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MASTER IN REAL ESTATE MANAGEMENT

Research Plan for :

**Title: Integrating Artificial Intelligence and Building Information Modeling (BIM) in Hotel Development in Saudi Arabia: A Framework for Enhancing Feasibility and Investment Performance**

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## 1. INTRODUCTION:

Vision 2030 is changing Saudi Arabia's economy in a big way. The goal is to make the country less dependent on oil and more of a global tourism and investment hub. The hospitality industry is a key part of reaching these strategic goals. Big projects like NEOM, Red Sea Global, Diriyah Gate, and Qiddiya, as well as big events like Expo 2030 and the FIFA World Cup 2034, help make this happen.

The fast growth of tourism infrastructure has made it necessary to quickly build hotels that are efficient, scalable, and financially sound. Recent reports from the industry say that Saudi Arabia wants to greatly increase its hotel capacity to accommodate millions of visitors each year. This puts a lot of pressure on developers to finish high-quality projects on time and within budget. The hospitality industry is also growing because more and more businesses are using digital technologies and data-driven strategies.

Hotel developments are much more sensitive to changes in the market and how well they run than other types of real estate. Key performance indicators like occupancy rate, Average Daily Rate (ADR), and Revenue per Available Room (RevPAR) are important for their financial success. Demand patterns, pricing strategies, competition, and macroeconomic factors all have a direct effect on these indicators. Because of this, hotel investments are riskier than other types of investments, so it's important to make accurate predictions and plans (Henriques, 2024).

Feasibility studies are very important for figuring out if hotel investments are worth it in this case. However, traditional feasibility methods use static financial models like discounted cash flow (DCF), which are often based on assumptions that don't always hold true in a changing market. These models usually rely on fixed inputs for things like demand, prices, and costs, which can cause problems when market conditions change. As a result, making investment decisions based on these kinds of models could be very risky (Habib, 2024). Artificial Intelligence (AI) has become a game-changing technology that can help with these problems. AI makes it possible to do advanced data analysis, make predictions, and make decisions in real time. AI is widely used in the hospitality industry for things like predicting demand, setting prices, and managing revenue. Machine learning models can look at past data, booking patterns, and outside market indicators to make very accurate predictions. This is a big improvement over traditional method (Ampountolas, 2026; Henriques, 2024).

Also, AI is becoming more and more known as a key factor in the hospitality industry's competitiveness, improving customer service, personalization, and strategic decision-making (Alhelal, 2025). AI is being used more and more in the hospitality industry in Saudi Arabia. The market is worth about USD 1.2 billion and is expected to grow a lot because of Vision 2030 initiatives.

At the same time, Building Information Modelling (BIM) has changed the construction industry by allowing for digital modelling of projects that are all connected. BIM helps with lifecycle management, design coordination, and visualization, and it cuts down on mistakes. It makes it easier for everyone involved in a project to work together and makes sure that all design, cost, and scheduling information is in one place. But BIM is mostly about the physical and technical parts of projects. It can't predict how well a project will do in the market or how much money it will make.

Even though AI and BIM have both come a long way, they are still often used on their own. AI is mostly used for operations and analysis, while BIM is mostly used for design and construction. AI-driven feasibility analysis and BIM-based project execution don't work well together. Because of this disconnect, decisions are made in pieces, and financial assumptions don't always match up with how things are really designed and built.

Recent studies also show that data-driven technologies are becoming more important for improving tourism performance and operational efficiency in Saudi Arabia. This shows that there is a need for integrated digital solutions throughout the project lifecycle (Khan, 2025). This study fills this gap by suggesting a framework that brings together AI and BIM throughout the entire lifecycle of hotel development projects. AI is used in the pre-construction phase to improve feasibility analysis, such as market forecasting and financial modelling. BIM is then used during the design and construction phases to make sure the project is delivered on time and on budget. Finally, AI is brought back into the operational phase to improve revenue performance and give feedback on future projects.

This study seeks to revolutionize hotel development by merging AI and BIM, transitioning from a disjointed process to a comprehensive, data-driven framework. This method makes feasibility more accurate, lowers investment risks, and makes the whole project work better. It also fits with Saudi Arabia's bigger plans for digital transformation and helps the hospitality industry grow in a way that is good for the environment in a global market that is becoming more competitive.

