An online system for issuing buildings permits in light of e-government in Egypt

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ABSTRACT
A building permit is the green light in housing development projects, without the permit issued from the local authority, no construction can legally take place. The process of issuing buildings permits is complex and faces many problems and difficulties. The current permitting system in Egypt is a traditional manual system, resulting in a set of consequences such as loss of time, the possibility of human error, the possibility of losing permit papers, and other consequences. Therefore, the presence of an electronic online system capable of applying and submitting the permit requirements will be necessary to facilitate the work of the local authorities’ employees, as well as to facilitate the process of obtaining building permits for the citizens. The electronic online permitting system speeds up the building permit process for individuals, contractors, employees, and plan reviewers. This system changes the way governments provide services to the community by speeding the process for the citizens and providing better and more timely information to the local authority’s staff, decision-makers, and city officials. The objective of this paper is to develop a conceptual framework for an electronic online system for issuing building permits in the Egyptian context regarding its laws and regulations to support citizens and local authority’s staff in issuing buildings permits. It also discusses the organizations involved in issuing buildings permits, their responsibilities and the requirements and data needed for the online system.

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Introduction
Constructing a building requires a building permit and a plan review. Without the permit, no development can take place legally. The local authority or the municipality is the main organization responsible for reviewing and issuings the building permits. The type of permit, laws and regulations vary from one
city to another which makes the process for obtaining a building permit complex, and often needs many visits from the applicant to the local authority or the municipality. [1]

Many local authorities and municipalities are facing problems and work pressure because of the increased demand for permitting services. Therefore many governments are moving toward improving the quality and speed of issuing building permits process. In Egypt, the current building permit process is facing many difficulties, some are related to local administration structure and staff, some are related to legislation, and laws and others are related to lack of data and information. As a result of some of these problems, the Egyptian government updated the laws that regulate the process of issuing buildings permits to minimize the problems related to the local authority and the plan review.

The Egyptian Government seeks to build a ‘digital Egypt’ and reach to an Egyptian society that deals digitally in all aspects of life, to improve the performance of ministries and other government agencies, raising the quality and efficiency of services by improving the work environment, providing support for the decision-making process and find solutions to issues of concern to society. It also seeks to build specialized applications for each ministry.

**E-government and electronic online system for issuing building permit**

The ultimate goal of e-government is to provide an improved set of public services in an efficient and cost-effective manner to citizens. The emphasis is to bring the government closer to its citizens by using information technology to improve its ability to meet the needs of society [2].

**Importance and objectives of e-government**

The e-government provides transparent, equitable, better, and accountable service delivery to the citizens. It utilizes information technology to deliver efficient and cost effective services, information and knowledge to the citizens. The main objectives of e-government are [3]:

- Increasing government transparency and accountability.
- Providing better information and service delivery
- Empowering people through information.
- Improving the interface with business and industry.
Advantages of electronic online system for issuing building permit

Permits applications can involve hundreds of documents, all of which need to be reviewed and approved by multiple departments and organizations. An electronic permitting system is an answer for many local governments and municipalities. It allows the service online all day, arranges administrative processes, improves the time needed to complete a task, and strengthens responsibility, liability and responsiveness.

The electronic online permitting system is one of the e-government services, it speeds up the building permit process for individuals, contractors, employees, and plan reviewers. This system changes the way governments provide services to the community by speeding the process for the citizens and provide better and more timely information to the local authority’s staff, decision-makers, and city officials.

Many local authorities are using digital methods of permit submission to make plan reviews quicker and more efficient. Digital submissions have many benefits such as immediate delivery, digital and/or cloud storage, maintaining the paperless trend, no printing costs to the applicant, and ease of inspector coordination. [4]

Benefits of an electronic online permit system: [5–7]

- A better system for recording and archiving the permit file.
- Easier in tracking the status of the permit request and approval process faster.
- Optimum use of staff time and reduce duplication of efforts.
- The higher ability for the internal management to measure the efficiency of the department and discover problems.
- Improving staff accountability and efficiency.
- Eliminating the possibility of manual errors and increase technical accuracy.
- Reducing waiting time for the applicant.
- Accelerating the review process.
- Eliminating paperwork which is more cost-effective than providing printouts.
- Creating a centralized digital database.
- Retrieving and searching information easily.
- Good electronic accessibility
- Improving public services
- Isolating the employee responsible for issuing the permit from the applicant.
- Empowering the state with e-government and promoting the values of transparency, accountability and control of all business through interaction and partnership between the various parties.
Easy access to all data needed (laws, codes, regulations, plans, organizations involved in reviewing and issuing the permit, ...) for issuing the validity of the site in terms of planning all in one place.

