LEVERAGING TECHNOLOGY TO SUPPORT CONSTRUCTION REGULATION AND PERMITTING REFORM

INSIGHTS FROM RECENT COUNTRY EXPERIENCE

WORLD BANK GROUP

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ABOUT THE GLOBAL BUSINESS REGULATION UNIT

The Global Business Regulation Unit of the World Bank Group supports client governments through analytics, advice and lending operations, to implement reforms designed to promote an efficient, transparent and predictable business environment for growth.

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Governments have engaged in reforms aimed at improving building control and accelerating issuance of construction permits, which in turn can help improve the competitiveness of their business environments. To that end, national and local authorities increasingly leverage information and communications technology (ICT) solutions to improve processing times, transparency, and predictability for the private sector; increase compliance by the building industry; enhance efficiency and accountability for the public sector; and lower costs for all involved parties.

A recent survey conducted by the Global Business Regulation Unit in the World Bank Group's Macroeconomics Trade and Investment Global Practice examines the experience of 27 national and local authorities that have deployed ICT solutions to support more effective building control.
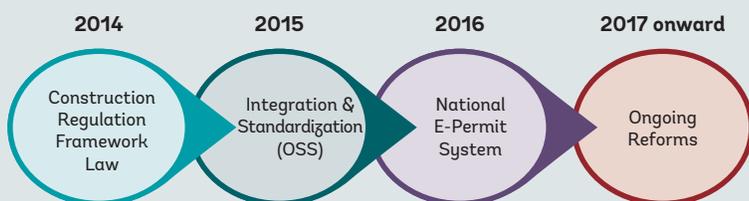
Good regulations, combined with sound enforcement mechanisms and an efficient, transparent, and affordable permitting process, can ensure safety standards for the community, facilitate investment in new building stock, and contribute to capital formation.[1] A recent study shows that long delays in obtaining permits can lead to higher transaction costs and fewer transactions.[2] Similarly, an earlier study in the United States (US) found that accelerating permit approvals by 3 months in a 22-month project cycle could increase construction spending and property tax revenue.[3] Unpredictable, lengthy, and expensive permitting procedures influence entrepreneurs' decision making. A recent competitiveness report on the US, for example, found that construction costs and the permitting process were among the top 20 factors in determining the location of a start-up.[4] Given the relevance of this area for both communities and investors, governments have sought to leverage technology to enhance permitting service delivery and improve availability of zoning requirements and building regulatory information.

The emergence of nationwide platforms for construction permit administration is one of the notable trends highlighted by this survey. With the increasing use of cloud-based technologies in government, deployment of nationwide transactional portals has become a cost-effective approach to standardizing delivery of permitting services within a country. Serbia provides a good example.

Until 2014, developers seeking to obtain a building permit in Serbia faced high costs and a long, convoluted process involving several agencies with limited coordination. Following a set of reforms implemented between 2014 and 2016, Serbia has addressed some of the major challenges and now offers developers a more transparent and efficient system, enabled by a national e-permit portal. A 2014 law on planning and construction introduced a new governance framework, including a new standardized procedure with strict timelines for review. A clear supervision hierarchy and sanctions were also established, allowing an independent central agency to monitor performance at the municipal level. A year later, a new integrated system was launched, and migration was initiated by digitizing records. The new system attributed a "leading agency" role to the municipalities, which had become the single access points for developers, consistent with a One-Stop Shop approach. In 2016, a national online platform was launched with a wide scope of functionalities, such as electronic filing, archiving, electronic exchange of information between the various authorities, automatic notifications to reviewers about upcoming deadlines, and monitoring of all statutory deadlines. The platform automated the new standardized process across municipalities, improved controls during construction, centralized the system for utility approvals, and introduced a new information system for end users and a monitoring mechanism for the authorities. The Serbian Business Registry Agency platform now connects more than 7,000 employees and 1,200 institutions and offers 30 different business processes online. Doing Business 2018 reflects these results: Two years after concluding these reforms, Serbia's economy leapfrogged from the global rank of 152 in 2016, to 10 in 2018.

