

**Ministry of Higher Education  
and Scientific Research  
University of Diyala  
College of Engineering**



## **Investigation the Opportunity of GIS-BIM Integration in Construction Projects**

**A Thesis Submitted to the Council of College of Engineering  
University of Diyala in Partial Fulfillment of the  
Requirements for the Degree of Master of Science in Civil  
Engineering**

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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الآية ( ١١ )

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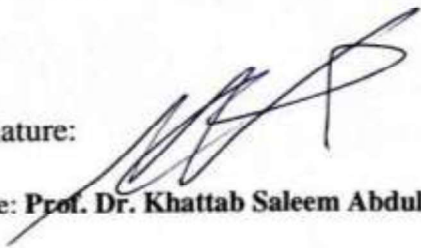
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## **Dedication**

I dedicate this research to;

### ***My Dear Father***

You are my role model in life and the light that lights my way,  
from you I learned to struggle and succeed.

### ***My sweetheart Mother***

Whose she tired for me and supported me to achieve my  
dream.

### ***My Brothers and Sister***

Whom encouraged me and made life beautiful in my eyes.

### ***My best Friends***

Who have shared my success and supported me to make my  
dream come true.

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# **Abstract**

## **Investigation the Opportunity of GIS-BIM Integration in Construction Projects**

**By**

**Balqees Mohi Nsaif**

**Supervisor by:**

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The integration of Geographic Information Systems (GIS) and Building Information Modeling (BIM) is receiving increasing attention in recent times, especially in the construction industry, because BIM provides detailed information about buildings while GIS provides information on the external environment, and that the integration process between them provides one environment that represents the real world.

The aims of the thesis is to develop a model of integration between (GIS-BIM), using the smart platform for the purpose of improving data documentation management and improving demolition waste management.

The thesis started with a review of previous literature and researches that includes the topic of integration between the GIS and BIM, as well as the topic of demolition waste management.

The main feature in the field of integration between the GIS and BIM is to deal with the project through one file and manage all project details centrally through a file built between the integration of the two techniques. Because of the inability to exchange files between the GIS and BIM techniques directly, the options available for developing a common platform that combined the two studied techniques and the researcher was able to accomplish the goals of the research effectively. As several tracks were tried and the researcher found that the adoption of Autodesk InfraWorks software is the best solution to its effectiveness and its ability to deal with the two techniques is flexible at the same time. The completion of the integration between the two techniques required great efforts in providing satellite images of the case study (Baqubah City) and the part studied (University of Diyala), and in a manner that suits the characteristics of the three software so that the researcher can process them by adopting the GIS software and prepare them to be ready for export to the InfraWorks software. As well as making the building schemes

for a site with the smallest details, by taking advantage of the previous researchers' work, completing the remainder of them and modifying a number of them, then exporting them to the InfraWorks software. The buildings positioning and management, coordination of measurements, comprehensive site management, and project file feeding with quantitative and technical data and documents for each building were subsequently managed with an enhanced environment for all aspects of the project. In addition to study the effect of natural light and shadows on the site and at different times and dates. After completing these items, the integrated project model was tested through a case study to determine the extent of benefiting from it and the effectiveness of the two techniques.

To demonstrate the importance of integrating the two techniques and studying the expected results in benefiting from this, the researcher intends to take the demolition waste management as a case study in which integrated BIM is applied with GIS. The results showed that the BIM model gives the ability to calculate the exact quantities of demolition waste. In addition, use the GIS model to manage demolition waste, especially concrete landfills by identifying and calculating the volume of this region. A comparison was also made between BIM volume and GIS volume and found that the percentage of error around (3.03%), which is a small and acceptable percentage. The number of trucks was determined based on the project schemes and by taking advantage of the integration from the two techniques.

Finally, the researcher concluded that the integration of the two techniques, GIS and BIM, can be used in managing Iraqi projects through dealing with one file to manage all project items, including the demolition waste management. As a result, using the questionnaire and according to the opinion of the experts and engineers, an evaluation was made for the integration platform (GIS-BIM), and it was found that it saves time and cost by 60% compared to traditional methods.