## **2. Research Problem:**

Even though the hospitality industry in Saudi Arabia is growing quickly, hotel development projects still have a lot of problems that make them less likely to be profitable and successful.

One of the biggest problems is that it's hard to predict how much demand there will be. The future demand for hotels is very important to their performance. This demand is affected by things like tourism trends, the economy, and events around the world. Traditional forecasting methods often use averages and assumptions from the past, which may not be able to accurately reflect how the market is changing.

Another problem is that it's hard to guess things like occupancy rate, ADR, and RevPAR, which are important performance indicators. These numbers are very important for making investment decisions and financial models. If you make wrong predictions, you might overestimate or underestimate the returns on a project, which could lead to bad investment choices. Also, there is a lot of fragmentation between the different stages of hotel development.

Feasibility studies are usually done separately from the design and building processes. Because of this, financial assumptions don't always match up with design limits or the realities of construction. Also, financial modelling tools like discounted cash flow (DCF) and digital design tools like BIM don't work well together. BIM is more about physical design and construction, while DCF models are more about financial performance. Because these tools don't work together, it's hard to make smart, all-around decisions.

AI is widely used in hotel operations, especially for managing revenue and optimising prices, but it is still not widely used for early-stage feasibility analysis. This is a missed chance to make forecasts more accurate and lower the risks of investing. These problems show how important it is to use both AI and BIM together to make better decisions throughout the whole project lifecycle. The goal of this study is to fill this gap by creating a framework that combines these technologies to make hotel development projects more accurate and profitable.

### 3. The Importance of Research:

This research is significant due to the swift evolution of the hospitality industry in Saudi Arabia and the growing demand for sophisticated digital solutions to facilitate efficient, data-driven hotel development.

Saudi Arabia's Vision 2030 aims to significantly increase tourism's contribution to GDP by bringing in millions of visitors from both inside and outside the country each year. This change has led to an unprecedented rise in hotel development projects, which has given investors and developers both chances and problems.

In this situation, old-fashioned ways of developing hotels are no longer enough to handle the size and complexity of modern hotel projects. Combining Artificial Intelligence (AI) and Building Information Modelling (BIM) is a strategic way to make feasibility more accurate, make projects run more smoothly, and get the most out of investments.

#### 3.1 The Importance of Academics :

From an academic standpoint, this research enhances various nascent domains in real estate development, construction management, and digital transformation.

**To start**, it adds to what we know about how to use AI in the hospitality industry. Most of the research that has been done so far on AI in hotels has been about things like revenue management and customer experience. There isn't much research on how AI can be used to analyse feasibility and make investment decisions.

**Second**, this study connects BIM and AI integration. BIM has been thoroughly examined as a tool for design and construction, whereas AI has been investigated in the realms of data analytics and forecasting. Nonetheless, there exists a deficiency of research that amalgamates these technologies into a cohesive framework throughout the project lifecycle.

**Third**, this study enhances real estate investment theory by integrating financial modelling techniques, such as discounted cash flow (DCF), with digital technologies. This study presents a more dynamic and data-driven method for evaluating investments by using AI in feasibility analysis.

**Lastly**, the study presents a lifecycle-based framework that links the stages of planning, building, and running a project. This all-encompassing approach marks a transition from disjointed decision-making to cohesive project management.

### 3.2 Practical Importance :

This research offers substantial value to developers, investors, project managers, and policymakers engaged in hotel development in Saudi Arabia.

One of the most important practical contributions is making feasibility studies more accurate. AI can make demand forecasting more accurate by looking at past data, market trends, and outside factors. This makes it easier to accurately predict occupancy rates, ADR, and RevPAR, which are all important for financial modelling.

AI also improves financial modelling by making it possible to do dynamic DCF analysis. Traditional DCF models use fixed assumptions, but AI can change things like demand, prices, and costs in real time by simulating different situations. This makes investment decisions more reliable.

BIM helps make project delivery more efficient by improving design coordination, cutting down on mistakes, and streamlining construction processes. This saves money, cuts down on delays, and makes the project better.

Also, combining AI and BIM lowers both financial and operational risks. By making sure that feasibility analysis is in line with design and construction processes, developers can make better choices and avoid expensive design changes or delays.

This research supports better decision-making from an investment point of view by giving a data-driven framework that connects market analysis, financial performance, and project execution. This is especially important for big hotel projects where the risks of investing are high.

