IT Report 2021
Annex to the Annual Review
Executive summary

Digital transformation at the European Patent Office (EPO) continued to gather momentum in 2021. Significant progress was made with multiple projects to digitalise workflows and upgrade IT systems under goal 2 of the EPO’s Strategic Plan 2023 (SP2023). As a result, the patent workbench platform covered over 99% of workflows in the European Patent procedure by the end of 2021.

Another milestone was reached towards the end of the year when the EPO completed the first two phases of decommissioning its outdated, unreliable mainframe and replacing it with a new Linux platform. Given that IT infrastructure is crucial to supporting the EPO’s high-performance digital patent granting process tools, this marked a huge step forward.

IT security is also vital to the operations of an increasingly digital organisation like the EPO. With a view to obtaining ISO27001 certification in 2022, the EPO adopted a new information security policy framework in 2021 and made substantial investments in upgrading its security technologies.

The EPO’s inhouse data scientists also continued to develop new artificial intelligence (AI) solutions to support the patent granting process last year. Although this is just the beginning of a long journey, AI is clearly a gamechanger for the EPO. Thanks to frequent, automated re-training, the EPO’s new in-house AI pre-classification engine, for example, allocated thousands of files in 2021, with greater accuracy than the legacy service.

On top of upgrading tools for examiners, digital tools began to deliver tangible benefits for users too. Last year saw the launch of a six-month pilot for a new online user area for parties to proceedings before the EPO. This platform allows parties to view their application portfolio, perform tasks, file procedural requests and reduce formal errors in applications with real-time quality checks.

In parallel to working on the user area, the EPO also broadened the reach and scope of its electronic Mailbox. Over 1 000 new users signed up for the service last year and the range of communications that can be notified via the Mailbox was also extended, with users able to submit 98% of all EPO forms via the Mailbox by the end of 2021.

Last year witnessed a rapid acceleration in IT co-operation with the EPO’s member states within the European Patent Network. Thanks to excellent collaboration with national patent offices and a minimum viable product approach, several projects were completed ahead of schedule. First patent filings were received from Lithuania and Spain under the new Front Office pilot, and a bilateral agreement builder was launched as part of the single access portal project.

Overall, digital transformation had a far-reaching and profound impact on the EPO in 2021. By enhancing productivity and service delivery, it continued to play a key role in helping the EPO to fulfil its mission as an innovation enabler.
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1. Using IT to build an engaged, knowledgeable and collaborative organisation

In 2021, the Office continued to operate remotely on a massive scale. It is now clear that the future of work will be different from what we have known in the past. We therefore set about preparing a fundamentally digital framework for these new ways of working.

In 2021, we started exploring how new technologies can help us not only communicate and collaborate, but also nurture a sense of belonging among staff. As an example, the virtual worlds project produced several proofs of concept using virtual reality to enable virtual walkabouts of the Office, our art collection, and so on.

A digital environment is fast-paced, requiring both adaptability and a broad and accurate flow of information. We have therefore modified our methods of delivering digital tools to increase awareness of new developments. We have started holding “unboxing events” to demonstrate and explain new functionalities a few days ahead of their introduction, accompanied by training texts and videos. This has also helped build a sense of community around the digital heart of the Office.

Our new IT tools support cross-site collaboration, offering new opportunities for experts to work together on applications and fostering a “one-Office” culture. We continued to leverage staff expertise by involving them in software development using state-of-the-art collaborative platforms.

Of course, the future is not only digital, it will also exist in the physical reality of our buildings. We have therefore continued to refine and plan the reintegration of our premises, as well as a number of hybrid set-ups to ensure a smooth transition to the new ways of working. A special chapter as regards physical equipment has been preparing and planning the Vienna Green Hub project in terms of the IT landscape for both the interim site and the final building, including decommissioning a legacy data centre in Vienna that is no longer required.

2. Simplifying and upgrading IT systems

2.1 Delivering PGP¹ and search

Maintaining the accelerated pace of digitalisation that was required during the previous year, we continued building the end-to-end PGP backbone that will support the operations of the Office in a digital world.

Earlier than planned, the cumulative progress over the last two years has already started delivering tangible benefits for the Office in terms of the achievements that are expected from digital operations.

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¹ Patent granting process.
2.1.1 Patent Workbench

Launched in 2021, Patent Workbench is at the heart of the workflow in examiner teams. It was expanded to include refusals, refunds, informal phone conversations, summons to oral proceedings, production of minutes, communications and so on. All in all, we are now covering more than 99% of workflows by volume in EP and have begun adding the first workflows for opposition and PCT procedures.

Moreover, we not only cover but have also started optimising the vast majority of workflows, as in the case of the communication and summons to oral proceedings in examination, which no longer require any action on the part of formalities officers. By automating certain steps, we are enhancing both the efficiency of the organisation and the timeliness of our operations. In terms of the IT landscape, it also brings us closer to decommissioning CasexPrima, a central legacy tool used by formalities officers.

