



## Journey with an Engineer

### Dr. Adnan Al Tamimi:

- I developed an interest in civil engineering because of my father's work in the field.
- I joined the BSE after my BS graduation from the UOB in 1991.

### Profile

**Strategic projects in the Kingdom of Bahrain... Examples include roads, sewerage, and construction projects.**



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## Speech of the Editor-in-Chief

DR. Isa Salman Qamber

The Bahrain Society of Engineers has a clear vision for the advancement of engineers and their participation in all activities in various engineering fields. We also upgrade the various activities in keeping with the latest requirements.

The Al-Mohamdis magazine helps impart all knowledge and information by exchanging thoughts and this elevates the realization of their ambition and aspirations by going back to many engineering topics.

In this issue, we stress that the engineer must have the ability to anticipate the future by developing a set of possibilities that can be achieved and studied to reach the desired goal. It was because of that we decided to interview Dr. Adnan Al-Tamimi due to his great experience in the field of engineering in terms of both the field and the academics who prepare future engineers.

Currently, Dr. Adnan holds the position of Vice President for Administrative and Financial Affairs at University of Technology Bahrain. He is a certified consultant in the field of civil engineering. Through the interview, much of his expertise was detailed in the issue through his practical life.

We also discuss important projects undertaken by the Ministry of Works in Bahrain to build a strong infrastructure. We also discuss the strategic importance of these projects, including those that are being implemented or are in the planning stage.

Developments of roads and highways contribute to the smooth flow of traffic and these are all important projects. There are also sanitation projects, and among these is an improvement and rehabilitation project of the Tubli Bay and Ma'ameer Canal. The project of the Sheikh Abdullah bin Khalid College

for Islamic Studies is one of the projects included in the Ministry's plans, which have begun to be implemented.

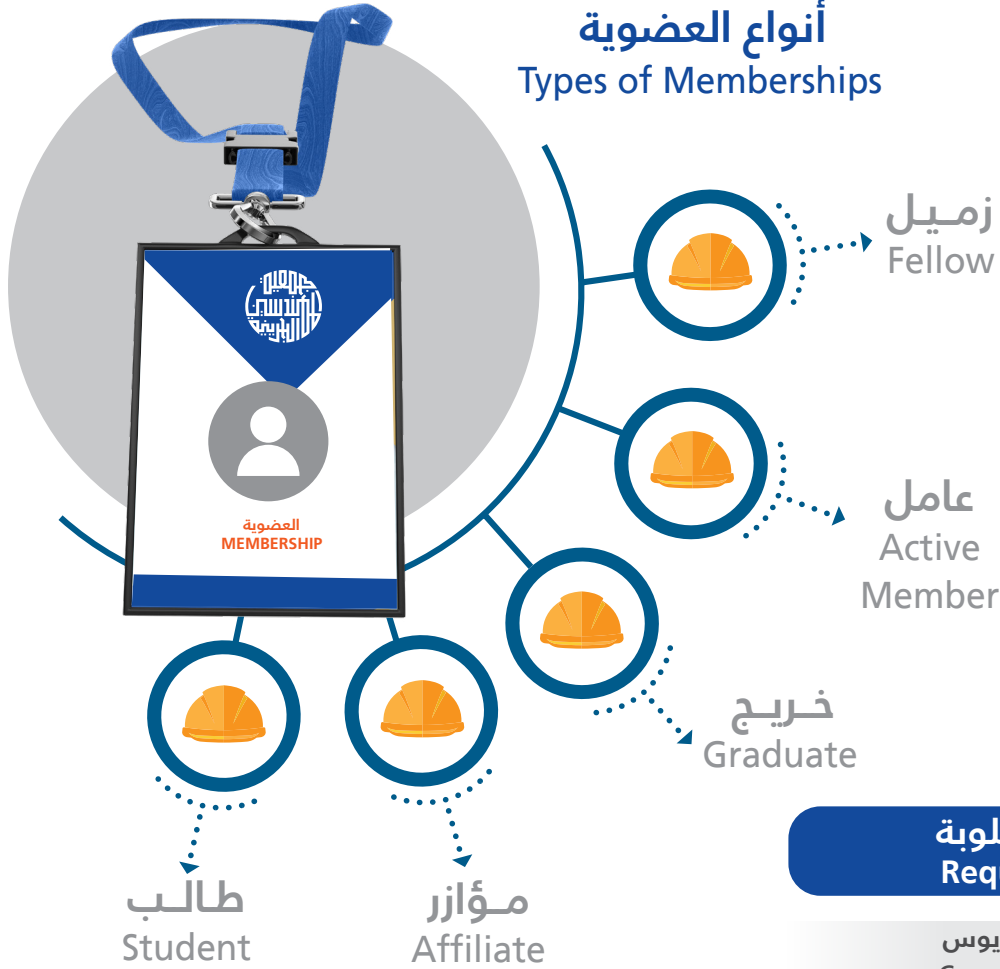
As it is well known, one of the tasks of the Bahrain Society of Engineers is to publish engineering knowledge that is of interest to the society in which we live. One of these is the great challenges in the field of chemical engineering, where researchers address this issue.

One of the engineers has an article discussing the applications of artificial intelligence in the real estate sector. The transport and logistics sector, which is one of the main factors in economic growth, has also been discussed. The researcher touched on statistics related to the logistics services market in the Gulf Cooperation Council countries. One researcher has included Building Information Modelling, which is a technology and process that people apply through available resources, and includes discussions of several aspects related to technology, process, people, and resources. Another researcher, in his article, discusses "Are People Willing to Buy Genetically Modified Foods?", followed by an article that discusses the meaning of academia which can approach industry.

Finally, the upcoming engineers have not been ignored or forgotten and we have discussed on projects they have worked on for their graduation. These include projects on renewable energy such as wind and solar panels.

One of them designed a virtual network laboratory at the University of Bahrain. Another designed a parallel parking vehicle while yet another one had a project that discusses the variable frequency control of the induction motor

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# A Journey with an Engineer

## Dr. Adnan Al Tamimi

- I developed an interest in civil engineering because of my father's work in the field
- I joined the BSE after my BS graduation from the UOB in 1991
- BSE plays a major role in the development of the engineering sector in Bahrain



### Interviewed and prepared for publishing by: Husain Ismail

Veteran civil engineer Dr. Adnan Al-Tamimi has over 30 years' experience in the field. He holds a Ph.D. in Civil Engineering from the University of Nottingham, UK and is currently the Vice President for Administration and Financial Affairs at Bahrain University of Technology (UTB).

Due to his passion in the field and his wealth of knowledge, Dr. Al-Tamimi is a certified consultant in civil engineering and an arbitration and engineering expert in the Ministry of Justice and Islamic Affairs and at the GCC Commercial Arbitration Centre.

During his career, Dr. Al-Tamimi has held several top positions such as Dean of Student Affairs and Head of the Department of Civil Engineering and Architecture at the University of Bahrain. He has also worked as a field engineer in the Ministry of Housing. His research has been featured in leading scientific journals and his contributions in the field of civil engineering have been widely recognized.

Dr. Al-Tamimi served as the Head of the GCC Emergency Management Center (GCC EMC) at the GCC General Secretariat, Kuwait until the end of 2017

### At the outset, readers of the "Al-Mohandis" magazine would like to know about the beginnings of Dr. Adnan Al-Tamimi, including your childhood and educational background?

I was born in Bahrain on February 15, 1964 and grew up in Muharraq. My education began at

Omar bin Abdul Aziz Boys Primary School, also known as "Al-Dowi School," where I spent three years until the third grade.

Our family home was near Al Qaisariyah Market in Muharraq. The house is no longer in our possession but it still is in the same area.



#### Dr. Adnan Al-Tamimi in Sakhir, 1983

Later, we moved to Gudaibiya Block 338, where I continued my primary education at Gudaibiya School until intermediate. Later, I spent a year at Manama Boys Secondary School before finishing my high school at Sheikh Abdul Aziz School in Adliya.

My childhood, like that of many of my peers, was filled with energy and activity. We spent much of our time playing football after school, where I was the goalkeeper. Despite our love for football, we also took part in many popular games such as Dawamah, "The Whirlpool," "Teelah," "Celalengo," "Dehroi," and "Sageer," especially during the Holy Month of Ramadan. Our lives were full of fun, entertaining games and activities that helped renew our energy and vitality.

#### What motivated you to choose, study and specialize in engineering?

My father worked at the Laboratory Department of the Bahrain Petroleum Company (BAPCO) in the 1950s. Later he was sponsored to study in the United Kingdom. In the 70s, he retired and set up a contracting company. Being exposed to this line of work since my childhood, I became interested in civil engineering, which is closely related to the nature of my father's business.

#### Where did you study engineering and what field did you specialize in?

I began my studies at Gulf Polytechnic and obtained a diploma in civil engineering in 1984. The same year, I was employed by the Ministry of Housing in the Department of Technical Affairs where I was responsible for overseeing maintenance of apartments in various regions, including Hidd, Busaiteen, Muharraq, Sanabis and Um Al Hassam.



Dr. Adnan Al Tamimi during his secondary school years

Dr. Adnan Al Tamimi at the UOB's Isa Town campus

I was later sponsored by the Ministry of Housing to pursue a Bachelor's degree at the University of Bahrain. The Gulf Polytechnic College had been merged with the University College of Bahrain, and I graduated with a Bachelor's degree in civil engineering in 1991. Upon returning to my work at the Ministry of Housing, I supervised the implementation of several housing projects in Hamad Town, in addition to overseeing the housing buildings located on Estiqlal Avenue in Isa Town.

While working at the Ministry of Housing, I continued my education and earned a Master's degree in civil engineering, specifically in Structural Engineering from the University of Bahrain in 1995. The same year, I was approached by professors and asked to work as a teaching assistant at the university. I decided to take up the offer and started working as a teaching assistant. Two years later, the

university sponsored me to pursue a Ph.D. in construction at the University of Nottingham.

### **How were you involved in and connected to the engineering field during your university studies and after graduation?**

During my university years, I was very active. At that time, there was no student association representing the engineering students. So, we organized student elections at the College of Engineering. During that election, six of my colleagues and I won and within our agreement, I was appointed as the President of the Student Engineering Association at the College of Engineering. Elections were held every academic year and I continued as president of the association for five years. During those years, we often won in most of the competitions. The time I received the Student of the Year Award was unforgettable.



Dr. Adnan Al Tamimi in a group photo for the College of Engineering Society in 1994

the first to hold organized elections before the launch of public parliamentary and municipal elections in 2002.

During that period, I also continued to teach Structural Engineering subjects. In 2005, I returned to teaching in the Department of Civil Engineering, Architecture, and Interior Design. In 2009, I was appointed as Head of the Department of Civil Engineering, Architecture, and Interior Design, and I held that position until 2011. I consider this period of my life as one that was rich in achievements, works, and activities.

From 2013 until the end of 2017, I was seconded to the Gulf Cooperation Council as the Head of its Centre for Emergency Management at the General Secretariat of the Arab States of the

### **What were your responsibilities and accomplishments while working in the engineering sector in the country?**

As I said earlier, I worked at the Ministry of Housing and in 2001, became the Director of the Student Development Department at the University of Bahrain.

After earning my Ph.D. from the University of Nottingham, I returned to the University of Bahrain where I was chosen to oversee student council elections, due to my experience working with students. I was also appointed to lead a new department called the "Student Development Department" which included the Rovers Activities Section and Exemptions Division, in addition to overseeing the student council and organizing elections. At that time, there were no public elections in Bahrain and we were among



Adnan Al Tamimi in London, UK, 1978

Gulf as Assistant Secretary General. During this period, the Centre was established and a five-year strategy and plan was laid out in addition to a training programme between GCC countries. Coordination between the ministries of the six countries was also established. Among the major projects carried out by the Centre was identifying regional risks that GCC countries may face, the mechanisms for confrontation and recovery and the necessary exercises to face such risks.

At the international level, memorandums of understanding and agreements were signed with several international and global entities such as the International Atomic and Radiological Energy Agency, European Union, United Kingdom and other centres in the United States, Australia, Japan and China. This experience added a lot for me in the strategic, political and diplomatic fields, and even in my capacity as an engineer, which contributed to the success of this experience

## Can you tell us about your involvement in volunteer work? Have you participated in volunteer activities in both social and engineering fields?

Volunteer work has been a passion of mine since I joined the University of Bahrain. I spent a significant amount of time serving student associations, which greatly impacted the implementation of many works and activities both inside and outside the university.