### 3.3 Research Opportunity :

Saudi Arabia offers a distinctive and opportune context for the integration of advanced technologies in hotel development, attributable to the magnitude and rapidity of its hospitality sector growth.

Vision 2030 projects, mega-projects, and international events like Expo 2030 and the FIFA World Cup 2034 are all helping the Kingdom grow faster than ever before. These changes are expected to bring in millions of tourists, which will greatly increase the need for hotel rooms.

Because of this rapid growth, there is a strong need for development solutions that are both efficient and scalable. Conventional methods might not be enough to handle the complexity of these projects, especially when it comes to analysing feasibility and delivering the project. Hotel developments have a unique advantage for using BIM because they have standard design requirements. International hotel chains usually have strict brand standards that include set room layouts, spatial configurations, and operational specifications. These design features that repeat themselves make hotels very good for BIM because they make modelling, coordination, and optimization easier.

The hospitality industry also collects a lot of data, such as booking patterns, occupancy rates, pricing trends, and customer behavior. This information is a great starting point for AI programs that predict demand, maximize revenue, and create financial models.

When developers combine AI and BIM, they can use both structured data and predictive analytics to make better decisions throughout the life of the project. This integration makes it possible to go from fixed and broken processes to flexible and data-driven development plans.

Additionally, Saudi Arabia's broader goals for digital transformation, such as building smart cities and digital infrastructure, are in line with the use of AI and BIM. This makes the proposed framework not only useful but also necessary for the future of hotel development in the Kingdom.

## **4. Research Questions :**

### **4.1 Main Research Question**

How can the integration of Artificial Intelligence (AI) and Building Information Modeling (BIM) enhance feasibility analysis and investment performance in hotel development projects in Saudi Arabia?

### **4.2 Sub-Research Questions**

1. How can AI improve demand forecasting and market analysis in hotel development projects?
2. How can AI enhance financial modeling, particularly Discounted Cash Flow (DCF), in feasibility studies?
3. What is the role of BIM in improving design coordination and construction efficiency in hotel projects?
4. How can the integration of AI and BIM improve decision-making across the project lifecycle?
5. What is the impact of AI-BIM integration on investment performance indicators such as ROI, ADR, and RevPAR?
6. How applicable is the proposed AI-BIM framework in real-world hotel development projects in Saudi Arabia?

## **5. Literature Review (Saudi, Arabic, and International)**

### **5.1 Hospitality Sector and Market Dynamics:**

The hospitality sector is one of the most dynamic parts of the real estate industry. This is because it depends on market demand, operational performance, and the state of the economy. Hotels make money every day, so they are very sensitive to changes in demand and prices. Henriques (2024) says that key performance indicators (KPIs) like occupancy rate, ADR, and RevPAR are important for judging how well a hotel is doing. Vision 2030 is helping the hospitality industry grow quickly in Saudi Arabia by bringing in big investments and more tourists. The use of AI technologies in the hospitality industry is also on the rise, with the market reaching about \$1.2 billion thanks to the need for data-driven decision-making.

### **5.2 Artificial Intelligence in Hospitality Market Analysis:**

AI has become an important tool for studying hospitality markets and making predictions more accurate. Saudi Studies Recent studies in Saudi Arabia show how AI can help with market analysis and forecasting. Machine learning models have shown to be very accurate at predicting demand for real estate and tourism, which helps people make investment decisions (Alsulamy, 2025). AI is also being used in Saudi Arabia's hospitality industry to handle the growth of tourism, improve operations, and make the customer experience better. Studies from the Arab world talk about how AI can help with strategic planning and finding patterns in the market. AI-driven analytics can look at huge amounts of data, like social media and tourism data, to find new trends and help people make decisions in markets that are changing quickly (Aalijah, 2025). International Studies: AI is used a lot around the world to predict demand and group customers. Machine learning models are much better than traditional statistical methods at predicting hotel demand (Ampountolas, 2026).

### 5.3 AI in Feasibility Studies and Financial Modeling:

Saudi Studies Research in Saudi Arabia shows that AI can significantly improve forecasting accuracy and investment analysis by using advanced machine learning techniques in real estate and construction sectors. AI also helps with predictive analytics in construction projects, which makes planning better and lowers risks in line with the goals of Vision 2030. (Alsulamy, 2025) . Arabic Studies Regional studies highlight the role of AI in analysing economic trends and supporting feasibility decisions using large-scale data analytics (Aalijah, 2025). International Studies Globally, AI enhances feasibility studies by transforming DCF models into dynamic systems through scenario simulation and predictive modelling (Deloitte, 2025) .