Patent Workbench is fully integrated with the new digital file repository, giving examiners easy access to the documents they need for their work. An extra space has been added to provide division members with the documents relevant for grants, as we continue to invest in the usability of our tools and the ergonomics of our digital environment.

2.1.2 Digital file repository and Aly

At the beginning of the year, we continued our successful approach of delivering incrementally by launching a minimum viable product of the digital file repository (DFR), the new archive that will manage and store all patent application documents in several incoming and outgoing formats as they are processed.

By the end of the year, we had improved the DFR’s stability and performance, including the option of annotating files using several layers (private annotations, shared annotations). As a result, we were ready to roll it out to all sectors in DG 1 and launch a pilot in the Boards of Appeal to explore its suitability for their work.
The DFR is also a central component in the architecture being redeployed in the new user area (MyEPO Portfolio), demonstrating the modularity and reusability of this key element of the patent granting process and its potential to transform the way we interact with users in the future.

As DFR features continue to replace those in Aly and the legacy DI+ and PHOENIX systems, it will become the single tool for all users, built on modern architectures and, over time, allow us to further decommission legacy tools.

The DFR is already integrated with the AI-powered in-house solution for OCR, thereby enabling us to process unpublished patent documents in our EPO data centres without having to outsource this sensitive content to third parties. OCR-processed content is directly integrated in the repository as soon as it is processed, without requiring data exchanges or further processing.

2.1.3 Workflows for oral proceedings

New workflows have been put in place to simplify and streamline the organisation of oral proceedings, including providing a booking calendar, automatic scheduling of virtual Zoom meetings and full integration in the new digital workflows in Patent Workbench, thereby removing the need for all manual work previously involved in this procedure.

Two new tools were released in 2021, offering an integrated end-to-end solution for scheduling videoconferences, logging any rescheduling requests received from the applicant before the date and enabling the first examiner to take a decision electronically on whether to keep, postpone or cancel the oral proceedings.

- The OP Scheduling tool enables examiners to identify the earliest possible date and time for oral proceedings and book the time slot. The Outlook invitations and Zoom link are created automatically for all participants’ EPO calendars, without any intervention by formalities officers as in the past.
- The Oral Proceedings User Service allows formalities officers and examiners to handle various types of submissions received before oral proceedings in a structured manner.

2.1.4 Paperless working

After the iPad pilot phase in 2020 (800 opposition examiners and members of the boards of appeal), the general rollout to examiners, formalities officers, team managers, staff in Directorate Quality Audit and legal members in Directorate Patent Law took place in April 2021. By the end of 2021, a total of 4,200 iPads had been issued to volunteers among these staff groups with a view to moving away from paper at all stages of the PGP.
In parallel, and following implementation of on-demand search file printing in May 2020, further steps were taken in 2021 to move away from printing. Over the course of the year, on-demand printing of examination and opposition files was gradually launched in all DG 1 sectors. In terms of reducing paper consumption, the impact has been massive. As detailed in the Environmental Report, the EPO cited a record low of 24.3 million printed sheets of paper in 2021, a decrease of 40.7 million sheets compared to the previous year (-62.6%) or the equivalent of 137 fully grown trees.

Moreover, the shift towards digital, paperless solutions and the integration of collaboration tools have paved the way for greater collaboration and knowledge-sharing between examiners, while allowing them to work remotely.

### 2.1.5 Other new PGP tools

In 2021, we introduced "Added matter check", a new application to help examiners analyse amendments by comparing two sets of claims in a given dossier and producing a text with an initial analysis that can be shared with other members of the division. In 2021, the tool was offered to pilot users as a minimum viable product and then steadily improved. On this basis, we will move to an integrated solution accessible via Patent Workbench in 2022.

We also introduced a new form editor for "free text communications" by formalities officers. The new product provides a state-of-the-art editor on a modern architecture and supports a library of template texts that users can include in their communication to applicants. Reusing a standard library of texts enhances both predictability and consistency.

At the end of the first quarter of 2021, the Foundations project in the PGP programme delivered a new form-rendering platform to support interaction with users. The existing 2 500 forms were each scrutinised prior to their migration to the new platform, resulting in the removal of about 500 obsolete forms that had not been used for years and the successful migration of approximately 2 000. This was accomplished by 18 December, when the mainframe, which hosted the legacy form-rendering engine, was decommissioned.

### 2.1.6 Improvements to existing tools

Trimaran has been improved to make it easier to collect information when searching in Ansera and then reuse it when preparing a written opinion, particularly as regards identifying citations and passages to be referenced when drafting the search report.

Also during 2021, our classification and search management system (CLASMA) was upgraded to handle the classification workload, offering increased transparency and easier administration of the system. The sampling procedure for classification quality ("Class-OQC") was fully aligned with ISO 9001. This facilitates the transfers of teams and management of technical fields and is automatically synchronised with HR systems, giving the organisation greater flexibility. Lastly, transferring tasks among classifiers is now more transparent, thereby improving quality monitoring and alignment with work processes.
A new workflow supporting video citations has been implemented in CiteNPL, streamlining the process for citing non-patent literature documents in this format.

