoSmart IT, entrepreneurs and citizens, the Polo Tecnológico del Sur, chambers of commerce, trade unions, and universities, designed the DesdeCasa platform, which allows users to find in a simple and agile way the products and services offered online by some companies in the city.

This initiative originated in the Innovation Laboratory of the Municipality of Bahía Blanca, with the participation of technological entrepreneurs and professors from the Computer Science Department of the Universidad Nacional del Sur (UNS). Through this platform, local businesses and companies are connected with potential buyers, and the possibility of home delivery of the product is offered. By the end of April 2020, 1 114 businesses and 1 196 vehicles were registered for door-to-door delivery. Nexo Smart, a young business IT consulting company, was responsible for the technological development of the platform, which was designed free of charge. In turn, UNS Computer Science Department volunteers were responsible for supporting the help desk created to guide platform users and answer their questions.

The DesdeCasa platform has the participation of more than 1 400 companies from different sectors. For practical purposes, the platform functioned as a directory of local companies, with information on the products and services offered, geographical location, and availability of digital channels for contact and interaction. A priori, the size of the companies registered on the DesdeCasa platform, in terms of number of employees or turnover, is unknown. Nevertheless, considering that about 74% of the registered companies do not have a website, these data suggest that most companies are not large. According to the literature, most large companies have their own website, although this may vary by sector and activity.

On the other hand, the Polo Tecnológico del Sur has collaborated in training and enabling merchants and entrepreneurs to learn about e-commerce and digital sales tools. On the other hand, the municipality has also complemented the platform's service with training for entrepreneurs on e-commerce and Internet sales with the support of professors from the Economics Department of the Universidad Nacional del Sur. Nevertheless, no data on traffic and transactions, such as the number of visits received, sales made, or interaction with buyers, were recorded.

## **Theoretical framework**

The adoption of ICT by companies is an evolutionary and dynamic process that requires certain minimum levels of technological infrastructure, knowledge, and organizational skills as a starting point. Throughout this process, the necessary actions are identified in terms of technological solutions, knowledge, and resources needed to increase productivity and move to higher levels of maturity as experience is gained in adopting more complex technologies (Peirano & Suárez, 2006; Kotelnikov, 2007; Rivas & Stumpo, 2011).

E-commerce has become important for small and medium-sized companies as a channel and tool to enter or remain in the market. Digital channels enhance the possibilities of designing commercial strategies based on the knowledge of the preferences of clients and prospects, facilitate the personalization of proposals, and favor loyalty (Choshin Ghaffari, 2017; Kurniawati & Siddiq., 2020). Nevertheless, their successful implementation is conditioned by several internal and external factors to organizations (Tambunan, 2020; Choshin Ghaffari, 2017). Accordingly, for example, entrepreneurs' perceptions of the potential benefits of e-commerce (Poorangi et al., 2013), as well as their commitment to strategically manage the factors that enable or facilitate its successful adoption, such as the different channels through which it is conducted (websites, apps), after-sales service and delivery time, the reputation of the company, and the type of product (Jones et al., 2016; Vázquez Esquivel, 2019), are of great importance.

Social commerce can be considered an extension of e-commerce, using social networks as communication and marketing channels. Social networks are digital channels of an interactive nature that

help companies to have a market presence, extend and strengthen contacts with clients and suppliers, provide customer services, and, more recently, support online marketing and sales (Wang et al., 2020; Zhang et al., 2017). The number of businesses using social networks to promote products and services has grown rapidly (Han et al., 2018). Social commerce, which arises from the combination of e-commerce and Web 2.0 or participatory web, is mainly used to support the various interactions and contributions that occur between users in the processes associated with the purchase of goods and services online (Liang & Turban, 2011; Turban et al., 2011). Accordingly, considering the large number of participating members and their ease of use, social networks are positioned as a tool with great potential for e-commerce in creating value for companies. They are channels where clients do not limit themselves to consuming but also participate in opinions and exchanges. Therefore, companies want to capture their economic value (Alderete & Jones, 2019a). On the other hand, a study by García et al. (2017) concludes that, among Spanish SMEs, Facebook is the most used social network, although only half of the companies in the sample analyzed used social networks as a communication channel. In other words, a testimonial type of use of social networks by the companies is evident since they seek to favor positioning in search engines rather than to provide a space for dialogue with clients, which is why very poor levels of engagement are generally observed (García et al., 2017).

Institutional theory indicates that governments play a critical role in creating an institutional environment that promotes private investment and e-commerce in particular (Oxley & Yeung, 2001). Lip-Sam and Hock-Eam (2011) and Jeon et al. (2006) found that government support for SMEs was effective for e-commerce adoption at all levels. Government measures to promote e-commerce range from training entrepreneurs and promoting e-commerce to investments in telecommunications, imposing fair taxes for online transactions, etcetera.

