DIGITAL TRANSFORMATION FOR IP OFFICES

White Paper prepared by the Industrial Property Office Business Solutions Division (IPOBSD), World Intellectual Property Organization (WIPO)

INTRODUCTION

The world economy is entering a phase which has been described as the fourth industrial revolution. This term captures the impact of the many technology innovations that are currently converging and creating opportunities for major changes in the way we live, work, and do business.

Some of the more prominent technologies that are currently receiving a lot of interest include artificial intelligence, robotics, bioengineering, 3D printing and 5G networking. These technologies are also driven by significant infrastructure improvements such as cloud computing and networking, and are enabling new business models such as customer-driven product design or transport-as-a-service (e.g. Uber, Grab, etc).

To adapt to this new environment, organizations need to adopt digital transformation strategies – to move from manual or procedural business processes to fully online, responsive and modern processes that will enhance productivity and service delivery.

> *Digital transformation is the process of adopting modern IT technologies such as cloud computing, IoT, artificial intelligence, and integrating these into business processes to create new business models or to significantly enhance existing service delivery.*

The purpose of this document is to look at digital transformation from the perspective of the people at the core of the IP system – the IP offices.

DIGITAL TRANSFORMATION AND IP OFFICES

All of the technologies that are creating the fourth industrial revolution (FIR) are highly intensive in their use of intellectual property. Because of the nature of many FIR technologies and business processes, there are networking effects and increasing returns to scale which mean that new products and services can be dominated by a very small number of providers in a "winner takes all" effect. There is intense competition to create and protect the intellectual property that is driving these new products and services, as can be seen in the statistics and analyses of patenting trends in the last few years.

IP offices are at the centre of the IP system in their role as the authority which grants the IP rights and provides the services to stakeholders to ensure that rights are effectively created and protected. IP offices are impacted by the fourth industrial revolution and by digital transformation into two important ways:

1. As an *enabler*, the IP office needs to provide the services that meet the needs of new industries and new applicants. This means adapting the IP system and the examination capabilities to the new technologies and businesses that will be seeking IP rights.

2. As an *example*, the IP office can demonstrate how digital transformation can be applied to government services to create customer-focused, efficient and effective service delivery.

KEY TECHNOLOGIES FOR IP OFFICES

Of the many technologies that are emerging in the fourth industrial revolution, three in particular need to be adopted by IP offices in the short term. They are cloud computing, artificial intelligence and data analytics.

1. CLOUD COMPUTING

It is difficult to under-state the impact of cloud computing. Since the availability of the first true public cloud services in 2006, the service has grown at an exponential rate. The largest service providers now have hundreds of data centres world-wide with many millions of servers available for use at low hourly rates. Public cloud computing providers have extended their services beyond simply providing servers and storage. There are now hundreds of platform-level services (managed databases, serverless programming frameworks, etc) and thousands of software services (accounting, web site hosting, customer relationship management) that are simple and easy to use compared with developing in-house solutions.

Cloud computing has four main benefits for IP offices:

1. *Service delivery*. New services can be delivered much more quickly. A cloud infrastructure for an IP office can be created, or upgraded, and applications can be deployed in minutes instead of weeks or months.

2. *Resilience*. Cloud IT infrastructure can be configured so that it recovers automatically in case of an incident (e.g. server crash). Systems can be globally distributed so that an outage in one area does not affect overall service delivery.

3. *Security*. Although security was a concern in the early days of cloud computing, the tools provided by public cloud service providers are now very sophisticated and systems can be configured to be extremely secure much more effectively than the equivalent in-house systems.

4. *Cost effectiveness*. Cloud IT infrastructure can be at least 20% cheaper than in-house data centres, and up to 80% cheaper if all the amortized costs of in-house data centres are considered.

On the other hand, cloud computing introduces new challenges for management.

From a financial perspective, IT resources are no longer a capital cost but a variable, monthly, operational cost. This may impact how budgets are managed and controlled and requires careful monitoring of costs on a daily basis.

IT staff must learn new skills, including security skills, to fully and effectively use the new resources. The new generation of IT staff needs to have new and different skills from the previous generation.

For developing countries in particular, cloud computing requires reliable and high-speed internet connectivity. In some cases, this may be difficult or expensive to acquire, but this cost should be compared to the cost of purchasing and maintaining an in-house data centre which often has equivalent challenges.

2. ARTIFICIAL INTELLIGENCE

Artificial intelligence has been around for more than 50 years, in fact since the beginning of the creation of computer science. It has recently achieved major progress due to the convergence of two new innovations – learning algorithms and massive computing power.

