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FACILITATION OF TRANSPORT AND TRADE IN LATIN AMERICA AND THE CARIBBEAN

# Digital Transformation in Latin American and Caribbean logistics

## Background

The outbreak of the COVID-19 pandemic abruptly and dramatically changed the prevailing way of life and development model. The economy has suffered severe consequences from the closure of production activities and delays in border crossings caused by the additional processes implemented to contain

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This *FAL Bulletin* continues the Reflections on Disruptive Technologies in Transport that ECLAC has been publishing through this medium. The present edition analyses the importance of the digital transformation of logistics, especially in the current circumstances where the need for fluid, safe and resilient logistics calls for additional actions on traceability and process facilitation.

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the spread of the virus. This has led to a surge in unemployment, with a consequent slump in demand for goods and services. In this situation, designing and implementing actions to maintain the fluidity of international logistics chains has been fundamental for ensuring the timely supply of inputs, food and essential goods. Technology, in conjunction with urban logistics and e-commerce, have permitted a degree of operational continuity in urban activities, by facilitating the distribution of food and goods needed for the lengthy periods of confinement to which a large part of the population has been subjected (ECLAC, 2020).

The COVID-19 pandemic became a catalyst for a number of digital transformation processes that were already under way; and it accelerated them to the maximum, suddenly placing logistics in the fourth industrial revolution, where information management is one of the greatest strategic assets of modern organizations (Davenport and Harris, 2007).

As discussed in FAL Bulletin No. 375, logistics are not extraneous to this fourth industrial revolution, and its processes have been heavily modified to ensure a smooth, safe, competitive supply chain with the least amount of human contact. The logistics system of the future, therefore, must harness information interconnectivity and optimize time and resources, with significant investment and development in innovation to maintain competitiveness (Barleta, Pérez and Sánchez, 2019).

The report that follows consists of six analytical sections and one containing strategic recommendations. Section I analyses the digital transformation in logistics processes under what is referred to as the "fourth industrial revolution". Section II analyses the progress made by the region in the digitization of trade logistics; and then section III discusses the next steps to be taken by the region in order to move forward to more advanced digital states. Section IV gives details of the strategic guidelines and regulations needed to operate in the new digital reality; while section V is devoted to analysing the role of international regulations and standards to promote the interoperability of digital systems. Section VI, in contrast, emphasizes that technology is not an end in itself, but a powerful tool to strengthen logistics decision-making. Section VII concludes the document with a set of recommendations for adequately incorporating the dimensions of rural and territorial development into infrastructure policies.

# I. The digital transformation and the fourth industrial revolution

The development of information technologies and the capacity to analyse large data volumes are the advances that enabled the fourth industrial revolution, in which information is the key business asset and States must ensure its security and proper use. The importance of information is directly related to the technological capacity to possess and process real time data on various types of device, which, in conjunction with today's large and very low-cost storage capacities, have fostered the emergence of technologies capable of "learning" and improving their results. In the words of Klaus Schwab, executive director of the World Economic Forum (WEF) "The fourth industrial revolution is not defined by any particular set of emerging technologies, but rather by a transition to entirely new systems that are being built on the infrastructure of the [previous] digital revolution" (Schwab, 2016).

As in the previous industrial revolutions, the main beneficiaries are most likely to be those who were able to innovate and adapt to the new scenario with the existing tools in the early stages of the process. In this way they differentiated themselves from the rest of the market, although the benefits of the advances obtained eventually reached everyone over time. The digital transformation refers to the implementation of changes in existing processes, to make them more efficient by improving decision-making based on the large volumes of relevant data that the newly available technologies make it feasible to manage. In other words, the cultural and organizational change that technology enables is more important than the technology itself.

In this context, COVID-19 is making it even more necessary to monitor these trends, owing to the restrictions imposed by countries the world over to prevent its spread. This has had major repercussions on logistics processes and chains worldwide (World Bank, 2020). Given the urgent requirements and needs associated with overcoming the crisis and maintaining existing processes, a series of basic guidelines appeared for the new processes that have been defined. These include maximizing the execution of automated processes, remote execution capacity for processes that cannot be automated, and the existence of contingency plans coordinated with third parties; and giving processes a resilience capacity that enables them to continue providing services albeit on a reduced scale. (Salvador, 2020).

While the COVID-19 pandemic has impacted changes in processes, it has also been the major and genuine catalyst of digital transformation and the adoption of innovative technologies and processes that were in a pre-adoption trial phase in the pre-pandemic period, or where the courage to make the change was simply lacking (Zelada, 2020). In this connection, the measures implemented during the first phase of the pandemic have shown that many of the technologies deployed in response to the contingency are mature enough to drive the definitive changes required by the newly formed scenario (Lioy, 2020). One of the positive results that this pandemic could leave in its wake is the major push that has been given to paperless trade and contactless technologies, thus promoting a paradigm shift in the way different industries work —changes that it will be neither possible nor advisable to reverse once the pandemic is over. Thus, purchase decision variables such as short and reliable delivery times, total cargo traceability, integrated door-to-door services and costs, will henceforth be a minimum requirement for any international logistics operation.

It is also highly likely that requirements related to improving processes and enhancing their resilience capacity will prove permanent (Fornos, 2020). For this reason, it is essential that the different actors in the regional logistics industry equip themselves to satisfy this new level of service quality (Kilpatrick and Barter, 2020), which will certainly require process redesign —digitization of some processes and automation of others— in order to improve logistics decision-making and afford greater visibility and traceability to logistics chains. Moving towards a paperless form of trade logistics will not only reduce the risk of contagion, but also eliminate inefficiencies, reduce costs and transit times, and enhance the transparency and traceability of processes.

A counterpoint to the advantages of process digitization is the issue of cybersecurity. The adoption of new technologies will alter the risks associated with the processes they implement. Accordingly, cybersecurity needs to be incorporated from the outset as an integral part of every process-digitization effort; and it must be taken into account and satisfied in every area of supply-chain implementation and improvement (KPMG, 2020).