2.1.7 Search programme

As Ansera is our search tool of choice, we invested heavily in 2021 in improving its functionality, the way it interacts with other tools and the performance of its algorithms, as well the interface to offer an enhanced user experience. These are important steps away from our legacy systems towards an environment that is better able to serve our growing and changing search requirements. By the end of 2021, almost 90% of all citations were generated in the Ansera ecosystem.

Figure 2 – Ansera

Source: EPO

One of the most important steps towards a fully digital search is enabling examiners to efficiently create and manage digital annotations. We have thus improved Ansera's annotation capabilities during the search phase, placing greater emphasis on collaboration and knowledge-sharing in this key aspect.

In 2021, we integrated rich annotation capabilities and adapted the Vinbar concept to manage multiple layers of information, for search hits, term-highlighting and manual annotations such as underlines, comments and tags. It records numerous decision-making aspects during the search preparation, search execution and document evaluation. All this information is now available in the subsequent examination stage and supports collaboration.

Integrating pre-search in Ansera allows examiners to work directly with pre-search results, meaning that many can now perform their complete search in Ansera. More specifically, Ansera is now able to:

- capture more search results and display why they were identified as relevant matches to provide a better record of the pre-search. This is helpful for the search division but also for examiners continuing their work, as in the case of PCT searches or divisional applications.
• take advantage of automated pre-search as the first search step. With the full Ansera toolkit available, it is easy to analyse pre-search documents against claims, improving both application understanding and initial query formulation. Building on this foundation, new (AI) methods will gradually be added to the Ansera pre-search.
• use one new pre-search function consisting of a native Ansera implementation of "combi", a search function that finds all cited and citing documents. In 2022, this will be upgraded with an extended "combi" mode, which repeats this search for each document found during the original search.
• access the database of application documents, now indexed in Ansera, for both pre-search and manual searches.

Throughout the year, we improved the Ansera tool by accelerating the speed of the search algorithms and the visualisation of results, as well as by enhancing image quality and the visualisation of colour documents. Concrete actions include:
• real-time performance monitoring for the search applications to continuously fine-tune viewing performance, for example image flip rate, on the basis of information collected from real interactions in real searches.
• viewer improvements to quickly locate passages in the original facsimile view, a very useful shortcut when information is only available in the facsimile, as with chemical formulae or tables, especially in older publications. General improvements to the facsimile display quality to support reading of identified passages and the display of coloured scientific literature.
• Ansera has been adapted for multiple monitors. Examiners can display search results and retrieved documents side by side. This offers a more ergonomic environment, more efficient use of the extra screens and generally supports paperless working.
• harmonising the user interface across search applications and other PGP applications. Gradual modifications towards a common design system are increasingly showing benefits. Filters and buttons for essential functions are now standardised and easily recognisable, accelerating the introduction of features and supporting the fast-paced evolution of Ansera.

Furthermore, we have upgraded Ansera with a concept manager, a new tool that promotes peer-to-peer knowledge-sharing among examiners by enabling them to create content in search concept libraries also accessible to their colleagues, who can then reuse the content in Ansera. It builds on the Ansera synonym dictionary and marker library, which have now been combined to provide synonym and query-sharing.

2.2 Upgrading online tools

Modernising the Office means reviewing not only how we work in-house but also how we engage and interact with our users. Building IT solutions in this area calls for strong, transparent and constructive user involvement in discussing early prototypes and providing feedback on their practical experience in real-life pilots. Creating tools hand-in-hand with users can sometimes lengthen the process, but we firmly believe it is the best way of ensuring our tools are fit for purpose.
2.2.1 Launch of the user area pilot phase

In November 2021, we launched a pilot of the new "user area" (MyEPO Portfolio) service for parties to proceedings before the EPO. This new online platform will ensure more efficient interaction, fewer manual steps and greater transparency by allowing users to view their application portfolio and documents, perform tasks and file procedural requests in reply to a communication from the EPO. It also carries out real-time quality checks, reducing the potential for errors in submissions.

The first group of 100 pilot users were given access to the user area; just over 50% of these pilot users are patent attorneys based at companies of differing sizes across 22 countries.

Pilot users gradually experimented with the tool and provided constructive feedback as different types of interaction took place. Drawing on their input, we will adjust the new user area, adapting it to user needs, providing effective interaction for the Office and making it more accessible.

The user area pilot phase marks a milestone towards the digital transformation of the customer journey, facilitating the exchange of structured information and enabling more direct interaction with the EPO on files.

2.2.2 New epo.org – statistics and trends centre, plus a new digital version of the European Patent Convention (EPC)

The first deliverable of our initiative to revamp the epo.org website was the launch, in July 2021, of a new statistics and trends centre. This free online service makes our annual Patent Index interactive and fully explorable, allowing users to discover trends and connections with greater flexibility.

Its intuitive interface enables users to select data on countries and/or up to 35 technology fields, then choose from four different display modes. This approach makes it very easy to clearly visualise long-term trends in patenting behaviour or the distribution between countries for a particular year. Results can be instantly shared or downloaded locally. This service has been designed to be accessible on a smartphone or tablet just as easily as on a laptop or PC, offering a glimpse at the future design of the EPO website.