In 1984, a Cray X-MP supercomputer cost $US 15 million and delivered 0.8 GFLOPS (billion operations per second) of computing power. Today, an AMD Raedon GPU can deliver 20,000 GFLOPS and costs around $US 350. In terms of price/performance, the new technology is 1 billion times cheaper! More importantly, there is not one such computer in the world, there are millions and they are readily available.

This is why it is now possible for a computer to process all the data necessary to beat world champions at highly complex tasks such as Chess or Go, or to drive a car.

History of GFLOPS prices according to Wikipedia
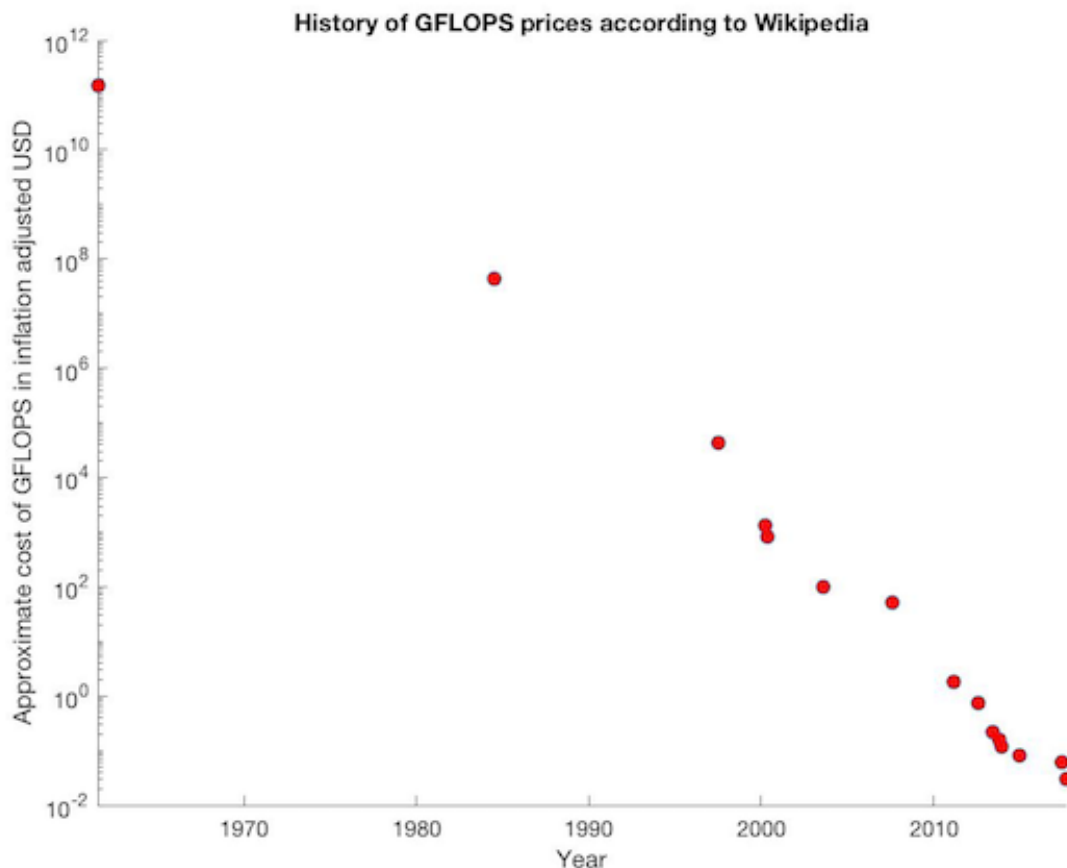
However, at the moment there are still significant barriers to taking advantage of artificial intelligence. Programming, or training, an AI machine requires a large amount of data and very highly skilled personnel to create and guide the training models. Once a model has been created and trained with data, it can be used relatively quickly by almost anyone.

One example of this is machine translation. It took billions of records of data and many person-years of effort to create the Google Translate service (or any of the equivalent services that are now available). However, this service is now available to anyone in the world with an internet connection, for free.

How does this impact the work of IP offices?

There are at least three applications of AI that can immediately be used to improve IP office service delivery:

1. *Classification services*. The IP system is dependent on good quality classifications to enable search and retrieval and to determine the scope of protection (IPC, Nice, Vienna, Locarno). Classification is one of the fundamental applications of AI and so this technology can be relatively easily applied to IP classifications, including classification of images.