2014	2015	2016	2017 onward
Construction Regulation Framework Law	Integration & Standardization (OSS)	National E-Permit System	Ongoing Reforms

Modern technology solutions enable building departments and other agencies involved in administrative decisions regarding planning, zoning, and building to streamline and automate their procedures and to improve transparency and accountability in government service delivery. Electronic permitting has evolved since the early 1980s when only a few pioneering jurisdictions in the US and Europe had their own self-created software on mainframe computers.[5] Today, software vendors offer sophisticated technology solutions that can be tailored to each jurisdiction's needs and budgets. These range from customized software to off-the-shelf packages and from task-specific systems to more integrated solutions that coordinate all building department activities, connect to other stakeholder agencies, and provide end users with a public interface through which to submit permit applications and monitor the review process.

To assess the current state and level of effectiveness of these efforts, the Global Business Regulation Unit in the World Bank Group's Macroeconomics Trade and Investment Global Practice has undertaken a survey of the ICT solutions deployed by 27 national and local governmental authorities. This note reviews the main findings of that study.

THE SURVEY AND REFORM CONTEXT

A World Bank team identified approximately 60 cities globally that currently employ ICT solutions in the area of building control and permitting. Out of these, 27 jurisdictions[6] were surveyed for the study. Among the surveyed regimes, early adopters had begun rolling out their ICT solutions for permitting in the early 2000s. This cohort includes primarily high-income countries, such as the Netherlands, which launched the *omgevingsloket* in 2010, and Singapore, which launched *CORENET* in 2001. The majority of surveyed jurisdictions, however, deployed their systems more recently, primarily between 2014 and 2016.

Almost half of the surveyed platforms were implemented within a broader context of legal and regulatory reforms in building control. In Serbia, for example, the national portal for construction permitting was implemented following a set of far-reaching reforms between 2014 and 2016 (see Box 1).

When ICT is combined with broader reforms in construction regulation at the national level, governments can reap the full benefits of new technologies by integrating back-office procedures through software solutions linking the stakeholder agencies and offering integrated service delivery to the private sector. In about a third of the cases surveyed, the ICT solution was implemented in the context of downstream reforms aimed at improving service delivery for construction permits and were accompanied by other simplification and streamlining initiatives. In fewer instances, the ICT solution was implemented independently of other reforms.

The survey further revealed that about a third of the technology platforms surveyed have a national scope (see Box 2). Several reformers in the Balkans region, for example, recently implemented centralized national portals for construction permits.[7] In most other cases, the system covered multiple jurisdictions within the economy's commercial capital. Lastly, several of the jurisdictions included in the survey implemented a technology solution developed by the World Bank Group for use in developing regions in which no local commercial offering was available; this application is further described in Box 3.

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BOX 2: THE EMERGENCE OF NATIONAL TECHNOLOGY PLATFORMS FOR BUILDING CONTROL, A NEW TREND?

The emergence of national platforms for building control is one of the notable trends highlighted in this survey since an increasing number of jurisdictions have implemented (Serbia) or are currently implementing (Albania) technology platforms that allow applicants across the country to submit permitting applications online.

Although building code implementation is devolved to local governments, national portals can offer several advantages, particularly in jurisdictions with uneven capacity and resources for building control. For example, deployment of national transactional portals is a cost-effective approach to standardize service delivery of permitting services across a country.

At the same time, national technology platforms can help building departments in under-resourced local governments deliver adequate services, when they lack resources or relevant expertise. The urban building stock is expected to double in developing countries by 2030 and this may put local governments in urban areas under increased pressure. When building authorities lack the staff or expertise to evaluate complex project proposals, a national technology platform can help leverage experts elsewhere, in government or the private sector, to review these designs. A centrally-managed technology solution can also help reduce the technology management burden on local governments by outsourcing this function to a designated authority and reaping the benefits offered by scale.

Lastly, a national technology platform can help strengthen oversight and performance management. For example, the central authority managing the platform can monitor service delivery by local building authorities and technical review agencies (if these are connected to the system) or even track performance of individual reviewers.

BOX 3: THE WORLD BANK GROUP'S TECHNOLOGY SOLUTION FOR BUILDING CONTROL

In 2011, the WBG supported the pilot deployment of an online system supporting construction permit administration in Nairobi, Kenya. Due to the lack of commercial software alternatives in Sub-Saharan Africa, the WBG teamed a local software developer with international building control experts to develop a technology solution using open source technologies (PHP, Symfony, MySQL). This approach enabled the WBG to retain the intellectual property rights and provide the system license-free to the Nairobi County government. This has proved to be a cost-effective and sustainable approach, particularly when the application is hosted in a government or public cloud environment, and it has since been replicated in several other developing countries.

