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Facing up to the new world of border control
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Every decade brings its challenges, and while it’s true that the 2020 global Covid-19 pandemic has presented one of the biggest that many of us have faced, we need to prepare for what the post-Covid world will look like. Global travel may have ground to a halt during this year, but as planes take to the skies again and as more land, sea and air borders are re-opened, governments and border control authorities are once again focused on ensuring their borders remain safe and their newly implemented measures are future-proof.

Until the pandemic struck, the number of passengers travelling across borders was growing to record levels, driven by low-cost flights, the effects of globalisation, the rise of emerging markets and fewer visa restrictions imposed by many countries. According to the 2019 Airports Council International (ACI) World Airport Traffic Report, smaller airports around the world had made strong gains and the largest hubs were continuing to expand. This study revealed that the number of airports handling more than 40 million passengers a year rose from just 16 in 2008 to 54 in 2018. And although the sector took a massive hit in 2020, some insiders believe air travel could return to normal as soon as 2021 – while others have been more cautious and forecast that it won’t be until 2023 that we see passenger levels back to those of 2019.

However optimistic you are about future travel and passenger growth, the role of border control isn’t going to change, and authorities are intent on ensuring that the experience for travellers at air, land and sea borders is as quick, easy and secure as possible. Aside from dealing with the pandemic and its aftermath, terrorism, drug smuggling and people trafficking remain major threats to border security. So it is essential that the right strategies, technologies and processes are in place to combat them.

Biometrics answer
Over the years, border control has become smarter with ePassports using biometric technology as a key element, enabling authorities to verify that a traveller is who they claim to be and that they are authorised to enter a country. Today, biometric technology is being used worldwide to improve border security and throughput. Queries can be automated to databases, as in the case of the leading Visa Information System (VIS) operated by eu-LISA. This alerts authorities to potential threats and risks, while the majority of travelers, who are passing through a border for lawful and legitimate reasons, can be granted straightforward passage through automated border control (ABC) gates.

As requirements for biometric borders grow, many authorities are now introducing self-service kiosk systems to optimise passenger flow. Examples include the Trusted Traveller programmes in the US and most recently the EU’s upcoming Entry/Exit System (EES). Again, in Germany’s Smart Borders project, self-service kiosks were used to pre-register third-country nationals, including capturing people’s biometrics before they approached the manual border control booth.

Kiosks can help to simplify and speed up the processes at critical passenger touchpoints. In a border control setting, people can pre-enrol their own data at the kiosk, moving time-consuming tasks such as biometric acquisition or custom declaration away from the manual border control booth. This also enables the authorities to start the verification process early and perform background checks before the passenger arrives at the booth. After pre-registering at the kiosk, the traveller is then referred to border control officers, who decide whether to allow or deny them entry, after examining their travel document, the captured biometric data (ie, their facial image and possibly the fingerprints) and the background check results.

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**EES example**

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**Figure 1: Comparison of time needed at the border control desk with and without prior kiosk usage.**

| TCN-EES-EU – Total duration at the border control booth [s] |
|-------------------------------------------------------------|
| Visa Exempt | Visa Holder | Without prior Kiosk usage | With prior Kiosk usage |
|--------------|-------------|--------------------------|------------------------|
| 92           | 39          | 137                      | 55                     |

*Source: Results of the Smart Borders pilot project in Germany*
that from 2022 all travellers from third countries will have to register with EES as part of the European Parliament’s Smart Borders Initiative. When entering the Schengen area via land, sea or air borders, third-country nationals (TCNs) will be required to register with four fingerprints and a facial image.

The EES is designed to increase the security of the external borders across the Schengen area and to make the border control process more efficient. It will centrally register and store the arrivals and departures of TCNs at border control points, while the European Travel Information and Authorisation System (ETIAS) will check visa-exempt travellers from third countries before they even cross into Europe. The EES will enable border guards to quickly access information, such as those who have previously been refused entry. It will also provide travellers with details about the maximum duration of their authorised stay, and will automatically warn the national security authorities if a person has not left by the deadline.

The biometric data captured at the kiosk or manual border control booth will be stored in the EES, together with the person’s identity data and other information taken from their travel document, to create an individual file for each traveller. Each time the traveller enters or exits the Schengen area, this data is recorded in their individual EES file. The now digitally stored information replaces the previous manual stamping procedure.

The launch of EES will mean that many new, complex and time-consuming tasks will take place at the border, and self-service kiosks could form part of the infrastructure to address this challenge. The technology is covered in EU Regulation 2017/2226, which indicates that the use of automated methods and self-service systems – as defined by Article 2, Number 23 of Regulation (EU) 2016/399 – can simplify and speed up the border control process.