### 5.4 AI in Hotel Revenue Management :

AI is very important for getting the best prices and making the most money for hotels.  AI-driven revenue management systems for international studies use dynamic pricing and demand prediction to raise ADR and RevPAR (HotelTechReport, 2025) [8].A Saudi Arabia AI is being used more and more in Saudi Arabia to improve the guest experience and make operations more efficient, which is helping the hospitality industry grow.

### 5.5 Building Information Modelling (BIM) in Hotel Development:

Studies show that Building Information Modelling (BIM) makes construction in Saudi Arabia more efficient, lowers project costs, and makes it easier for everyone involved to work together. Research demonstrates that BIM facilitates enhanced design integration, minimises errors, and promotes efficient planning and management processes in construction projects (Al-Yami & Sanni-Anibire, 2019; Alghuried, 2023).

Another study says that BIM helps with integrated project delivery and makes construction more sustainable and efficient by making design more efficient and encouraging better use of resources (Alghuried, 2023).

Globally Building Information Modelling (BIM) is a widely used tool in construction projects around the world. It is especially useful for coordinating designs, finding conflicts, and

keeping costs down. BIM makes it possible to find and fix design problems early on, which cuts down on rework and makes it easier for everyone involved in the project to work together. BIM also helps with more accurate cost estimates and schedules, which makes projects run more smoothly and lowers risks. Research shows that using BIM can lead to significant savings in time and money for a project, as well as better overall performance (Das et al., 2025; Eastman et al., 2011).

## 5.6 Integration of AI and BIM

Studies show that combining Artificial Intelligence (AI) with Building Information Modelling (BIM) makes many parts of construction projects better, such as optimising designs, predicting costs, and making decisions. AI-driven algorithms make advanced generative design and predictive analytics possible, and BIM gives project data a structured digital space to work in.

This synergy makes planning more accurate, cuts down on design mistakes, boosts productivity, and makes the project as a whole perform better. AI-BIM integration also helps lower costs and risks by using smart automation and real-time data analysis (Attia et al., 2025).

## 5.7 Gap in Research and Contribution

Even though there is more research being done, there are still some gaps. AI is mostly used in hotel operations, not in analyzing feasibility and early-stage investments. BIM is mostly used for design and construction, and it is only used a little bit for financial modelling. Also, AI and BIM don't work well together throughout the hotel development lifecycle. Additionally, there is a lack of studies that concentrate on the hospitality industry in Saudi Arabia, notwithstanding its swift expansion and economic significance. Current research often regards feasibility, design, and operation as distinct processes, resulting in fragmented decision-making and diminished precision in investment analysis.

### Research Contribution and Distinctiveness

This study fills these gaps by suggesting a unified framework that uses AI and BIM throughout the entire process of building a hotel.

The main contributions are:

Lifecycle Integration: Putting together the different parts of a project, like planning, building, and running it.

AI in Feasibility: Using AI to predict demand, make DCF models, and run scenario analyses.

BIM–Finance Integration: Connecting financial modelling to project development based on BIM.

Hospitality Focus: Dealing with the difficulty of investing in hotels (ADR, RevPAR).

Saudi Context: Making the framework fit with Vision 2030 and the growth of the market.

Feedback Loop: Using operational data to make future investment and feasibility decisions better all the time.

Final Thoughts

This research offers a data-driven framework that increases the accuracy of feasibility studies, boosts project efficiency, and helps investors make better decisions about hotel development.

## **6 . Research Methodology :**

### **6.1 Research Design**

This research employs a qualitative research design to investigate the amalgamation of Artificial Intelligence (AI) and Building Information Modelling (BIM) in hotel development projects within Saudi Arabia. The qualitative approach is suitable because the study emphasises the comprehension of concepts, relationships, and processes instead of evaluating numerical hypotheses. The research is predominantly conceptual and theoretical, seeking to establish a cohesive framework that improves feasibility analysis and investment decision-making. It relies on analytical reasoning, industry standards, and what is already

known instead of large amounts of quantitative data. This design enables the research to investigate the integration of AI and BIM throughout the project lifecycle and its potential to enhance project outcomes within the hospitality sector.