The WBG system automates the entire application and review process and supports several permit types. These may include construction and occupancy permits and development permits (change of use, land subdivision, demolition permits etc.). It can be integrated with electronic payment systems through a variety of online payment channels, such as debit cards and bank and mobile money transfers.

Once registered in the system, building professionals can submit their permit applications online as well as upload blueprints and supporting documentation. Applications can be reviewed online by various government departments either sequentially or concurrently. Tracking and monitoring tools, such as SMS or email notifications and a personalized web interface, inform applicants at key milestones of the approval process (such as when a payment is due), and the actual permit document can be issued online when the review is completed.

The application supports activities during construction as well. Field inspectors can upload information using mobile devices, for example, and the system generates preconfigured checklists to ensure consistency in building control. This documentation can then be used in issuing the occupancy permit.

A flexible reporting module enables users to generate specific reports and statistics. In some jurisdictions, the system has been integrated with land management and GIS systems. Users can thus more easily leverage existing land and geospatial data in the permit review process.

A searchable archive helps ensure all captured information is secure and instantaneously retrievable. Various encryption mechanisms ensure that all stored information, as well as system messages, are protected. A robust user-management module ensures that users receive only those system privileges they need to perform their tasks. Where nationwide authentication (single sign-on) is in place, the system can also be integrated with external authentication mechanisms. Moreover, secure audit trails capture all actions performed by users, strengthening accountability.

Today this system is deployed in more than eight jurisdictions across four countries: Afghanistan, Iraq, Kenya, and Lesotho. In Rwanda, the system supports permit administration in the nation's seven largest cities and will eventually be rolled out nationwide.

The costs per deployment average between US$120,000 and US$140,000 for system configuration, localization, and staff training, not including any needed upgrades to ICT infrastructure. The benefits realized include increased transparency of permitting processes, reduced compliance costs for businesses, and, for governments, increased ability to handle growing permit volumes with existing staff and increased revenues through improved compliance and fee collection.

SURVEY FINDINGS

Common features and functionalities

The surveyed entities' ICT applications vary widely in capabilities, ranging from back-office systems intended to improve workflow to more sophisticated enterprise systems. The latter category can typically serve many departments in a local government, coordinate a range of activities,[8] offer transactional services to end users, and provide project tracking tools for both building control bodies and building practitioners. Figure 1 summarizes the scope of the surveyed systems showing their level of sophistication, which in some cases may be higher in developing countries than in some high-income economies. For example, although over 80 percent of the surveyed systems allow applicants to track the status of their applications, this percentage is higher in developing countries (89 percent). In most cases, the option to track applications is available through a web interface, and in over one-third of cases this option is also available through SMS notification. Only in exceptional cases, however, can applicants track their applications through a smartphone application.

The surveyed ICT systems offer both back-office automation and public portals allowing end users to complete procedures online (Jamaica's Amanda system is an exception; it does not currently have a client facing feature). In addition, in 81 percent of surveyed regimes the application led to a paperless

process, including both back- and front-office automation. In some cases, however, applicants must still visit the issuing authority's premises to submit applications and blueprints, as in Kabul, Afghanistan, for example. These situations perhaps arise due to not yet adequate legal or local telecommunications infrastructures. The survey revealed, for example, that around 30 percent of economies deploying ICT permitting systems have not yet enacted a legal framework for digital signatures. In other cases, internet connectivity may not be fast and reliable enough to support uploading large files such as building designs produced through computer-aided design (CAD) or building information modeling (BIM).

In terms of features and functionalities, almost all surveyed technology solutions supported several construction-related procedures, ranging from zoning and land use requests to demolition permits and regularization of informal buildings. In some cases, the system allows applicants to complete procedures online even during the construction phase. In about a third of the surveyed systems, for example, applicants can request on-site inspections online, and inspectors can upload information (such as pictures) directly from the field using mobile devices. Figure 2 summarizes the survey findings on the main features and functionalities offered by the surveyed systems. More than half of these systems allow applicants to complete post-permit procedures,

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FIGURE 1: SCOPE OF ICT SOLUTIONS

In some cases, applicants in low and middle-income economies captured in the survey must still visit the issuing authority's premises to file applications, possibly due to inadequate internet bandwidth and ICT literacy.