One of my contributions is my participation in drafting the GCC Youth Strategy in terms of scientific aspect, in addition to contributing to the Youth Strategy for Bahrain in terms of environmental aspect.

My tenure as the President of the Student Development Department was one of the best periods I spent at the University of Bahrain, particularly in the Rovers Activities Section, where the number of volunteers increased to nearly 300. They were performing many volunteer tasks and I was deeply interested in this category of volunteers who were serving their country with dedication and sincerity.

When I became the Dean of Student Affairs, I was eager to restructure the deanship by adding the "Disability" Division, and we carried out great work through this division. We were able to reduce the burden on students with disabilities within the university and made it easier for them to study and move forward.



Dr. Adnan Al-Tamimi, Muhammad Radhi and Muhammad Abdul Khaleq at the College of Engineering Association

Although in 2011, I stopped being the head of the department and became the Dean of Student Affairs at the University of Bahrain, my attachment to volunteer work and my previous activity in this field motivated me to work with all my energy in leading the Deanship of Student Affairs until 2013. This period was full of achievements and new projects, and perhaps it was one of the best periods for the Deanship of Student Affairs in the history of the University of Bahrain as witnessed by many students and officials.

Some called that period “the golden period”, which was full of volunteer activities that were targeted to all students at the university. We progressed to the extent that with the increase in the volume of activities, no day passed without organizing at least one event for the student council, clubs, and associations. Overall, my experience in volunteer work has been a huge part of my life, and I have made a significant impact in both social and engineering spheres.

### **Tell us about your involvement with the Bahrain Society of Engineers and your key contributions on its committees or boards?**

I joined the Bahrain Society of Engineers (BSE) shortly after obtaining my bachelor's degree from the University of Bahrain in 1991, and became a life member three years later. In 1996, I was responsible for overseeing the organization of the Silver Jubilee Exhibition, which was inaugurated by the late Amir Sheikh Isa bin Salman Al Khalifa. I supervised the collection of photos and arranged and printed them for the exhibition.

Through the years, I have been a member of various committees within the society, including the Arbitrators and Experts Committee and Membership Committee. My volunteer work with the BSE has provided me with valuable experience, including attending conferences and exhibitions, participating in committees, and networking with colleagues in



Adnan Al-Tamimi on a visit to Jabal Ad-Dukhan in 1989



my profession. The BSE plays a significant role in the development of the engineering sector in Bahrain and continues to work towards influencing engineering sectors further.

**How do you evaluate the role of the engineering sector in the development and urban renaissance in Bahrain?**

Bahrain has undergone significant development and urban renaissance, and the engineering sector has played a crucial role in this growth. This is due to the presence of highly-skilled engineers in Bahrain, both male and female, who are capable of working in various engineering fields.

In my opinion, Bahraini engineers are known for

Dr. Adnan Al-Tamimi attends an event as the Dean of Student Affairs at the University of Bahrain



Dr. Adnan Al-Tamimi participated in an event to clean the sewer at Ain Adhari in the presence of its then President, Dr. Ibrahim Jamal Al-Hashemi

their ability to use the latest technology and specialized scientific methods to create unique and successful solutions for building projects. They are also known for their creativity and determination in infusing traditional Bahraini spirit in their work. Engineers in Bahrain strive to excel and provide exceptional work.

### **What about your personal life. Has your engineering background influenced the educational choices of your family?**

Since my wife and I are engineers, it is not surprising at all that we encouraged our children to follow in our footsteps. However, as it turns out, our children had different career aspirations. My eldest son, Ali, tried his hand at civil engineering, but ultimately decided to pursue a career in law. My daughter Latifa

studied architecture at the University of Bahrain, worked as a teaching assistant and is currently pursuing a master's degree in architecture at the University of Edinburgh. My son Abdulrahman studied environmental science at the University of Colorado Boulder in the United States, and my youngest daughter is currently in high school and is still figuring out her career path. Though we may have failed in our attempts to create a family of engineers, we are proud of their individual choices and accomplishments.

### **What is your motto in life and why?**

My philosophy in life is rooted in the saying "Do something good and throw it in the sea". I have always attempted to do good by being attentive to solving the problems of teachers and students and assisting them in overcoming any obstacles

they may face, regardless of whether or not I have a direct connection to them. I am very interested in listening to people's problems to help them in any way possible. I firmly believe that showing love and helping others without expectation or gain is one of the most effective ways to attain true happiness and inner peace.

**What was your experience running for the 2022 parliamentary elections like, and what did you learn from it?**

Running for the parliamentary election in 2022

was a valuable experience for me. Even though I did not win a seat, I had the opportunity to gain knowledge and understanding of a new field. I am grateful for the support and solidarity I received from the community and the people who rallied around me. Though I did not win, the trust they placed in me is an honour. I extend my gratitude to those who voted for me and wish the new parliament success in their current session. My hope is that they will work towards the betterment of all Bahrainis.



Dr. Adnan Al-Tamimi as a member of the BSE election committee in 2018

## What advice would you give to young engineers or those considering studying engineering?

My advice to young engineers or those considering studying engineering is to be passionate about the field. Make sure it is something you truly enjoy and are interested in. When choosing a specialization, pick one that aligns with your interests and tendencies. Research the different fields of work available in the Bahrain labour market.

Once you start studying, put in all your efforts, be patient and persistent. Remember, studying engineering is not just about obtaining a degree, it's a lifestyle. Keep up with the latest methods and advancements in the field to stay competitive. With hard work, dedication and perseverance, you can achieve great success and make a real impact in the engineering world.



Dr. Adnan Al-Tamimi honoured by current Minister of Foreign Affairs Dr. Abdullatif Al-Zayani and the then Secretary-General of the Cooperation Council for the Arab Gulf States

# Strategic projects in the Kingdom of Bahrain

Examples include roads, sewerage, and construction projects

We look forward to reading about the numerous ongoing and upcoming strategic projects being planned in the Kingdom of Bahrain in the Al Mohandis Magazine.

In later editions, we will continue with more examples of strategic projects by learning about models in the domains of construction, sewage, and highways.

## Al-Fateh Highway Development Project

### General project objectives:

The Ministry of Works is working to complete several significant projects to improve Bahrain's north-south and west-east ring highways, which will result in safe, high-quality roads and a more efficient traffic flow.

Traffic was cleared for those travelling from King Fahad Causeway, passing through the soon-to-be-expanded Shaikh Isa bin Salman Highway, and the intersection of the Bahrain Map, and then through the intersection of Umm Al-Hassam and Mina Salman to reach Al-Fateh Highway, which the ministry is currently developing towards the Bahrain Bay area and the Bahrain Financial Harbour across the northern Manama Bridge.

With the completion of the 20 kilometre project, traffic movement for those coming from the

King Fahad Causeway towards Muharraq or the Gulf of Bahrain area will be free and non-stop.

The Al-Fateh Highway development project supports Bahrain's economic development and attracts investments that revitalise the economic sectors, given that the road connects the intersection of Mina Salman and the northern Manama bridge that connects to the Gulf of Bahrain, as well as other tourist and vital areas whose entrances and exits will be developed as part of the works.

### The project:

The Al-Fateh Highway will soon be home to one of the main lines of the Bahrain Metro, which will be built by the Ministry of Transportation and Communications.



### **Project strategic objective:**

The Al-Fateh Highway expansion project is part of a strategic plan that includes the construction of the Manama Ring Street to enable free, non-stop travel in the capital, Manama, to facilitate movement and alleviate traffic congestion on the road network.

### **Implementation phases:**

Due to the importance of the highway and the abundance of ground services, some of which conflict with the extension and development of the Al-Fateh Highway, which either requires protection or transfer, the Ministry divided the project into two main phases as follows:

#### **Preparatory work phase:**

Since 2018, the Ministry has been working on a series of preliminary works for this project to eliminate as many disputes as possible from the main project work schedule.

The most notable were:

Removing the wall of Gudaibiya Palace to make additional room for ground services, as well as building the tunnel at the intersection of the Gulf Hotel.

The removal works were finished in early 2019

at a total cost of BD 0.65 million. This was funded by the Ministry of Finance.

- Priority No. 1 is to relocate six 66-kilovolt high-voltage electrical networks along Al-Fateh Highway from its centre to other locations.

- These works began in 2018 and were finished in 2019 at a cost of BD 2 million.

- Priority No. 2 is the conversion of a group of 220 kV and 66 kV high-voltage electrical networks along Al-Fateh Highway from their original locations within the streets to more modern ones outside. This project will cost BD 2.75 million and be funded by the Saudi Fund for Development.

- As of August 2020, low-voltage cables are being used to transform low-voltage electrical networks.

- Extending the Juffair Al-Ghuraifa sewage line will increase capacity and eliminate a conflict with road construction for the main project. It will replace the current sewage line on Al-Fateh Highway located at the intersection of Awal Road and Bani Utbah Road (the intersection of the Gulf Hotel and Al-Fateh Mosque). This BD 2.283 million project was funded by the Saudi Fund for Development. It started in March 2020 and was completed in January 2022.

## Main business phase of the project:

Implemented with a 36-month work programme that includes:

- Construction of the ground tunnel at the Gulf Hotel junction, the one-way bridge at the intersection of Sheikh Duaij Highway and the flyover for the reverse turn close to the Al-Fateh Corniche entrance.
- Expansion of Al-Fateh Highway from three to four lanes, paving its roads with the layers in use in Bahrain, up to the asphalt layer, constructing sidewalks, and installing lighting poles, traffic lights, and the requisite traffic signs.
- Excavation and paving works, as well as ground piling for foundations, structural bridge constructions, and the re-establishment of a rainfall drainage network with a pumping station.

### Landscaping and beautification work.

- The project will also entail safeguarding

existing ground services or relocating them, as well as establishing ground channels for future usage.

It is important to note that while the project's main works cost BD 29,662,314,735, the total cost of the project's works - which includes preliminary work, the project's main work, and the hiring of consultants to oversee these works - was BD 39,856,756. Of that amount, BD 34,875,000 were generously provided by the Saudi Fund for Development and BD 4,981,756 were provided by the Government of Bahrain.

## Implementation difficulties:

- Traffic diversions: The project's strategic and significant location as a main artery connecting King Faisal Highway in the north to Shaikh Isa bin Salman Highway in the south and having main outlets to significant areas will require completion of the project in tandem with the flow of traffic and ensuring the least impact.

It takes a lot of time, effort, and cooperation with many authorities to prepare and approve traffic diversion plans that are in keeping with the project's nature and the needs of the major parties involved with its scope.

- Ground services: Several major and significant ground services must be handled with care and attention, either because of their exceptional significance or hazard or because of the high need for their protection or transfer in the event of a conflict with other services.

- Architectural requirements: Special architectural requirements for project implementation concerning the surrounding area for each of the tunnel walls and bridges that take time to plan and coordinate with the relevant authorities to secure the necessary approvals.

- Limited work area: The work crew is forced





to adapt to working in tight spaces due to the existence of buildings, ground services, or even road traffic diversions.

- Working in the evening hours or during the night: The challenge of working in the vicinity of machinery and heavy equipment, or even other activity that creates noise and may cause annoyance to nearby residents.
- Traffic accidents: Some drivers' irresponsible behaviour, which may result in accidents with other cars or pedestrians, or project work with a limited range of traffic on the road owing to closure plans and temporary traffic diversions to work on the project.

### **The role of the Bahraini engineer in the implementation of the project:**

Bahraini engineers participate in several projects and is an important member of a team that includes the ministry, the contractor, the project consultant, and other project-related support organisations.

Since the beginning of the project, Bahraini engineers have left their mark on the planning and design phase to achieve the best design per the project's requirements. During the implementation phase, they take on additional roles and perform a variety of tasks, the most crucial of which are:

- Managing the progress of the project and its works within the scope and basic work plan with requirements and high quality according to international standards.
- Manage communication between the various parties, especially the agencies and ministries involved in the project, and coordinate among them to resolve conflicts in ground services, protect them from damage, and work to provide future requirements.
- The financial management of the project and ensuring the implementation of the project within the specified financial scope, preparing financial flows and reviewing their disbursement.

# Shaikh Jaber Al-Ahmad Al-Sabah Highway Development Project

The Shaikh Jaber Al-Ahmad Al-Sabah Highway Development Project aims to construct the highway and expand it to four lanes in each direction, while developing the current intersections on it and establishing intersections in a new multi-level street to increase the capacity of the highway and release it from traffic congestion as well as raising the level of traffic safety on the highway, especially due to the increase in the proportion of heavy trucks on it.