Digital platforms are important drivers of the Internet economy and have developed in different sectors, helping to drive business innovation and increase efficiency and productivity for companies, including MSMEs. Platforms such as Amazon, Alibaba, eBay, and Mercado Libre create value by facilitating the encounter between buyers and sellers of the most varied items (ECLAC, 2018). Built on shared and interoperable infrastructures, they are data-intensive and promote efficiency in digital processes, providing secure solutions to conduct online transactions. Others, such as PayPal and Mercado Pago, connect retailers with consumers for electronic payments (World Economic Forum, 2017).

A feature of digital platforms is the generation of network effects: their value depends directly on the number of users in their different categories. Furthermore, they collect large amounts of market data that enable the analysis of sales trends in general and specific terms by category, product, area, segment, consumer profiles, etcetera. The personal and non-personal data recorded from interactions enable them to generate more value for their users by improving the personalization of services (European

Commission, 2016). At the same time, they provide companies with significant savings of money and effort in technological infrastructure by lowering the barriers to entry into e-commerce (Yadav et al., 2022), reducing the cost of transactions and communication and marketing efforts, and accelerating and boosting market penetration.

On the other hand, this process of e-commerce adoption by companies results in different levels or degrees of complexity. Molla and Likert (2005) propose different levels of ECA based on the characteristics of the institutional websites of each company. Thus, ECA reaches level 0 when the company has no website of its own, level 1 when the website is informative, level 2 when the website is interactive, and level 3 when the website is transactional. Companies with an informative website (low) only conduct the institutional presentation and provide access to a product/service catalog. The companies in level 2 (medium) have some type of interaction with clients and prospects, such as online consultations or through forms, consultation of budgets, and reception of online orders/reservations from clients. The companies with an ECA level 3 (high) have a website that enables the conducting of transactions with clients and suppliers, a shopping cart, online payment, order tracking, online sales and after-sales services, and access to suppliers' extranet, among others.

In the case of Argentina, several works (Alderete & Jones, 2019a; 2019b; Alderete et al., 2017; Jones, 2017; Jones et al., 2013) have contributed to the knowledge of the state of the art of e-commerce in the country and, therefore, in the Latin American region. Alderete and Jones (2019a) conduct a taxonomy of companies in terms of e-commerce. Based on an analysis of average k clusters, they obtain three groups of companies according to the perceived value of digital channels for their business: companies advanced in e-commerce and social commerce, with transactional websites and high activity in social networks; companies operating only in social networks that assign a low value to the contribution of these channels; and e-commerce-oriented companies, with non-transactional websites and a presence in social networks, although their valuation of these channels is low. These groups, in turn, show significant differences by sector of activity but not by company size.

Accordingly, the web alone is not a sufficient instrument to generate value. A successful outcome in these terms requires that users/clients have an active, collaborative participation and generate quality content for users. On the other hand, companies must constantly engage in social interaction, a situation known as engagement (García et al., 2017). Companies must participate with the public and experiment with them, empathizing with users to build loyalty (García, 2015). In this last aspect, social networks play a fundamental role.



## *E-commerce and pandemic*

As the pandemic unfolds, companies see an online presence as an essential opportunity to reach consumers. In the face of the economic and health crisis, governments have taken steps to support companies and consumers, but not all are underpinned by strategies with clear diagnostics and objectives. An ILO document (2020) identifies the various policies, regulations, and measures to support SMEs implemented by Latin American governments, referring to financing, tax support, employment protection, and digital tools and training.

Regarding measures and programs to strengthen the digitalization of business processes and the development of organizational capabilities, most countries already had initiatives with similar objectives before the health and economic crisis. Some examples of initiatives registered during the health emergency in various countries are mentioned below:

- The Chilean government has implemented and supported various platforms, including “Todos X las Pymes,” which offers training, courses, and information on where and how to sell online.
- The “Compra Lo Nuestro por Colombia” campaign aims to increase the companies’ productivity and competitiveness through training, information on financing, and online sales.
- In Mexico, various measures were implemented due to the COVID crisis, including introducing the digital platform “Mercado Solidario” to support SMEs through local consumption, home delivery, and in advance.
- In Peru, the Ministry of Production launched the “Unstoppable Peru” campaign to accelerate the digitalization process and cushion the loss of connection between companies and their clients. Nevertheless, in the interviews recorded, it was pointed out that the increased digitalization was a process motivated by the companies after the pandemic, which could be accelerated through public-private collaboration.
- In Uruguay, a cycle of videoconferences, “Virtual coffee for entrepreneurship and companies,” was implemented as a new measure during the health crisis. This initiative was added to other pre-existing programs to support digitalization (ILO, 2020).

