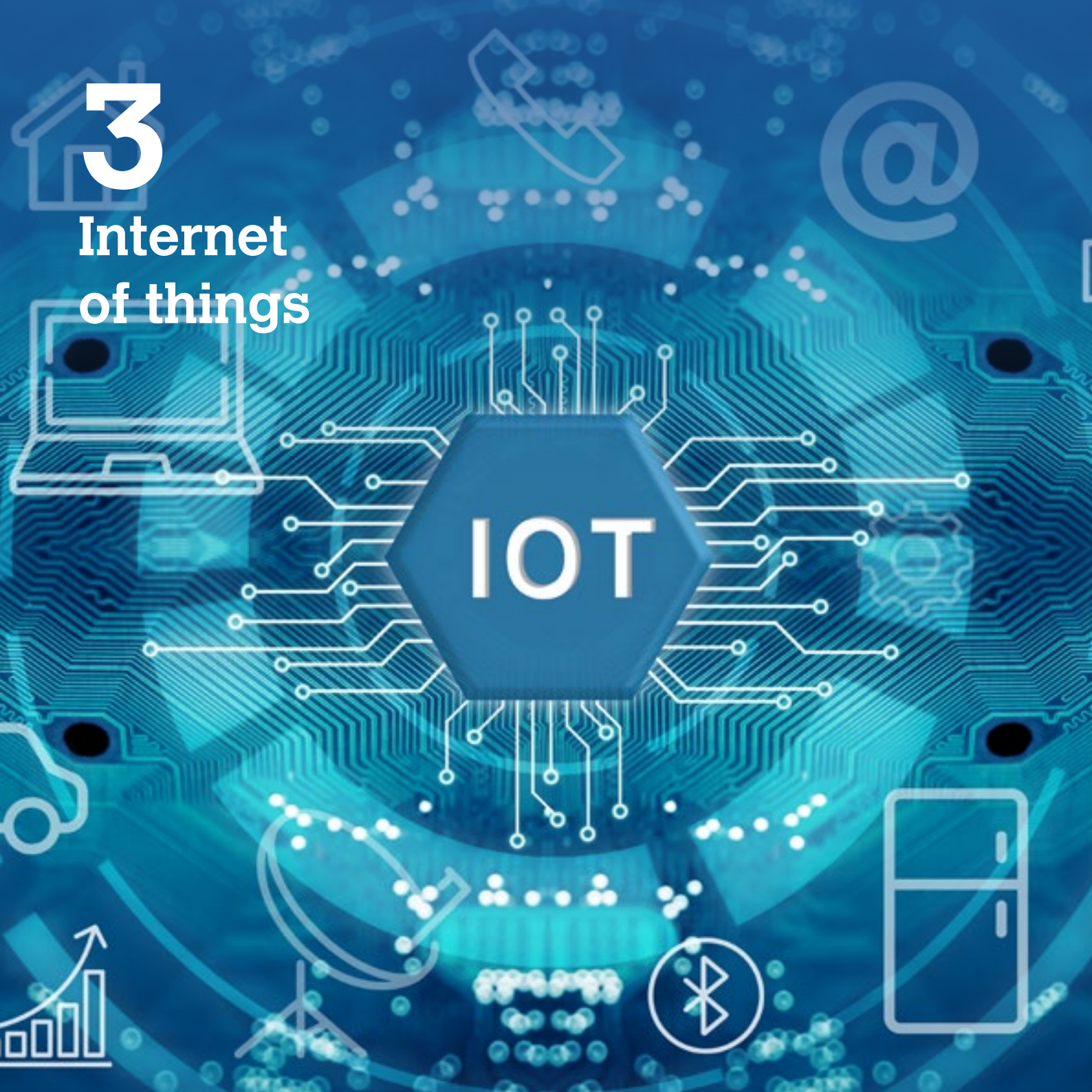
3 Internet of things



Members are experimenting with the use of IoT to fully automate border-crossings and customs procedures in national ports. Other projects have introduced centralized X-ray image analysis across multiple scanning stations and the use of radio frequency identification (RFID) antennas or e-seals to ensure traceability of goods and means of transport.

Thanks to IoT, members benefit from better risk management, greater efficiency of customs clearance processes and improved analytics. However, one of the greatest challenges is integrating information collected through IoT devices into customs operating systems and the lack of compatibility and interoperability of different IoT solutions.