In October, we launched a new digital version of the European Patent Convention (EPC). Almost 50 years after the EPC was first signed in pen and ink by the EPO's founding states, the latest format is simpler to navigate and can be instantly viewed on mobile devices. It marks the beginning of a new era of convenient online access to our legal texts, presented in a modern format that is easier on the eye.
2.2.3 Improved support for customer service management

As part of our drive to enhance customer care, the EPO is improving the handling of external customer enquiries with the help of a new customer service management solution.

The new system was launched as a pilot in November 2021 to streamline enquiry handling processes, before being rolled out across the Office in 2022. The software is modern, easy to use and gives customer support staff access to the information they need. They can now interact seamlessly with colleagues from other departments to resolve issues and respond quickly to customers.

2.2.4 Decommissioning of CMS filing

As the Online Filing 2.0 system was made available to end users throughout 2021, the EPO decided to decommission the older Case Management System (CMS) filing tool. Online Filing 2.0 incorporates and improves the features of CMS, covers all procedures before the EPO, including procedures before the Boards of Appeal, and offers a more user-friendly interface.

The decommissioning was announced in May 2021 and took effect on 31 December 2021. During this sunset period, a reinforced support group was set up to assist users with the transition to Online Filing 2.0.

The decommissioning meant that the Office could remove an IT system that was notoriously complex, requiring considerable maintenance in obsolete technologies for which expertise was no longer readily available.
2.3 Supporting corporate functions with advanced tools

The Office continued the digital transformation of its corporate areas, aiming to improve efficiency, while making the Office an engaging working environment.

2.3.1 Modern and digital HR

We made solid progress in modernising our HR tools. Following a thorough assessment of our processes, we identified priority areas where new or improved tools would bring instant benefits in line with the objectives of Goal 1 of the Strategic Plan, and modified our payroll system to accommodate the new salary adjustment method.

A new skills framework was made available in the digital job profile, including a tool for creating digital individual development plans. Making them digital ensures greater transparency and traceability, offering a holistic view and connecting all job profile elements, thereby facilitating professional development. A new learning platform was set up, all content was migrated and the old legacy tool decommissioned.

An enhanced performance and goals tool was delivered for the 2022 goal cycle, giving managers greater flexibility in terms of goal setting and continuous follow-up during the year. It also breaks complex goals down into more tangible activities, makes it possible to gather feedback and caters for situations of partial internal job mobility.

A minimum viable product for onboarding was launched to support the limited recruitment that took place in 2021. This will be refined, based on the feedback from candidates, new staff and onboarding teams. Moreover, the module for annual leave management was enhanced to provide greater transparency and allow for stricter control over days carried over into the following year.

2.3.2 Modern meeting and videoconferencing solution

We completed the transition of all oral proceedings via videoconference to a single platform (Zoom) following positive feedback on the technical and usability aspects of the platform during the pilot project or oral proceedings in opposition. We have now trained all examiners and established it as the only platform for examination, opposition and appeals since 1 October 2021. This allowed us to carry out 8 819 online proceedings (3 784 opposition, 3 709 examination and 1 326 appeals) throughout the year.

Meanwhile, we also upgraded our Office telephony to an integrated solution. By the end of 2021, more than 6 800 users had been migrated, with a few special lines remaining for 2022, when we will decommission our legacy system.

2.3.3 Business intelligence and analytics project

We implemented a new data analytics platform (WYRM) based on open-source technologies, available for all EPO employees and covering different aspects of modern data analytics, including scalable storage, distributed processing, real-time analytics and integration with collaboration tools.
By leveraging this platform, we can now achieve higher performance and scalability that was not possible with our legacy SAS and SQLServer platforms. This allows the processing of larger sets of data (we have four times more storage available, in a scalable way) that offer greater insight into our operations, as well as faster processing times in analysing and following up on the evolution of trends. Queries to generate statistics in PATSTAT that used to take days are now finalised in minutes; the citations data mart previously took approximately 12 hours to load but is now completed in less than a minute, while the fees data mart similarly loads in seconds instead of hours, to name but a few examples.

This has already reduced the footprint of our SAS portfolio to half of the costs in the previous year, a development to be continued in 2022.

2.3.4 Other ongoing projects

The initial stages of the document and knowledge management project were completed with the setting-up of an Office-wide content governance framework, including a document classification scheme that will serve as the basis for organising and finding information in the new system.

New EPO.tv and EPO events sites were launched in June, based on the future intranet platform, with a new design, better ergonomics and navigation, receiving very positive feedback from users. The IP5 and Trilateral websites were also migrated to the new platform.

By May 2021, we had completed the full WiFi coverage of all EPO buildings (which had to be postponed in 2020 due to the pandemic), enabling all staff and visitors to use laptops, iPads and mobile phones in all areas, including meeting rooms, social spaces and visitor centres. We also completed the migration of corporate email to our new cloud-based solution in July 2021.