## Project strategic objective:

This road is regarded as the primary conduit for traffic in Bahrain's eastern region.

Additionally, it plays a significant role in the industrial revolution and the development of the global transportation system.

From the Umm Al Hassam intersection in the north via Sitra Island and onto the Nuwaidrat intersection in the south, the development project stretches roughly nine kilometres.

## Implementation phases:

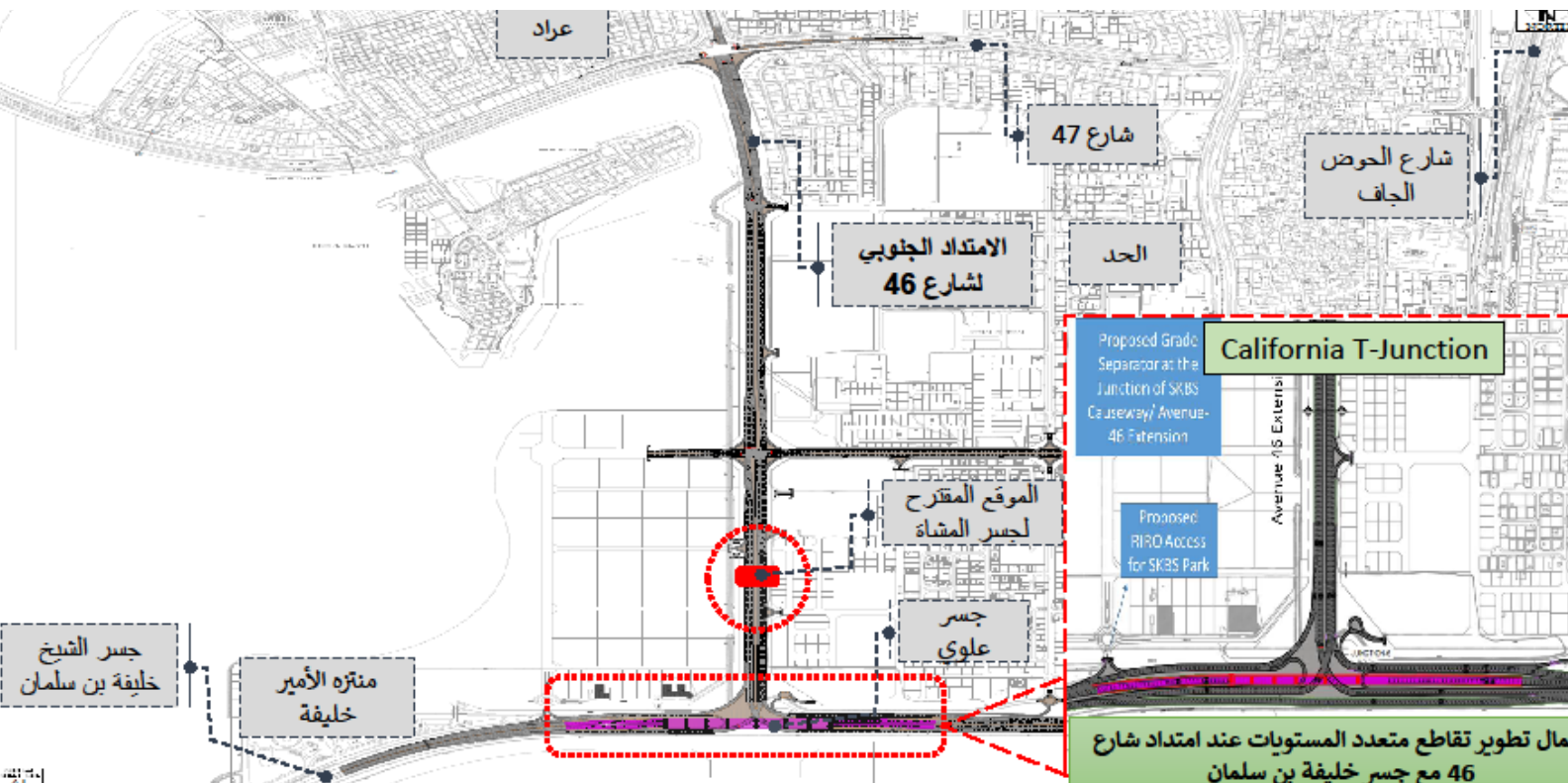
**Preparatory works:** These include the transfer and protection of service lines that conflict with the project works.

**First package:** Widening the highway in both directions from the Umm Al Hassam intersection to the Al Ma'ameer intersection and developing the Salman bin Ahmed Al Fateh intersection with the Bapco reservoirs intersection.

**Second package:** It includes the development of the intersections of Nabih Saleh and Street 1 and the intersection of Ma'ameer.

## Bahraini engineer's role in project implementation:

Bahraini engineers are part of the work team supervising the preparation of studies and designs.



# East Hidd City outlets development project

## Developing East Hidd City outlets - the southern extension of Street 46 in Arad:

### Project objectives:

This highway is a parallel route and an alternative to the Dry Dock Highway, and it will help to relieve traffic congestion on the Dry Dock Highway while also enhancing access to West Hidd and Arad.

### Project strategic objective:

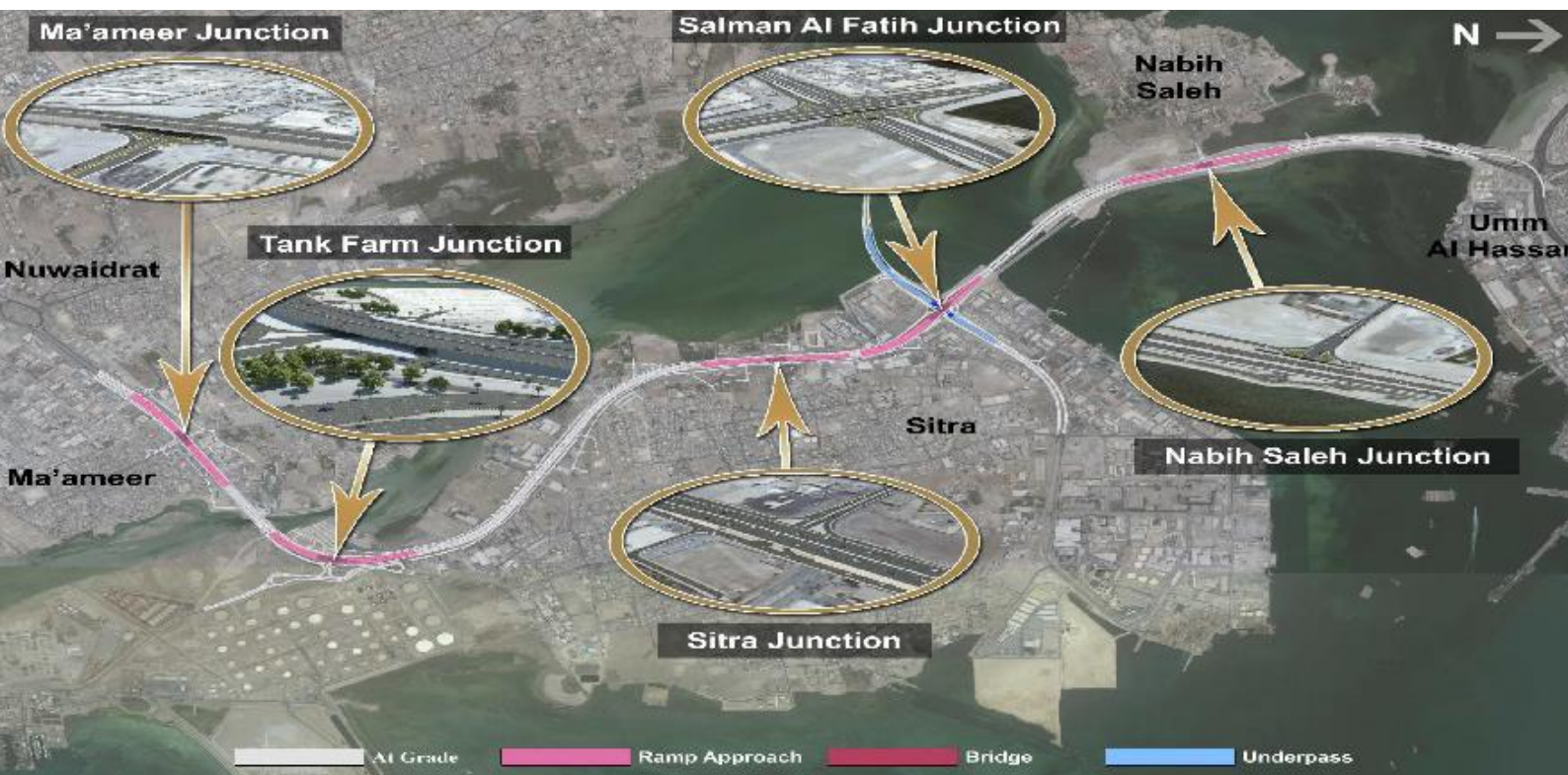
It will contribute to alleviating traffic congestion on the Dry Dock Highway, thus facilitating access to the East Hidd Housing Project and improving access to West Hidd and Arad.

### Implementation phases:

- Burial and marine reclamation works
- Street development works
- Construction of the upper flyover on the Shaikh Khalifa Bin Salman Bridge Highway.

### Bahraini engineer's role in project implementation:

The Bahraini engineer is part of the work team supervising the preparation of studies and designs.



# Environmental improvement project in the Gulf of Tubli

## Project objectives:

The Ma'ameer Canal will help increase water movement and renew it in the gulf every 74 hours instead of the current situation, in which water is renewed every 110 hours, according to a group of studies that have been carried out. The Ministry of Environment considers this percentage to be very good. The project to improve the environmental situation in the Gulf of Tubli seeks to rehabilitate this gulf by developing and enhancing the water flow in it.

## Project strategic objective:

Improving the environmental status and water quality of the Gulf of Tubli and Ma'ameer Canal.

## Implementation phases:

The project work is divided as follows:

1. Expansion and development of the water crossing under Shaikh Jaber Al-Sabah Highway (Al-Ma'ameer crossing): The project's construction tasks include lengthening the existing canal by 24 metres from north to south, making the entire length 100 metres, as well as widening the waterway by installing parallel

pipes with a length of 120 metres to make the stream's overall width 77 metres.

There are 12 tubes in all, and each one is 1.2 metres in diameter.

2. Development of the sea bridge of the Ma'ameer Canal (Alba Bridge): The Ma'ameer Canal Sea Bridge (Alba Bridge) will be enlarged by 120 metres as part of this project to widen the strait under the road and turn on the new system for the circulation of freshwater rejuvenation in the Gulf.

## Expansion and deepening of the Maameer Canal:

According to digital studies, the project includes expanding the current canal located in the Gulf's south from 30 metres to 180 metres, six times the current width, as well as deepening the canal, which is 750 metres long, to reach a depth of two metres, which will help to increase the speed of the course and movement of water through this strait that connects the Gulf of Tubli from the south to the sea, which is considered a major outlet.



## Implementation difficulties:

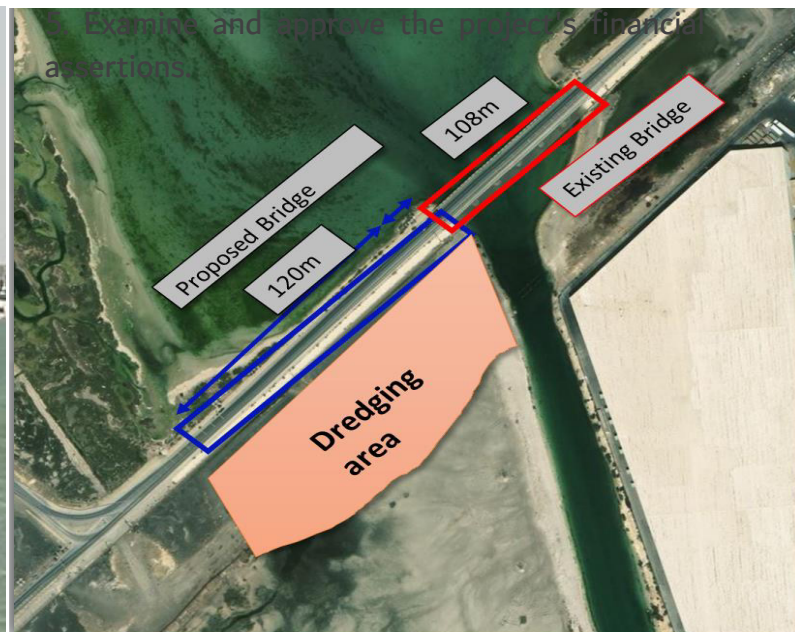
1. Some services contradict the work plan, necessitating the identification of workable ways to resolve the conflict.
2. The accessibility of the necessary funding sources to finish the added task.
3. Upholding the necessary completion rate during the duration of the summertime prohibition.
4. A delay in getting some of the licences and permits needed to launch the firm.