2. *Translation services*. The multi-national and multi-lingual nature of the IP system make it necessary for documents to be translated between many national languages. Although AI translation services are not yet "legally authentic", they can already be used to understand and to search documents in many languages.

3. *Search services*. AI can enable new search techniques, such as semantic and context-aware search to enable retrieval of documents that are similar to a source document, without the user needing to specify keywords or classifications.

Future applications may also be considered, particularly in the area of service to applicants. AI could be used to advise applicants on how and where to file a particular application, or how to specify it to increase the probability of acquiring and enforcing good-quality IP rights.

As noted above, there are still some significant barriers to utilizing AI technologies, and small-medium IP offices, particularly in developing countries, do not have the resources to create their own AI services.

The adoption of AI technologies by the IP community should therefore follow some guiding principles:

− re-use, not re-invent. Many of the necessary tools are already available and IP offices should not waste resources competing with existing service providers to develop the core AI tools. IP offices should take existing products and then adapt them for the specific needs of IP services;

− IP offices should collaborate in the creation of AI tools, to reduce the duplication of effort;

− tools should be shared and made available as "public good" resources, at least within the community of IP offices; and

− tools should be developed with open interfaces, so that they can be integrated into national/regional IP office systems, rather than being dependent on centralized services.

3. DATA ANALYTICS

The third digital transformation technology that may be applied to IP office management is data analytics. IP offices generate vast amounts of data (hundreds of millions of IP records globally) but so far, the use of this data by IP offices has been limited.

As users, we can see the impact of effective data analytics in the ways we interact with services as customers. It is now common for online e-commerce providers to target products or services based on analysis of data about our historical purchases, searches and preferences. In fact, the ability to analyse data has become the core revenue-generating business of several large online providers.

There are risks to this new capability, particularly in the area of privacy. In some cases, the user has become the product which is sold to advertisers for a profit, and users may be unaware of the volume and nature of data that is collected about them.

Data analytics may be used to improve IP office management by measuring business processes and establishing performance indicators. Management can drill down into bottlenecks in the process and find out where efficiency or quality is below standard, and then design strategies to improve performance, such as modifying business processes, training staff, or redeploying resources.

Data analytics may also be used to understand trends in the IP system. Traditionally we have used the data to generate statistics about high-level trends in the system (e.g. top 10 applicants, overall growth rates, etc) but deeper analysis techniques may be used to understand micro-trends, such as the distribution of filings from SMEs, or evolving technologies that may become significant in the future.

This information may then be used to improve services to the users of the IP system. For example, customer service has traditionally focused on the larger users, because they are known and visible. But if IP offices could better understand the behaviour of the thousands of smaller users of the IP system, they may be able to find strategies to better support them and to enable them to make better use of the IP system.

As with AI tools, data analytics also requires skilled resources and large amounts of data. Ideally, data should be aggregated at an international level so that analytics can be provided to all IP offices.

A similar set of guiding principles should be followed:

–   IP offices should collaborate in the study and design of data analytics, to reduce the duplication of effort;

–   data should be aggregated internationally and the data and tools should be shared and made available as "public good" resources, at least within the community of IP offices; and

–   data should be available with open interfaces, so that all IP offices can take advantage of it.

THE FRAMEWORK FOR DIGITAL TRANSFORMATION

Digital transformation for IP offices is the process of absorbing new technologies and new business models in order to improve service delivery to users of the IP system.

IP offices are government agencies working within a specific legal context. Digital transformation for IP offices needs to be applied in a three-dimensional framework.
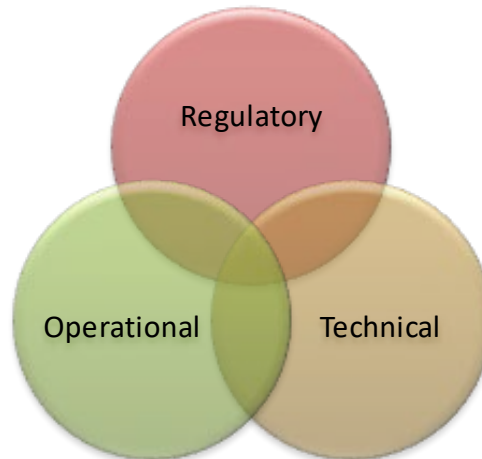
REGULATORY DIMENSION

IP offices work within a clearly defined regulatory framework. Often, this framework is designed with the assumption of manual and paper-based procedures.