Among the initiatives presented by the government of Argentina, two stand out: 1) “Digital Assistance Network for SMEs,” a public-private collaboration space that features a range of solutions and tools that chambers of commerce and technology companies make available to MSMEs: distance work, connectivity, e-commerce, and logistics; 2) “PAC COVID-19 Competitiveness Support Program for micro, small and medium-sized companies.” To stimulate the production of goods, participants can access non-refundable contributions for the development of projects whose purpose is the development of

technological services and activities aimed at generating innovative changes for SMEs (such as teleworking platforms, e-commerce, and electronic payments).

Chang and Meyerhoefer (2020) analyze the impact of the pandemic on demand for online food retail services using data from the largest e-commerce platform in Taiwan, which did not impose quarantine or stay-at-home orders. Demand for grains, fresh fruits and vegetables, and frozen foods recorded the largest increase, benefiting small farms linked to agribusiness.

A multi-case study on seven Indonesian manufacturing SMEs from different industries during 2020 shows that in the face of the pandemic, SMEs took different paths by distinguishing three different situations based on the companies' digital maturity level. SMEs with a high level of digital maturity responded to the context's challenges by accelerating the business's comprehensive digitalization. SMEs experiencing liquidity problems and with a low level of digital maturity decided to digitize only the sales function. Finally, SMEs with limited digital literacy but supported by a high level of social capital met the challenges by finding partners with excellent digital capabilities (Priyono et al., 2020).

According to Gao et al. (2020), who conducted a study in Wuhan, China, government support and regulation in terms of e-commerce should be focused on ensuring the safety of food sold online and providing financial support to the low-income population to access food and assisting the disadvantaged sectors due to lack of digital skills. On the other hand, the risks inherent in buying food online (that the products are fresh and comply with health conditions, etcetera) can present obstacles to online sales. Another difficulty is associated with China's logistics system, which is fairly mature and works adequately in large cities but still faces challenges for fresh produce distribution in small cities. Next, heterogeneities are expected in the level of success of online food sales according to the size of the cities.

In the case of the Latin American region, there was a significant increase in the number of company websites in Brazil, Chile, Colombia, and Mexico in March, April, and May 2020 compared to the previous year. "Between April and March 2020, the increase in the number of these sites was 800% in Colombia and Mexico, and about 360% in Brazil and Chile (ECLAC, 2020, p:13)." In the first six months of 2020, in Brazil, Chile, Colombia, and Mexico it is observed that 20% of the changes in existing websites correspond to transition to transactional type sites.

On the other hand, the ability of companies to ship/deliver products to clients is paramount. In this context, delivery services have become increasingly important, as they avoid mass visits to supermarkets, warehouses, and small businesses and simultaneously sustain the activity of some commercial premises. In particular, at the beginning of the pandemic, face-to-face sales of food and pharmacies decreased by 51% (ECLAC, 2020).

In the case of Ecuador, e-commerce revolves around purchases in foreign portals. Therefore, it is very unlikely that this type of e-commerce will generate direct benefits at the country level since these

categories generally involve imported goods, missing the opportunity to use e-commerce as a tool oriented to the export of national products (Pesántez Calva et al., 2020, p. 82). In Colombia, Serna-Gómez et al. (2020) indicate that with teleworking, the real estate and financial services sectors have a probability of more than 50% adaptability to maintain their economic activities. On the contrary, hotels and restaurants, communications, transportation, commerce, and industry are the most affected.

According to ELAC-ECLAC, recovery initiatives must pay attention to solving fundamental problems for e-commerce and the digitalization of production, such as insufficient digital infrastructure, a lagging regulatory framework, lack of skills in companies, low penetration of different digital means of payment, consumer distrust of the virtual world, and poor infrastructure and operation of logistics services (LACTLD, 2020). All these issues inherent to digital transformation companies are hindering the adoption of e-commerce despite requiring lower capital investments than other industries (LACTLD, 2020; UNCTAD, 2019). LACTLD (2020) launched a document with policy options to support the digitalization of business models in the context of the COVID-19 pandemic. Based on surveys of partner countries, it compiled information on policy initiatives that have helped accelerate the availability and use of digital tools to strengthen business continuity and resilience in the context of COVID-19.

## **Methodology**

When the work began, the companies included in the DesdeCasa directory were 1 284 (July 2020). Each company adds its business to the directory by completing the requested information. Since approximately 90 categories or activity items were registered, the aim was initially to reduce and homogenize the categories to simplify the analysis; 18 categories were defined. Then, the information provided by each company regarding the availability of digital channels such as WhatsApp, Facebook, Instagram, and Own website, and the level of adoption of e-commerce (ECA) was explored. While the website variable determines the possibility of accessing e-commerce, ECA indicates the level of e-commerce achieved by the companies.