## Bahraini engineer's role in project implementation:

1. Making sure that the job is being done per the authorised requirements and standards to achieve the desired quality.
2. Ensuring that the project is being carried out per the agreed programme to ensure that it is finished on schedule.
3. Working with people involved in government and other service sectors to secure the necessary clearances to prevent delays in the activities associated with them.
4. Analyse the project blueprints.



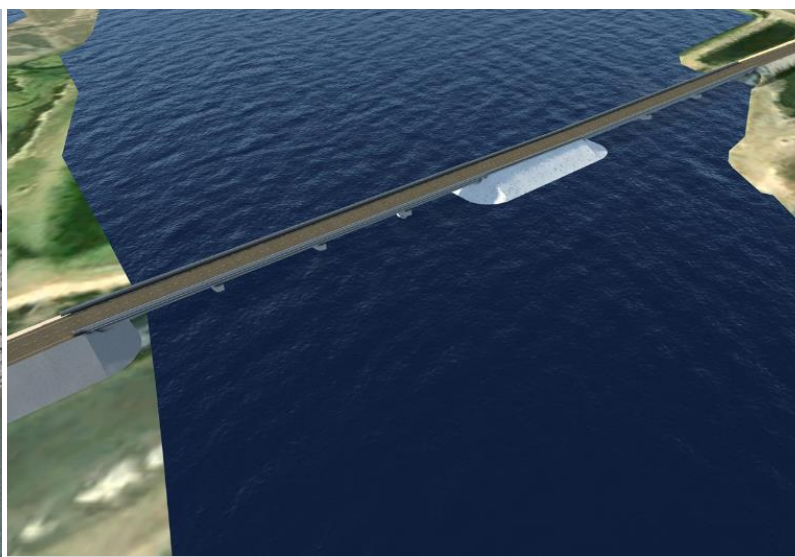
New & old bridges from the north.



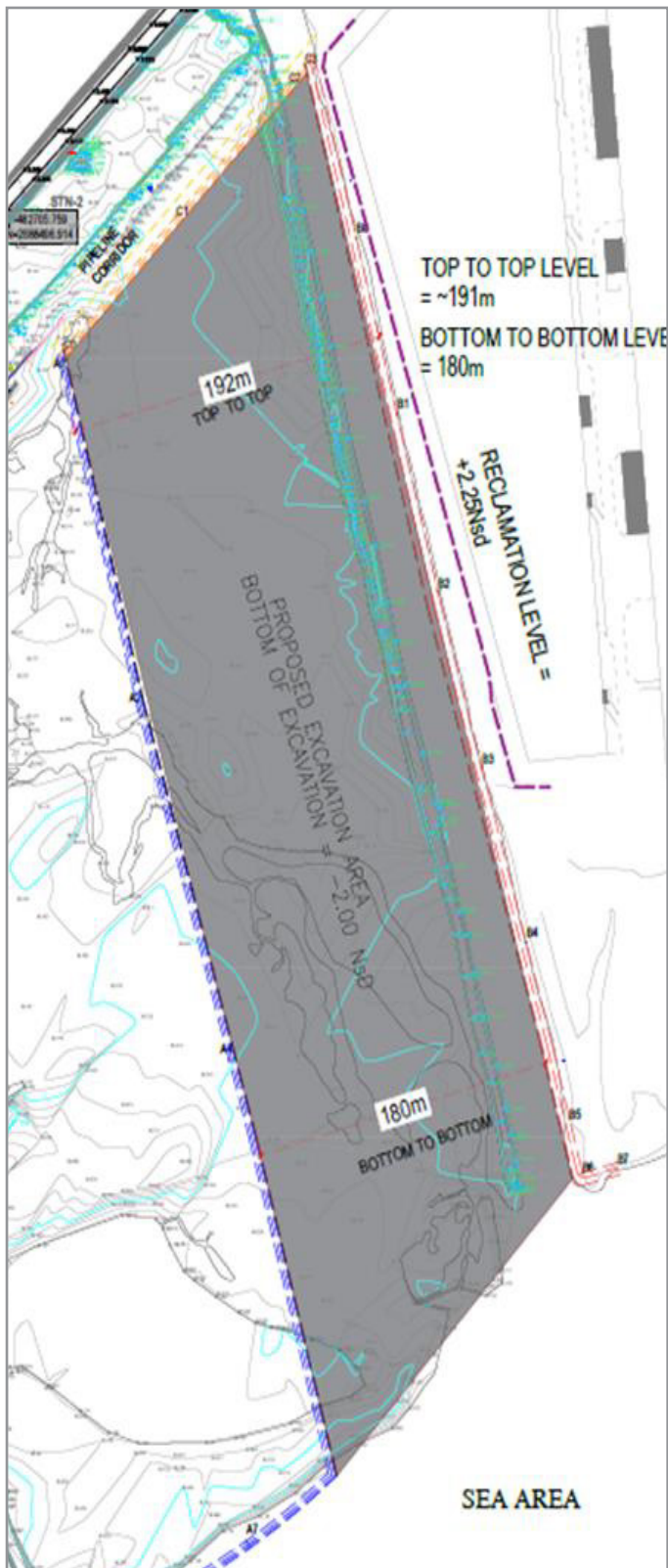
Development of Ma'ameer Canal's bridge.



New & old bridges from the south.



Development of Ma'ameer Canal's bridge.



مشروع توسعة قناة المعامير جنوب خليج توبلي

## Project objectives:

Designing and developing a 300-student capacity integrated higher education institution with a focus on Islamic studies that promote the improvement of the Kingdom's educational system and the expansion of numerous academic areas.

## Project strategic objective:

In accordance with the royal decree issued by His Majesty King Hamad bin Isa Al Khalifa, the King of Bahrain, may Allah protect him, a higher education institution, Abdullah bin Khalid College for Islamic Studies, was established in honour of his contributions to serving Islam and Muslims and promoting moderation.

## Implementation difficulties:

- Technical and engineering challenges related to the redevelopment of the project building.
- Building evacuation.

## Bahraini engineer's role in project

### implementation:

- The project was designed by an integrated team of Bahraini engineers with specialization and experience in all fields of engineering (architectural, structural, mechanical, and electrical).
- Construction work is supervised by a specialized Bahraini engineering team.





# AI Applications in the Real Estate Sector

Eng. Ebrahim Ali Ebrahim AlBurshaid

## I. Introduction

Decision-making in the real estate industry has traditionally been a highly subjective and manual process involving the analysis of large data sets, market research, and intuition (Conway, 2018). However, with the advent of big data and advancements in artificial intelligence and machine learning technologies, firms in the industry are starting to incorporate these tools into their decision-making processes. By leveraging big data and utilizing AI for valuation analytics and predictions, companies can gain deeper insights into the market and make more informed investment decisions. While adoption in real estate is still in its early stages, it's clear that AI and ML technologies have the potential to impact the way we do business in the industry significantly. The integration of AI in real estate has the potential to streamline decision-making and improve efficiency. However, careful implementation is necessary to address ethical considerations and reliance on technology.

The real estate industry is one of the most critical sectors of the economy, with things constantly changing. One of the most significant changes nowadays is the emergence of artificial intelligence (AI). Artificial intelligence (AI) refers to systems or devices that simulate human intelligence to perform tasks and can improve themselves based on the data and information they are provided with (Conway, 2018). This game-changing technology can help improve industry efficiency and contribute to its growth.

Artificial intelligence technology has affected practically every aspect of the real estate industry in recent years. It can help real estate investors to identify "profitable investment" opportunities through market analysis and data interpretation. Additionally, AI-powered chatbots can provide customer support

and answer questions related to real estate transactions. The real estate sector has always been slow to adopt the latest technology, but it looks different regarding AI applications. For example, AI is changing the way people search for homes. According to some observers, the global real estate market is expected to grow exponentially because AI can help speed it up.

Decision-making in real estate can be a complicated balancing act, and accurate real estate valuation is a crucial component. Traditional valuation methods, such as those practiced by appraisers, often involve extensive on-site analysis and comparison with comparable properties. However, with big data and advanced technologies like artificial intelligence (AI), new approaches such as Automated Valuation Models (AVMs) have emerged to derive valuations

using available data quickly. While these tools are not yet widely used, they have the potential to revolutionize the way we approach real estate decisions. However, it is essential to remember that AI and data analytics can only supplement - not replace - the human aspect of decision-making in real estate valuation.

## II. Business Motivation and Drivers

The real estate sector has always been slow to adopt the latest technology, but it looks different regarding AI applications. Using AI in the real estate market can help make more accurate predictions and more intelligent decisions. By utilizing advanced technologies, real estate practitioners can more effectively match benefits with preferences in the decision-making process. Accordingly, the global real estate market is expected to grow exponentially.

Raising awareness of the potential of artificial intelligence can help the most vulnerable by applying AI in the real estate sector. Business drivers and drivers for AI adoption in real estate can be the need for advanced technology and solutions, including big data and intelligence tools. Moreover, the continued focus on modern technologies, such as the development of VAT payer registration, filing, payments, refunds, and other services, plays a vital role in pushing AI adaptation forward.

Cost saving as a driver is the primary objective of automating any process by reducing time, effort, and cost. The automated appraisal models save the costs and time needed for a visit or inspection visits by the appraiser to value the property.

Significantly reduce the rate of error as a driver exists when a real estate valuer practitioner inspects a property; there is always a possibility of error, even if its percentage decreases with the increase in the practitioner's experience; this

is of course, other than the potential conflict of interest that may make him include incorrect information in his report (for example If the real estate inspection company has a department specialized in home maintenance, the inspection expert may list some defects that do not already exist in the property to push you to use the same company again). But with the databases used by automated valuation models, the error rate in calculating the property's value is significantly reduced, and your chance of getting a realistic valuation of your property increases.

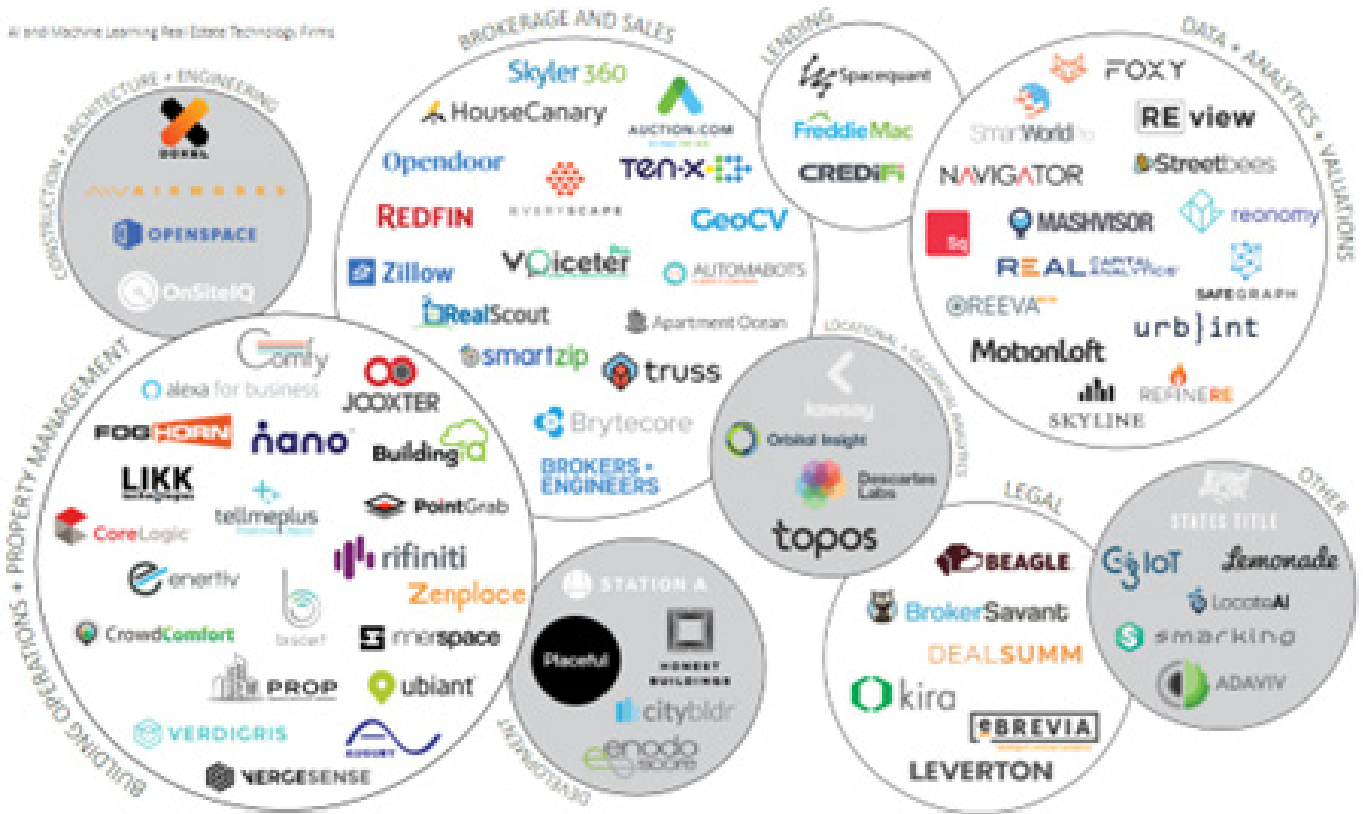
The lack of direct inspection is another feature we just mentioned. While automated evaluation models significantly save time, effort, and money, they do not consider the property's condition and if it needs repairs due to the absence of direct inspection. For this reason, it is possible that the final result calculated by the model will not reflect the current actual value of the property.