## II. Recent progress in the digitization of regional logistics

With the aim of reducing logistics costs and shortening the time spent completing customs procedures, the countries of Latin America and the Caribbean have made significant efforts in the last two decades to advance the digitization of port-logistics processes and trade facilitation. Many of these initiatives focus on two types of development: Single Windows for Foreign Trade (*Ventanillas Únicas de Comercio Exterior* – VUCEs) and Port Community Systems (PCS).

The VUCEs are technological platforms that seek to integrate into a single portal or access point all procedures pertaining to goods import, export and transit operations. This often calls for major changes in foreign trade regulations, not only to simplify processes, but also to enable the use of electronic media without undermining the controls, security and functional conception of the agencies involved (UN/CEFACT, 2004).

A PCS is a technological platform that allows for the transparent and secure exchange of data between public and private actors, in order to improve the competitive position of port logistics, including their connection with the hinterland, road hauliers, urban logistics operators and final users/consignees. To this end, it combines a series of technologies for the capture, processing, optimization and transfer of data that is shared in real time among the members of the community. Although there are different variants of PCS and levels of sophistication in the technologies used, a basic feature would be the provision of information services for decision-making without having to re-enter data into the PCS platform, otherwise it would be more like an Internet information portal. Table 1 displays a sample of some of the initiatives under way in the region, considering both PCSs and VUCEs. The list is not exhaustive, so there may be developments that are not properly considered.

**Table 1**
Latin America and the Caribbean (selected countries): interoperability among existing VUCEs and PCSs, 2020

| Country | Platform | Launch year | Interoperability | |
|---|---|---|---|---|
| | | | Local / National | Regional |
| Argentina | VUCE | 2016<br>(Re-evaluation) | Currently being restructured and rebranded as *Ventanilla Única de Comercio Exterior* (CiVUCE), which provides information on the operation's interventions, taxes and tariff preferences. | Interoperability with MERCOSUR countries under development. |
| | PCS | 2020<br>(Re-evaluation) | The Port of Buenos Aires is interoperable with its port logistics community. Currently being evaluated for roll-out to the rest of the country. | |
| Bahamas | PCS | Implemented | Nassau Port. | |
| Barbados | PCS | 2016 | Bridgetown Port. | |
| Bolivia (Plurinational State of) | VUCE | In development | Currently under development, a physical window that will later be migrated to an electronic platform. The initial phase will be confined to La Paz, for later extension to Cochabamba, Santa Cruz, Chuquisaca and Tarija. | Interoperability with MERCOSUR countries under development. |
| Brazil | VUCE | 1993<br>1997<br>2014 | In 1993, the Integrated Foreign Trade System (SISCOMEX) was launched as an electronic interface between exporters and government agencies. In 1997, it was expanded to include import operations. In 2014, the Single Foreign Trade Portal Program was launched, for imports, exports and transit. | Interoperability with CAN countries projected. |
| Brazil | PCS | In development | Port of Santos, then Rio de Janeiro, Suape and Paranaguá in first phases. Subsequently projected nationally. | |
| Chile | VUCE | 2009 | Although not mandatory, it covers 90% of transactions. In imports it encompasses the Ministry of Health, the Agricultural and Livestock Service and the Public Health Institute. | 2009: Certificates of Origin with Colombia and Mexico.<br>Interoperability the Pacific Alliance being developed. |
| Chile | PCS | 2015 | Ports of Valparaíso and San Antonio. Also being implemented in the country's other ports. | |
| Colombia | VUCE | 2006 | Mandatory use. Promotes the technological and legal security of procedures by integrating digital signature and online electronic payment. Eliminates physical procedures, shortens times and streamlines foreign trade processes. | Certificates of Origin 2009: with Mexico and Chile; 2014: with Ecuador; 2016: with the Netherlands. Full interoperability with the Pacific Alliance being developed. Projected with CAN. |
| Costa Rica | VUCE | 2013 | 2006: The Foreign Trade Single Window System is regulated. 2013: the VUCE comes into operation. VUCE 2.0 is currently in operation, with interoperability across 16 national institutions. | Digital Platform for Central American Trade under development. The Central American Single Customs Declaration (DUCA) is currently interoperable with all other SIECA countries. |
| Cuba | VUCE | In development | Projected. | |
| Ecuador | VUCE | 2013 | Operates under the name of *Ventanilla Única Ecuatoriana* (VUE). Mandatory use for the 20 public entities comprising it. | Interoperability with CAN countries projected. |
| El Salvador | VUCE | 2011 | 2011: Launch of Center for Import and Export Procedures (CIEX) of El Salvador. Currently, exports are managed 100% online and authorized by Customs; it issues the cargo manifest and the bill of lading from the Integrated Foreign Trade System (SICEX). | Central American Single Customs Declaration form under development. Currently the DUCA is interoperable with all other SIECA countries. |
| Guatemala | VUCE | 1986<br>1998<br>(relaunch) | Operates under the names of *Ventanilla Única para las Exportaciones* (VUPE) and *Ventanilla Ágil para Importaciones* (VAI) (in 2013). Payment is made from the window to the institution with real-time transfers and electronic invoices and receipts from the institutions to the users. | Work ongoing on phyto- and zoosanitary export forms with Mexico; Certificate of Origin for the treaty between Mexico, Guatemala, El Salvador and Honduras. Digital Platform for Central American Trade under development. |
| Honduras | VUCE | 2013 | Operates under the name of *Ventanilla Única de Comercio Exterior* (VUCEH); makes it possible to complete online payments and track operations in real time. | Central American Digital Trade Platform under development. DUCA currently is interoperable with all other SIECA countries. |