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## List of Abbreviations

Abbreviations	Explanation
AEC	Architecture, Engineering and Construction
BIM	Building Information Modeling
C&D	Construction and Demolition waste
CAD	Computer Aided Design
CMC	Computer-Mediated Communication
cci	The conversion ratio of the amount of item (i)
ct <sub>i</sub>	Demolition Factor or called Coefficient to Transformation the V <sub>ac</sub> to V <sub>ad</sub>
D&R	Demolition and Renovation waste
DEM	Digital Elevation Model
2D	Two Dimension
3D	Third Dimension
4D	Fourth Dimension
5D	Fifth Dimension
6D	Sixth Dimension
ESRI	Environmental Systems Research Institute
FTF	Face To Face
FME	Feature Manipulation Engine software
GCS	Geographic Coordinate System
GIS	Geographic Information System
HBIM	Historical Building Information Modeling

HOAL	Hijazi Architectural Objects Library
HTML	Hyper Text Markup Language
IFC	Industrial Foundation Class
LOD	Level Of Details
O&M	Operating and Maintenance phase
P&D	Planning and Design phase
PCS	Projected Coordinate System
Q.T.O	Quantity Takeoff
qi	The quantity of each item (i)
TLS	Terrestrial Laser Scanner
$V_{ac}$	apparent construction volume
$V_{ad}$	apparent demolition volume
$V_{ar}$	apparent wreckage waste volume
$V_{ar}$	apparent package waste volume
$V_{ac}$	apparent construction volume

# **Chapter One**

## **Introduction**

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## **Chapter One**

### **Introduction**

#### **1.1 General**

Currently, the world is looking for possibilities to create a more controllable, collaborative, seamless, and realistic information management environment for the GIS and the construction industry. The integration of BIM and GIS data has developed as an important research area to generate valuable information that can be of the utmost importance to the decision-making process. Several efforts have made to take advantage of the rich information in BIM and use it in GIS. There is no fixed or standard rule for integrating information elements between both systems (Sani et al., 2019). The real integration between GIS and BIM using the strong parts from BIM technology in GIS, and of course using the strong parts of GIS in BIM (De Laat & Van Berlo, 2011).

The GIS and BIM creates a digital representation of the real-world but in different ways and different dimensions. GIS describes the macro-level to entities on earth such as cities, terrain, and external environment that link with exact geographic coordination (Wu & Zhang, 2016). While BIM focuses on buildings representation at the micro-level (Wang et al., 2019).

As a result of increased global awareness of the green environment, both the government and contractors should think about effective construction and demolition (C&D) waste management practices (Cheng & Ma, 2013). In general, a massive amount of waste and debris are generated as a result of existing buildings demolition. Therefore, the construction managers and site engineers face difficulties in accurate calculates a volume of these materials, which has a significant effect on the time and cost of the

project (Al-Saggaf & Jrade, 2015). Based on the previous, the need has become urgent to find scientific and local methods.

This chapter produces the general view of introductory to identify the research's background. The research problem and justification were presented. Research aim, objectives, scope, limitations, and methodology were formulated. In addition, the structure of the thesis and review of previous studies were explained in this chapter.

## 1.2 Research Problems and Justifications

There are numerous problems that lead to use the integration between BIM and GIS techniques and manage the demolition waste. The researcher summarizes the research problem with the following points.

1. The need to study the integration of BIM and GIS to solve various problems in the Iraqi construction projects has emerged, including BIM using Revit software, can deal with specific building or project meanwhile GIS can deal with an entire city as the environment for planning and designing.
2. The main reason for studying the topic of integration between GIS and BIM that the platform of integration collects more than one file in one environment including the Revit file.
3. Projects suffer from the loss of many contracting documents therefore, the need emerged to documentation of projects by integrating GIS and BIM.
4. There are numerous buildings in Iraqi construction projects that have exceeded the life of design and become dilapidated therefore, the emerged need to study demolition waste management.

## 1.3 Research Hypothesis

There is a need to implement the integration between (GIS-BIM) during the project stages (design stage and demolition waste management phase).



## 1.4 Research Aims and Objectives

Develop a model of integration between (GIS-BIM), using the smart platform for the purpose of improving data documentation management and improving demolition waste management. To achieve the current aim, some of the objectives must achieve as follows:

1. Visualization of all case studies in the urban model.
2. Documentation of all case studies in the urban model.
3. Calculate the demolition waste volume using the BIM model.
4. Identify the optimal location of the concrete landfill through the GIS model and calculate its volume.
5. Calculate the number of trucks required to manage the concrete landfill for both the BIM and GIS models.
6. Comparison between the results of BIM and GIS model in the aspect of concrete landfill.