Although there are some pitfalls to automated evaluation models, it is expected that future development and modification will help reduce the negative impact of these issues. Technology plays an increasingly important role in many industries, not just the real estate market, which means developers continually work to improve these systems.

Several challenges need to be addressed when using AI in real estate. One of these is ethical considerations, such as the impact of automation on jobs. Another challenge is the increased reliance on technology, which can lead to difficulties if there is a power outage or other technical issues. Additionally, ensuring accurate and unbiased data crucial for AI's effectiveness (Abdulaziz & Zeki, 2020).

## III. AI Applications

In real estate, the application of artificial intelligence and machine learning technologies



Current Applications in Real Estate

Figure 1 AI Real Estate firms' classification by the application type (Conway, 2018)

is becoming increasingly prevalent. From decision-making and property valuation to big data analytics and the internet of things, AI is changing how the real estate industry operates. Real estate practitioners can now gather larger and more diverse sets of data, allowing for more accurate predictions and projections. In addition, AI technology can automate repetitive tasks such as document management and communication, freeing up time for agents to focus on deeper analysis and client interaction. These technological advancements have made AI an invaluable tool for real estate professionals, providing a wealth of actionable opportunities for its application.

There are several ways in which AI can be used in the real estate industry. One way is through predictive analytics, which can identify trends and patterns in data sets. This information can then be used to make more informed decisions about properties, financing, and marketing strategies. For example, if a specific type of property is selling well in a particular neighborhood, AI can be used to predict future

demand and adjust prices accordingly.

AI can also be used to create virtual assistants. Virtual assistants are software programs that can perform tasks on behalf of a user. These tasks can range from simple tasks, such as setting up appointments, to more complex tasks, such as managing property listings. Virtual assistants can be a valuable asset to real estate professionals, as they can help to reduce the amount of time spent on administrative tasks.

Furthermore, AI can be used to improve the accuracy of property valuations. In the past, property valuations were often based on subjective factors such as appraisers' opinions. However, real estate professionals can now obtain more accurate valuations based on objective data using AI-based algorithms. This can be extremely helpful when making decisions about pricing and marketing strategies. Overall, AI is changing the landscape of the real estate industry. By automating tasks, improving accuracy in valuations, and providing insights through predictive analytics, AI offers real estate professionals a wealth of new opportunities.

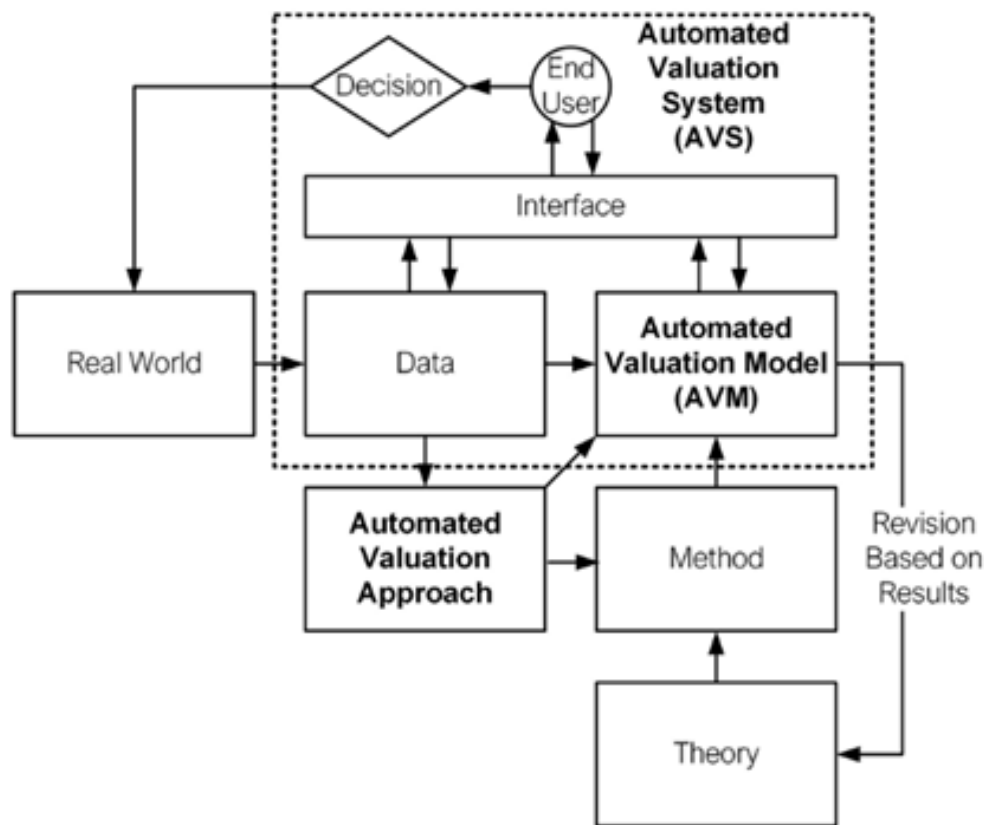


Figure 2 AVM Methodology framework as per (Glumac & des Rosiers, 2020)

Fig. 1 shows a classification of real-estate firms based on their AI applications.

In the world of real estate, valuation methods are constantly evolving. With the advent of big data and AI technologies, automated valuation models (AVMs) are becoming more popular for their streamlined processes and improved predictive abilities. The term “AVM” was first used in 2003, but the concept originated in the early 1970s (Glumac & des Rosiers, 2020). An AVM is “A mathematically based computer software program that market analysts use to estimate market value based on a market analysis of location, market conditions, and real estate characteristics from information that was previously and separately collected.” (STANDARD ON AUTOMATED VALUATION MODELS (AVMS), n.d.). However, despite these advantages, there is still hesitation from real estate owners and investors to fully entrust their decision-making to AVMs. In this industry, human verification can often be crucial in handling unforeseen variables and nuances that may not be accounted for by data or algorithms

alone. It may be some time before AVMs become the dominant valuation method in the real estate market. Until then, a combination of technology and human expertise will likely continue to shape the future of valuation methods. Real estate professionals can make informed decisions that accurately reflect a property’s value by balancing traditional techniques and modern advancements. Fig. 2 shows a methodology framework for utilizing AVM.

#### IV. AI Future Development

The future of artificial intelligence in the real estate sector looks very promising. There are many advantages that artificial intelligence can bring to the industry, such as helping to evaluate real estate and search for the best deals. Additionally, AI can help revolutionize the application development sector by changing how applications are developed. This is a massive advantage for the real estate sector, which has often been slow to adopt new technologies. With the help of artificial intelligence, the real estate

sector can catch up with other industries and become a leader in the latest technologies. Real estate companies can evaluate the prices of their properties compared to other properties in the market and search for the best deals. In addition, artificial intelligence will help companies better understand their customers and needs. This technology will also help companies develop their operations and make better investment decisions.

The application of artificial intelligence in real estate has many benefits. Artificial intelligence is changing app development. This could be a game changer for real estate investment companies as it only takes a few minutes to update the real estate appraisal in one portfolio, resulting in dynamic system optimization. The benefits of applying artificial intelligence in real estate are many, as it can help real estate practitioners by providing them with smart solutions derived from artificial intelligence. New technologies such as AI and AVM will create many jobs.

The future of valuation methods in the real estate market largely depends on the continued development and refinement of automated valuation models (AVMs). As these technologies become more accurate and efficient, they will likely play an increasingly important role in the industry. However, it is also important to remember that human expertise will still be necessary to handle unforeseen variables and complexities that cannot be accounted for by data or algorithms alone.

As artificial intelligence (AI) and machine learning (ML) technologies continue to develop, it will be increasingly essential to sift through their use and validity. We cannot assume that a marketing pitch simply leveraging the hype around these terms is more than just that – we need to ensure that the data scientists and engineers using these technologies are appropriately qualified and that the insights they produce are valuable.

In the real estate industry, AI and ML technologies are used for various purposes, from automating property valuations to analyzing market trends. Let's take a look at some of the most common applications of these technologies in the real estate industry today extracted from (Conway, 2018):

1. Automated valuation models (AVMs) are computer-generated estimates of a property's value based on recent sales prices of similar properties, public records, and other market data. While AVMs have been around for quite some time, they are becoming increasingly accurate as more data is fed into the algorithms.
2. Market analysis: AI and ML can be used to analyze market trends, including pricing trends, rental trends, and demand for specific types of properties. Investors can use this data to make more informed decisions about where to buy or sell the property.
3. Predictive analytics: By analyzing historical data, AI and ML can be used to predict future trends in the real estate market. Investors can use this information to identify potential opportunities and by developers to plan future projects.
4. Lead generation: AI and ML can be used to generate leads for real estate agents by analyzing a variety of data sources, including social media, public records, and demographic data.
5. Contract analysis: AI and ML can be used to analyze real estate contracts, including lease agreements, purchase agreements, and other legal documents. This can help identify errors or omissions and potential risks associated with a particular contract.

These are just a few of the ways that AI and ML are being used in the real estate industry today. As these technologies continue to develop, we can expect to see even more innovative applications emerge.

Company	Real Estate Focus Area	Machine Learning/Artificial Intelligence									
		Data	Analytics	Valuation	Risk	Bus. Process	NLP/NLG	Comp. Vision	3D	Geospatial	IoT
Bowery Residential	Valuation										
CityBldr	Development										
CoStar	Data & Analytics										
CrowdComfort	Bldg Ops/PM										
DataRobot	Other										
Dealpath	Brokerage & Sales										
Doxel	Construction										
Enertiv	Bldg Ops/PM										
Enodo	Development										
Envelope City	Development										
Foxy AI	Data & Analytics										
Honest Buildings	Development										
HqO	Bldg Ops/PM										
Lease Pilot	Brokerage & Sales										
Leverton	Legal/Contracts										
LocateAI	Other										
Motionloft	Data & Analytics										
Mynd	Bldg Ops/PM										
Nano	Bldg Ops/PM										
Navigator CRE	Data & Analytics										
Placeful	Development										
Real Capital Analytics	Data & Analytics										
Reonomy	Data & Analytics										
REview	Data & Analytics										
Ten-X/Auction.com	Brokerage & Sales										
Truss	Brokerage & Sales										
Zillow	Brokerage & Sales										

Current Applications in Real Estate

Figure 3, Most worldwide Real Estate Sector utilizing AI. Source (Conway, 2018)

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# How can Academia get closer to industry

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Academia has been established to serve communities. Part of the community, academia serves is industry. It was noticed that the link between the two in our region is not strong enough. This paper presents an attempt to close the gap between the two through using industrial equipment in teaching. The equipment used is based on two major items: YOKOGAWA distributed control system (DCS) CENTUM VP (Vigilant Plant) and a manually operated reverse osmosis rig (RO Filmtech® BW-30-2540 Spiral Wound Type) with following specification: Membrane - Polyamide Thin Film Composite, Max. Operating Temperature 45°C maximum, Pressure 600psi Max. Feed Flowrate 16gpm.