There are at least four aspects of the regulatory framework that need to be reviewed and potentially adapted to enable digital transformation:

1. *Electronic records and transactions*. IP records are legal records and they need to be recognized as legally authentic, especially when they are used in court proceedings. Many countries are now adopting electronic transactions laws that determine how and where electronic transactions may be used in commercial and government services. This is a necessary precondition for the IP office to provide fully online services and to keep its registers as digital records.

2. *Electronic payments*. Many national banking systems are now offering electronic payments systems. However, the regulatory framework may need to be reviewed to ensure that the IP office, and other government agencies, can take advantage of these systems.

3. *Reform paper-based procedures*. Regulations may contain provisions that assume that operations are paper-based, for example requiring applicants to submit 3 copies of an application form, or requiring the use of registered mail, or publishing information in a "Gazette". These regulations need to be revised to enable online services and to be technology-neutral.

4. *Sustainable funding models.* The fee schedules of many IP offices create barriers to providing fully online services. For example, there may be fees for "copies" of documents and the office may be dependent on those fees as a source of revenue. Fee schedules need to be adapted so that users pay for the core services while allowing information and other services to be provided for free.

OPERATIONAL DIMENSION

The operational dimension covers the management processes of the IP office and should be used to create efficiently managed processes that fully take advantage of the online tools.

1. *Digitize business processes.* IP administration systems, such as WIPO IPAS, allow offices to automate most business processes. However, management should review business processes to ensure that they are adapted for the digital environment, and not simply replicating the paper processes. Processes for review and approval of actions can be changed from time-consuming procedures to simple one-click operations. Multiple procedural steps can be combined into a single online operation, under the responsibility of multi-skilled staff.

2. *Customer-focused service delivery.* Business processes should be designed from the perspective of the users of the IP system, i.e. outside-in rather than inside-out. This means, for example, identifying the list of services that are provided to users, based on the legislative framework, and then designing business processes to provide those services effectively and efficiently.

3. *Quality metrics and quality processes.* A management principle says that "what you measure is what you get". To improve service delivery, IP office management should establish metrics and performance indicators on key processes and then use these to improve the quality of services. Ideally, these metrics should be designed in terms of the delivery of services to the users, such as the deadline for an office decision.

4. *Multi-skilled staff.* To fully implement digital processes, staff need to become multi-skilled and proficient in the use of online tools. The use of online systems is no longer optional or the domain of the IT section – all staff are implicated. Offices need to consider continuous training and upgrading of staff skills to take advantage of new ways of working.

In order to provide more customer-focused services, the IP office may need to reorganize and to create new units or organizations to provide new services. An example of this would be an *IP Customer Service Centre* that is already established in some offices. Such a centre would have the following functions:

– Helpdesk for online services, including registration of new users;

– data digitization and OCR (conversion of documents to text) for documents filed on paper or in scanned image format;

– training services;

– search and information services; and

– assistance with drafting and filing of IP applications.

TECHNICAL DIMENSION

The core of the technical dimension of IP office digital transformation is, of course, the IT systems that support the office. The IP office needs systems such as the WIPO IP Office Suite which provide for fully online services, business process automation, paperless processing, etc.

In addition to this, IP offices need to take advantage of new technologies and the following principles should be considered:

1. *Cloud Hosting.* IP offices should develop strategies to move to cloud service providers and to move away from in-house data centres. As described above, there are significant benefits for service delivery, resilience, security and cost.

2. *Artificial Intelligence.* IP offices should collaborate to take advantage of new AI technologies to improve their service delivery. Ideally, these AI technologies should be provided as *shared, intelligent services* by a community of collaborating IP offices.

3. *Data & Analytics.* IP offices should actively share their data so that it can be aggregated at an international level and used to provide analytics to IP office management to better understand trends, as well as to improve service delivery.

4. *International/Regional Integration.* IP offices need to be fully integrated into regional and international IP systems (PCT, Madrid, Hague, EPO, ARIPO, GCC, etc) so that exchanges of notifications and documents between these systems is fully online and automatic.

5. *International Standards.* There should be continued effort to develop international standards to enable digital transformation of IP offices. These standards should be practical and should be immediately integrated into shared tools so that IP offices do not need to expend significant resources in their implementation.

SHARED INTELLIGENT SERVICES

The IP community has accumulated a large amount of data in the past few decades. For example, WIPO's global IP databases currently hold 76 million patents and 40 million trademarks, and these resources are growing quickly.

These resources have been used to create online search services, sometime with advanced features such as cross-lingual search or image search. However, small to medium IP offices still do not have access to the tools that they need for high-quality search and examination.