2.4 IT infrastructure

Reliable IT systems are vital for business continuity. Although modernising our IT systems entails some risks and challenges, it is critical for the Office’s sustainability that our essential IT systems run on state-of-the-art infrastructure, rather than on an obsolete and overly complex landscape, dependent on proprietary technology vendors. When it comes to IT infrastructure, we made good progress throughout 2021 on all of our major projects.

2.4.1 Data centre migration

By the end of 2021, more than 90% of all IT systems in the Office had been migrated to the Luxembourg Tier 4 data centre. The only non-mainframe systems remaining in The Hague were either those that are local by nature (physical access to buildings, security cameras, printing facilities, etc.) or those that are scheduled for decommissioning in 2022 and will therefore not be relocated to Luxembourg.
This was achieved over 16 migration waves, taking place at weekends throughout the year with very limited disruption to the day-to-day operations of the Office, involving dozens of technical staff and users. Of the hundreds of IT systems that were migrated in these 16 waves, only three required urgent rollback and had to be retried.

The only task remaining for 2022 will therefore be to migrate the re-platform mainframe. This is scheduled to take place once the mainframe is switched off in the first quarter of 2022, after which the project will close.

### 2.4.2 Mainframe re-platforming

To ensure a reliable and sustainable basis for all IT systems, we embarked on a journey to decommission our mainframe systems and re-platform our backend IT tools. This is essential as the old mainframe is overly complex, unreliable, completely outdated and very expensive to run, costing the EPO millions of euros every year. Although the costs are considerable, the implications are more fundamental: replacing the mainframe technology of the 70s is necessary for the continuous development of the new PGP toolset, which is the cornerstone of a digital EPO.

In 2021, we completed two of the three waves of mainframe decommissioning. The system managing PGP procedural tasks (MUSE) was ported to the Linux platform in September 2021, demonstrating that the new platform was stable and robust, that the migration process itself was workable and that the final port-out of all remaining mainframe applications would be successful.

Our document image retrieval service (Phoenix) and all mainframe-based prior-art applications were also ported to Linux between September and December 2021. The prior-art collection accounted for 86% of all mainframe data and 67% of all mainframe processing.

### Figure 4 – Mainframe legacy

Source: EPO

86% of mainframe data and 67% of processing were ported out
By year end, the two key systems were running smoothly from the new Linux platform. The third and last wave progressed significantly towards completion in early 2022. The Office negotiated a new three-year contract with IBM, resulting in significant savings compared to the previous three years and focusing on strategic elements rather than legacy platforms. It also enabled us to decommission our disaster recovery mainframe in Munich in December 2021.

2.4.3 Cloud and cloud-native

Due to the pandemic and the need for teleworking across the board, cloud implementation has been much faster than anticipated. A careful and gradual approach was taken in line with the Office's cloud strategy of keeping unpublished patent documents in EPO data centres.

The baseline infrastructure of thorough contractual agreements and dedicated connectivity via high-speed lines was set up for all three major cloud providers (AWS, Azure, GCP), including native cloud security mechanisms. By late 2021, a strong baseline for all three providers was in place, with good integration in other cloud solutions (SAP, Zoom, etc.) and EPO data centres.

BIT staff continued their upskilling drive to acquire the technical skills and competences needed to manage the new platforms. Cloud activities are now a big part of daily operations across several teams in BIT, be it operating the cloud infrastructure itself or running applications on it.

2.4.4 Other projects

Pending completion of the mainframe re-platforming and data centre migration, the disaster recovery project continued to run simulation exercises – speed tests – on a regular basis to ensure that we become increasingly familiar and comfortable with disaster recovery procedures.

A new IT service management tool was launched in October 2021 to replace the legacy one. Originally launched as a minimum viable product for a subset of IT processes, new functionality was rolled out on a weekly basis, and this will continue in 2022.

New monitoring tools for the cloud and cloud-native platform have been rolled out. These include a new approach to event management, enabling faster reaction times to system alerts.

2.5 Cybersecurity

IT security is fundamental to an increasingly digital organisation like the EPO. Given the prevalence of teleworking during 2021, we continued to enhance our secure remote-working solutions, building on what had already been set up for the longstanding part-time home working scheme and the extra measures taken during the pandemic. Our laptops are now kept permanently up to date without requiring physical presence on Office premises, connectivity is secured and local data encrypted.

Enhanced security for remote-working solutions
Together with staff awareness, this allowed the Office to remain secure and not suffer any significant disruption despite several global exploits and increased cybercrime levels in 2021, including during the worldwide log4J vulnerability disclosed in December.

As regards our threat protection capabilities, the Office deployed a new advanced threat protection tool and additional attack surface reduction measures on EPO workstations and servers, thereby reducing our risk footprint considerably. Also, in terms of intrusion detection and prevention capabilities, we continued to improve our existing network infrastructure and security information event management.

Moreover, in 2021, we continued to integrate security in the product development process under the principle of security at source, using automated security testing for our new tools, along with effective vulnerability management, involving product teams, and monitoring resolutions. Penetration tests are automated and performed with modern systems, both for blackbox and “glassbox” scenarios.