**Table 1 (concluded)**

| Country | Platform | Launch year | Interoperability | |
|---|---|---|---|---|
| | | | Local / National | Regional |
| Jamaica | VUCE | 2020 | Operates under the name of Jamaican Single Window for Trade (JSWIFT). | Interoperable under the ASYCUDA platform. |
| Jamaica | PCS | 2016 | Kingston Container Terminal. | |
| Mexico | VUCE | 2012<br>2016<br>(relaunch)<br>2018<br>(relaunch) | Operates under the name of *Ventanilla Única de Comercio Exterior Mexicano* (VUCEM). Makes it possible to process the different regulations and non-tariff restrictions on foreign trade issued by 10 government agencies. Has achieved a 90% reduction in bureaucratic procedures and a 10% reduction in the time needed to clear products. Currently being re-engineered for VUCE 2.0 targeting SMEs and additional services. | The current version is interoperable through the use of electronic data exchange standards (OMA, EDIFACT, Cargo-xml, IATA). Since 2009: Certificates of Origin with Chile and Colombia. 2016: Phytosanitary documents with countries of the Pacific Alliance. Full interoperability with the Pacific Alliance currently under development. |
| Nicaragua | VUCE | 1994<br><br>2018 | 1994. Decree No. 30-94 creates a Single Export Window. At present, a pilot project is under way that will allow for procedures and payments related to the export and import process to be made through a digital platform. | Central American Trade Digital Platform under development. Currently, DUCA is interoperable all other SIECA countries. |
| Paraguay | VUCE | 2003 | Processes nearly all of the 120,000 export operations per month. Import and export processes are separated in Customs and in the Ministry of Industry and Trade, respectively. | The LAIA Certificate of Origin is in the process of being standardized. Interoperability with MERCOSUR countries Under development. |
| Panama | VUCE | 1985<br><br>2018 | Operates under the name of *Ventanilla Única Marítima de Panamá* (VUMPA). Has six single windows by customs zones: Colon, Cocle, Chiriqui, Los Santos, Bocas del Toro and Panama. It currently processes exports, VICOMEX certificates of origin, self-certifications, and the Free Zone Trade Movement Declaration in under two hours. | Central American Trade Digital Platform under development. Currently DUCA is interoperable all other SIECA countries. |
| Peru | VUCE | 2008 | The project came onstream in 2010. There are 27 institutions participating, 17 from the public sector, nine business associations and one port administrator. Has achieved reductions of 25% in the time and 5% in the costs of foreign trade. | 2016: Phytosanitary documents with countries of the Pacific Alliance. Full interoperability with Pacific Alliance being developed. Interoperability with CAN projected. |
| Dominican Republic | VUCE | 2014 | Operates under the name of *Ventanilla Única de Comercio Exterior de la República Dominicana* (VUCERD). Provides 234 services and encompasses 10 institutions. | |
| Saint Lucia | PCS | Implemented | Port Castries. | |
| Suriname | PCS | In design | Paramaribo Port. | |
| Trinidad and Tobago | VUCE | 2010 | Operates under the name of TTBizLink. Currently consists of 47 services with 10 ministries. | Interoperability with port processes and with business partners worldwide under development. |
| Trinidad and Tobago | PCS | In design | To be implemented for the Port of Point Lisas and Port of Spain. | Will be interoperable with VUCE (TTBizlink), ASYCUDA, TTConnect ID and port systems (NAVIS). |
| Uruguay | VUCE | 2007 | 73% of Comex operations and integrates 90% of government agencies. | Interoperability with MERCOSUR countries under development. |
| Venezuela (Bolivarian Republic of) | VUCE | In development | Projected. | |

**Source**: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of information from the individual countries, specialized publications and multilateral banks.

**Note**: The most up-to-date version of this information is available at: http://www.cepal.org/es/notas/interoperabilidad.

Although both PCS and VUCEs are an integral part of foreign trade logistics, in many of the cases listed in table 1 the technological developments in question have been implemented as independent and separate technological platforms. From a functional standpoint, however, they should be highly complementary and not represent a piecemeal view of the logistics process. This issue is gradually being overcome, and efforts are being made to achieve interoperability at least among the VUCEs in the four countries that comprise the Pacific Alliance: Chile, Colombia, Mexico and Peru. This technological development also makes it possible to interconnect with any other trade bloc or country with a VUCE that operates on the basis of international standards.

In April 2017, the countries of the Southern Common Market (MERCOSUR) agreed on a road map for rapprochement with the Pacific Alliance, in order to converge on trade facilitation actions, with the VUCE playing a central role (IDB, 2017). There is also an idea to do the same between the Pacific Alliance and the Central American Digital Trade Platform, a technological initiative developed by the Secretariat for Central American Economic Integration (SIECA) for the benefit of Central American countries (Mejías Rivas and Maday, 2019).

At the same time, the Andean Community has made "Contributing to the implementation of national Foreign Trade Single Windows and promotion of interoperability among its four member countries: Colombia, Ecuador, Peru and the Plurinational State of Bolivia", one of its priority projects and actions in its program of Trade Facilitation in Customs Issues (SGCAN, 2016). The Latin American and Caribbean Economic System (SELA) is also engaging in intraregional technical cooperation and relationship actions to contribute to the development, coordination and convergence of subregional technological processes and systems in Latin America and the Caribbean.

A few years ago, ECLAC identified policy fragmentation as one of the problems hindering the development of competitive logistics; and it proposed the alternative of constructing a regionally coordinated national logistics and mobility policy that would be capable of articulating the paradigm shifts required by the sector (Jaimurzina, Pérez Salas and Sánchez, 2015).

When analysing the technological developments existing in the region, the silos paradigm that was imbued in sectoral policies seems also to have been replicated in the digital world. Although several of the digitization initiatives and the development of information technology systems for logistics correctly incorporate the spirit of the policy and the need for a holistic and integrating approach among stakeholders, in practice, many of these developments display a biased view of logistics that is focused on fulfilling the partial objectives of the organization leading the effort. They also fail to consider the integration of new present and future actors in the logistics chain, ignoring the fact that, in logistics, systems interoperability will increasingly be an essential requirement. If current developments are unable to interact with each other, future efforts will be required to force compatibility, which it would be more efficient and less costly to implement, and would offer a better level of service, if considered from the outset.