There is a potential to create shared intelligent resources, targeted at the needs of IP offices, which enable small to medium IP offices to provide services on a level playing field. At least three areas could be developed immediately:

1. *Patent search services.* Free online search services such as WIPO Patentscope provide access to large amounts of data. However, IP offices require specific search tools that are integrated into their IP management systems and which enable them to explore different search strategies, compare prior art, analyse patent claims, and record their results in search and examination reports. Such services could be created and provided specifically to IP offices.
2. *Classification services.* Small IP offices struggle to train staff to implement classification systems for patents, trademarks and designs at a detailed level. AI

tools have been developed and these could be integrated into IP office systems to provide AI-assisted (fully automated is still unrealistic) tools to enable IP offices to properly classify their IP records. This would then enable higher-quality search, better examination, and improved information dissemination.

3. *Trademark search services*. The trademark search that is done by IP offices is, because of the legal framework, a national search. Trademark search tools could be developed to enable IP offices to take advantage of AI-enhanced image and similarity search, but these tools need to be made available at the national level if they are to be useful to trademark examiners.

In the future, additional shared services could also be considered, particularly in the area of customer-focused tools that would enable IP applicants and agents to more easily integrate their own online systems with the online systems of IP offices.

The development of shared services needs to be coordinated and directed to the needs of IP offices in particular.

THE DEVELOPMENT DIMENSION

IP offices in developing countries have typically faced challenges to upgrade their service delivery to the level of other countries. However, the new possibilities of digital transformation offer the opportunity to leapfrog older technologies and business models and to operate on a level playing field. There are also challenges to overcome.

An analysis of the demand for IP rights shows a significant increase in the last 20 years. Most analyses focus on the dramatic increases in the "top 5" IP offices, and China in particular. However, in the last 10 years, patent and trademark applications have grown faster in lower-middle-income countries than in high-income countries[1] (36% vs 9.4% growth in patents, 79.5% vs 36% growth in trademarks). Moreover, in lower-middle income countries, applications from residents are growing faster than applications from non-residents. Although patent applications from non-residents are the majority in most developing countries, residents are often filing the majority of applications for trademarks and industrial designs.

This presents a different picture of the IP system in developing countries:

−   IP applications in middle-income countries are growing faster than the world average; and

−   Applications from residents are significant for trademarks and designs and are growing quickly for patents.

The demand for IP rights is becoming more significant in developing countries and IP offices need to be ready to meet this demand. This increased demand is coming from users who are becoming more sophisticated and who expect to do business online and to receive efficient services.

Digital transformation of IP offices in developing countries will be needed to meet this demand. Following the strategies outlined above, IP offices in developing countries can deploy modern business practices and modern IT tools to significantly upgrade their services. This gives them the opportunity to quickly reach a level playing field in the provision of IP services.

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[1] Source : WIPO Statistics Database, patent and trademark (class count) applications from high-income and lower-middle income countries from 2008 to 2018.

However, there remain some particular challenges to address:

1. *Personnel skills*. As in all countries, the personnel of the IP office need to be continually trained or retrained to take advantage of new technologies and to provide high quality services. However, smaller IP offices face challenges to attract or retain good quality people. Resources may need to be increased in this area and a particular focus needs to be directed to IT skills.

2. *Internet connectivity*. Although the challenges that we have traditionally faced with infrastructure (availability of IT equipment, power supply, etc) will be minimised by the use of cloud computing and other technologies, it becomes even more critical for IP offices to have fast and reliable internet connectivity. Fortunately, this is a problem that is being addressed by the private sector in many countries, although there is still a lot of potential for improvement in cost and availability.

3. *Funding models*. IP offices generate revenue, but in many countries the revenue is held in consolidated funds and not available to the IP office. This restricts the ability of the office to invest in necessary improvements.

If IP office management focus on these critical issues, there is potential to fully realise the benefits of digital transformation in developing country IP offices.

CONCLUSION

The digital transformation of IP office business is a necessity. Investors, both local and international, increasingly rely on IP rights to protect their investments, create market certainty and to create value and employment in the economy. The IP office has a critical role to play both as an enabler of value creation through IP and as an example of digital transformation for government services.

IP office managers need to carefully study the landscape of emerging technologies and need to understand how these new technologies affect them as service providers. Strategies need to be developed to absorb and take advantage of new digital technologies, and to adapt the operations of the IP office to fully online services.

If the transformation is managed effectively, IP offices will be key players in the next phase of economic development.

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