To define the levels of ECA, the websites of the companies registered on the platform that indicated having a web page were examined. To this end, the methodology of previous works on the subject was followed (Alderete and Jones, 2019a, 2019b; Alderete et al., 2017; Jones et al., 2016; 2013;), which only considers in the definition of e-commerce internet sales through the company's institutional website. These works take as a reference Molla and Likert (2005), who propose different levels of ECA, considering the degree of complexity of this. Consequently, this variable does not contain information on using social networks as a sales channel (social commerce) or on using marketplaces such as Mercado Libre.

On the other hand, the presence or performance in Argentina's most popular social networks, Facebook and Instagram, was recorded for each company through dichotomous variables. On the other hand, although the directory collected information on the companies' WhatsApp, it was not included as a variable in the digitalization index since all the companies registered had this communication channel without variability being perceived in this factor. Then, with this information, a digitalization index of the companies is compiled using factor analysis.

Factor Analysis (FA) is a multivariate statistical analysis technique of interdependence whose fundamental purpose is to reduce the dimensions of a set of observed variables to define the most parsimonious underlying variable's structure. In FA, the observed variables are reduced by fewer unobserved variables, called factors (latent variables) plus error expressions. Principal component analysis (PCA) aims to find a set of factors that explain the total variance of the original variables as much as possible. PCA is a dimension reduction technique that describes the information of a set of observed variables using a set of smaller variables (principal components) that are linear combinations of the starting variable and uncorrelated. Unlike FA, PCA does not assume that there is an underlying common factor among the variables. This method is based on constructing a linear combination from the original variables, such that the first principal component found is a combination that explains the largest proportion of the sample variance, the second, the second largest proportion of the variance, and that, in turn, is not correlated with the first and so on. In this way, the factor or component found enables capturing the greatest variability and information of the variables through the principal components method (Ferrando & Anguiano Carrasco, 2010).

Then, the weighted sum of the components is found to obtain an overall indicator, where the weighting arises from the participation of the variance of each component in the accumulated total. Given that these components are divergent values, which can adopt negative values, the index is normalized to obtain values between 0 and 1. Once the digitalization index has been determined, contingency tables are used to analyze whether there is a relation between the digitalization index, the type of activity developed or category, and the product's shipping capacity.

## **Results**

After regrouping the original categories into the most aggregated and homogeneous categories possible, the following results were obtained: The 18 defined categories are: 1) healthy - gluten-free food; 2) food in general; 3) grocery - self-service; 4) personal care - aromatherapy; 5) nurseries - veterinaries, and others; 6) furniture - decoration; 7) household appliances - hardware, and others; 8) restaurants - breweries, and others; 9) clothing - footwear, and accessories; 10) computers - electronics, and others; 11) vehicles - auto

parts; 12) graphic industry - printing; 13) construction materials and others; 14) pharmacy - perfumeries; 15) bookstores - party accessories - toy stores; 16) sports - tourism, and others; 17) architecture - design - gardening; 18) cleaning.

From the characterization of the companies according to the 18 established categories, a predominance of category 9, clothing - footwear, and accessories, and category 10, computers - electronics, and others, with 30.8% and 13.2% of the sample, respectively, can be observed. The least numerous categories are architecture - design - gardening, with 1.5% of the companies. Table 1 shows the descriptive statistics of the variables that make up the digitalization index.

Table 1  
Descriptive statistics

|           | N     | Minimum | Maximum | Mean | Standard deviation | % of total |
|-----------|-------|---------|---------|------|--------------------|------------|
| ECA       | 1 284 | 0       | 3       | 0.64 | 1.130              | 100        |
| Facebook  | 1 279 | 0       | 1       | 0.60 | 0.490              | 60.3       |
| Instagram | 1 279 | 0       | 1       | 0.59 | 0.492              | 59         |
| Web       | 1 284 | 0       | 1       | 0.27 | 0.442              | 26.6       |

Source: created by the authors

Next, the sample is characterized according to the variables used jointly to construct the digitalization index. Regarding ECA, it is observed that most companies (73%) do not have an institutional or proprietary website. Of the 1 284 companies, only 26.6% have their own website. Regarding the ECA variable, out of the total sample, 3.2% of the companies are at an informative level, 8.9% at an interactive level, and 14.5% at a transactional level (Table 1). Notably, among the 341 companies with a website, the most advanced level of ECA predominates since 186 (54%) have a transactional site.

If only online sales and purchases through this medium are analyzed, 27% of the registered companies have their own website, although only 14.5% can make online sales through this medium since they have a shopping cart, among other transactional features.