## 1.5 Research Scope and Limitations

The research scope and limitations include the following points:

1. This research focuses on the use of a smart platform for integration GIS and BIM called Autodesk InfraWorks software (ver.2020) free software.
2. Sixteen case studies are studied within the site of University of Diyala campus.
3. The satellite image is studied involving the City of Baqubah only.
4. In the case of demolition was adopted the worst case.
5. This study applied in design stage and demolition stage.
6. Temporal limitation: It covered the period from 2019-2020.

## 1.6 Research Methodology

The research methodology is mainly divided into two parts.

**First part (theoretical):** This part involves the literature review of techniques that were used in integration of GIS and BIM also the previous studies of demolition waste management in the construction industry.

**Second part (Experimental):** This part mainly consists of the following steps:

1. To create the integration environment in the smart platform using [Autodesk InfraWorks software (ver.2020)]. The researcher needs to add the main data that support this topic.
  - a) GIS data: This data involves the satellite image of City Baqubah. The researcher used Arc GIS software (ver. 10.3) as the GIS tool.
  - b) BIM data: This data involves a 3D model of the case studies used Autodesk Revit software (ver.2018) as the BIM tool, and this data is taken from previous local studies. BIM data also includes the documentation of all case studies.
  - c) The integration platform was evaluated using engineers' opinions according to the questionnaire.
2. To create the (BIM-GIS) integrated model to manage the demolition waste. In addition to BIM data also the researcher needs the contour lines that were drawn in AutoCAD by a Spanish Company, and these contour lines were placed in GIS software to identify the region that needs concrete landfill waste.
3. The main results and discussion are clarified.
4. The main conclusions, recommendations, and future studies also are clarified. The researcher demonstrates the research methodology as shown in figure (1.1).