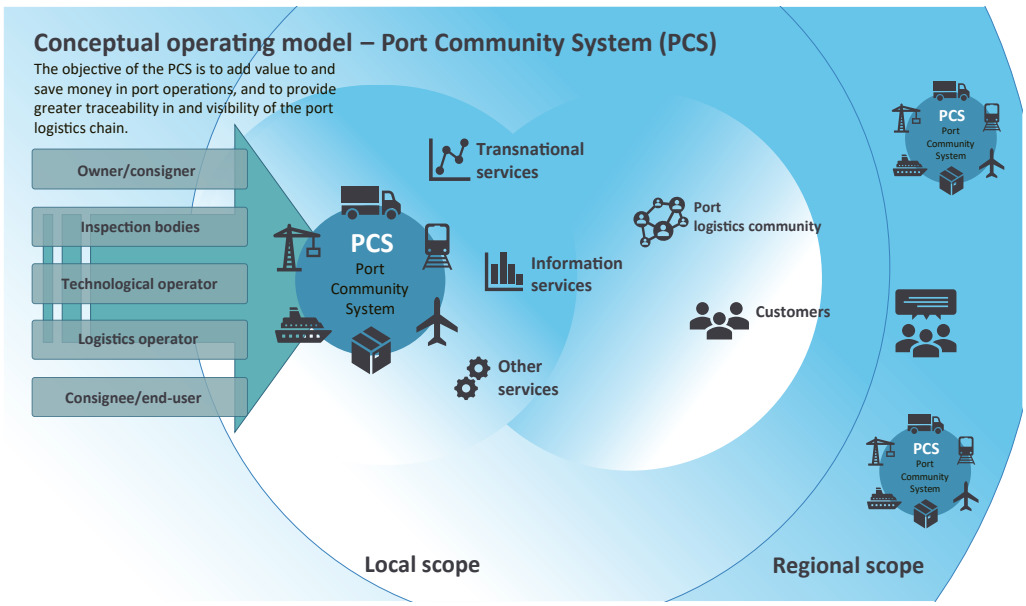
It is also important to remember that digitization requires an analysis of processes and, in many cases, a re-engineering to ensure the efficiency and effectiveness of the solution proposed. Otherwise, there is a risk of digitizing bureaucratic processes that do not add value. It is therefore essential for the State to promote a national logistics vision together with a basic technological platform as a way of ensuring interoperability among the various existing and future developments, both in the port, logistics and trade domains, as well as other developments related to digital government, cybersecurity and process traceability.

Continuing the analogy with logistics policies and their regional coordination, it is also important that these technological platforms include a regionally coordinated national logistics vision, as a way of ensuring interoperability and promoting technological integration through adherence to regional standards that allow for interoperability of the different national logistics systems, just as South Korea, Japan and Singapore have already done (Volpe Martincus, 2018).

In practice, with PCS and VUCEs, there are as many technological-platform models as there are countries developing them, even though the concept is the same and based on the same definition. The combination of services and instruments they offer to firms will depend on multiple factors, including the scope for which the platform is created, the specific needs of the actors involved, the commitment of the agencies involved in the control of operations, the level of political support the initiative enjoys, the resources available to improve processes, and the technologies used.

In view of this, one way to improve the implementation of technological solutions of this type is to consider their integration as a functional requirement from the design stage. Diagram 1 displays a conceptual model of the operation of a PCS, emphasizing the different relationships that exist between the national, regional and international actors, with whom they exchange information flows, payments and trade documentation.

**Diagram 1**
PCS Conceptual operating model

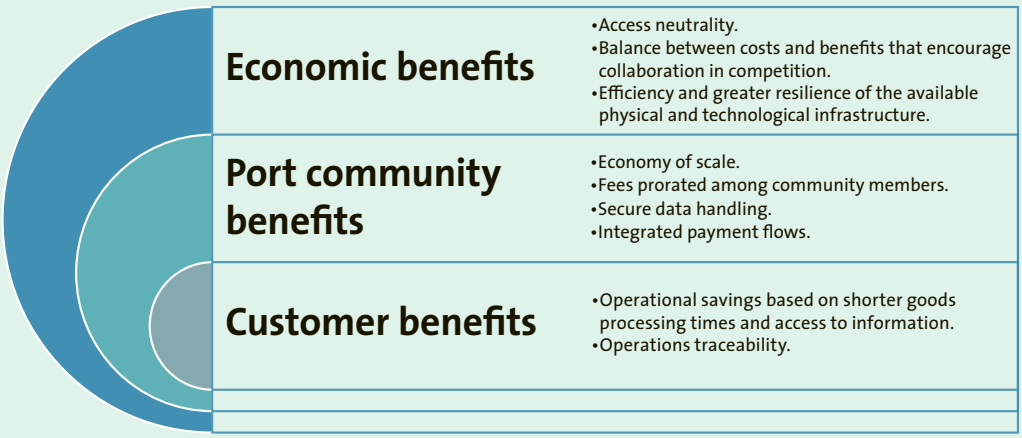



**Source**: Prepared by the authors.

The implementation of a PCS should pursue shared benefits for the community, which go beyond reductions in the cost and time involved in trade and port logistics operations. As shown in diagram 2, they have cumulative effects ranging from the global (economic benefits) to the individual (customer and user benefits).

Having this vision as part of the scope of the solutions enables the region's countries to adopt a coordinated border management approach, fostering coordination among control agencies, both domestic and international, in pursuit of efficiency gains in trade flows, as indicated in the Coordinated Border Management Compendium published by the World Customs Organization (WCO, 2015).