- Enhancing the communication and collaboration between the applicant and all organizations involved in the permitting process.
- Contributes in the drawings review easily and their compliance with the requirements and laws.

International case studies for electronic online building permits

The research studied several case studies that have an electronic online system for issuing building permits. Two case studies were chosen to identify their system, the first case in the United Arab Emirates because the UAE achieved second place in the field of building permits in the world and the first in the Arab region. The second experiment is the Netherlands because it is one of the first European countries that introduced this system in its municipalities and has experience in this field.

The United Arab Emirates case study

Introduction

In 2010, the government formed a committee of 8 governmental organizations who were involved in the process of issuing building permits to improve and reduce the steps required for issuing a permit. [6] The government has developed strategies to facilitate the procedures of issuing building permits. It reduced the cost of obtaining a permit, shortened the permitting steps, they created an unified electronic window for permitting and reduced the time taken to issue a permit. The United Arab Emirates ranked second globally and first regionally and in the Arab world in the ease of obtaining building permits, according to a 2018 World Bank report [8].

The authorities responsible for issuing building permits

Local municipalities in the UAE are the entities responsible for issuing building permits in the country. All building permits must comply with the Unified Building Codes, which deal with building safety and fire protection [9].

Procedures of issuing building permits according to the Emirate of Abu Dhabi 10

1- Construction project registration
2- Request approval and vacancy of the site: This service aims to obtain site approvals, which include the absence of infrastructure services, the availability of services in vouchers, and approvals to stay away from buffer zones.
3- Preparatory and preliminary approvals (special approvals): This service aims to obtain the approval of the services departments related to the building permit, such as water, electricity, the roads authority, the Land Department, Civil Defense, communication, and sometimes the Knowledge Authority if it is related to building a school, or the Tourism Department if the building is a hotel. This service can be requested by the consultant or the contractor.

4- Approval of Shop Drawings: The objective of the service is to approve shop drawings. The service can only be requested by the contractor. Obtaining approvals on the shop drawings from some organizations.

5- Building Permit: This service aims to get approval on the building permit application by reviewing the requirements and the engineering drawings that have been prepared by the consultant and submitted to the municipality. This service can be requested by the consultant only after achieving all approvals needed in steps 1, 2, and 3.

6- Issuing the building permit: This service aims to receive the building permit after paying the fees to carry out the works on the site. The service can be requested by either the consultant or the contractor only after approval of the construction permit application.

*How the system works*

The client creates a username and a password to use the electronic system. The client must log into the system to be eligible to use it, and then apply for achieving all approvals needed from all organizations online via the municipality’s website. Afterward, apply for the building permit, and the municipality will handle the rest after they receive the order of the client.

The online system is designed to be opened with any web browser. It provides all types of building permit applications and services related to it. There is an option for the applicant instead of going to a specific organization to discuss the project; they can discuss the drawings through video conference. They also can track the status of the permit request, view any notes on the project, book appointments for discussions and, pay the fees.

All information and data needed by the engineers or all parties involved in issuing building permits can be accessed in the system. [11]

*Conclusion*

The government has developed strategies to facilitate the procedures of issuing building permits, to speed up the completion of services with all concerned authorities, developing systems and requirements that would facilitate the procedures for investors and customers, and enhance the country’s competitiveness in the global competitiveness indicators. [12]
It has developed and facilitated the procedures to reduce the time taken to obtain the permit and to unify the regulations and requirements, the government also provided a unified platform through which all building permit procedures and works can be completed.