The DCS used is Yokogawa Centum VP R5. Centum VP is one of the most widely used DCS in the middle-east. It is used by plants such as Bapco, Alba, Banagas, GPIC here in Bahrain just to mention a few as well as huge plants such as Aramco, SABIC and many others in Saudi Arabia. Yokogawa is first in the world to produce a Distributed Control System (DCS) back in 1975. Honeywell was the second company to launch its independent DCS shortly afterward. Centum VP is the platform of Yokogawa's Vigilant Plant solutions. With more than 40 years of R&D, the Centum VP has an inbuilt Human Interface and Field Control Station with the availability of 99.99999% (Seven-9s) with features such as Pair & Spare concept. Basic components of Centum VP: There are three main components of a DCS:

- Field Control Station (FCS): FCS is the central processing unit where the main control functions are executed. It consists of a memory which stores all the functions and interlocks programmed using the Centum VP software. Each FCS node consists

- of eight Input/output modules (I/O) where field instruments are hard-wired.
- Engineering or Operator Station (HIS/ENG): ENG or HIS is a commercial off the shelf personal computer (PC) with a Microsoft Windows-based operating system installed with Yokogawa Centum VP software. The CPU consists of a Vnet/IP interface Card and an Ethernet card which enables connectivity to the DCS network. ENG or HIS stations provide an inbuilt software interface for operation and design depending upon the acquired license.
- Communication Bus: The Centum VP has two buses namely Vnet/IP and Ethernet. The Vnet/IP is called the control bus which is used for connecting the FCS and the HIS and the Ethernet is used as the network bus used to connect different HISs or management PCs. A bus coupler is used to connect Centum VP to older systems or to other third party systems. The DCS installed in the Department is shown in fig.1. The show piece of the DCS is the Field Control Station (FCS). It is referred to as (1) in fig.1. The FCS consists of eight

slots configured as follows: slot1 FOUNDATION FIELDBUS (ALF111) card, slot2 PROFIBUS (ALP111) card, slot3 sixteen input analogue current channels (AAI143-H) card with HART, slot4 sixteen output analogue current channels (AAI543-H) card with HART, slot5 32 digital input channels (status inputs) card (ADV151-P), slot5 32 digital output channels (status output) card (ADV151-P) and slot7 Serial Communication – RS232/RS485 card (ALR121). The latter is connected as MODBUS low level network connected to a tri-sensor (MEC-10) to measure temperature, conductivity and concentration. Node2 is reserved for the emergency shut down PROSAFE (ESD) as is referred to as (2) in fig.1. The ESD, beside the CPU and power supply, has an analog Input module (SAI143H – 4-20mA) installed in slot1 with sixteen channels with HART, an analog output module (SAI533H- 4-20mA) in slot2 with eight channels with HART, a sixteen digital input channels (SDV144) and eight digital output 24VDC channels (SDV531). In node6, is installed the ESD simulator where up to six digital inputs and six digital outputs together with an analog input and an analog output are simulated. In fig.1 (7) node are presented two temperature transmitters, one connected to the FIELDBUS segment and the other to the PROFIBUS PA segment together with a positioner driven by a current loop 4-20mA. In node fig1.(8) sits the PROFIBUS segment and in fig.1 (9)sits the FIELDBUS segment. In fig1.(10) are the switches for VNET1 and VNET2. On the supervisory side, four ENGINEERING stations are interfaced to the DCS. One of the four stations is shown in fig.1 (3). The four machines are configured as engineering stations where they could be used either for development or as HUMAN INTERFACE STATIONS where they can be used for monitoring. Each machine is provided with a screen (fig.1 (4)). Finally the system is equipped with two different sets of keyboard one QARTE and on graphic as shown in fig.1 (5).



Fig.1 DCS system at UOB: 1-Field Control Station (FCS) 2- Emergency shut down (ESD) 3- Engineering

Station 4- Screen 5- QAWRT Screen and Graphic Screen 6- ESD Simulator 7- 2 transmitters connected to FIELDBUS and PROFIBUS PA and current loop connected to a positioner 8- PROFIBUS PA segment 9- PROFIBUS Segment 10- VNET switches 1 and 2

## DCS application:

Before interfacing the DCS, the application which was available is a manual RO rig (pressure, flow rate temperature, temperature, controlling the reject pressure). The system was automated by introducing two flow meters, one in the feed path and one in the reject path and interfaced to the DCS. The same thing with the feed pressure



Fig.2 RO:1- membrane 2- visual pressure and flow 3- manual reject valve 4- reject control valve 5- diverting input flow control valve 6- feed flow transmitter 7- feed pressure transmitter 8- reject pressure transmitter 9- feed compressor 10- feed tank 11- reject flow transmitter 12- input pump 13- Mec10- sensor

and reject pressure. Temperature, conductivity and concentration are picked up by the MEC-10 sensor and interfaced to the DCS through a MODBUS connection. The DCS is driving two control valves (Burkert 2712 Globe Valve with Top Control<sup>®</sup> Pneumatic Actuator). One valve controls the reject flow and the other controls the feed flow by diverting part of the feed to vary the input flow and pressure. (refer to fig.2 for details). The mimic was developed using the DCS HIS and is shown in fig.3.

## RO control system:

The DCS configuration and programming is done through the YOKOGAWA SYSTEM VIEW platform. The hardware configuration is carried out in IOM builder where all the input and output modules are set. The control tasks are programmed in one or more of the two hundred function blocks. Fig.4 shows a closed loop controller where the measured variable is the permeate flow rate FI103. This flow rate is calculated indirectly by subtracting the reject flow rate (FT02) from the feed flow rate (FT01) through the adder/subtractor (ADD1). This measured flow rate is subtracted from the set point which is fed to the DCS through the face

plate. The error drives a PID controller (PID101). The parameters (gain, integral time constant, derivative time constant and the sampling time) are all fed to the controller through the face plate. The output of the controller drives the control valve (%%CONVAL01). The flow rates are displayed through FI101, FI10 and FI103. The setting of the parameters is shown in fig.5. P(gain)=105, TI(integral time constant)=0.3, TD(derivative time constant)=0, CK(sampling frequency)=1.0Hz and the set point SP=1.8L/min. The response of the system is shown in fig.5. The graph is divided into two. The top part where all the variables are set and monitored and the bottom half shows the trend of the controller. On the right side of the graph is the controller face plate.

To conclude, this article shows the introduction and implementation of an industrial DCS in the education in the same way as it is implemented in industry. The only difference is that it is at a small scale. This type of experience will certainly build strong ties between academia and industry. The future engineers gain in self-belief which pushes them to face industrial challenges with determination and confidence which we believe is missing in our graduates.

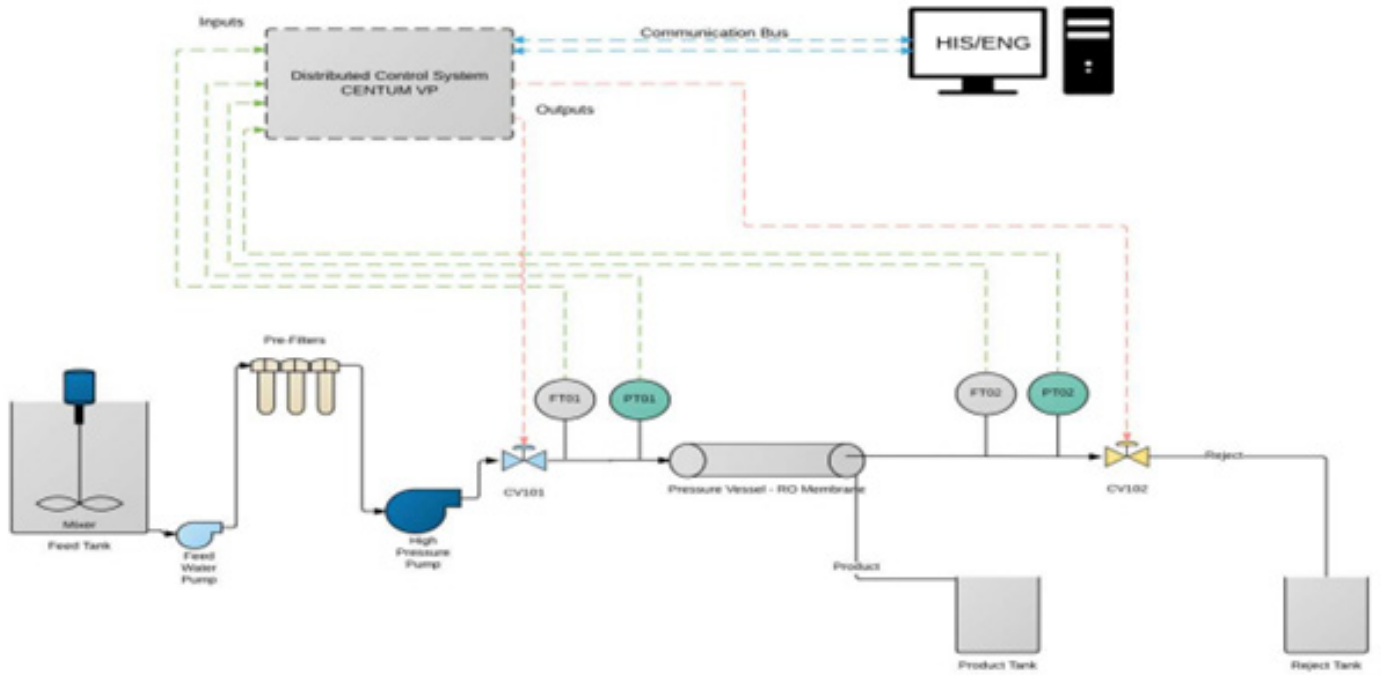


Fig.3 RO control system mimic

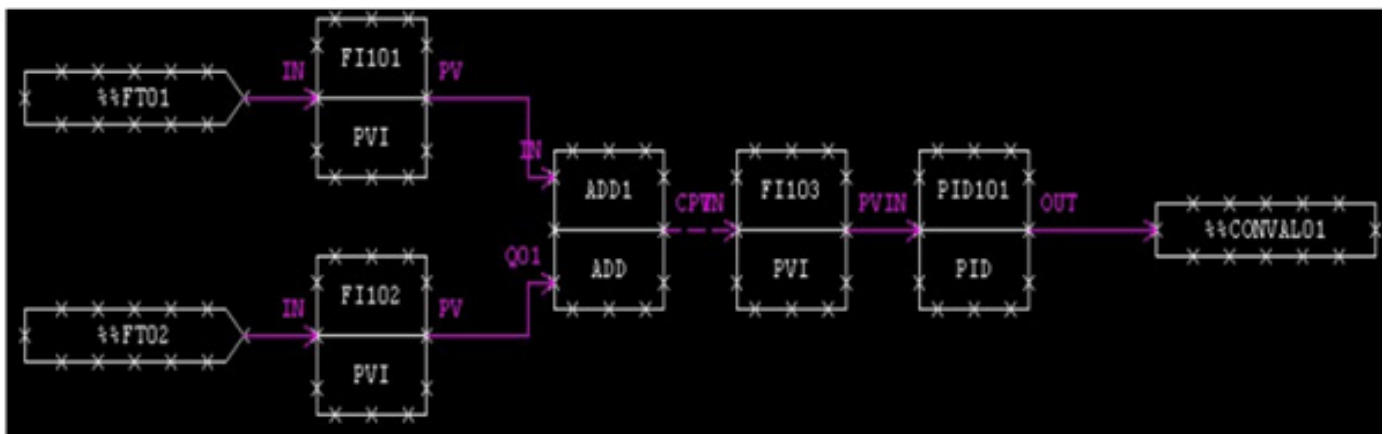
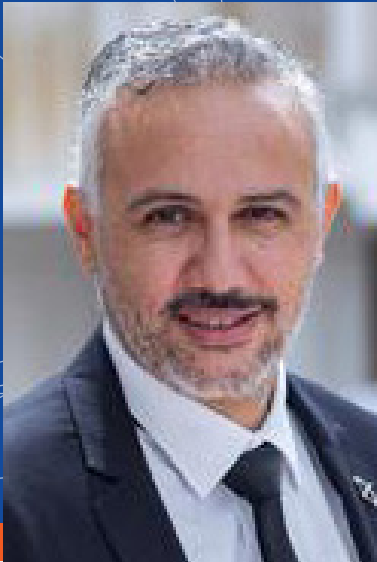


Fig.4 Building PID closed loop controller in the DCS function block



Fig.5 Parameters setting with trend window and the faceplate



# Transforming the Transport and Logistics Sector in Bahrain:

## Vision and Professional Development

**Dr. Ahmed Jedidi**  
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The Transport and logistic sector is one of the key contributors to the economic growth. In fact, Kingdom of Bahrain considers the transport and logistic sector a locomotive for the economic vision 2030, due to the major investments in infrastructure projects, which requires cost-effective distribution and fulfillment solutions to reduce the setup and operating costs.