Meanwhile, a recent study by Fact.MR predicts that there will be a steady growth in the use of self-service kiosks at airports worldwide. The market size is expected to grow from an estimated $1.5 billion in 2019 to $5.2 billion by the end of 2029. The largest driver for this growth will be border security, with the adaptation of kiosks for automated passport control (APC). APC kiosks are already widely used in the United States where the US Customs and Border Protection (CBP) programme streamlines the entry process for travellers.

Kiosks combine systems for document verification, passenger biometric capture and verification. And when implemented correctly, they can help reduce overall operating costs; enable airports to rapidly scale up to cope with increased passenger numbers; allow travellers to perform the necessary authentication steps quickly; provide greater flexibility in using restricted space at airports; and free up border security officers to focus more closely on enforcement and intelligence efforts.

Help for officials

Kiosks can play a major role in supporting border officials in their day-to-day duties. For example, when a border control system, such as EES, is put into operation, border control officers will have to add biometric data acquisition into the control processes, alongside their existing inspection and verification duties. This significantly increases the complexity of the duties for the staff involved.

The resulting need to focus on travellers directly – and on the new scanning technology being used to register biometric data – means there is a risk that officers may pay less attention to other aspects of border control, such as observing the behaviour of individuals before they reach the desk. In other words, if officers become mere clerks for biometric data capture, this could lower overall security at border crossing points.

“Germany’s Smart Borders project found that with travellers self-registering their data at kiosks, the time they spent at the border control desk could be cut by more than half”

To counter this, kiosk technology can play a key role in helping border control officers to continue focusing on their essential duties, such as controlling arriving and departing travellers and monitoring the border crossing area. By enabling the pre-enrolment of biometric data and prior interviewing of incoming travellers, kiosks can significantly reduce the workload of the staff performing these controls.

Language barriers can be overcome by conducting the entry interview at the kiosk in the native language of the traveller, and directly translating the answers for the official. With their integrated security mechanisms, kiosks can also guarantee consistent data quality in the border control process. And by continuously monitoring passenger behaviour, kiosks enable staff to risk-assess subsequent steps in the border control process. They provide border control officers with additional information and also help to optimise passenger flow management – for example, by giving instructions to proceed to the manual border control desk or the ABC gate.

The automated supervision mechanisms used in a kiosk system also enable border control officials to monitor several kiosks from one workstation and to interact with travellers if necessary. By combining self-service with support from an official, the whole process can be accelerated, so enabling border guards to focus on the small number of suspicious and high-risk cases that require further detailed inspection.

Saving time in complex processes

As border control authorities move to more complex methods of capturing biometric data, and passenger numbers return to normal, then longer waiting times at border crossings are to be expected – unless automated systems are implemented to increase throughput. The German Smart Borders pilot project mentioned earlier found that the wait time for TCNs at the border control desk more than doubled if additional biometric data acquisition (face and finger), and the required searches of the central EES system, were performed entirely at the manual border control desk.

It also showed that kiosks can help optimise passenger flow while also compensating for the extra time needed at border control. The study revealed that in situations where prior kiosk usage was encouraged, significant amounts of time could be saved at the stationary border control desk. For border control officers, the inspection time for travellers requiring a visa fell by an average of 60% (82 seconds saved) and for visa-exempt travellers by an average of 58% (53 seconds saved).
Overall, self-registration of data at kiosks meant that the time spent at the border control desk could be cut by more than half.

A significantly longer inspection process at the stationary desk not only affects border control procedures and results in longer waiting times for travellers, it also has an impact on subsequent unrelated processes. In airports, for example, it can result in increased transfer times, increased baggage claim times and consequently changes to flight schedules. So the introduction of kiosks could not only reduce the impact of bringing in stricter ID procedures on the border control process, but on travel processes as a whole.

**Optimising limited space**

Authorities have struggled to keep pace with the rapid growth in international travel; and it’s not possible to substantially adapt existing air, land and sea border infrastructures at short notice. So if authorities are to avoid longer passenger queues, they need to consider how they can roll out smart and flexible solutions.

In this respect, kiosks provide more flexibility, as the waiting areas for self-service systems and stationary desks can be kept separate from each other. And kiosks can make flexible use of space further away since, because of their integrated monitoring functions, they do not have to be within view of the border control desks. Their positioning systems can be optimised for local conditions. For example, depending on requirements, self-service kiosks can be placed next to each other in a row, along a wall, at an angle in the middle of the room, back to back, or in a circle. They can even be moved elsewhere without the need for extensive construction work.