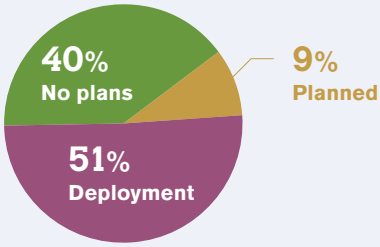
The information collected through smart devices is, in the majority of cases, not shared with other stakeholders. However, those who share often have multiple data-sharing channels and primarily share their information with other government agencies or customs authorities and, in a few cases, with the private sector.

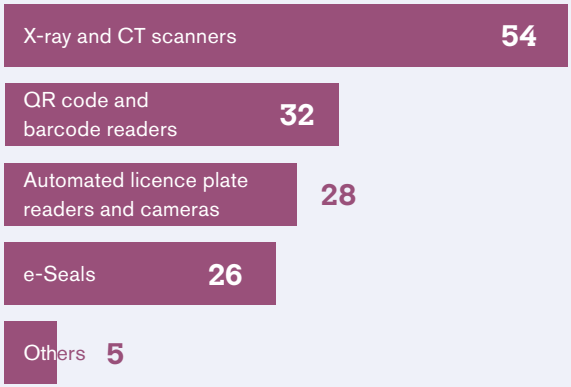
Stage of adoption

Half of respondents indicated that they use IoT in customs business processes, and 9 per cent plan to deploy them (see Figure 8). However, as many as 40 per cent have no plans to use the technology. Of the 72 respondents which deploy IoT, the majority indicated deployment of X-ray or computed tomography (CT) scanning, and significant numbers use QR code and barcode readers, automated licence plate readers and cameras, and e-seals.

FIGURE 8

Stage of adoption of the internet of things





Note: Total respondents numbered 94. Figures in the bottom chart indicate the number of responses for each category (respondents could give more than one answer).

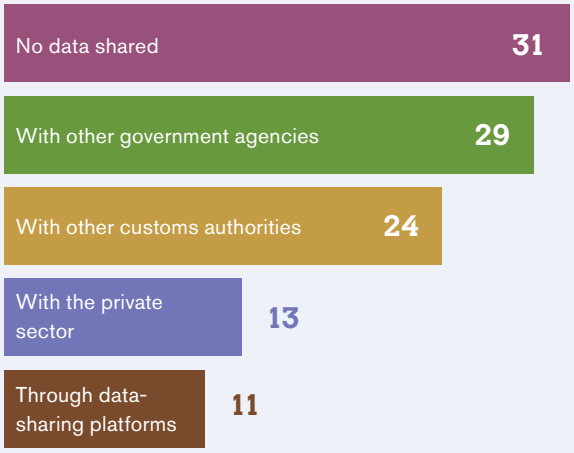
With regard to sharing information collected through IoT devices, 108 responses were provided by 78 members, which means that some customs authorities use multiple channels (see Figure 9). For those who share information, the majority only share information with other government agencies and customs authorities. A large number of respondents (31) do not share information with any stakeholders.

A number of members provided examples of their data-sharing solutions. One of them is Indonesia, which uses the National Logistic Ecosystem, which is a data-sharing platform for government agencies and the private sector to share trade documents and information relating to the flow of international goods. With the application programming interface, both domestic and global logistics platforms can share information (e.g. trucking, warehousing, shipping, forwarding).

The platform reduces duplication of documents and information and simplifies business processes through integrated inspection services, with single submissions, port services and permits. Another example is Italy, which is developing a model that will operate with other customs authorities, in particular through the use of passive RFID e-seals.

FIGURE 9

Sharing information with other stakeholders



Note: Total respondents numbered 108. Figures indicate the number of responses for each category.

Benefits

The main benefit of IoT for customs authorities is to enhance the volume and variety of data, which in turn helps to achieve improved risk management, greater efficiency in customs clearance processes, and better analytics (see Figure 10). One respondent mentioned the benefit of monitoring the integrity of transhipment cargo movement between entry and exit control points. Another emphasized the benefit of using IoT to standardize processes for the benefit of traders, enhancing port performance by reducing times for loading and unloading goods in port areas, linking innovative solutions already implemented by the customs authorities, and reducing manual procedures to improve security and legitimate trade.