A set of smart and electronic systems has been developed to build a unified central system for the provision of smart services through a unified window, where customers ‘consultants, contractors, owners and developers’ can follow up on their transactions, learn about permitting stages, view regulations and laws, pay fees and insurances, and book and implement appointments. [12]

**The Netherlands case study**

**Introduction**

In the Netherlands, a building permit must be obtained for most construction work. ‘A permit is needed to build, repair, modify, move, convert, remove, improve, or demolish a building or change its use, regardless of whether the structure is to be used as a dwelling and whether or not it has foundations. A standard application is used nationwide.’ The applicant can apply digitally via the website or in writing in the municipality. [13]

In the past, they used to have around 25 former separate permits for construction, spatial planning, listed buildings and the environment. Then the Dutch Act ‘Wabo’ replaced these permits with a single one-stop-shop permit that covers all the activities. This Act shortened all these permits into one transparent procedure that is applied to the municipality. [14]

**The authorities responsible for issuing buildings permits**

The Ministry for Infrastructure and the Environment is in charge of planning and buildings regulations. Municipalities, under the Housing Act, are responsible for issuing buildings permits, supervise construction work and check permit applications against zoning regulations. [15]

**Procedures of issuing buildings permits**

Most planning is administrated at the municipal level. Building permits will be checked against the local zoning plan. The zoning plan is the key planning document that contains information regarding planning rights and restrictions. Information on the zoning plan can be obtained at the Municipal offices.

Pre-application consultation: It is suggested for the owner or the engineer to visit the local Municipality office to consult them before applying for a permit. [15]
Step 1: Submitting the permit application: The applicant submits the building permit application accompanied by the necessary documents, drawings, fees, photos and pertinent reports.

Step 2: Screening for completeness: The municipality will check whether the application is complete or not. If not, the applicant will receive a letter with a request to provide the missing information within a specified time.

Step 3: Review of application: The municipality will check the permit application against the regulations. If the application does not meet all regulations, the municipality will inform the applicant to see if the application can be adapted to meet the regulations.

Step 4: Draft decision: This step is subjected to some applications, such as an environmental permit and a national monument permit. If Step 4 is not applicable, the municipality will take the final decision directly. This draft decision will be published online and the applicant will be able to submit a standpoint on the draft decision within a 6-week time period.

Step 5: Final decision: The municipality will grant or refuse the permit request and this decision will be published on the website Overheid.nl (external link).

**How the system works**

The applicant should create a username and password by creating a ‘DigiD’ account through the website. Once the user logs into the system, he will be directed to the Local Authority Building Control Department. The websites provide detailed information on the procedures and steps for applying for a permit and all information related to the application.

The website of the municipality provides all information and links related to issuing building permits. The applicant can upload the permit file and the application via the internet website of their municipality. He can get support via a help function if needed and can check for permit file completeness. The applicant receives an automatic confirmation of receipt after uploading all files needed.

The central server sends the application to the municipality. They decide who has access to the file and imports it into its registration system in the back office. The municipality checks the completeness of the application and the permit file then starts the assessment. Authorized assessors can access the drawings and other documents can be studied online, and measurements can be taken. The assessors can add any comments on the file. The applicant is automatically notified of the decision as soon as the review is finished. [16]
Conclusion
The Netherlands is one of the first countries that introduced electronic online system in its municipalities. It used to have around 25 former separate permits. The government replaced these permits with a single one-stop-shop permit that covers all the activities, to reduce the time and effort spent in the process of issuing building permits. The Dutch government enhanced and integrated information and communication technology in public services to improve accessibility and speed.

Egyptian case study
Egypt has recently witnessed a huge urban boom, that was accompanied by the issuance of many decisions regulating at several levels that were added or modified to decisions and laws followed for decades, and within the framework of the principle of governance, this research will propose and design an electronic online system for issuing building permits.

Organizations involved in issuing building permits in Egypt [17,18]
There are several organizations involved in the process of issuing building permits:

- **Technology Center ’TC’**, is located inside the local authority ‘LA’. Each district has its own technology center. It is the main organization that will deal with the applicant and the other main organizations that will issue the permit. Its main task is to receive permit applications and permit files from the applicant and deliver them to the organizations that grant the permit.

- **Unit of a special nature ’USN’**, is a unit affiliated to the university in the same governorate. It is responsible for preparing and authorizing the statement of the validity of the site in terms of planning and building regulations and also responsible for reviewing and checking the engineering drawings and the permit file and approving the engineering drawings.