Table 2  
Adoption level of EC companies DesdeCasa

|               | Frequency | Percentage | Valid percentage | Cumulative percentage |
|---------------|-----------|------------|------------------|-----------------------|
| Null          | 943       | 73.4       | 73.4             | 73.4                  |
| Informative   | 41        | 3.2        | 3.2              | 76.6                  |
| Interactive   | 114       | 8.9        | 8.9              | 85.5                  |
| Transactional | 186       | 14.5       | 14.5             | 100.0                 |
| Total         | 1 284     | 100.0      | 100.0            |                       |

Source: created by the authors

Regarding social networks, unlike websites, this digital channel is more widespread among companies since 80% of them have a presence on social networks (either Facebook or Instagram). In particular, 58.7% have Instagram, and 60% have Facebook. From this perspective, the results coincide with those of Alderete and Jones (2019a), where the proportion of companies with a presence in social networks was very high, given the ease and affordability of access. Nevertheless, in that study it is pointed out that the presence in social networks does not necessarily imply an added business value for companies. On the other hand, 17% of the companies registered in the directory do not have digital channels, i.e., neither their own website nor a presence on social networks (Table 3).

Table 3  
Companies without a digital channel

| Typology                        | Number of companies | Percentage in relation to total |
|---------------------------------|---------------------|---------------------------------|
| No website with social networks | 718                 | 73.94                           |
| No website or social networks   | 221                 | 22.76                           |
| No social networks with website | 32                  | 3.30                            |
| Total                           | 971                 |                                 |

Source: created by the authors

To analyze the level of correlation between presence in social networks and ECA, i.e., whether it is to be expected that companies that are present in social networks also adopt more advanced levels of EC, the average level of ECA is analyzed according to whether or not they have a presence in social networks.

Table 4  
ECA, according to presence on social networks

| Social networks           | Mean ECA | N     | Standard deviation |
|---------------------------|----------|-------|--------------------|
| 0 without social networks | 0.27     | 253   | 0.756              |
| 1 On a social network     | 0.57     | 527   | 1.062              |
| 2 On both social networks | 0.91     | 499   | 1.283              |
| Total                     | 0.64     | 1 279 | 1.130              |

Source: created by the authors

These differences in ECA are statistically significant according to the ANOVA test ( $p > 0.000$ ). Companies not on social networks also have low to no e-commerce, while companies with a presence on social networks have medium/high levels of e-commerce. It should be noted that there are 5 missing cases regarding the information presence on social networks.

Then, considering the relation between ECA and social networks, the companies are classified according to the typology proposed by Alderete and Jones (2019a). Unlike these authors, who measured

the Likert scale value assigned to social networks, only information on their presence or absence in social networks is available. Thus, the following characterization of the sample is conducted.

Table 5  
Types of companies in some digital channel

| Typology                          | Number of companies | Percentage in relation to total |
|-----------------------------------|---------------------|---------------------------------|
| Companies advanced in e-commerce  | 175                 | 16.54                           |
| Companies oriented to e-commerce  | 133                 | 12.57                           |
| Companies only on social networks | 718                 | 67.86                           |
| Companies with website-only       | 32                  | 3.02                            |
| Total                             | 1 058               | 100                             |

Source: created by the authors according to Alderete and Jones (2019a)

Accordingly, the results differ from Alderete and Jones (2019a), since the categories presented by these authors covered all the companies analyzed. In this case, the category “companies with website only” is added: those with a presence on the Internet but do not have social networks. Outside this typology are the companies with no presence in any digital channels. According to Table 3, there are 221 companies, which together with the 1 058 give a total of 1 279 companies.

Following the typology of Alderete and Jones (2019a), of the total number of companies that have some digital channel (Table 5), 16.54% of the companies have an advanced level of e-commerce since they have social networks and have a high level of ECA (transactional site). On the other hand, 12.57% have social networks, but a medium or low level of ECA (informative/interactive website), which leads to a level of orientation toward e-commerce. Finally, of this total, 67.86% are only present on social networks, thus registering a zero ECA level.

Some companies without a website will likely conduct e-commerce through social networks and channels such as WhatsApp or Mercado Libre-type portals. Accordingly, Liang and Turban (2011) argue that the level of exploitation that companies conduct on the Internet and social networks will depend on the definition of effective strategies and the allocation of resources necessary for managing social networks and other digital channels. Nevertheless, no such information is currently available to corroborate this, and it is beyond the scope of this paper.

## Construction of the digitalization index by factorial analysis

To construct the indicators, the factorial and principal component analysis technique was used to summarize the information on the variables available in the survey. In this way, a digitalization index is created that groups information on presence on social networks (Facebook and Instagram), availability of own website, and level of adoption of e-commerce (ECA).

Table 6 shows the two components obtained from the rotated components matrix of the Factor Analysis.