FIGURE 10

Main benefits of introducing the internet of things

Note: Total respondents numbered 83. Figures indicate the number of responses for each category (respondents could give more than one answer).

Obstacles to adoption

Many respondents view the cost of introducing IoT solutions as a significant obstacle, along with integrating IoT into established processes and issues of compatibility and interoperability of different systems (see Figure 11).

Having the necessary knowledge to introduce IoT is a significant obstacle. Respondents indicate the lack of expertise and good practices, and the challenge of handling unstructured data. Legal issues, data security and privacy, as well as the lack of government strategy, were also mentioned.

FIGURE 11

Main obstacles to adopting the internet of things

Note: Total respondents numbered 82. Figures indicate the number of responses for each category (respondents could give more than one answer).

Respondents also emphasized that if two or more neighbouring countries introduce IoT solutions, then they could all reap the full benefits across borders. However, not all customs authorities are familiar with the technology, nor able to introduce it; rather, there can often be resistance to change. This lack of infrastructure is another obstacle to a more profound uptake of IoT technologies.

Examples of use

East and Southern Africa

In the ESA region, IoT is used to facilitate acquittal of transits through QR codes. Zambia uses QR codes for online acquittal of transits. In Eswatini, the barcodes generated by Automated System for Customs Data software (ASYCUDAWorld) are already one element in place to implement IoT.

Europe

The use of IoT is widespread in Europe and are either fully or partially integrated with automated systems for customs clearance. CCTV cameras, X-ray scanners, GPS tracking and licence plate readers are quite broadly used and integrated with customs processes at the national level, or even shared at the regional level.

Other projects include the use of geo-fence and telematics data for transferring information to customs authorities through smart phones and apps to recognize border arrivals (e.g. used by Switzerland).

Baltic States

The Baltic X-ray Images Exchange (BAXE) is implemented by Estonia, Latvia and Lithuania, and led by the latter's customs authority. BAXE was designed to address challenges such as the lack of interoperability of X-ray scanners produced by different vendors, disparities in software and user interfaces, and a lack of unified training software.

Since its adoption, 16 X-ray scanners in operation in Estonia, Latvia and Lithuania have been integrated into BAXE and two training centres have been established in Riga and in Vilnius.

The use of a single format by the three countries has enabled the exchange of X-ray images, which are then analysed centrally in Latvia, under a pilot project started in September 2019. The specialized training facility for X-ray systems operators and the unified training software for image analysis have optimized human resource allocation and enhanced the quality of image analysis.

There is also an automated licence plate recognition system between the Baltic States and Poland, and IoT is utilized in the corridor-as-a-service (CaaS) pilot project to experiment with fully automating a border-crossing. Sensor data identify vehicles by their licence plates and GPS at a specific northern border-crossing point.

Italy

The Customs and Monopolies Agency (ADM) is conducting a project to completely digitize customs procedures in

Italian ports for goods transported by both rail and road. The project, which involves all the main port institutions, is based on IoT, with special readers providing information to authorized stakeholders. A unique identification code is generated in a universally unique identifier format and issued by the ADM. The system, which is interoperable with the Port System Authorities, enables automatic tracking of vehicles and goods in the port area.

In addition to advantages for operators such as fewer requirements and submissions, the goal is to optimize the multimodal movement of goods to increase the competitiveness of the port system in the Trans-European Transport Network (TEN-T) and to attract new traffic flows by standardizing and simplifying customs processes and developing advanced services based on IoT technology, in cooperation with customs authorities and other port stakeholders.

Asia and Pacific

The Asia and Pacific region has a number of IoT projects using e-seals, QR codes and X-ray scanners.

Hong Kong, China

Since 2016, the Single E-lock Scheme (SELS) has connected the Intermodal Transhipment Facilitation Scheme of the Hong Kong Customs and Excise Department with the Speedy Customs Clearance of the mainland customs authority towards establishing a green lane to facilitate the flow of goods through a seamless clearance service.

One single e-lock and GPS technology accredited by both customs authorities are applied in the SELS under the principle of one single e-lock under separate monitoring. The GPS device is used for real-time tracking of the movement of the goods to ensure the security of transhipment cargo in Hong Kong, China.