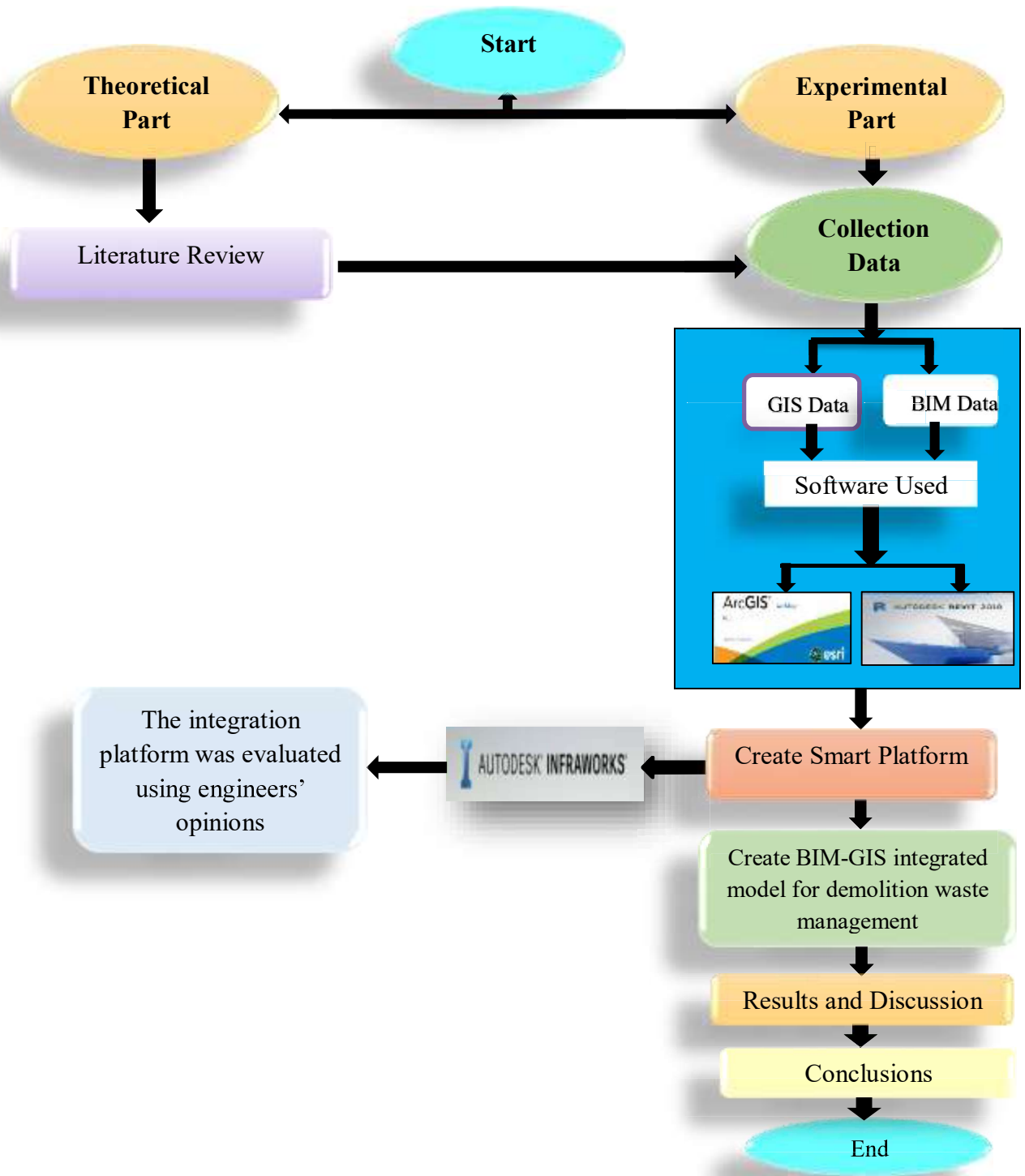


Figure (1.1): The Research Methodology (Researcher).

## 1.7 The Structure of the Thesis

The thesis is divided into six chapters: The researcher summarizes the chapters as follows:

**Chapter One:** It clarifies background of the research, research problem statement and justifications, research hypothesis, research aim and objectives, research scope and limitations, brief research methodology, the structure of the thesis, and review of previous studies.

**Chapter Two:** This chapter introduces the four parts. The general overview of the first part (GIS) in terms of (its history, definition according to each researcher, its components, its layers, and its applications). The second part (BIM) includes (its definition according to each researcher, its concept, BIM vs CAD, its dimensions, slow BIM adaption, the programs that used to implement it, advantages of it, and hindrances of it). The third part is the integration of (GIS-BIM) include (its history, its progress in the previous studies, comparison between them, in addition to its levels, its applications in the AEC projects, literature analysis, in addition to potential advantages of its application, and finally its hindrances). The fourth part introduces the demolition waste using BIM-GIS integrated model.

**Chapter Three:** It includes a general overview of the data collection process that the researcher uses to achieve integration between GIS and BIM. This data divided into three parts; the first part of GIS data that includes (the full satellite image, clipping the satellite image and creating the database for each case study). The second part of BIM data includes (full details of all case studies and display the 3D model using Revit software, specify the project location, export all case studies, and documentation of all case studies).

**Chapter Four:** It reviews the experimental part that the researcher has done through presenting the smart platform that is used to achieve the requirements of integration between GIS and BIM.

**Chapter Five:** It reviews the estimation of demolition waste using the (BIM-GIS) integrated model and makes a comparison between them.

**Chapter Six:** It summarizes the main conclusions based on the obtained results, recommendations, and suggestion for the future studies.

### 1.8 Review of Previous Studies

Table (1.1) summarizes the previous studies that include the integration of GIS and BIM and demolition waste management.

Table (1.1): The Reviews of Previous Studies.

No.	Researcher and Country	The work
<b>BIM in Iraq</b>		
1	(Zainab A., Abd Al-Kareem, 2016)	The research aimed at the ability to use advanced communicative tools such as computer-mediated communication (CMC) rather than traditional communication face to face (FTF). The Revit software was used as a tool of the BIM technique that helps in exchange design information between the designer, site engineer to speed in making a decision, solving problems, reduce the missing time and reduce the expenses that expensed as a result of using FTF the communications. The results showed that the quantity of communicative in FTF was more as compared in CMC. In addition to the work time in CMC was a little higher than FTF and this indicated that CMC was more productive from FTF.
2	(Dunya S. Jarullah, 2017)	This research aimed to produce alternative brick sustainable and economic using the lightweight foam concrete (LWFC) instead of traditional clay brick. Using BIM and entering the experimental data that got from this research, the Autodesk Revit used to model and assess the new alternative building units. Six rise buildings were designed using Autodesk Revit to assess the LWFC and compared with fired clay bricks in terms of cost, thermal and acoustic insulation, absorption, and mechanical properties. The results showed the cost of brickwork using