## 6.2 Research Approach :

The study employs a deductive research methodology. It starts with what we already know about AI, BIM, and real estate development, and then builds a new conceptual framework on top of that. There are three main parts to the research process:

### Analysis of Literature:

A thorough examination of scholarly and industrial literature is performed to pinpoint essential concepts, technological implementations, and research deficiencies pertaining to AI, BIM, and hotel development.

### Making a framework:

A conceptual framework is created to bring together AI and BIM throughout the lifecycle of hotel development projects, based on what the literature says.

### Analytical Use:

The proposed framework is conceptually applied to real-world case studies to illustrate its practicality and relevance.

## 6.3 Research Strategy :

The research strategy employs a conceptual and analytical methodology, integrating theoretical investigation with practical implementation.

This method works best for research that wants to come up with new ideas instead of just testing old ones with numbers. It lets you look at how technologies, processes, and investment choices are related in a flexible way.

The study concentrates on three primary elements:

Understanding how AI makes market analysis and feasibility studies better

Looking at how BIM makes it easier to coordinate designs and build things faster

Looking into how combining AI and BIM can make investments work better overall

#### 6.4 Data Collection Methods:

This study utilises secondary data sources instead of primary data collection.

The sources of data are:

Research papers that have been peer-reviewed and academic journals

Reports from the industry, like those from McKinsey, Deloitte, and PwC

Magazines and newspapers about real estate and hospitality

Reports on case studies and professional projects

Secondary data is suitable for this study as it offers access to an extensive array of validated information concerning AI, BIM, and hotel development. It also lets the researcher get a full picture of global and regional trends without having to spend a lot of time in the field.

#### 6.5 Data Analysis Method:

The study employs a qualitative analytical methodology to interpret and integrate the gathered data.

The process of analysis includes:

Recognizing essential themes and patterns in the literature

A comparison of traditional and modern methods for feasibility analysis

Assessing the advantages and drawbacks of AI and BIM applications

Creating logical connections between AI-driven analysis and BIM-based project delivery

The goal of the analysis is to show how AI and BIM can work together to make the development process more integrated, efficient, and based on data.

#### 6.6 Case Study Approach :

A comparative case study approach is employed to augment the practical applicability of the research. This method tests the suggested AI-BIM framework in the Saudi hospitality sector under a variety of project conditions.

Two case studies have been chosen:

Case Study 1: The Ibis and Adagio Hotel in Jeddah

Organized project

Standards for international operators

Design that is the same for everyone

Good for BIM and AI use

Case Study 2: Hotel Development Project in Al Khobar

Design not clear at first

Weak alignment of feasibility

Limited use of BIM

More likely to have changes and cost overruns

Objective for Comparison

Look at the differences between structured and unstructured development.

## **7. Limitations of the Research**

This research has several limitations:

- It relies on secondary data rather than primary field data
- The framework is conceptually applied rather than empirically tested
- The case studies are limited to selected projects in Saudi Arabia

Despite these limitations, the research provides valuable insights and a strong foundation for future empirical studies.

## **8 . Research Structure :**

Chapter 1: Introduction

Chapter 2: Literature Review

Chapter 3: Research Methodology

Chapter 4: Proposed AI–BIM Framework

Chapter 5: Case Study and Discussion

Chapter 6: Conclusion and Recommendations

## 9 . Initial Reference List :

- [1] Henriques, H. (2024) *AI in hotel demand forecasting*. Tourism & Management Studies.
- [2] Ampountolas, A. (2026) *AI forecasting models in hospitality*. Tourism Management.
- [3] Deloitte (2025) *AI in real estate investment and feasibility analysis*.
- [4] HotelTechReport (2025) *AI in hotel revenue management*.
- [5] Tasneem, S. (2025) *BIM coordination in hotel development*. SSRN.
- [6] Boston Consulting Group (BCG) (2026) *AI and BIM integration in real estate*.
- [7] Alsulami, A.G. (2026) *Machine learning for tourism prediction in Saudi Arabia*. Nature Scientific Reports.
- [8] Alzahrani, A. (2025) *AI applications in Saudi tourism sector*. MDPI.
- [9] PwC (2025) *AI in hospitality and tourism*.
- [10] Arab News (2025) *AI adoption in Saudi tourism and hospitality sector*.
- [11] Alhelal, A. (2025) *AI and competitive advantage in hospitality*, Sustainability Journal.