Internal online workflow allowing relevant government staff to review and comment on applications

Electronic application can be submitted online (without visiting the issuing authority's premises)

Ability for applicant to monitor status of pending application through website or SMS

Ability for applicant to file an appeal to a decision during the plan review or construction phase

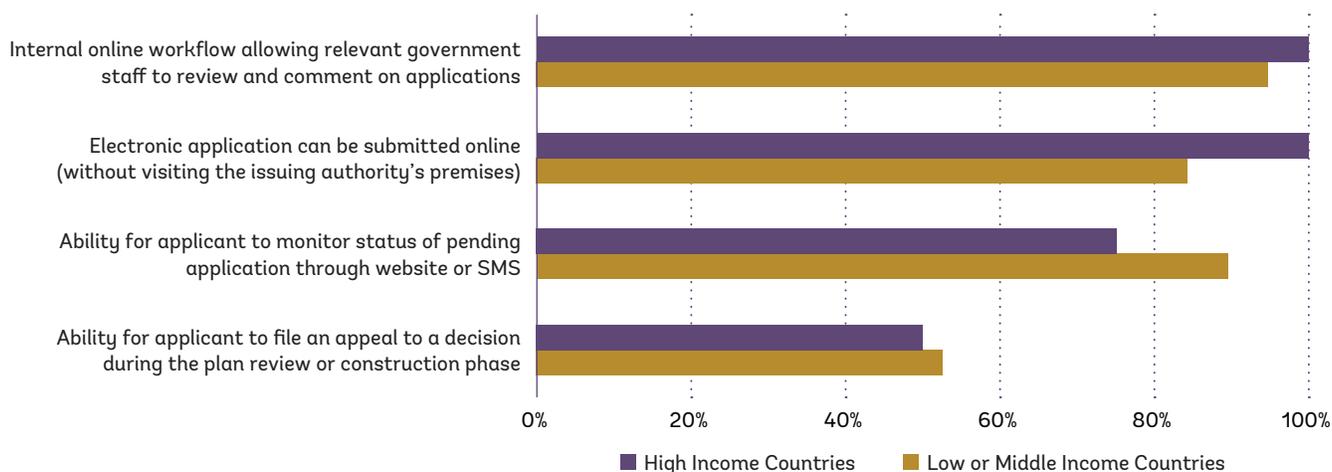■ High Income Countries   ■ Low or Middle Income Countries