**Diagram 2**
Expected benefits of implementing a PCS




**Source**: Prepared by the authors.

## III. Next steps in logistics digitization: from isolated developments to logistics intelligence

In the current situation of heightened uncertainty, and as the region's countries are generally price-takers in international transport charges, it is essential to gain competitiveness in the domestic market, through actions that make it possible to reduce domestic logistics costs and generate value-added services to maintain competitiveness. These measures need to be implemented in coordination with other economic and social measures, with a view to promoting an economic recovery with social and environmental benefits.

In this context, it is worth returning to the reflection on integrated policies proposed by ECLAC, now viewed in this new digital setting. Although the principles and objectives of a regional logistics and mobility policy may be very well designed, they may still be ineffective if the subsequent stages of the policy fail to adequately consider the integrated nature and sustainability of the approach (Jaimurzina, Pérez-Salas and Sánchez, 2015).

In terms of technology, the strategic planning layers, sectoral guidelines and the basis of programs, plans and projects must be appropriately anchored at higher political levels. This will make it possible to adapt sectoral rules and regulations to the logistical context and to promote a digitization of processes that will help reduce inefficiencies,

cost overruns and negative externalities, and thereby enhance the productivity and competitiveness of the economy and foster social inclusion among the population, both present and future.

Alongside these political aspects, logistics strategies, whether national or corporate, need a technological pillar to ensure an adequate transition to a paperless digital logistics aligned to the standards imposed by the fourth industrial revolution. At this point it is essential to redesign the region's investment strategy, to encourage resilient, efficient and sustainable investments, where supply chains cannot be excluded from this paradigm shift, promoting the use of more efficient, more competitive modes of transport that operate on physical infrastructures that are adapted to climate change.

Interoperability refers to services, regulations and technologies that encourage a modal shift in passenger, freight and urban mobility, towards less polluting means of transport that operate in an integrated and efficient manner both over long distances and in urban logistics. The next element is regional integration, which is a key area for economic recovery and for healing the social fabric damaged by the pandemic. Promoting trade facilitation actions and coordinated investment measures in transport and technology networks can foster productive transformation, grow intraregional trade and promote inclusive employment. Lastly, logistics intelligence seeks more expeditious, competitive and sustainable trade flows, through regionally coordinated actions that generate gains in efficiency and the security of services for the operational continuity of international trade and domestic logistics.

## IV. Strategic and regulatory guidelines for the digitization of logistics processes

To develop technological platforms that support integrated and sustainable logistics, it is essential that they share a holistic vision, both in their design and in terms of interoperability when implementing the technological solution in question. Thus, taking advantage of both good design practices and the use of international standards fosters a development that is both time-bound and economical and ensures interoperability with other existing or future systems, both domestically and internationally.

The term "holistic vision" means an analysis of the processes independently of the technical solution, considering all the actors involved and prioritizing the efficiency of the complete logistics chain ahead of the individual costs in each link. The aim is to make a complex process more efficient (extended process), which often requires redesigning relationships or even regulations to eliminate inefficiencies or demands for specific information that do not add value to the overall process. This means that the design of these systems needs to be aligned with the major national logistics and mobility objectives, prioritizing regional integration —whether economic, political or technological— with neighbouring countries ahead of ad-hoc solutions or those that seek to self-finance by charging for their use (the "as-a-service" approach). Like all logistics development, the ultimate goal of digitization must be to strengthen decision-making and improve coordination between public and private agents (Pérez-Salas and Sánchez, 2019).

The implementation of changes leading to the digitization of the logistics industry in the region depends heavily on having a regulatory framework in place that adapts to new needs and the emergence of new fully digital actors that radically alter the sector, as Uber did for urban mobility, for example. It is therefore essential to be aware of changes in the industry and the emergence of these "unicorn" developments, in order to adapt the regulations in time to take advantage of the dynamic potential of the innovations in question, through training and the leveraging of technological solutions by the rest of the industry.

Another important element involves strengthening logistics governance in order to integrate logistics digitization within the domains of collaboration, fostering the integration of knowledge and data between the different systems and decentralized, collaborative technological solutions, with their evolution based on the work of communities of experts (open-source approach). These elements not only make the systems more resilient, but also reduce the duplication of data and the monopolization of developments and existing information, thereby promoting a much more efficient, secure and competitive logistics (Pérez-Salas and Sánchez, 2019). They will also generate greater transparency and accountability, and strengthen digital governance in the medium term.

## V. The role of international regulations and standards in promoting interoperability between digital systems

Establishing a platform that allows for integration with other existing or future technological solutions, from the design phases of the solutions through to their implementation, is fundamental for facilitating collaboration between organizations, increasing efficiency and reducing the implementation cost and rate of failure owing to information that is duplicated or re-entered in the systems. The adoption of international standards and regulations, such as those developed under United Nations auspices, makes it possible to abstract from the technical aspects (the how) to focus on what should be solved and how this interacts or influences other entities and digital processes.

Another point to highlight is the fact that the standards and regulations developed by the United Nations are coordinated by expert groups, which allows for the existence of a specialized community both on the trade logistics topics and on the technological issues. This makes it possible to develop new functions and to keep the regulations up to date with the new developments, and thus reduce exposure to technological change and regulatory obsolescence.

In this connection, it is worth noting the progress made in the Caribbean, where many of customs services use the ASYCUDA computerized customs management system developed by the United Nations Conference on Trade and Development (UNCTAD). This system covers most foreign trade procedures, handling manifests and customs declarations, accounting procedures, transit and suspense procedures. It also takes into account the international codes and standards developed by the International Organization for Standardization (ISO) and the World Customs Organization (WCO) among other best practices. At the design level, it provides electronic data interchange (EDI) functions between traders and customs, using leading standards such as XML; and it can be configured to adapt to the national characteristics of individual customs regimes, the national tariff and legislation (see table 2).