In 2021, the Office successfully combined cloud-based authentication systems with a new internal public key infrastructure (PKI) solution to improve our authentication methods and enable new security features. These features improve both security and ease of use, including one-click connectivity to the Office network, PIN-based logon on workstations (Windows Hello), certificate-based access to our wireless networks and multi-factor authentication (MFA).

We also initiated a proof of concept of authentication with eIDAS (EU regulation on electronic Identification, Authentication and trust Services for electronic transactions in the European Single Market). Our aim is to understand the options of linking with authentication through eIDAS.

For our external users, we created the new Customer Identity and Access Management self-service portal, providing a uniform user experience for login and enabling single sign-on. It offers device-independent access anytime and anywhere, with self-service for digital access tokens of choice (while supporting EPO smartcards). This portal is already used in production by the new fee payment tool and will be extended to further online applications in the course of 2022.

In 2021, the ISO 27001 project delivered the Information Security Policy framework. The objective is to provide a central, structured and up-to-date documentation framework for all available rules, policies and guidelines for all user categories in the area of information security at the EPO. It is a stepping stone towards the Office’s objective of achieving ISO 27001 certification and complies with its duty of due care and due diligence in matters of information security towards its internal and external stakeholders.

Central to all our information security initiatives, we prepared an 18-month security awareness campaign. An initial Office-wide phishing simulation exercise was performed in mid-2021. As a result, and based on feedback received, we introduced warning banners on all emails coming from outside the Office and a “one-click” reporting mechanism, integrated with our backend threat intelligence systems.
3. Driving the delivery of high-quality products and services

The combination of performant toolsets for classification and effective management of the Office's high-quality prior-art collections remains central to maintaining the quality of our products. We therefore continued to invest in these tools in 2021 under several programmes, as announced in the Strategic Plan 2023.

3.1 Preclassification

Built in-house, an AI-based preclassification engine was launched in May 2021 and has allocated over 50,000 European and PCT patent applications to examiners. Since December, the service has been used to route files in all three EPO official languages. A preliminary evaluation of the routing quality indicates that the KPI for automatic preclassification has increased from 86% to 90% with the new service, reaching the target KPI quality band for preclassification.

3.2 Classification

The classification bridging project, which aimed to make improvements on a number of existing classification-related issues (touching on processes and tools), was concluded successfully. As a result, the number of classification-related issues had dropped from approximately 30 per month to just one or two per month by year end.

In July 2021, we released the first version of a classification tool (Canopée), integrated in the search platform Ansera. Examiners can classify their applications and documents found during the search. This marks the beginning of the integration of a full set of new and improved classification functionalities into the search environment.

3.3 Reclassification

In January 2021, we released the first version of an electronic assistant to help in managing and handling reclassification activities. The tool has enabled "smart" reclassification projects, where part of the reclassification can be completed by an examiner before the rest is sent to a subcontractor. Of the 12 reclassification projects carried out in 2021, covering 33,000 documents, five used this smart feature, resulting in a reduction of contractor work of around 6,000 documents.

Moreover, the tool allows the Office to familiarise subcontractors with its latest classification practice, based on a living sample of 100,000 documents, to improve the quality of their work.
3.4 Management of prior-art collections

A significant portion of our efforts in this area in 2021 was dedicated to migrating the 400+ systems that manage the full prior-art repository from the mainframe to a cloud-native platform, reimplementing them in modern technologies (Python, Java) to replace the 19 000 COBOL files that we had previously. The prior-art collection accounted for 86% of all mainframe data (>40TB of information) and these programs for about 67% of all mainframe processing.

Having taken this step, at the end of 2021, we found ourselves in an excellent position to optimise our processes further and start reaping the benefits. We have already seen some gains: easier access to experts in modern technologies, more hands-on knowledge in our teams, faster turnover of improvements in tools and bug-fixing, access to greater computing capacity for faster processing of prior art, more interoperability with PGP systems and lower infrastructure costs.

2021 also saw the decommissioning of our old data flow platform, which was developed back in 2009, when the first data pipeline was implemented. Since then, up to 800 data pipelines relating to prior art, legal status, life sciences and classification have been running in parallel, subject to 16 500 updates, and have processed close to one billion records.

In 2020, we started the migration of data flow platform to the Spring Cloud Data Flow (SCDF) platform deployed on Kubernetes in our Luxembourg data centre, finishing early in 2021. The old platform was decommissioned in June 2021.

4. IT co-operation

4.1 Strengthening the EPN

In 2021, we continued to make progress in our IT co-operation projects. Co-operation within the EPN accelerated and projects were ahead of schedule thanks to the excellent collaboration with national patent offices and taking a minimum viable product (MVP) approach, based on the incremental delivery of increasingly advanced versions.