Indonesia

The Customs Office of Tanjung Priok has electronically sealed containers to supervise the transfer of containers and to monitor the shipment history in real time with GPS. The sealed containers are all monitored in a dedicated control room. This initiative is to improve the performance of the Customs Office in facilitating the flow of goods out of the port.

In addition, it is hoped that the swifter flow through simplified customs procedures will create a conducive business and investment climate.

Malaysia

SmartCargo uses new cargo scanners which include a radiation portal monitor and AI and optical character recognition technology linked to the customs system. The licence plate and container number are run against stored customs declarations.

The image analyst reviews this declaration together with the scanned cargo image while the container is monitored for radiation, which will automatically alert the analyst, who then decides either to release the container or to send it for physical inspection. Ideally, this takes

place within one minute because of the interconnectivity of the different systems that generate real-time data.

Malaysia also has a project to use embedded certificate authority to authenticate a new tax stamp. When the QR code is scanned, the authenticity of the tax stamp is verified, which will lower the risk of counterfeited tax stamps.

Singapore

Singapore also uses e-seals to enhance the visibility and security of container movements beyond the checkpoints, and has an integrated command centre system to analyse X-ray images from multiple scanning stations.

Timor-Leste

In Timor-Leste, barcodes are built into the ASYCUDAWorld Single Administrative Document, among others, and are commonly used for the manifest, goods declaration, payments, container pass, and the release and exit of goods from controlled customs areas.

North of Africa, Near and Middle East

A number of projects in the MENA region use X-ray scanners and tracking solutions.

Jordan

Jordan is introducing electronic gates at airports. At the Queen Alia International Airport, in Amman, the government has introduced an automated immigration clearance system to reduce the time it takes for a passenger to pass through immigration to just a matter of seconds. The system uses two-factor authentication of e-gate ID cards utilizing RFID technology and biometric fingerprint verification of passengers. Registered travellers can bypass immigration through the automated booths.

United Arab Emirates

The United Arab Emirates has a number of IoT initiatives, such as X-raying cargo on the move and a container risk tracking platform which X-rays and monitors risks inside containers with scanners integrated into the customs risk and declaration management system.

The Dubai Customs integrated vessel tracking system uses marine traffic data to track vessels across the world and feeds the data into the internal risk and declaration management system. The marine traffic system uses IoT to collect data transmitted via an automatic identification system of receiving stations that form a marine traffic network. When a vessel enters a remote area out of the range of a receiving station, its position is identified with satellite tracking.

South America, North America, Central America and the Caribbean

The AMS uses IoT for goods inspection and tracking along the supply chain through X-ray and CT scanners, e-seals and licence plate readers.

Argentina

The Customs Transit Security Initiative (ISTA) uses e-seals for goods in transit, which allows the General Directorate of Customs (DGA) and the customs transport agent to respond immediately when accidents occur, providing security to the global logistics chain and a reduction in operating costs. The e-seals are placed on certain consignments upon arrival in Argentina, whose movement is tracked to the destination point and a record of all events during internal transit is generated.

In addition to cargo security and constant monitoring, the benefits of ISTA also include a simplified declaration process, reductions in cost, an agile logistics chains and improved operational compliance times. In accordance with WCO standards and in the spirit of facilitating and securing international trade, mutual agreements relating to the technology utilized by ISTA have been signed with countries in the region. Coordinated work with other customs authorities is being promoted to improve quality controls, for example by sharing scanned images.

Chile

Seaports have adopted licence plate readers integrated with customs authorities and port systems.

Guatemala

Customs authorities have requested X-ray scanners to control the loading and unloading of goods. RFID antennas have been installed to collect information on goods crossing the Pedro de Alvarado customs authority. More RFID antennas are to be introduced, which will ensure the traceability of the goods and means of transport.

United States of America

CBP is exploring the use of IoT to manage its extensive network of sensors. The objective is to improve domain awareness and to make the data available to a wider audience within CBP by using an IoT gateway. CBP is also looking at IoT to help to modernize the experience of cargo processing at the border, reduce time spent on inspections and increase the speed of passage. AI and machine learning will utilize data from IoT devices to gain deeper insights on the information gathered and better secure borders.

West and Central Africa

In the WCA region, IoT is used to track cargo in transit through e-seals and barcode readers (e.g. in the Democratic Republic of the Congo).