**Table 2**
Caribbean (selected countries): use of the ASYCUDA automated customs system

| Country | Implementation | Characteristics |
|---|---|---|
| Anguilla | 2011 | ASYCUDA World (upgrade 4.3.2) |
| Antigua and Barbuda | 2016 | ASYCUDA World (upgrade 4.2.2) |
| Aruba | 2014 | ASYCUDA World, e-Payment |
| Barbados | 2019 | ASYCUDA World (upgrade 4.3.2), Trade Licences and Permits |
| Belize | 2010 | ASYCUDA World, e-Payment |
| Curaçao | 2014 | ASYCUDA World, e-Payment |
| Dominica | 2009 | ASYCUDA World (upgrade 4.2.2) |

**Table 2 (concluded)**

| Country | Implementation | Characteristics |
|---|---|---|
| Grenada | 2011 | ASYCUDA World (upgrade 4.2.2), Trade Licences and Permits |
| Guyana | 2017 | ASYCUDA World |
| Haiti | 2013 | ASYCUDA World |
| Jamaica | 2014 | ASYCUDA World |
| Montserrat | 2011 | ASYCUDA World |
| Saint Kitts and Nevis | 2015 | ASYCUDA World (upgrade 4.2.2) |
| Saint Lucia | 2010 | ASYCUDA World |
| Saint Vincent and the Grenadines | 2013 | ASYCUDA World (upgrade 4.2.2) |
| Suriname | 2015 | ASYCUDA World |
| Trinidad and Tobago | 2010 | ASYCUDA World, Interface SW-TTBizLink |
| Turks and Caicos Islands | 2011 | ASYCUDA World |
| Venezuela (Bolivarian Republic of) | 2010 | ASYCUDA World |

**Source**: Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of official information from ASYCUDA and United Nations Conference on Trade and Development (UNCTAD).

**Note**: Further background and more up-to-date information is available at https://asycuda.org/.

Regionally, it is also advisable to have communities of experts to strengthen public- private collaboration, and to promote innovation and the generation of applied research in logistics. These should take advantage of the business-universities link, which, if well channelled, will make it possible to capitalize on the practical experience and technological knowledge existing in the region, to find new ways to solve problems and thus generate value-added services that provide international comparative advantages.

The development of these communities, under the auspices of subregional non-profit or financing organizations, such as ECLAC, would make it possible to avoid duplication of efforts; systematize and disseminate the lessons learned in implementing technological solutions; generate a critical mass and an expanded digital market that fosters the adoption of standards; and achieve economies of scale, agglomeration and specialization. This would enable the region to move through the fourth industrial revolution via a transformation of production, in which information is one of the main business assets.

The fact that actors in the logistics supply chain cooperate in integrating technological solutions does not preclude them from continuing to compete in the market. This idea of collaborative competition was developed in 1996 by Adam M. Brandenburger and Barry J. Nalebuff and in their book titled "Co-Opetition". This is not a new concept in the technological world, where major players like Microsoft and IBM participate actively in Open Source development communities.

## VI. Use of technology and logistics decision-making

As in most modern industries, decision-making is strongly supported by the development of high precision mathematical models that simulate production processes, mainly in areas and processes that involve closely interacting physical components that are hard to recreate owing to the complexity of their interactions. The use of data models, simulations or even systems that make it possible to work with digital twins (as explained below), are elements that support decision-making by taking advantage of the full potential of data already existing in the industry.

In logistics, digital twins can be understood as a digital representation of the elements that form part of the processes of the logistics chain, including their current states (through

monitoring elements based on intelligent sensors, the use of the Internet of Things (IoT)[1] or Big Data). For example, a digital twin might be the digital representation of a container crane and its relationship with other components, including its weight, temperature and speed variables, among other elements of interest that will be modeled and simulated by artificial intelligence technologies to analyse potential results in a hypothetical scenario. For example, in the case of the crane, using historical and real-time data flows (such as those captured by IoT) the digital twin would provide information on certain parameters that are relevant for the industry, such as costs, productivity or waiting times with a view to a potential change in the distribution of the port layout, thus providing additional background for decision making. Another advantage is that a digital twin can be continuously calibrated throughout its life cycle to converge towards a very faithful model of reality.

Like any other process digitization effort, the use of these systems must be backed up by cybersecurity. Along with the increased technology adoption, attacks on the security of information technology (IT) systems are also becoming more sophisticated as cybercriminals use different tactics and technology to exploit vulnerabilities in the hardware or users, affecting access to data or modifying it to breach the systems' physical controls.

Logistics must learn to deal with this issue and include it in its risk matrix, just as happened with other threats in the past, such as drug trafficking and terrorism (Barleta and others, 2020). In 2013, ECLAC referred to logistics-chain security as the set of actions undertaken to ensure the proper and timely functioning of supply chains when confronted by external threats such as terrorist or criminal acts (Pérez, 2013). The first category of threat includes all actions that involve using transportation media (including containers) as a weapon or device containing explosive, radioactive or contaminating elements to perpetrate acts that are intended to spread terror throughout the population. The second category encompasses criminal acts such as illegal trafficking of goods or persons, as well as cargo or vehicle theft (Pérez-Salas, 2013). To supplement the above, the view of security needs to be expanded beyond physical components and critical infrastructure, by adding a third dimension that covers the operational continuity of technology, and the integrity and invulnerability of the data that comprise the firm's information, as integral elements of logistics security. The foregoing is justified by the fact that the cybercrime industry has demonstrated a keen interest in industries that are starting to grow on the basis of technology, viewing them as an opportunity to generate profits by exploiting any security breaches that may exist, by hacking or some other form of unauthorized data capture.