Table 6  
PCA rotated component matrix

|           | Component |       |
|-----------|-----------|-------|
|           | 1         | 2     |
| eca       | 0.981     | 0.112 |
| facebook  | 0.067     | 0.761 |
| instagram | 0.091     | 0.743 |
| web       | 0.982     | 0.095 |

Source: created by the authors

Table 7  
Cumulative variance PCA

| Component | Initial eigenvalues |               |               | Sums of the squared saturations of extraction |               |               | Sum of the saturations squared by rotation |               |               |
|-----------|---------------------|---------------|---------------|-----------------------------------------------|---------------|---------------|--------------------------------------------|---------------|---------------|
|           | Total               | % of variance | % accumulated | Total                                         | % of variance | % accumulated | Total                                      | % of variance | % accumulated |
| 1         | 2.054               | 51.349        | 51.349        | 2.054                                         | 51.349        | 51.349        | 1.939                                      | 48.486        | 48.486        |
| 2         | 1.039               | 25.971        | 77.321        | 1.039                                         | 25.971        | 77.321        | 1.153                                      | 28.835        | 77.321        |
| 3         | 0.856               | 21.393        | 98.714        |                                               |               |               |                                            |               |               |
| 4         | 0.051               | 1.286         | 100           |                                               |               |               |                                            |               |               |

Source: created by the authors

The digitalization index can therefore be expressed as a linear combination of the extracted factors. These factors of the Exploratory Factor Analysis are indicators with divergent values, i.e., they take both positive and negative values, so an auxiliary index is constructed with the sum of the squared saturations of the rotation:

$$Digitization\ Index = \left( \frac{\% \text{ of Variance CP1\%}}{\text{Accumulated} * \text{Component}} \right) 1 + \% \left( \frac{\text{of Variance CP2\% Accumulated}}{* \text{Component}} \right) 2 \quad (1)$$

This index is normalized, so the values are between 0 and 1, and the DI is finally obtained. The commonalities (part of the variance explained by the common factor) also show that these factors explain them well since they are greater than or equal to 0.6 (Table 8).



Table 8  
 PCA Commonalities

|           | Initial | Extraction |
|-----------|---------|------------|
| eca       | 1.000   | 0.974      |
| facebook  | 1.000   | 0.584      |
| instagram | 1.000   | 0.561      |
| web       | 1.000   | 0.974      |

Source: created by the authors

After building the index by principal component analysis, a mean of 0.37 was obtained for the digitalization index of the companies. The DI is highest in item 6, which corresponds to home decoration and furniture, followed by item 10 (computers - electronics, and others) and item 1 (healthy - gluten-free food) (Table 9). The differences in the DI by category are statistically significant.

Table 9  
 Digitalization index of companies DesdeCasa by category

| Category                                    | Mean DI | N     | Standard deviation |
|---------------------------------------------|---------|-------|--------------------|
| Furniture - decoration                      | 0.4467  | 124   | 0.32112            |
| Computers - electronics, and others         | 0.4389  | 169   | 0.33015            |
| Healthy - gluten-free food                  | 0.437   | 26    | 0.31562            |
| Household appliances - hardware, and others | 0.4225  | 46    | 0.3481             |
| Sports - tourism, and others                | 0.3968  | 36    | 0.27175            |
| Construction materials and others           | 0.3881  | 42    | 0.3441             |
| Restaurants - breweries, and others         | 0.3864  | 34    | 0.25576            |
| Clothing - footwear, and accessories        | 0.3847  | 386   | 0.3219             |
| Graphic industry - printing                 | 0.3729  | 43    | 0.28468            |
| Vehicles - auto parts                       | 0.3503  | 25    | 0.34185            |
| Bookstores - party accessories - toy stores | 0.3215  | 76    | 0.2911             |
| Nurseries - veterinaries, and others        | 0.3208  | 42    | 0.26069            |
| Architecture - design - gardening           | 0.286   | 19    | 0.23995            |
| Personal care - aromatherapy                | 0.2825  | 47    | 0.26191            |
| Cleaning                                    | 0.2715  | 23    | 0.32335            |
| Pharmacy - perfumeries                      | 0.268   | 21    | 0.29103            |
| Food in general                             | 0.2209  | 85    | 0.2261             |
| Grocery - self-service                      | 0.1488  | 28    | 0.18438            |
| Total                                       | 0.3686  | 1 272 | 0.31181            |

Source: created by the authors

Table 10  
ANOVA

|      |              |            | Sum of squares | gl    | Root mean square | F     | Sig.  |
|------|--------------|------------|----------------|-------|------------------|-------|-------|
| ID * | Inter-groups | (Combined) | 6.319          | 17    | 0.372            | 3.967 | 0.000 |
|      | Intra-groups |            | 118.164        | 1 261 | 0.094            |       |       |
|      | Total        |            | 124.483        | 1 278 |                  |       |       |