The Front Office project went from launching a call for interest to select pilot countries at the beginning of the year to rolling out MVPs in two of them: Lithuania and Spain, where the first real filings have already been received. A series of proofs of concept for key business-related elements, such as validation of European patents, fee payments and filings of supplementary protection certificates, have also been implemented. In terms of back office functions, in 2021, we published a joint "blueprint" setting out key areas for offices to consider when managing or embarking on a back office project.
Significant progress was also made in the Single Access Portal project. 2021 saw the launch of the single access portal featuring the bilateral agreement builder (released in February 2021) and the PATLIB collaboration platform (in April 2021). The first part of the MICADO replacement in the single access portal was tested by some Council members and we saw a working version of a new website for SACEPO towards the end of the year. A technical co-operation area, where detailed documentation on IT co-operation projects can be consulted, posted and exchanged, was launched in December.

The External Classification Portal (ECP) was integrated into the single access portal in December 2021 and is now available live as a pilot for the members of the CPC working group on Cooperative Patent Classification (CPC). It enables offices to contact expert examiners in the various CPC ranges and provides up-to-date information on the reclassification work needing to be undertaken following CPC revisions.

In 2021, Morocco and Bulgaria joined the CPC family, which is now made up of 32 offices worldwide, including 18 EPO member states and one validation state. The CPC coverage of EPO documentation continued to increase: at the end of 2021, about 65 million documents were classified. Moreover, the EPO started to include CPC in its publication server, the European Patent Register, the European Patent Bulletin and EP Bibliographic Data (EBD).

In terms of data quality, the EPO continued the digitalisation of national patent offices’ patent collections, with ten authority files being analysed for completeness and correctness. A modern data transfer tool has been developed, thereby reducing manual operations: machine-to-machine data transfer is being piloted by one country and the web data transfer interface by three countries.

For process mapping, the mapping of major procedures is now complete and available to support implementation work. The final report and recommendations will be presented at the meeting of the Technical and Operational Support Committee in 2022.

We started piloting the new search tool using public patent data in ten countries, subsequently introducing a more powerful cloud-based setup to bring essential improvements in stability and speed. All in all, in 2021, we saw two surveys and more than 15 000 hours invested by examiners of the national patent offices. Moreover, significant contributions were made towards the data policy revision. While accomplishing all of this was a real challenge, it is one of the most exciting developments in terms of IT co-operation and has paved the way for offering the tool to ten more countries in 2022.

Another important event in IT co-operation was the creation of an information security working group. This was one of the key takeaways from the EPN Cloud Event, held online in September 2021. The event brought together representatives from national patent offices, international organisations and user associations to exchange views on cloud computing security, best practices in its adoption and its opportunities and challenges. Speakers included EPN experts as well as top cloud providers Google, Microsoft Azure and Amazon AWS. The information security working group have its kick-off in 2022.
Working together with national offices to build tools sometimes means providing them with timely technical support. In 2021, we introduced a scheme whereby member states actively participating in major software developments have the option of requesting support from technical experts. Lithuania and Spain received this kind of expert support as pilot countries in the Front Office project, while the same process is underway for Greece. The EPO’s National Office Support (NOS) continues to provide technical assistance on the tools and remains the central point of contact for technical issues. NOS is expanding its support to offer additional resources for the new tools such as Common Search, Front Office, Single Access Portal, Data Quality, CPC and Process Mapping.

Ultimately, in terms of IT co-operation, we moved beyond discussions about the future and started implementation in many areas, even seeing concrete results in 2021.

4.2 eEQE

In 2021, we supported the EQE Secretariat in successfully delivering an online version of the EQE examination for 3,733 enrolled candidates. This involved all phases of the examination: preparation, mock exercises, technical support during the exam and so on. In parallel, we initiated the selection of a new solution to replace the obsolete candidate management system.

4.3 IP5

Work has started on developing a global IP5 alert system that sends mails to subscribers when a change occurs in the file wrapper data of an IP5 patent family member. The EPO is leading this initiative, which will result in a new service to the public in 2022.

The EPO and CNIPA have begun co-operating on delivering a real-time legal status service based on web services. This initiative will have added value for users who need this information for their strategic decisions.

4.4 CPC project with USPTO

2021 was a successful year for the Cooperative Patent Classification (CPC) project, which managed to publish an impressive 216 revision projects, with just four projects remaining in the backlog (at the beginning of 2020, there were more than 120 projects in backlog). The goal of arriving at a maximum period of nine months from the request to the publication of the revision is now within reach. This was also made possible by a more modern IT infrastructure, both for exchanging CPC data and facilitating the data loading after reclassification.

The first version of a new collaboration platform, the CPC Collaborative Environment, was launched in December to enhance work-sharing between the EPO and the USPTO during CPC revisions. The previous platform, CPC Electronic Forum, has now been decommissioned and is now kept only as an archive.
A series of bilateral technical meetings on harmonisation took place between USPTO experts (called search and classification examiners) and their counterpart quality nominees to reach a consensus on classification practice, including the scope of the classification groups, CPC definitions and the use of both C-Sets and orthogonal symbols. In 2021, we processed four batches covering 137 areas of CPC: the first three batches reached our target 80% harmonisation with the USPTO and the fourth was very close to this objective. These activities resulted in opportunities to improve the scheme and definitions, giving rise to a total of 55 CPC revision projects.