FIGURE 2: CORE FEATURES AND FUNCTIONALITIES

The advent and affordability of ICT has allowed small cities, such as Maseru in Lesotho, to implement systems with features comparable to those in high-income economies.
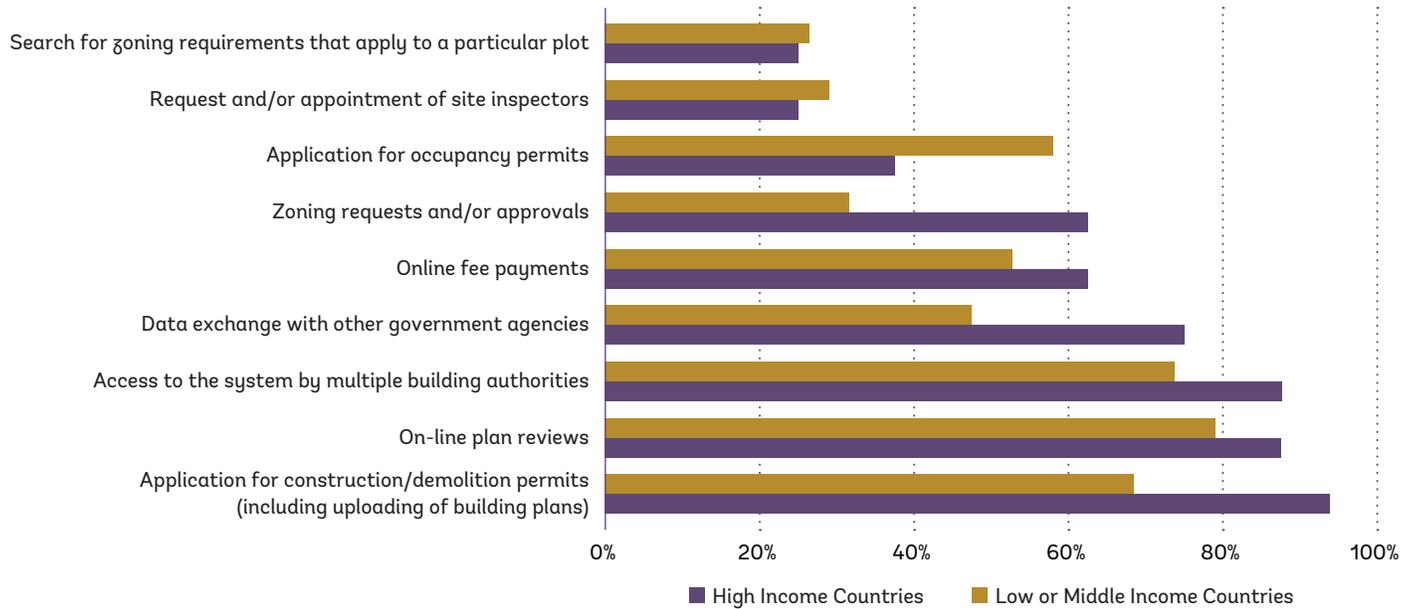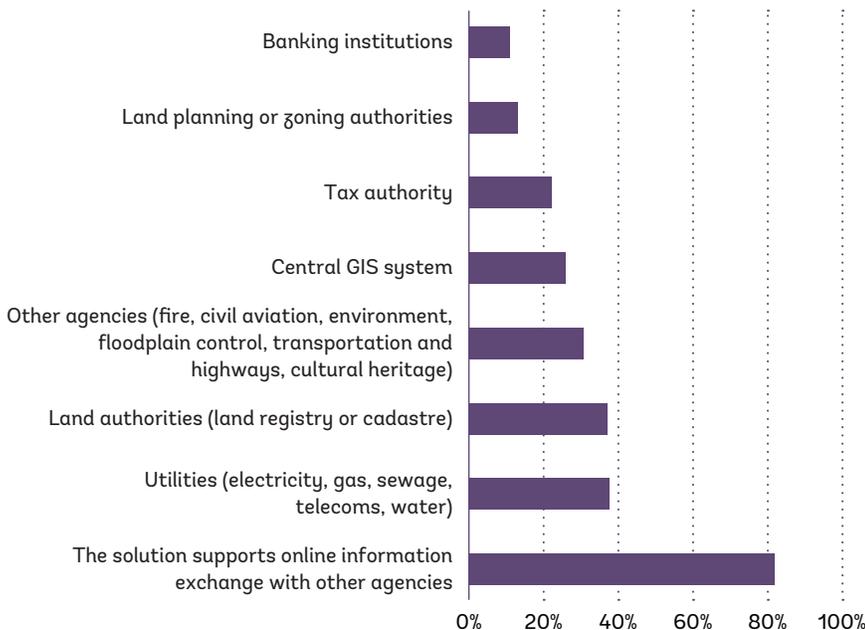

FIGURE 3: CONNECTIVITY AND INFORMATION EXCHANGE WITH OTHER AGENCIES

Information exchange is typically established between the land authorities and the central GIS system when available.

such as inspections and applications for occupancy permits. More than a third of the systems allow applicants to notify authorities of commencement of works, while over half allow applicants to notify authorities upon completion of works and request their occupancy permit. Most of these applications, in both developed and developing economies, also support online fee payment.

Accessibility and information exchange with agencies outside the building authorities

Nearly all the surveyed solutions enable data sharing but the degree of information exchange varies significantly. Dakar's TeleDac, for example, which covers 52 municipalities in the Dakar metropolitan area, shares information with 96 agencies, ranging from land planning, land registration, and tax authorities to forestry, fire, and civil aviation departments to utility services and banking institutions. In cases where a system has a narrower scope and covers one or a few municipalities, as in Istanbul, Turkey, information exchange with other agencies is typically more limited. Figure 3 illustrates the percentage of systems reporting information sharing with select authorities. Broadly, the higher the

number of stakeholders connected to the system, the greater the benefits for building authorities, referral agencies, and end users. When building authorities can share plans online, for example, reviews occur significantly faster than manual processes. Permit applications can be routed directly to reviewers in other relevant agencies, allowing concurrent performance of reviews. This unlocks opportunities for greater service integration, as users may be able to submit applications through a single access point (typically the municipality) without needing to visit each stakeholder agency independently, thus lowering private sector compliance costs and agencies' administrative costs.