A third factor that can improve decision making is to concentrate developments and innovations in processes that add value or differentiate from the competition, outsourcing all others so as not to divert scarce human and economic resources. One of these is the provision of IT services through the Internet (commonly known as "cloud" services) which makes it possible to use software and data storage as a service (SaaS), by paying a subscription which in many cases can be cheaper than owning physical data servers that require maintenance and security work to ensure a reliable world-class service. This approach can be especially useful for small and medium-sized enterprises (SMEs) and logistics firms, because of the ubiquity provided by the Internet. The solution-as-a-service (SaaS) model also enables the use of legal software and official technical support, with a modular and secure design, making the technological infrastructure more efficient and scalable as the needs of the business change.

The SaaS model is a paradigm that has spread in the logistics sector, with technological solution providers that specialize in solving recurring problems and allow access to solutions on a payment per transaction basis. This technological development model enables firms to concentrate on processes and innovations that add value to logistics, and to outsource the implementation of recurrent solutions to external suppliers. This shortens development time and appropriately separates the design layers of the business operation.

[1] Internet of Things (IOT): The connection of devices to a data network to interrelate with each other and provide information on their status and behaviour in real time over the Internet. Big Data: The ability to store and manage data sets whose size, complexity and growth rate make them difficult to process using conventional technologies (e.g. relational databases).

However, it is not sufficient merely to adopt the proposed recommendations to implement the digital transformation of the logistics chain in the region. Any initiative undertaken must be evaluated to check that its objectives are being achieved and whether adjustments to the model are needed. For this purpose it is essential to establish a series of indicators that trigger actions (such as the key performance indicator (KPI) and the key goal indicator (KGI)), and to document their formulation and the base line against which they will be calculated and compared. Ideally, these analyses should be performed by a third party not directly involved in the implementation of the digital processes in question, to obtain an unbiased view of the quality and maturity of the digitization in its various dimensions. For example, management indicators should focus not only on the number of orders processed by the system, but also on the percentage of orders correctly fulfilled and dispatched on time. These elements that are much more crucial to service quality, and actions can be taken based on their results.

## VII. Reflections on logistics digitization in Latin America and the Caribbean

The COVID-19 pandemic has imposed a number of restrictions on logistics chains, thereby creating a scenario that has had adverse consequences in many areas of international trade. However, the pandemic has also served as a catalyst for the digitization of trade logistics, accelerating a process that was already under way and will not halt when the pandemic restrictions are lifted, but will instead be part of the new logistics reality.

For this reason, to proceed with the digitization of the logistics industry in the region it is crucial to have a roadmap that identifies the relevant milestones and the expected benefits in each phase (measurable on the basis of quantifiable indicators). This roadmap should consider the following key points at least:

- The digitization and automation of processes, for the purpose of reducing human interaction and increasing efficiency, should be the result of a thorough analysis of processes and their redesign. This will ensure that they add value and that they are not digitizing bureaucracy or using technology merely for marketing objectives.
- In the fourth industrial revolution, information is an organization's greatest asset, and its analysis makes it possible to generate value-added services for the customer. Accordingly, adequate information management and security are key elements in this new reality.
- Strengthen interoperability, both nationally and subregionally, to reinforce the integration of technological solutions in the sector, generating a critical mass that enables cost reduction. In addition, face the challenge of technological and regulatory obsolescence jointly.
- The development of IT systems should add value to logistics, so it should focus on processes that affect the efficiency, resilience and security of the logistics chain.
- A continuous-improvement approach, taking advantage of international standards and best practices in software design and development, such as use of the cloud or the SaaS approach. This will make it possible to focus on the solutions ahead of the issues of financing and hardware operation, generating deliverable products in the short term that generate value for the business, constituting the concept of minimum viable product (MVP). This makes it possible to receive the benefits early as they are released without having to wait until the implementation program is completely finished. This "agile" approach, as it is known in technology, also enables adjustments to be made in line with the real benefit obtained and the needs of the business.

To address this transformational process in terms of strategy, it is essential to continue the work done by the countries on the logistics and mobility policies proposed by ECLAC, integrating these digital elements under strategic planning and sectorial guidelines.

Collaborative arrangements between the different actors of the logistics industry should be promoted, both public and private as well as technical-political advisory bodies, making it possible to integrate the guidelines and standards defined for the technological field in the logistics area within logistics governance, supporting the interoperability of the technological platforms that solve current (and future) problems. These elements will support the digital transformation of the logistics industry by making it possible to streamline cross-border processes and contribute directly to economic revival in the countries by integrating their foreign-trade activities.

## VIII. Bibliography


APEC (Asia-Pacific Economic Cooperation) (2018), *Study on Single Window Systems' International Interoperability: Key Issues for Its Implementation*, August.

Barleta, E., G. Pérez and R. Sánchez (2019), "Industry 4.0 and the emergence of Logistics 4.0", *FAL Bulletin*, No. 375, Santiago, Economic Commission for Latin America and the Caribbean (ECLAC), July.

Davenport, T. H. and J. G. Harris (2007), *Competing on Analytics: The New Science of Winning*, Harvard Business Review Press.

Deloitte (2020), *El impacto económico de COVID-19 (nuevo coronavirus)*, Deloitte Touche Tohmatsu Limited (DTTL) [online] https://www2.deloitte.com/ec/es/pages/strategy/articles/el-impacto-economico-de-covid-19--nuevo-coronavirus-.html.

ECLAC (Economic Commission for Latin America and the Caribbean) (2020), "The effects of the coronavirus disease (COVID-19) pandemic on international trade and logistics", *Special Report COVID-19, No. 6*, August.

Fornos, G. (2020), "COVID-19: Un desafío para las compras y la gestión del riesgo en la cadena de suministro", KPMG Tendencias, April [online] https://www.tendencias.kpmg.es/2020/03/covid-19-cadenas-de-suministro/.

General Secretariat of the Andean Community (2016), "Implementación de ventanillas únicas de comercio exterior en los países de la Comunidad Andina", *Documentos Informativos* (SG/di/1013) [online] http://intranet.comunidadandina.org/documentos/DInformativos/SGDI1013.pdf.