5. Contributing to long-term sustainability

In one way or another, all the steps towards becoming a fully digital organisation described in this document are contributing to the long-term sustainability of the Office. However, two dimensions stand out when considering this overarching goal: emerging technologies that may radically transform the organisation, and putting financial sustainability and enhanced financial processes at the heart of our corporate culture. The ICT sustainability of Office operations is covered in detail in the Environmental Report 2021.

5.1 Artificial intelligence and blockchain

In 2021, we continued to invest in artificial intelligence solutions, built in-house by EPO data scientists. Although we are still only beginning to tap into the potential of AI, we can already see how it will prove to be a game changer for the Office. Our team of data scientists are constantly exploring ways to make our processes more efficient by developing and training models and integrating them in our tools.

In March 2021, the previously laborious and cost-intensive task of identifying and cutting the front-page drawing of published patents in Espacenet was automated by a specifically trained component. In the past, front-page drawing identification was restricted to specific country codes and a limited number of files, due to the high costs per image. Now, almost all publications are automatically sent via this component, with over 800 000 files having been automatically processed at almost zero cost.

Figure 5 – AI cutting out of drawings

Source: EPO
The framework for AI-supported reclassification work was finalised and deployed, replacing previous tooling from an external provider. It was integrated in a graphical user interface and rolled out to all examiners, potentially saving many hours of manual reclassification while ensuring a high-quality standard. An iterative, semi-supervised approach was employed that allows quick iterations and manual quality checks on the fly.

Later in the year, our in-house preclassification service based on EP-BERT\textsuperscript{2} went live. Following a parallel run during most of the year, it displaced an external provider in the last quarter. As a consequence, routing quality is now consistently at 90%, outperforming the previous system by four to six percentage points. Since November 2021, all files have been processed using this preclassification solution, including German and French files that are first translated using our in-house neural machine translation engine. Currently, around 7,000 files are routed monthly by the system. By replacing the external provider, we are saving EUR 250,000 annually.

Furthermore, in April 2021, we deployed our first in-house neural machine translation engine for German and French, followed by two more models for Italian and Dutch later in the year. This enables all downstream models to work on these files, allowing a completely automated pre-search based on an English query, but simultaneously searching in a multilingual corpus. Since April 2021, hundreds of millions of sentences have been translated automatically. The system achieves state-of-the-art performances in established metrics such as BLEU and Comet.

\textbf{Figure 6 – Neural machine translation at EPO}

5.2 Supporting enhanced financial processes

Following the first deliverables of the Finance 360 programme, there has been an increase in transparency on financial matters. We have digitalised more processes and started generating tangible benefits for the Office and its users.

\footnote{2 EP- Bidirectional Encoder Representations from Transformers, a neural network trained on millions of European patents}
As part of our initiatives to improve financial planning and analysis, we launched a new monthly financial report in November 2021, which contains detailed financial data for all business units, down to directorate level. We also automated data collection for our budgeting process and fully integrated it into our standard controlling and accounting software, thereby eliminating manual steps and error-prone duplication of information. This automatic process will be put into operation in the next budgeting cycle and feed the relevant documents for the Administrative Council.

We also increased the level of automation in the revenue accounting process. By implementing the booking of revenues at patent application level using standard SAP functionality, we opened the door to new revenue reporting possibilities. Additionally, we achieved full automation of the “doublure” refunds paid where we are able to make use of an earlier search report (amounting to approx. 40 000 per year), a task previously carried out manually by formalities officers. This has led to a substantial quality increase (no more refund disapprovals) and allowed us to redeploy an estimated 2.6 full-time equivalents to more value-adding tasks.

Moreover, we centralised all payment methods accepted by the EPO in the Central Fee Payment service for external users that deploys standard e-commerce software. This is a step forward in decommissioning the legacy Online Fee Payment service.

In the area of procurement, we introduced a new portal that will allow suppliers to register for future tenders, creating opportunities to streamline vendor management and so reduce the workload for our Central Procurement teams.

6. Transforming our IT

BIT resources, both human and financial, are crucial in supporting the implementation of the Strategic Plan and the day-to-day operations of the Office. The BIT framework contract landscape was completed in 2021, readying us to engage with providers in all kinds of activities as and when required.

Exhaustive financial planning has been put in place to support the flexibility needed to adapt to changing conditions, while retaining rigorous planning discipline. BIT financial execution reached a historical 99.5%, which confirms the successful alignment between the business strategy and IT expenditure.

In 2021, the BIT risk framework was consolidated, accompanying the implementation and strategic decision-making under the Strategic Plan and laying the foundations for future operational risk management.

The alignment and integration of the work in the various areas coming under the Strategic Plan requires intense collaboration and monitoring to help identify potential deviations, risks and, of course, opportunities for acceleration and efficiency. The planning pipelines that were introduced in 2020 were further developed and guided stakeholders, both in accomplishing strategic deliveries and in switching off legacy systems, as monitored in a new decommissioning pipeline to complement the existing PGP, corporate and IT co-operation ones.