		LWFC units from grade A (2000 kg/m <sup>3</sup> ) and B (1800 kg/m <sup>3</sup> ) is higher by (19.4% and 11.9%) respectively as compared use traditional fired clay bricks. A grade C (1600 kg/m <sup>3</sup> ) the cost was converging to fired clay bricks (+2.9%). For the construction of brickwork using LWFC units of grade D (1400 kg/m <sup>3</sup> ) and E (1200 kg/m <sup>3</sup> ) was lowering by (8% and 18.6%) than fired clay bricks.
3	(Naghm N. Abbas, 2018)	This research aimed to investigate the possibility of application BIM and includes the advantages of it and the potential challenges in the application of it in the Iraqi construction projects. The researcher depended on the quantity approach through the questionnaire by reinforced with personal interviews in the construction project domain. The results showed the knowledge level to BIM technique low in a geometric medium, also the benefits of this technique showed for saving the project cost, speed in data documentation, reduce the change orders, reduce the rework through detected on the conflicts and enhance cooperation between different parties in the project.
4	(Alaa S. Khamees , 2018)	This research studied the possibility of adopting the BIM technique in documentation due to loss of project documents, change orders and unreliability. The results showed the ability of the technique to give distinct results in address the completed buildings through rehabilitation and development buildings that previously created. The accuracy of quantities between the actual and BIM showed (93.5%) for a case study (1), and (96.9%) for a case study (2).
5	(Noor S. Omar, 2019)	This research aimed to find the system to manage the maintenance works and depended on developing the deterioration models in order to identify the important elements that need maintenance using the BIM technique to manage the models, in addition, to create the 3D model loaded with the best of the design alternatives. The results showed that by linking the deterioration models to the 3D model of the case study and the researcher found the main construction elements that need to repair according to their priority, predicting with a required budget of maintenance and their distribution according to items of priority.

6	(Ghasaq T.Youssef, 2019)	The purpose of this research is to study the possibility of using BIM to raise the efficiency of site planning and managing spaces within buildings. Through modeling fourteen buildings within the Diyala University site. Through analyzing the case studies and finding the real data of the area using BIM technique and comparing it with the international specifications for space management on the campus, the researcher was found that there is a big difference in the areas and was noted that there is no indication to use the international specifications or local in the design of the spaces of these buildings.
7	(Hafeth I. Naji, Mohamed S. Mahmood, and Zahraa A. Jalil, 2019)	This research aimed to find the economic method to reconstruct the destroyed cities post-disaster and reduce the cost of reconstruction materials in Iraq. The method used in this research to recycle fine aggregate (RFA), fine recycled aggregate (FRA) instead of natural fine aggregate (NFA). The authors used the BIM technique to connect the data gotten from the theoretical part and modeling a small destroyed city and calculated the quantity of concrete used in ceiling and beams also extracted the volume of fine aggregate and its cost. In addition to calculate the cost of (RFA) instead of (NFA). The results showed the required total cost to purchase the building materials used in construction the ceilings and beams can be reduced by (18.38%).
8	(Hayder R. Abed, Wadhah A. Hatem and Nidal A. Jasim, 2020)	This research aimed to improve safety in the Iraqi oil projects also study the effect of applying the BIM technique on the schedule time and cost. The authors discovered that the application of BIM technique leads to identify and risks accuracy assessment, and the ability to provide the solutions for mitigating these risks and solving all safety problems in the early stages. The results showed the application of BIM technique in a project will increase the work duration by about (11) days, and a total cost of safety equipment according to a BIM approach by about (36569230 ID).
<b>BIM+GIS= Integration</b>		
9	(El Meouche et al., 2013)	This research reviewed the various programs that can be used in the integration of BIM and GIS. In this research used three case studies and the modeling it using Autodesk Revit and convert the models to different formats. The programs that tested include (AutoCAD map, Google