- **The local authority ‘LA’**, issues the statement of the validity of the site and the permit.

- **Examination committee ‘EC’**, this committee is formed by a decision of the competent governor, headed by him or whomever he delegates, and the membership of a representative of each of (the competent technology center – the competent engineering department – legal affairs – spatial variables unit – urban planning and calculation unit. This committee is responsible for examining the permit file and defines the fees required.

- **Special organizations ’SO’**, there are organizations the applicant may need their approval depending on the type, size, and location of the project. The applicant gets their approval, not the local authority, before applying the permit
file to the technology center. Examples of these institutions are Insurance Egyptian Mogamaa (Article 46), Multipurpose Project Review Committee at HBRC (Article 124 duplicate), Ministry of Archeology – Civil Aviation and others.

**Current procedures for issuing building permits in Egypt [17,18]**
The current system in Egypt leads to the possibility of occurring errors, corruption, delay in the period for the issuance of permits, loss of time and effort to obtain approvals from different parties. As a result, there was an update on the unified building law lately in June 2021. Figure 1 briefly presents information about the requirements and procedures for obtaining a building permit according to the last update of the law. Obtaining a building permit requires two main stages; the first is to obtain a statement of the validity of the site in terms of planning and for building regulations. The second is to obtain the building permit itself.

**Comparative analysis for the case studies**

**Conceptual framework for the proposed electronic online permit system**
The proposed system will benefit all the users; it will simplify and streamline the process of applying, reviewing and achieving a building permit. The system will define: the type of permit needed, all documents and drawings needed, building permit fees, tracking and achieving the permit, thereby no need to visit the local authority. The proposed online permit system will provide a highly interactive user interface and a set of predefined questions that helps and guide the users to identify the type of permit needed for their project.
Components of the proposed system

The goal of the proposed system is to provide a simple, fast and easy-to-use user interface for the end-users. The proposed system will organize the relationship between the applicant and the various organizations responsible for reviewing and issuing building permits, without the need for the applicant to visit these organizations. It consists of four main components: the applicant, the internal system, the local authority and the special organizations.

The applicant

The applicant could be the owner or an engineer. He needs a username and password to use the website of the local authority. The applicant needs his national ID number, mobile number and e-mail address to register. After registering he can use his e-mail address and password to login at any time to apply and obtain a building permit.

After registering on the website, the user-friendly interface will guide the applicant step-by-step how to apply for obtaining a statement of the validity of the site. The applicant will be able to contact the local authority employee, asks questions and will be able to track the permit request. He can download the permit application form from the website, fill it then submit it electronically. He can access the permitting services anytime and anywhere and check out the status and the progress of the application via the internet.

The internal system

The website server is the portal where the applicants can apply for achieving a building permit, upload documents needed, pay permit fees, track the permit, contact the local authority and finally receive the permit. All data relating to the permit are saved on the website server. It will provide information on how to apply for a building permit and offer facilities for downloading forms and applications. The application can be checked for completeness.

Local authority – Technology center

The technology center will receive the drawings and the permits files electronically. The technology center will contact and sends the permit file to the unit of a special nature and the examination committee via the internet, to review the permit files electronically to give their decision on it. The technology center contacts the applicant via e-mail to fulfill the permit file if something is missing. Finally, the technology center sends the applicant via e-mail
the building permit. The proposed permit system will also allow the local authority to manage complaints, violations, schedule appointments; manage tasks, and generate customized reports.

Special Organizations
There is no relation and link between these organizations and the technology center. Therefore, the proposed system will facilitate for the applicant the communication with these organizations. There will be a link to all these special organizations on the website that can direct the applicant to them to submit the necessary requirements online and obtain the necessary approvals refer Figure 2.

Permit system architecture and design
There are two main software used in the proposed system: web browser and ArcGIS. Web browser is used to direct the user to the local authority’s website where he can log in and apply for a permit. All data related to the applicants

Figure 2. Flow diagram for applying for a building permit electronically (source: researcher).
and permit requests are stored in the web browser database. While ArcGIS software is used to store and analyze data, spatial and tabular, related to the process of issuing building permits.

**General conception of the proposed system**

The main concept of the system architecture depends on a website that links all users together. They can communicate, download and upload files and documents. Some users have read-only access to the data and others have read-and-write access. Refer to Figure 3.