**Return on investment**

If border control authorities are to improve security to cope with the latest threats, they will need to adapt their existing infrastructure. To offset the additional expense this entails, they can either increase the number of stationary border control desks – with a corresponding increase in the number of trained staff – and/or use automated systems such as kiosks. When weighing up which route to follow, it is worth considering the relative cost and scalability of the potential solutions.

Experience shows that kiosks can be installed and integrated into existing infrastructure more quickly than stationary border control desks. Self-service systems frequently guarantee a fast roll-out phase and live operation. In addition, the number of kiosks can be readily adjusted as required to match variations in passenger arrival numbers. And while kiosks do not require investment in personnel, this cannot be avoided when setting up additional border control desks. Finding and recruiting qualified staff to operate these desks at short notice is often difficult. From this perspective, kiosks are more cost-effective when considering the total cost of ownership than expanding and operating stationary desks with trained border control officers.

**Security challenges**

Not all biometric kiosk solutions possess all the necessary security functions, so it is important to consider how a particular solution deals with some of the most common challenges for biometric technology. Kiosks should be able to provide high levels of 1:n search accuracy, capture high-quality images, and have technologies in place to deal with spoofed facial images and fingerprints.

Specifically, to counter presentation attacks at border crossings, kiosks must be able to reliably recognise forged and falsified documents, spoofed faces or fake fingerprints. Their liveness detection capabilities can also play a key role in identifying when a spoofing attack is taking place. In order to detect forged photos and/or fingerprints, kiosks should provide a robust presentation attack detection (PAD) system that complies with the performance criteria defined in the ISO/IEC 30107-3:2017 standard.

In this scenario, border control officers need immediate information about presentation attack attempts in order to detect misuse and spoofing attacks. The key elements that self-service kiosks provide to prevent attacks are advanced software algorithms for attack analysis and advanced sensors for liveness detection of fingerprint and facial images. The anti-spoofing algorithms, which automatically detect and mitigate risks, may be active (that is, the user has to perform an action, such as blinking) or passive (that is, the user does not have to perform an action).

In addition to these PAD technologies, self-service systems should be operated under the supervision of a border control officer who is focused on detecting any inappropriate, fraudulent or abnormal use of the self-service system. In the EU, this role is covered by specific regulations, but the principle is a sound one for any border control scenario. With the EU system, wherever there is a kiosk without sufficient monitoring functions, a border control officer must be present to watch the traveller enter their data.

"**Kiosks should provide high levels of 1:n search accuracy and be able to deal with spoofed images and fingerprints. They should be supervised by a border control officer who can detect any fraudulent use through liveness detection measures**"

In particular, it is important to ensure there is no change of travellers while using the self-service kiosk. For this reason, the kiosk should feature additional surveillance cameras and smart security functions that detect inadmissible or suspicious situations, so passengers can be monitored conveniently from a distance. In line with this, border control authorities should ensure that the kiosks can perform full frontal high-quality image acquisition, offer anti-circumvention...
technology using PAD, and feature integrated security functions.

**Image quality vital**

There is an old IT saying: garbage in, garbage out. In other words, a technology solution is only as good as the information it’s given. So if poor-quality biometric data is captured at the outset of a process, it will cause problems in the future – such as needing to recapture an individual’s data if there are doubts about the authenticity of the data involved.

Many border control systems work on the principle of carrying out a full 1:n search during enrolment. But if these searches return a large number of false positive identities, it will result in the border control officer having to spend a large amount of time reviewing and evaluating them, wiping out any advantages the kiosk might offer. The EES system, for example, will contain several hundred million identities – so it’s vital that the kiosks used in this and other international border control programmes capture facial images and fingerprints at the highest quality level possible.

Facial images should comply with the ISO 19794-5:2011 standard, while fingerprints must be captured in accordance with NFIQ 2.0. Only an integrated camera that automatically adapts its position to each passenger’s height can guarantee the optimum, fast and high-quality capture of facial images. In addition, clear user guidance and process indicators are needed to ensure travellers hold their head up and look straight at the camera.

**Conclusion**

As international travel gradually returns to normal, and passenger numbers begin to pick up again, it is vital that governments invest in the infrastructure, processes and strategies needed to deal with the growing challenges presented at air, land and sea borders. Easy, quick and hassle-free travel is an essential part of our global economy. But robust security and knowledge of those who have entered and left our territories is also an important part of keeping populations safe and providing the confidence that economies need to thrive. Kiosk systems that combine up-to-date anti-spoofing techniques with high-quality enrolment of biometrics, and are backed up by well-trained border guards, are an essential component in achieving these goals.

**About the author**

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