	(France)	Earth, Arc GIS). The results showed the first method to convert the BIM model in DWG format to Google Earth give unsatisfied result because of the integrated model is a mass and not include any information related to items. The second method to convert the BIM model in DWG format to AutoCAD Map 3D the result gives change in the structure of the model and still not provide a valuable solution. The third method to convert the BIM model in IFC format to Arc GIS and imported the IFC file to Arc GIS using data interoperability extension. Using this extension can bring the building to Arc GIS as a group of layers and can extract the required information.
10	(Baik et al., 2015) (Saudi Arabia)	The research reviewed the process of integrating 3D BIM in 3D GIS. The integration process includes scanning the building using Terrestrial Laser Scanner (TLS) and Close-Range Photogrammetry then design 3D HBIM based on HOAL in the Revit platform. Finally, the 3D model is integrated into the 3D GIS through Autodesk InfraWorks. The development of such models is very important in documenting and preserving more than 600 historic buildings. The results showed that integration helps in analyzing the historical sites and provides the decision-makers with information about a building and surrounding environment which can a problem in the BIM environment.
11	(Ma & Ren, 2017) (China)	This research has reviewed the previous works for an understanding of the field of integration between GIS and BIM. The application object, application phase, integration pattern, and integration platform is highlighted. The results show the integration between GIS and BIM that used mainly to build activities in (P&D) phase, and (O&M) phase. Extract the data from BIM to GIS is the prevailing way to integrate GIS and BIM and the system that most used called Arc GIS. The other researchers also used Autodesk Revit or developed special systems.
12	(Vacca & Quaquer o, 2019) (Italy)	This research aims to choose the integration between BIM and GIS in order to structure knowledge because of lacking a documentation "as-built" that related in the stages design and construction, it the main reason for ineffective activities in existing buildings. This research concentrated on two-part; firstly, the researchers studied the potential of integration BIM-3D GIS with integrated the building file. Secondly,



		<p>researchers studied two case studies in Italy. The parametric model in Revit cannot be imported in any GIS software then forced the researchers in order to find external software. The chosen external software FME. The results showed the parametric model is converted to a geodatabase file, the virtual components in Revit is linked with external tables and exported from Revit into Arc GIS. This integration has benefit in a query about the windows that can be replaced according to the level of decay also query about the public information, for example, a query about the implemented maintenance.</p>
13	(Colucci et al., 2020) (Italy)	<p>This study described different tests for evaluating two levels of conceptual interoperability (technical and semantic) when imported the Historical Building Information Modeling (HBIM) model into a GIS environment and used the commercial software such as (ArcGIS Pro and QGIS). The first case (.rvt file to ArcGIS Pro) was tested to investigate the data loss of semantic, geometry, and georeferencing from BIM to GIS and the second case (IFC file to FME to QGIS) was used the same test. In the last case, it was necessary to use the FME to see the standard data formats. This study has not covered the other levels of interoperability.</p>
<b>Demolition Waste</b>		
14	(Poon, C. S., Ann, T. W., & Ng, L. H. 2001) (China)	<p>This research reviews the results of the survey undertaken to evaluate three alternative waste sorting methods on building construction sites and to compare them with the use of an off-site central waste sorting facility. The results indicate source separation has the advantages of requiring less effort and resulting in better segregation of inert and non-inert wastes as compared with waste sorting centrally carried out at a designated area on- or off-site. In addition, the views of the building industry participants were also obtained through a questionnaire survey to give a better understanding of their attitude on on-site waste sorting. The results indicate that building construction participants are reluctant to carry out on-site waste sorting. Even when high a tipping fee is imposed, they have little incentive to perform on-site waste sorting which is considered to be time and labor demanding. Only through contractual requirements or legislation can on-site waste sorting be fully</p>