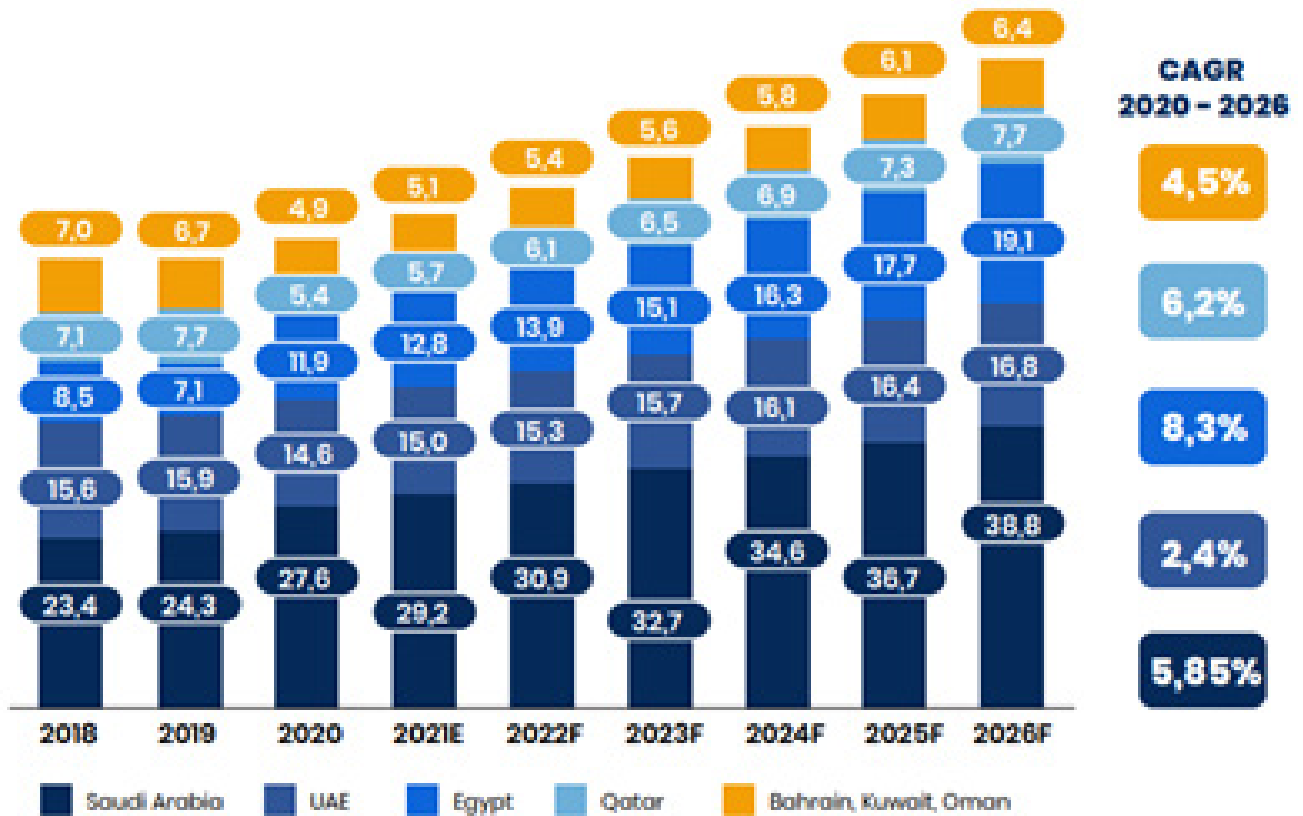
The significance of the transport and logistic sector in the kingdom is demonstrated by the statistics of the GCC logistics market chart below. It is clearly shown that the transportation and storage sector is recovering steadily with GVA growing by 6% year-on-year to BHD 807 million in 2021. In addition, the transportation and communication sector contributed 6.4% to the Kingdom's real GDP in 2021 and employs (2%) of the total private sector workforce. On other hand, the international statistic and studies show that the logistic and transport sector will reach more than 87 billion USD in GCC region.

Given the fact that digital transformation is playing a key role in Bahrain economic vision 2030, the related ICT technologies can serve as one of the key pillars in revolutionizing the transport and logistics sector. Technologies such as Artificial Intelligence, Machine Learning, Big Data, Natural Language Processing, Blockchain, and Cloud Computing are pushing the current

digital transformation and boosting supply chain productivity, reducing costs and errors. The sectors of the logistics industry that are expected to benefit from the aforementioned technologies include trucking transportation, supply chain management, international transportation (ocean and air), and shipment tracking.

In order for the transport and logistics sector to accelerate the economic developments plans in the kingdom of Bahrain, professionals with required knowledge and skills in this area is an absolute necessity. However, the academic sector in Bahrain is still lacking undergraduate and postgraduate programs that are capable of providing practical learning in vital areas such as operation management, procurement, inventory, logistics and supply chain. The related academic and professional programs are expected to deliver automation technologies in transport and logistics systems and equip learners with state-of-art ICT tools to optimize solutions

## GCC Logistics Market in Billion USD



Source: YCP Solidiance Research and Analysis

in this sector. Learners should also explore the deployment and implementation of ITS strategies for road network traffic operations, and provide engineering solutions for complex problems in transportation and logistics. Examples of topics that need be covered are:

Urban Mobility and Smart Cities, Geographical Information Systems for Transportation, Internet of Things, Data Analytics for Smart and Connected Cities, Traffic & Transport Safety, and Logistics in Supply Chains.

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# To Do BIM or Not to Do BIM

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Building Information Modelling (BIM) is a technology and a process applied by people through the available resources. Discussions in this article include aspects of the four previous areas of BIM (technology, process, people and resources), with emphasis on education, Figure 1. Applying BIM, therefore, appears as a cumbersome task to discuss and implement.

When it comes to the use of BIM in GCC countries, there are many aspects that impose themselves in such a discussion. Some of these aspects are globally investigated and discussed into wider comprehensive fields such as BIM education, BIM maturity level, construction project management, and facility management; while other aspects can be investigated and discussed within the GCC context, such as legislation and building codes, international construction firms, large scale projects, and small design offices in the GCC market.

This article focuses on the education area, particularly in the architectural engineering field. More articles covering other areas will be published to explore the potential use of BIM in GCC countries.

## Introduction

The importance of BIM manifests itself in the opportunities that lead to question the norm of the architectural design process as it is currently known. BIM offers the tools and the functions that improve many tasks in the designing process, such as decision-making processes, reconciling the technical requirements in the initial design phases, communication between the design team of multidiscipline, and many more procedural tasks. BIM potentially transforms and alters some design tasks commonly being practiced by the designers themselves. BIM introduces one multidisciplinary model that facilitates the transformation from the conceptual design to the detailed design required for the processes of construction and execution.

The BIM use offers inevitable benefits to the design process, especially when detailing is involved in the later phases of designing. Representing building service systems' details in a BIM model is greatly effective to all the stakeholders involved.

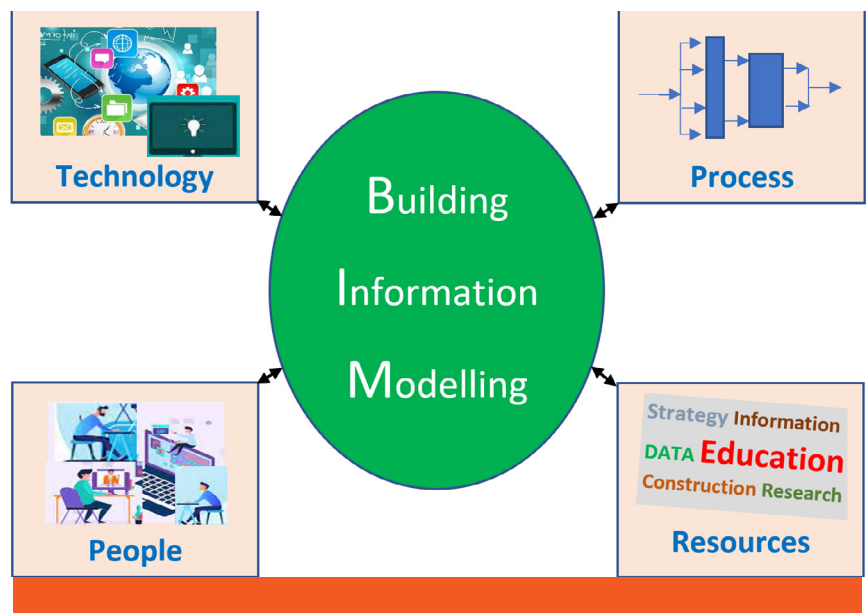


Figure 1, the four main components of BIM

Examples of the importance of BIM in the construction from different countries reflect this point. BIM has become a mandatory, legal requirement in the USA AEC sector since late 2006 and in Denmark since early 2007 (Holzer, 2007), and by the UK Cabinet Office in 2006 (Succar et al., 2013). In 2007, the Finnish Building Information Group has published a set of structural building components in the Finnish language to form the proposed BIM platform for integrated design and production (Penttilä, 2007). Research efforts have been conducted to globally link the BIM use; for example, Kassem et al. (2013) propose three metrics to help establish the overall BIM maturity in sample countries: Australia, UK, and USA.

### How to Teach BIM in Architectural Education

BIM has various applications that can be potentially integrated into many courses and teaching areas in architectural education, such as construction, construction management, and building environmental analysis -energy saving, orientation and ventilation, daylighting, and acoustics-. BIM analysis can be beneficial to all these areas, and consequently, BIM may play an essential role in the processes of designing and decision making. Traditionally, architectural design was based on function, and later on conceptualization. Recent design philosophies employed environmental analysis as the main factor in the design process. More recently, the design process has begun to focus on sustainability as the main driving factor.

For the BIM use in academia into the conceptual design phases, there are different research findings. On one side, some directions of thoughts argue that involving the junior architects and the architecture students in technical details required by the BIM use would limit the fluency and the spontaneity they should have in these conceptual design phases while constructing their design ideas and creating their design forms (Morton, 2012; Ding et al., 2015). On the other side, some researchers maintain that BIM has brought the architectural practice and education to a new dimension, in which the design process and the design product will be benefitted and even transformed by integrating the emerging BIM potentials, particularly in creating one multidisciplinary model for all design participants.

To conclude, the current architectural design practices are subject to being altered and transformed for environmentally enhancing the design outcome, which is the major priority of the design process rather than the design practices or the procedural tasks (Tuohy and Murphy, 2015; Donato et al., 2018; Arayici et al., 2018; Abdelhameed, 2018b). The design process should cope with and adapt to these BIM potentials, particularly the environmental analysis (Abdelhameed, 2018a, 2017). The design output enhanced with BIM analysis leads to environmentally sound solutions and sustainable applications which are essential for our societies and our planet.

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# Are people willing to buy Genetically Modified Food?