Transparency

Greater access to regulatory information is consistently associated with more efficient regulatory processes.[9] In the context of construction permitting, this is relevant both to enhance legal certainty for developers regarding where and what they can build and to enable applicants to complete the application process without incurring "facilitation fees." ICT can be leveraged to improve transparency both before and after filing a permit application by making zoning and building regulation information easily accessible to users and by providing applicants with an "architect's portal" for finding comprehensive information on permitting requirements. The majority of surveyed systems offer such services, as shown in Figure 4A. Similarly, good practice applications allow users to track the status of their applications during the review phase, a feature of almost 80 percent of the surveyed systems (Figure 4B). In most cases this option is available through a web interface, although several technology solutions provide SMS or e-mail notifications at key milestones in the approval process.

## Procurement and management of the technology solution

According to all the respondents from developed economies[10] and just under half of the respondents from developing economies, government budgets funded the implementation of the technology solution.[11] The remaining solutions in developing economies were funded by donors or by a combination of donor and government budgets. At the same time, no clear pattern emerges between funding the systems' maintenance and national income levels. About half of the systems rely on

FIGURE 4: TRANSPARENCY BEFORE CONSTRUCTION (A), AND TRANSPARENCY DURING CONSTRUCTION (B)

A. What type of information is available before construction?
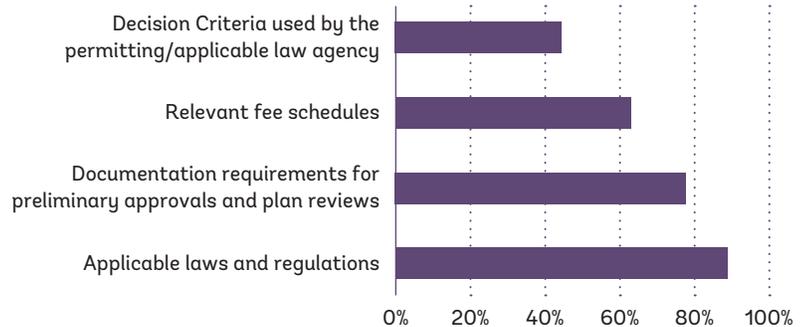
B. What type of information is available during construction?
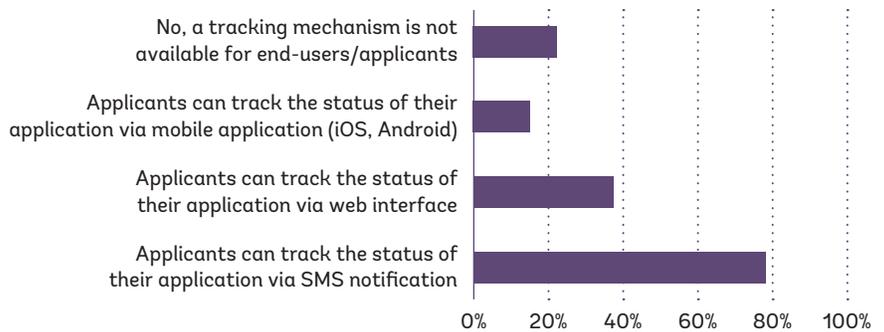
government budgets, while the rest use a combination of internal resources and transaction fees to ensure sustainability. The implementation cost varies greatly depending on the systems' scope. Solutions implemented in the Sub-Saharan Africa and Latin American regions generally cost in the range of US$200,000 to US$800,000, with some outliers above and below those figures. Solutions developed more recently in the Balkans region typically range between US$250,000 and US$500,000, but most of these have a national scope. Systems in middle- and high-income economies tend to require larger investments, ranging from US$600,000 to over US$20 million, although most fell between US$2 million and US$10 million.