**Design a unified database for the local authority**

Design and build a geographical database that includes the structure of the databases that the technology center and the unit of special nature need to issue the statement of the validity of the site and building permit. [17] Build a web browser to publish the metadata of the central geo-database of the building permits data. Build mechanisms that allow other parties to view and query via the Internet spatial and descriptive data within the central database.

**Access of each user to the system**

- **The applicant**: has read-only access to some data. He can download applications and upload drawings and documents on the website.
- **Special organizations**: do not have any access to the data. The proposed system just directs the applicant to the organization's webpage that needs its approval. The applicant can download the requirements of the organization needed to get approval on the project. They can contact special organizations, upload drawings and documents needed via the internet.

- **Technology Centers – IT**: they have full access to all data, upload, download, update, change and delete data.

- **Unit of Special Nature**: has full access to the central database but through read-only access. They can access data upload, download files but cannot change the contents of the local authority’s data.

- **City Officials**: the system proposed their presence to check and inspect that all procedures and timing are according to laws and regulations and there aren’t any violations or delay in the issuing process. They have full access to the central database, it is available to them as Read/Write Access. [19]

**Online portal offers the ability for the applicant to [20]: Refer to Figure 4**

- Apply for a permit anywhere and anytime.
- Pay permits fees online anytime.
- Submit plans and documents electronically.
- Track the progress of the permit request.
- View comment letters.

**The importance of the proposed system for the stakeholders Refer to Figure 5**

- The existence of based criteria for the city officials or inspection organizations to evaluate the workflow of the different bodies.
- The existence of a unified automated system depends on the machine directly without human intervention or modification for the local authority.
- The possibility of information exchange between organizations.
- The existence of specific criteria for assessing the levels of individuals.
- Drawings can be viewed on-screen and comments can be made digitally.

**Limitations in implementing the proposed system**

Several limitations may face the implementation and the success of the proposed system. These limitations are:
• Most of the data (master plans, land ownership, laws and regulations ...) related to the issuance process are not digital, they are documented on paper. There are some exceptions such as the new communities, the data are digital but there is no link between the spatial and tabular data.
• The owner must visit the technology center to verify the title deed before starting in issuing the statement of the validity of the site in terms of planning and for building regulations.
• Many places all over the republic do not have master plans.
• The applicant must visit the technology center to hand out a printout of the drawings according to Ministerial decision No. 410 for the year 2021 added to the Executive Regulations of Egyptian Building Law No. 119 the year 2008.
• Some special organizations that need their approval on the project may also need a printout of the drawings to review the project.
• Many applicants would like to receive a hard copy of the permit itself from the technology center instead of a digital copy.

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**Figure 4.** Screenshot of the proposed system website (source: researcher).
Database design for building an electronic online permit system

Table 2 illustrates the proposed database design for the system of issuing buildings permits.

Conclusion & recommendations

Conclusion

Issuing buildings permits in Egypt is facing many problems and difficulties. This research proposes an electronic online system for issuing buildings permits that will overcome some of these problems and would benefit the local authority’s staff as well as the citizens, by improving the end-user experience and the permit process.
**Table 1. Comparative analysis in issuing building permits for the case studies.**

| Problems faced the issuing process before the online system | Authorities involved in the issuing process | Procedures of issuing building permits | How the system works | Current problems |
|-----------------------------------------------------------|--------------------------------------------|---------------------------------------|---------------------|------------------|
| - They used to have around 25 former separate permits for construction. - The process took a long duration | The local municipality | 1. Submitting permit application 2. Screening for completeness 3. Review application 4. Draft decision 5. Final decision | - The user creates a DigiD account. - Sign in to the website, then upload the application and the permit file. - The municipality checks the completeness of the permit file then starts the assessment. | - Many organizations involved in issuing the permit - The procedures are many and complex - Take approvals from many organizations. - The process took a long duration |
| - The process took a long duration to obtain the building permit. - The procedures were many and complex. - Take approvals from many organizations. | The local municipality and special organizations (for special approvals) | 1- Construction project registration 2- Request approval and vacancy of the site 3-Getting special approvals. 4- Approval of shop drawings. 5-Review & issue building permit. | - The client registers on the website - Achieve all special approvals online via the municipality’s website. - Apply for the permit online, upload the permit file, then the municipality will handle the rest. | - Technology Center (local authority) - Unit of a special nature, - Examination committee - Special organizations |
| - Authorities involved in the issuing process | | - The applicant applies to the technology center to obtain a statement of the validity of the site. - The USN prepares the statement of the validity of the site. Then the local authority issues the statement. - The applicant gets all the approvals needed, then submits the file to the TC. - The USN reviews the permit file - The EC reviews the permit documents - LA issues building permit | - The applicant applies to the technology center to obtain a statement of the validity of the site. - The USN prepares the statement of the validity of the site. Then the local authority issues the statement. - The applicant gets all the approvals needed, then submits the file to the TC. - The USN reviews the permit file - The EC reviews the permit documents - LA issues building permit | |
| Proposed system from international experience | | | | |