Source: created by the authors

This result explains, in part, which were the items that sold the most online in 2020 according to CACE, since these are the activity items with a higher digitalization index than the rest. Then, through the relation between the index and the results analyzed by CACE (2020) and ECLAC (2020), it can be deduced that the best digitally prepared items according to the digitalization index achieved higher sales. These results, in turn, support the categories found by Priyono et al. (2020), where the companies that were more mature in digitalization strengthened their digital transformation during the pandemic, while those with less progress in their digitalization made fewer comprehensive applications of digital channels, due to the lack of resources and competencies to take advantage of the opportunity of e-commerce growth.

It is also observed that there are statistically significant differences in the level of e-commerce achieved by companies that have a presence on social networks and those that do not. That is, companies with a presence on Facebook or Instagram have a higher level of ECA than companies not on social networks. The results are consistent with those of Alderete and Jones (2019a), where the proportion of companies with a presence on social networks was very high, given the ease and affordability of access. Nevertheless, in that study it is pointed out that the presence on social networks does not necessarily imply an added business value for the companies. In the case of SMEs, it is often the case that they do not allocate the necessary resources to community management to obtain the networks' potential benefits. Only companies with transactional websites and social networks recognized the high business value of social networks.

### *Shipping capacity and additional shipping cost*

The companies in the directory also reported on the possibility of conducting home deliveries and whether such deliveries had an additional cost. Table 11 gathers information on the ability to deliver or ship products to clients according to the type of activity involved.

Table 11  
 Product delivery capacity according to category

| Category                                        | Capacity Product/service delivery |                  |          | Total   |
|-------------------------------------------------|-----------------------------------|------------------|----------|---------|
|                                                 | No data                           | Does not perform | Performs |         |
| 1) Healthy - gluten-free food                   | 0.00%                             | 19.20%           | 80.80%   | 100.00% |
| 2) Food in general                              | 0.00%                             | 16.50%           | 83.50%   | 100.00% |
| 3) Grocery - self-service                       | 0.00%                             | 35.70%           | 64.30%   | 100.00% |
| 4) Personal care - aromatherapy                 | 0.00%                             | 12.80%           | 87.20%   | 100.00% |
| 5) Nurseries - veterinaries, and others         | 0.00%                             | 20.90%           | 79.10%   | 100.00% |
| 6) Furniture - decoration                       | 0.00%                             | 13.70%           | 86.30%   | 100.00% |
| 7) Household appliances - hardware, and others  | 0.00%                             | 21.30%           | 78.70%   | 100.00% |
| 8) restaurants - breweries, and others          | 0.00%                             | 14.70%           | 85.30%   | 100.00% |
| 9) Clothing - footwear, and accessories         | 1.30%                             | 17.70%           | 81.00%   | 100.00% |
| 10) Computers - electronics, and others         | 0.00%                             | 24.70%           | 75.30%   | 100.00% |
| 11) Vehicles - auto parts                       | 0.00%                             | 32.00%           | 68.00%   | 100.00% |
| 12) Graphic industry - printing                 | 0.00%                             | 30.20%           | 69.80%   | 100.00% |
| 13) Construction materials and others           | 0.00%                             | 26.20%           | 73.80%   | 100.00% |
| 14) Pharmacy - perfumeries                      | 0.00%                             | 38.10%           | 61.90%   | 100.00% |
| 15) Bookstores - party accessories - toy stores | 0.00%                             | 27.60%           | 72.40%   | 100.00% |
| 16) Sports - tourism, and others                | 0.00%                             | 55.60%           | 44.40%   | 100.00% |
| 17) Architecture - design - gardening           | 0.00%                             | 36.80%           | 63.20%   | 100.00% |
| 18) Cleaning                                    | 0.00%                             | 30.40%           | 69.60%   | 100.00% |
| Total                                           | 0.40%                             | 22.00%           | 77.60%   | 100.00% |

Source: created by the authors

It can be seen that items 4 personal care - aromatherapy, 6 furniture and decoration, and 8 restaurants - breweries have the highest percentage of product deliveries. On the other hand, it can be seen that these are also the categories with the highest percentage of cases with additional delivery costs, i.e., clients had to pay an additional amount for delivery. In contrast, categories 14 pharmacy - perfumeries, 16 Sports - tourism, and others, and 17 architecture - design - gardening have the lowest product delivery capacity. The case of the furniture sector follows the national trend as indicated by ECLAC (2020) and CACE (2020).

The low level of digitalization of pharmacies at the time of registration in the directory is striking. Given the context of the pandemic, where pharmacy service has been considered essential, and in the face of increasing demand due to COVID-19, it is likely that such a level of digitalization will have improved by the end of 2020. Nevertheless, as mentioned above, no store performance data are registered in the directory.