IDB (Inter-American Development Bank) (2017), "Hacia la VUCE 2.0: Economía digital y facilitación del comercio en Alianza del Pacífico y MERCOSUR", *Conexión Intal* [online] https://conexionintal.iadb.org/2017/10/04/hacia-la-vuce-2-0-economia-digital-y-facilitacion-del-comercio-en-alianza-del-pacifico-y-mercosur/.

Jaimurzina, A., G. Pérez-Salas and R. Sánchez (2015), "Políticas de logística y movilidad para el desarrollo sostenible y la integración regional", *Natural Resources and Infrastructure series*, No. 174 (LC/L. 4107), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).

Kilpatrick, J. and L. Barter (2020), "COVID-19 Gestión del riesgo y las interrupciones en la cadena de suministro", Deloitte Touche Tohmatsu Limited (DTTL) [online] https://www2.deloitte.com/content/dam/Deloitte/cl/Documents/strategy/cl-Covid19_POV_SupplyChain.pdf.

KPMG (2020), "Consideraciones clave para la gestión de ciberincidentes durante el COVID-19", KPMG Tendencias, April [online] https://www.tendencias.kpmg.es/2020/03/ciberincidentes-covid-19/?utm_source=tendencias-suministro&utm_medium=tendencias&utm_campaign=covid-19.

Lioy, U. C. (2020), "Accelerate Digital Transformation: Mitigate the Business & Economic Impact of COVID-19", Innovation Agenda [online] https://innovationagenda.asia/asset/digital-transformation-business-impact-covid-19/.

Lucento, K., and J. Mendes Constante (2019), "Cómo lograr puertos más eficientes", 11 June [online] https://blogs.iadb.org/integracion-comercio/es/eficientes-puertos/.

Mejias Rivas, I. and M. Maday (2019), "Así conectó la Alianza del Pacífico sus Ventanillas Únicas de Comercio Exterior", 2 August [online] https://blogs.iadb.org/integracion-comercio/es/conecto-alianza-del-pacifico-ventanillas-unicas-comercio/.

Mendes Constante, J. (2019), *Casos de estudio internacional y buenas prácticas para la implementacion de Sistemas de Comunidad Portuaria*, Inter-American Development Bank (IDB).

Muir, J. (2017), *¿Estamos entrando en una nueva era de cooperación en materia de facilitación del comercio en América Latina?*, 31 January [online] https://blogs.iadb.org/integracion-comercio/es/estamos-entrando-una-nueva-cooperacion-materia-facilitacion-del-comercio-america-latina/.

Pérez, G. (2013), "Seguridad de la cadena logística terrestre en América Latina", *Natural Resources and Infrastructure series*, No. 161 (LC/L.3604), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).

Pérez, G. and R. Sánchez (2019), "Infraestructura logística y movilidad: las arterias de la integración centroamericana", *Logros y desafíos de la integración centroamericana: aportes de la CEPAL, ECLAC Books*, No. 156 (LC/PUB.2019/7-P), Santiago, Economic Commission for Latin America and the Caribbean (ECLAC).

Salvador, P. (2020), "COVID-19: el gran impacto sobre las cadenas de suministros", EY, Perú [online] https://www.ey.com/es_pe/supply-chain/gran-impacto-cadenas-de-suministros.

Schwab, K. (2016), "The Fourth Industrial Revolution: what it means, how to respond", World Economic Forum [online] https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/.

UN/CEFACT (United Nations Centre for Trade Facilitation and Electronic Business) (2004), "Recommendation and Guidelines Establishing A Single Window", *Recommendation*, No. 33 [online] http://tfig.unece.org/SP/contents/recommendation-33.htm.

Volpe Martincus, Ch. (2018), "¿Cómo responde el comercio cuando se simplifica mediante una ventanilla única?" [online] https://blogs.iadb.org/integracion-comercio/es/el-proceso-de-la-frontera-como-responde-el-comercio-cuando-se-simplifica-mediante-una-ventanilla-unica/.

WCO (World Customs Organization) (2015), "Coordinated Border Management Compendium" [online] http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/safe-package/cbm-compendium.pdf?la=en.

World Bank (2020), *COVID-19 to Plunge Global Economy into Worst Recession since World War II*, June [online] https://www.worldbank.org/en/news/press-release/2020/06/08/covid-19-to-plunge-global-economy-into-worst-recession-since-world-war-ii.

Zelada, S. (2020), "COVID-19, un acelerador de la transformación digital", Deloitte Touche Tohmatsu Limited (DTTL) [online] ttps://www2.deloitte.com/pe/es/pages/technology/articles/COVID19-un-acelerador-de-la-transformacion-digital.html#.

# IX. Publications of interest


*FAL Bulletin No. 375*

## Industry 4.0 and the emergence of Logistics 4.0

Eliana Barleta
Gabriel Pérez
Ricardo Sánchez

The fourth industrial revolution is bringing about a series of disruptive changes in both business models and the production chains that support them. Logistics, which is a fundamental element of these processes, is inevitably affected by these significant changes. This fourth industrial revolution is characterized by its speed, magnitude and depth. The changes are so dramatic that they will alter the way we live, work and relate to one other, affecting countries, companies, industries and society as a whole. Therefore, the logistics system of the future must aim for interconnected information and optimized time and resources, with significant investment in innovation and development to maintain competitiveness.

Available in: Spanish English


*Serie Comercio Internacional No. 151*

## Integración regional y facilitación de la logística en América del Sur

Héctor Maldonado
Gabriel Pérez

This document first analyses the importance of facilitating, not only commercial, but also logistics and inland transport processes. It then details the progress made in this regard, in both the Andean Community and MERCOSUR. Although both processes differ in how each organization structures and applies decisions, each has its advantages and challenges for the integration process and the governance of the blocs, elements that can be useful for other subnational or binational initiatives that seek to harmonize and facilitate their customs processes, integration at the border and in the facilitation of logistics processes used by interregional trade.

Available in: Spanish