The technology platforms are managed and maintained in a variety of ways as well. About half of the surveyed regimes opted for government-owned technology managed by government IT staff. The remaining systems were equally distributed

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Technology solutions brought significant efficiency gains by allowing authorities to process higher volumes of applications at lower administrative cost.

between government-owned platforms managed by contractor IT staff and technology platforms hosted offsite and managed either in-house or by contractor IT staff. An interesting trend revealed by the survey is that while most developing economies typically rely on government staff for platform management and maintenance, developed economies are likely to outsource these functions to contractors. At the same time, almost all the regimes surveyed receive some services from external vendors, even when the governments own the technology and manage the platform in-house.

In terms of software, the survey revealed a preference for custom-developed solutions over off-the-shelf packages, while none of the surveyed systems employed a software-as-a-service[12] approach. As a result, the majority of governments own the intellectual property (source code) of the software applications, making them less dependent on external vendors. Respondents cited as the most important factors behind selecting a custom solution the lack of specific features, the perceived difficulty of adapting packaged solutions to their specific requirements, and lack of interoperability with other government technology platforms. Lack of local support for packaged solutions was a shared concern as well. By contrast, governments that opted for packaged solutions highlighted the application's security features and functionality as the determining factors; the application's price was not as important. Some customization was still necessary in almost all cases in which a packaged solution was selected.

Outcomes

Survey respondents were asked to discuss some of the outcomes, main challenges, and lessons learned in implementing ICT solutions for construction-related procedures.

A strong consensus emerged regarding outcomes realized by both governments and the private sector. Respondents highlighted that the technology solutions brought significant efficiency gains by allowing authorities to process higher volumes of applications at lower administrative cost. The time required to issue a permit in Nairobi, for example, dropped from three-to-six months to one month. Moreover, the number of construction permits issued tripled, contributing to increased revenue collection as well.

The ability to track permit workflow and administrative performance through management dashboards helped improve accountability and performance management. Some respondents also cited improved record and data reliability due to digitization and increased capacity to perform building control activities, such as scheduling inspections. Notably, where the technology solution had a national scope, some respondents stated that automation helped push broader standardization and uniformity in building control procedures across the country.

Furthermore, it was widely reported that efficiency gains trickled down to service delivery and translated into faster processing with lower volumes of interaction at a lower cost for the community. Singapore, for example, estimates that CORENET contributed to compliance cost savings of about US$250 million for the private sector since its launch.[13] Enhanced transparency and compliance is almost universally cited by respondents as these technologies allow applicants to submit more complete applications and to track the progress of their requests.

CHALLENGES AND LESSONS LEARNED

Successful change management requires a clear strategy and staff training

One of the recurring themes captured by the survey is the challenge faced by government stakeholders in ensuring smooth transition from a paper-based to an automated system. Capacity building and training activities at all levels were almost universally cited by respondents as prerequisites for these reforms. Having a comprehensive change management strategy is even more important in cases where the platform has regional or national scope and the high number of stakeholders increases the reform's complexity. In Senegal, for example, the guiding and monitoring strategy laid out by the lead decision-making authority was vital to successful implementation of TeleDac, which connected 52 municipalities in Dakar and several referral agencies. Other respondents suggested starting the change management process early by ensuring staff are regularly updated on upcoming changes and supported with ongoing training. This can help reduce resistance from internal stakeholders

as well as facilitate the "cultural change" associated with automation.

Launching the new system in phases can help reduce risks

A system need not be perfect to have notable impact. In fact, adopting a phased approach to project implementation, including a pilot phase before scaling up, maximizes the chances of success. Technical issues such as software glitches in the initial launch phase, for example, were encountered by almost all respondents. Some mentioned that the project would have benefited from additional local IT support to resolve these issues. Furthermore, some respondents found that system deployment required more time than initially anticipated. In Istanbul, Turkey, for example, archiving and digitization of building authority records proved to be more labor-intensive and time-consuming than originally planned. Phased implementation becomes even more important given that nearly all of the surveyed economies reported a significant spike in the number of applications following automation.