		implemented and becomes a long-term solution to the landfill shortage problem in Hong Kong.
<b>GIS+ Demolition Waste</b>		
15	(Madi, N., & Srour, I. 2019) (Syria)	This study suggests a multi-criteria based on the GIS framework to manage CDW in emergency situations, specifically in war-stricken environments. The proposed framework covers estimating quantities of CDW, building a GIS model for automatic siting of suitable land for the construction of recycling facilities, and carrying out an economic assessment of CDW recycling. The framework is applied to the case of Syria, which has been suffering from the consequences of war for the past 7 years. The results show that the suitability rating for the location of recycling facilities nationwide varies from (18 to 64) % depending on the values allocated to various environmental factors such as topography, geology, and infrastructure.
<b>BIM+ Demolition Waste</b>		
16	(Cheng & Ma, 2013) (China)	This research aimed to develop a system to estimate and planning the demolition and renovation waste (D&R) based on BIM technique. The suggested system can extract the materials information and the volume through the BIM and integrate the information to estimate the wastes. The results showed this system cannot work only as a tool to estimate waste before D&R but it works to calculate the disposal charging and the requirements of the transport truck.
17	(Aws S. Noaman, 2019) (Iraq)	The research aimed to carry out the reconstruction of destroyed cities (as a result of military operations) in a more effective and economical way and with the least possible negative impact on the environment. The field survey was conducted in order to determine the size and nature of the accumulated construction waste using two different destroyed projects as a case study. The accumulated construction waste amount was evaluated, and calculated for the two academic cases and identifying the waste that can be reused or recycled for adding them in the reconstruction process depending on the BIM technique in creating two models and calculated the quantities of the required primary materials. A comparison was made with the field survey of raw materials prices to calculate the cost savings as a result of using recycled materials. The

		results showed that the percentage of the total decrease in costs is about (12.9%) for the first model, as well as the percentage of the total decrease in costs about (37.3%) for the second model.
<b>BIM+ GIS+ Demolition Waste</b>		
18	(Al-Saggaf & Jrade, 2015) (Canada)	The purpose of the research developed the integrated model of BIM and GIS for managing the demolition waste easily and control of megaprojects. The integrated model achieves through waste sorting, waste estimation, also calculated the travel distance between the site, storages, landfills and the associated time, and estimates the number of trucks required for loading, hauling and removing the demolition waste. The results showed the model validity and proved to benefit when it was tested using the case study. The integrated model will provide the construction managers a comprehensive tool that could benefit them greatly as compared to use BIM only.
As mentioned above, numerous researchers in different countries have studied separately (different techniques of integration between GIS and BIM, demolition waste using BIM only, and demolition waste using BIM-GIS model).		

Furthermore, Table (1.2) demonstrates the comparison between the current study and the previous studies in terms of (location, software used, and a brief description of the research).

Table (1.2): The Comparison between the Current Study and the Previous Studies.

Current study (2020)	Location	Iraq
	software	Autodesk Revit (ver.2018), Arc GIS (ver.10.3), AutoCAD (ver.2018), and Autodesk InfraWorks (ver.2020).
	Brief description about the research	This study objective to link BIM and GIS with a smart platform called Autodesk InfraWorks and the researcher tries to take the advantages of BIM and GIS to create an environment similar to the real-world. The BIM technique provides the indoor environment and GIS provides the outdoor environment and the integration of both gives many benefits to the project managers such as allows to open the Revit file for each building in one environment, in addition

		to, documented of all buildings instead of use the traditional method. The study also explores the possibility to use (BIM-GIS) integrated model to manage the demolition waste.
<b>Previous studies</b>	Location	France, Saudi Arabia, China, and Italy.
	software	AutoCAD map, Google Earth, Arc GIS (using data interoperability extension), Autodesk Revit, Autodesk InfraWorks, Arc GIS Pro, FME software, and developed special systems
	Brief description about the research	The previous researchers using different software's to give acceptable results in this topic. Using the AutoCAD map, Google Earth cannot give acceptable results. The use of data interoperability extension in Arc GIS that transfers the building model in (IFC format) to Arc GIS and shows the 3D model. The few previous researchers used Autodesk Revit and Autodesk InfraWorks. Autodesk InfraWorks (open-source) software and can integrate BIM and GIS for representing the digital environment of the real-world. Other previous researchers used Autodesk Revit, Arc GIS Pro, FME software that gives acceptable results but most of the researchers in Iraq cannot use these software (Arc GIS Pro, FME) because not open-source, also this method can be used in the spatial query. Most of the previous researchers used developed special systems and this system depends on the semantic web that helps to solve the different issues in data interoperability of BIM and GIS.

## 1.9 Summary

This chapter demonstrates a brief introduction for integrating BIM and GIS also clarified the demolition waste using BIM-GIS integrated model. The description of a research problem and Justifications, research hypothesis, explanation research aim and objectives, research scope and limitations, brief research methodology, the structure of the thesis, and review of previous studies.