Table 12  
 Digitalization rate by shipping capacity

|                            | Mean   | N     | Standard deviation |
|----------------------------|--------|-------|--------------------|
| Does not perform shipments | 0.3061 | 283   | 0.30220            |
| Performs shipments         | 0.3870 | 996   | 0.31269            |
| Total                      | 0.3691 | 1 279 | 0.31210            |

Source: created by the authors

According to the data in Table 12, the items that deliver products to their clients to a greater extent also have a higher digitalization index. This difference in the mean digitalization index of 0.08 is statistically significant according to ANOVA ( $p > 0.001$ ).

The presence in a greater number of digital channels coupled with the greater capacity to ship the product indicates that there are indeed items that are more advanced in e-commerce and were more prepared to face the pandemic crisis because they had not only greater experience in the application of digital technologies to sales channels but also a greater comprehension of the factors that favor creating value through e-commerce, such as shipping services. These results support the findings of Priyono et al. (2020).

## Conclusions

The current health crisis caused by the new coronavirus pandemic has harmed the economy in general and SMEs in particular. The context of the health and economic crisis during the COVID-19 pandemic put the economy and the survival of many companies at risk. Nevertheless, e-commerce has registered unprecedented growth rates at the global and national levels, offering a solution for the survival of many companies. Indeed, significant growth rates in online sales were recorded worldwide during the pandemic. Studies and measurements by various national e-commerce players and international organizations suggest that the pandemic has led to changes in consumer habits and behavior. On the one hand, new online shoppers increased; on the other hand, the ranking of categories of products and services most sold through digital channels was altered. Several authors state that many of these changes will persist after the COVID-19 context has passed.

On the other hand, the governments of many countries have promoted support measures through policies and programs to encourage the adoption of e-commerce by companies. These programs include, among others, the development of e-commerce portals and platforms, training programs, counseling, and linkage. In the face of this event, several local initiatives have been developed in Argentina to collaborate with the development of ICT-mediated commerce. In the municipality of Bahía Blanca, the online directory DesdeCasa supports local businesses and is a valuable service for the population. This study

enables the companies that participated in this platform to be characterized through a digitalization index considering the level of e-commerce adoption and presence on the most popular social networks.

The results show that approximately 74% of the companies that joined the DesdeCasa platform do not have a website. On the other hand, 19.7% of the companies do not have any social networks. Nevertheless, most of the companies use WhatsApp as a means of communication and interaction with clients. The percentage of the most disadvantaged companies having neither a website nor a presence on social networks is 17.2%. For this segment, the DesdeCasa platform mainly constituted an alternative linking instrument with the medium.

Nevertheless, there are no data on the results of this link. In other words, there is no record of the number of visits obtained through the directory or the sales volume made through it. It would have been interesting to analyze whether the platform enabled the companies to advance in e-commerce. A survey in this regard is planned for the future.

In order to assess the state of affairs of companies in Bahía Blanca in terms of digitalization of sales channels to cope with the pandemic, an index is created that collects information on presence on social networks (Facebook and Instagram), availability of own website and level of e-commerce adoption (ECA). After constructing the index by principal component analysis, an average of 0.37 is obtained in the companies' digitalization index (DI). The DI is highest in item 6, corresponding to home decoration and furniture, followed by item 10 (computers - electronics, and others) and item 1 (healthy - gluten-free food). The differences in the DI by category are statistically significant.

In turn, it is observed that there are statistically significant differences in the level of e-commerce between companies that have a presence on social networks and those that do not. That is, companies with a presence on Facebook or Instagram have a higher level of ECA than companies not on social networks. The greater use of digital channels during the pandemic by certain items had to do not only with a higher rate of digitalization but also with greater maturity in the adoption of e-commerce since the association between ECA and greater shipping capacity is another indicator that reinforces the findings that these company items had a priori a better preparation for e-commerce. These are companies with a greater awareness of the value of e-commerce to businesses that generate value through digital channels, internet presence, and professionalizing their digital channels. Thus, it is possible to deduce the existence of a positive relation between the digitalization index, online sales, and shipping capacity.

The role of local government has been to facilitate contact between local businesses and clients. Although it is impossible to corroborate, due to lack of data, whether the directory has increased sales, at least it has acted as a promoter for disseminating the contact information of the registered companies. Promotion is undoubtedly important, as are training, technical and financial assistance.

It is worth clarifying that the results only represent the population of companies registered on the DesdeCasa platform, not the total number of companies in the city. On the other hand, there is a great heterogeneity of activity categories, and no information was obtained regarding the main type of activity, be it industry, commerce, or services, although the platform was intended for businesses.

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