Communicating the reform and providing adequate support to end users are crucial

Cultural change not only challenges internal stakeholders but the private sector too must adapt to the new system. If change is not adequately communicated to the community, the transition will be unnecessarily painful. ICT solution implementation is often accompanied by major changes in administrative processes, presenting authorities with the dual challenge of communicating both new procedures and an automated environment. Some respondents mentioned that inadequate communication measures led authorities to spend significant time "hand-holding" applicants and training them on the new system following launch. Even where adequate communication measures are in place, end users may opt to conduct business in the old way. In response, some reformers provided incentives to the user community, such as lower fees when filing applications online, at least for the first few months following launch. Others made use of the automated system mandatory for all users, making hands-on support for end users indispensable.

Automation and service integration is a continuing process

Implementing an ICT solution is only the first step; automation and integration of government services is an ongoing process. This is even more relevant for construction permitting systems due to the multidisciplinary nature of building control activities. The inherent "gate-keeper" role of construction permits involves multiple stakeholders, including municipal building authorities; land use planning and zoning departments; agencies mandated with protecting the environment, cultural heritage, and other public goods; and utility providers—among others. Accordingly, to reap the full benefits that technology can offer in this context requires coordination and interoperability among all major stakeholders. Most reformers start by implementing technology at the local level, adding agencies and business processes into the system over time. Frontier reformers, such as Singapore, that have already established service integration, focus on expanding the system features and functionalities, such as by developing mobile applications to support service delivery or moving from CAD to the more information-rich BIM format, which enables automated review of plans for building code compliance. The common denominator among surveyed reformers is that technology is a key enabler for integrating and automating service delivery, but developing a successful client-centric approach also requires ongoing reforms to the underlying legal framework, business processes, and governance arrangements.

CONCLUSION

The survey results highlight many good international practices to consider when designing and implementing an online construction permitting system. As the experience and insights of these jurisdictions show, non-technological factors must be addressed—legal reforms, re-engineering existing business processes, change management, and stakeholder communications—to fully realize the benefits of the technology solution.

> Implementing an ICT solution is only the first step; automation and integration of government services is an ongoing process.

ENDNOTES

1 World Bank, *Good Practices for Construction Regulation and Enforcement Reform: Guidelines for Reformers,* Investment Climate (Washington DC: World Bank, 2013), http://documents.worldbank.org/curated/en/662881468170967367/Good-practices-for-construction-regulation-and-enforcement-reform-guidelines-for-reformers.

2 Sonia Hamman, "Housing Matters, Volume 1," Policy Research Working Paper 6876 (Washington, DC: World Bank, 2014).

3 PricewaterhouseCoopers, "Economic Impact of Accelerating Permit Processes on Local Development and Government Revenues," report prepared for the American Institute of Architects, Washington, DC, 2005.

4 KPMG, "Competitive Alternatives: KPMG's Guide to International Business Locations," 2009, http://competitivealternatives.com.

5 US Department of Housing and Urban Development, *Electronic Permitting Systems and How to Implement Them* (Washington, DC: National Institute of Building Sciences, 2002).

6 The sample contained 8 jurisdictions from high-income countries and 19 from middle- or low-income countries: 7 from Sub-Saharan Africa, 6 from Europe and Central Asia, 4 from Latin America and the Caribbean, 1 from East Asia and the Pacific, and 1 from South Asia.

7 This includes Albania, Greece, Macedonia, and Serbia. Note that Greece's platform is currently in the pilot stage and that at the time of writing of this note a nationwide launch had not been implemented.

8 These can range from planning, building safety, geographic information system (GIS) services, finance, public utilities, fire safety, environmental protection, cultural heritage, and public health, among others.

9 Carolin Geginat, "How Transparent Is Business Regulation Around the World?" *Doing Business* 2013 (Washington, DC: World Bank, 2012).

10 In some cases, government budgets may also include European Union funding. This was the case in Greece and Serbia, for example.

11 Including development, installation, and training, but excluding cost of hardware, operating system, databases, and other software.

12 Software as a Service (SaaS) refers to a software delivery model in which a third-party hosts applications and provides access to customers over the internet.

13 According to a report published by the International Organization for Standardization in 2015, CORENET's electronic submission capability helped the construction sector save approximately US$250 million between 2003 and 2012. CORENET, in combination with the IT standard CP83 (a CAD standard for technical drawings), improved productivity and efficiency by enabling electronic exchange of drawings in the industry and electronic submission of drawings for review and approval.