(Continued)
The proposed system organizes the relation between the local authority and the applicant and the relation between the applicant and the special organizations. All parties are now interconnected through the internet via the local authority’s website.

The proposed system works on linking the daily work with technology, and on producing organized work plans in an electronic and periodic manner based on information technology. It is efficient, user friendly and maximizes the role of information technology.

A unified database will be designed for the local authority. The system will offer the ability for the applicant to apply for a permit anywhere and anytime, pay permits fees online anytime, submit plans and documents electronically, track the progress of the permit request. Each party has its own access to data. The local authority has a full read/write access to the data that is stored in the GIS

Table 2. Permitting system database (source: researcher).

| Plots | Plot Divisions Data |
|---|---|
| Features | Features |
| Plot_id; District_id; Neighborhood_id; Document_id; Ownership; Area; Payment of expenses | Plot_id; Division status |
| Regulatory lines | Improvements Data |
| Features | Features |
| Plot_id; regulatory lines situation | Plot_id; Payment for improvement |
| Regulations | Permit Information |
| Features | Permit request |
| Plot_id; Landuse; % Construction for ground floor; % Construction for typical floor; Height in meter; No. of floors; Front regression; Back regression; Special regulations | Features |
| Owner | Permit decision |
| Features | Features |
| National_id; Name; Address; Tele.no.; Fax no.; P.O. box; Email | Permit no.; Plot_id; Permit type; Decision; Date; Remarks |
| Ownership | Consultant |
| Features | Features |
| Plot_id; Ownership type | National_id; Name; Address; Tele.No.; Fax no.; email; specialization; Syndicate registration no.; Years of experience |
central database. The applicant can apply for any type of permit via the website, download the application, and define all documents and drawings needed for the permit. He also can pay all fees online, no need to visit the local authority.

The implementation of the proposed system shall have many important impacts. The most important of which are:

- Creating a centralized digital database.
- Enhancing the communication and collaboration between the applicant and all organizations via the internet.
- It reduces the dependence on personal experience and human errors.
- Reducing waiting time for the applicant and accelerate the review process.
- Will contribute in the drawings review easily and their compliance with the requirements and laws.
- A better system for recording and archiving the permit file.
- Online submission is available 24 hours per day.

**Recommendations**

The process of issuing buildings permits is complex, difficult and faces many problems. The electronic online transformation process aims to solve many of these problems but unfortunately, this electronic transformation may not solve the problem, and may even make it more complicated. In order not to reach this stage, it is advised to implementation the following recommendations.

**General recommendations**

- There should be a political support for the implementation of this system, because it will face many difficulties in its implementation, including: the refusal of some beneficiaries of the current system to implement it, the difficulty of converting all paper documents into digital data, and employees’ fear of accepting and working on the new system.
- At the beginning, the applicant should have the freedom either to apply the permit online or at the technology center. This option should be for a specific time as a test period for the proposed system afterward the submission through the website should be mandatory.
- It is also recommended to start with the major cities because their inhabitants are more advanced in the use of computers and internet.

**Specific recommendations**

- There should be periodical update on the system.
There should be periodical training for the staff on the system.
There should be technical support for the staff especially at the beginning.
Databases should be updated from time to time.
Any deficiencies in the system must be overcome and resolved by the organization responsible for implementing the system.

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