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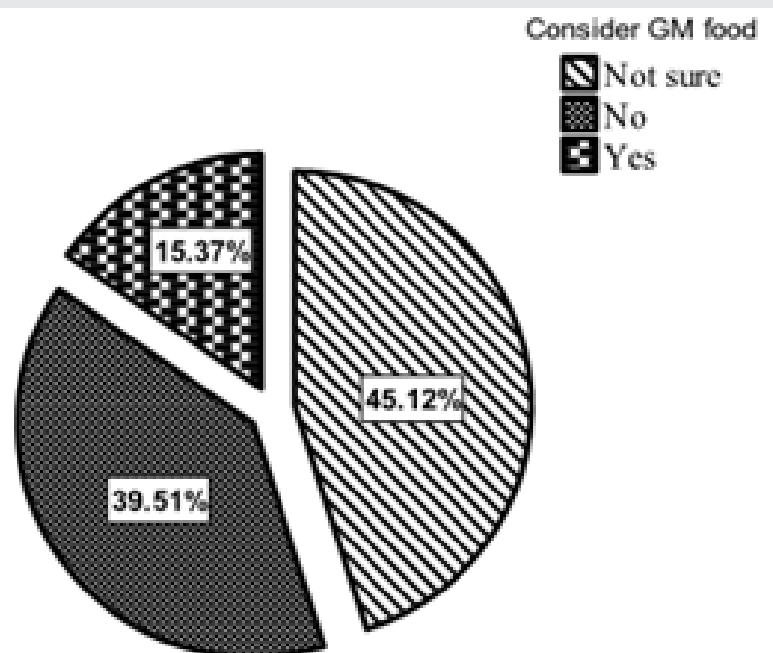
## Introduction:

Genetically modified (GM) food is currently a key topic in both academic and political circles regarding its implications for food security, economic growth, income distribution, human health, the environment, and agricultural trade. It is noteworthy that genetic code (DNA) is altered to create plants of GM food with desirable traits. Higher yields, lower prices, a lower requirement of pesticides and herbicides, longer shelf life, higher resistance to dry and excessive wet weather, and improved nutritional value and taste are some of the advantages of GM food. However, GM food has caused many controversies and raised concerns among scientists, environmental activists, religious organizations, public interest groups, professional associations, and government officials. General concerns include ecological pollution, cross-pollination, the possible creation of new viruses and toxins, limited access to seeds due to patents on GM plants, the threat to crop genetic diversity, religious, cultural, and ethical concerns, and unknown consequences. Therefore, the aim was to survey to measure the knowledge and awareness of people about GM food and evaluate if they are willing to buy these products or not.

## Methods:

A questionnaire survey was conducted. The survey consisted of the following four main parts: (i) demographic questions (e.g., age, gender, education, etc.); (ii) questions that assess the knowledge of GM food of the participants (understanding, ability to classify, awareness of labeling, etc.); (iii) questions assessing the acceptance and willingness of the participants to buy GM food; and (iv) questions designed to determine the presence of any obstacles to purchasing GM food. A total of 410 individuals participated in this study. The participants were from nine cities from various neighborhoods.

## Results and Discussion:



The survey sample consisted of 52% males and 48% females, with an average age of approximately 37 years. About half of the participants (46%) were in the age group of 31 and above who do their own grocery shopping, as it was assumed that they were the most concerned about consuming GM food. The survey also targeted people with different education levels to investigate whether the education level affects the awareness and acceptance of consuming GM food. About half of the respondents (50%) hold a bachelor's degree, 35% had higher degrees, while only 15% were high school students, which means that the sample can be considered an educated sample. Consumers with different characteristics have different attitudes toward GM food. Consumers who have not heard of GM food have a lower approval rate than those who are aware of them. The frequency of willingness to consume GM food is shown in Figure 1, which indicates that only 15.37% of the participants would consume GM food, about 39.51% do not prefer them, while 45.12% of the participants are uncertain, indicating that a majority of

the participants are not aware that GM food is available in the market. This reinforces the argument that 'adequate information is an essential factor affecting the attitude of consumers.

### Conclusions:

The results indicate that most consumers have little knowledge about GM food and cannot identify them in the market. The results also show that consumers are not ready to buy GM food due to the lack of information about them, indicating that the provision of information by media (both live and print) can play an important role. The public expects labeling and proper monitoring of the market by the concerned authority, especially the Ministry of Health. Future studies are expected to expand the scope of the survey both in terms of the size of the samples and the questions, providing more insight into policymaking and thereby helping decision-makers decide on how to proceed with the future GM food policy.

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# Design and implementation of virtual protection lab

## Project's Team:

- Osama Hasan Alaliwat
- Abbas Fadhel Alaraibi
- Mohamed Ali Alaffo

Supervisor Dr. Fadhel Albasri

## Abstract:

The purpose of this project is to adequately educate large number of students despite having one experimental setup in the university laboratory, as well as the limited availability time of the university laboratories. To resolve such issues, a virtual lab is designed and realized for the undergraduate protection course (EENG413) using the TeamViewers software, the game simulation software, the SEL-451 numerical relay and the Megger secondary injection test set (MPRT 8430). The new designed experiment for the virtual protection lab focused on testing the instantaneous overcurrent and time-overcurrent protection elements of SEL-451. A sample of students from EENG413 course has been selected to try the virtual experiment and their observations have been collected for further enhancement of the experiments in the future. This project represents the first step towards establishing a complete virtual lab as there are still room for enhancements to overcome the limitations and challenges relevant to system security and safety that should be considered in the future work.



Figure 6 shows the experiment setup and how the connection is established in the laboratory. The PC is connected to a switch that is connected to Megger testing device, SEL relay and the university internet.

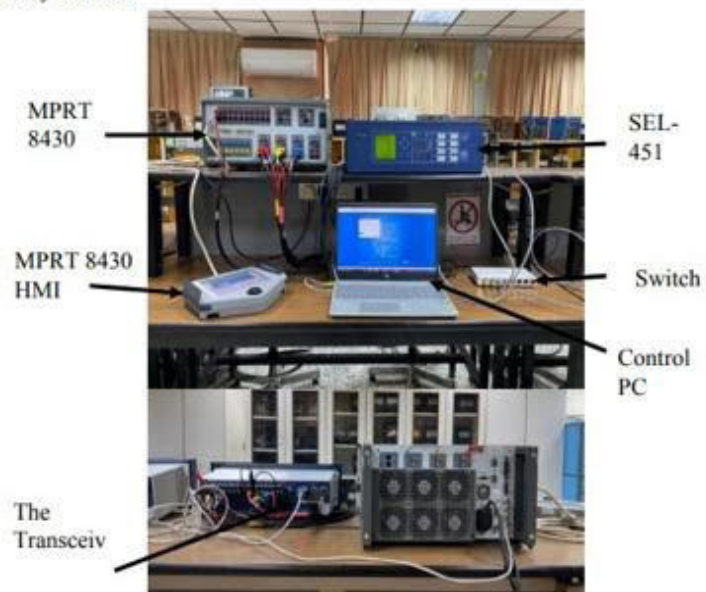


Figure 6 Relay testing experiment setup

# Increasing the efficiency of PV-Panels & Energy Generation

Project's Team:

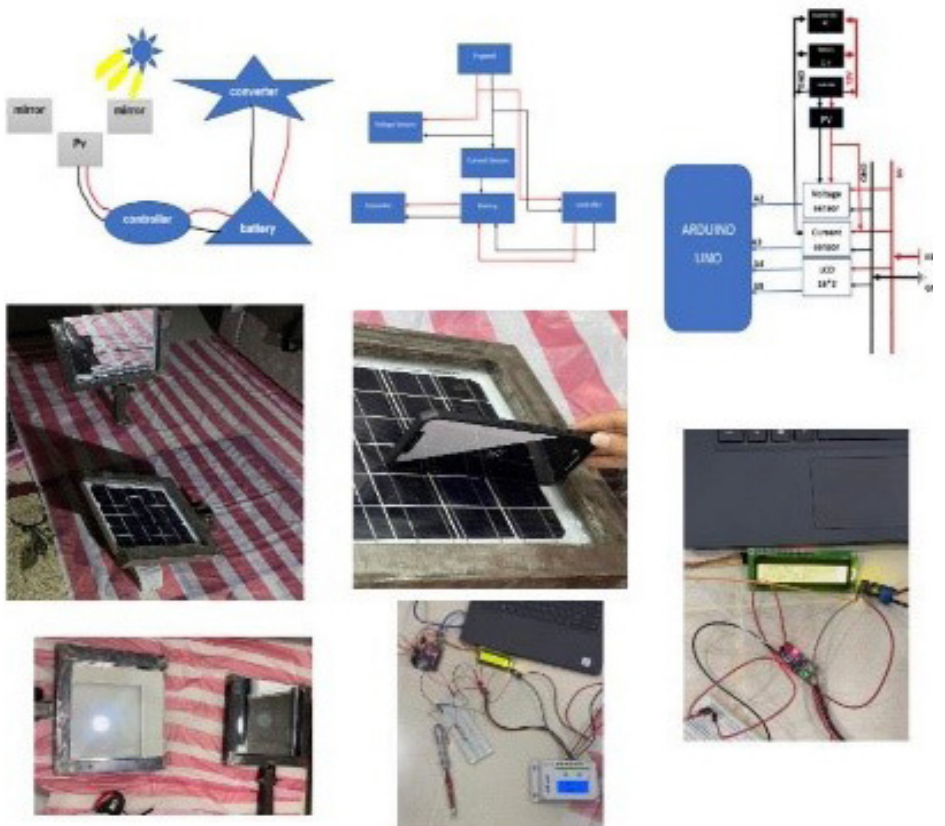
- Jassim Mohd Mahdi
- Sayed Amed Mohd Almosawi
- Sayed Ahmed Hadi Naser

Supervisor Dr. Zuhair Bahri

## Abstract:

The aim of this project is to implement cost effective method to boost the efficiency of PV based electrical generation systems by using static mirrors to reflect the sun light into the PV panels. Moreover, to control and monitor this operation we have created coding system (Arduino) which will control the voltages and currents and calculate the total power generated from the photovoltaic panel.

This project will help to reduce global issues like energy depletion with no cost and generates more energy without harming the environment. Increasing the efficiency of PV panels while generating more energy will be considered as a friendly environment method compared to other mythologies used to as a source of energy.



# Control of Vertical Axis Wind Turbine

## Project's Team:

- Heba Issa Salman
- Fatema Sayed Husain

Supervisor Dr. Ebrahim Abdulrahman  
Co-supervisor Dr. Maamer Taleb

## Abstract:

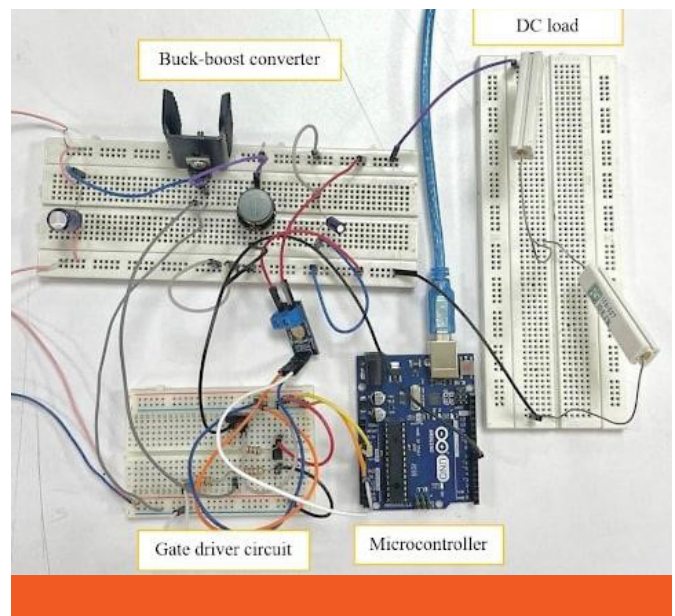
This project focuses on discussing and analyzing different problems in the field of wind energy generation. It was of interest to focus on wind energy to meet Bahrain's renewable energy target, which can be achieved by increasing the usage of wind energy along with solar and not relying only on solar energy.

The first problem is that the wind speed level in Bahrain is considered low. It has been concluded that any country with low natural wind speed can benefit from vertical axis wind turbines (VAWTs) since they can produce power at very low wind speeds.

Furthermore, another alternative is to use VAWTs on highways to recover the wasted wind power from fast-moving vehicles since VAWTs can work even in unstable wind conditions.

The second problem is that the output voltage from the wind turbine generator is not constant since it depends on the wind speed, which is also variable. It has been solved by designing a microcontroller-based voltage regulator using MATLAB/SIMULINK, followed by experimental implementation. The designed controller provides a fast response, can recover to the reference voltage Regardless of the disturbance and, has slight voltage fluctuation.

The last discussed problem is the effect of the distance between VAWTs when they are planted in an array on the highway, which has been investigated using MATLAB/SIMULINK by analyzing different cases. The simulations are performed on an array composed of no turbines. The array's performance is evaluated at different distances between turbines, and the optimal distance is provided for different cases.



# Design of Automatic Parallel Parking Vehicle (PP-Car)

Project's Team:

- Sara Hussain Ali
- Hasan Mahmoud Elkoufi
- Rehab Mansoor Abdulla

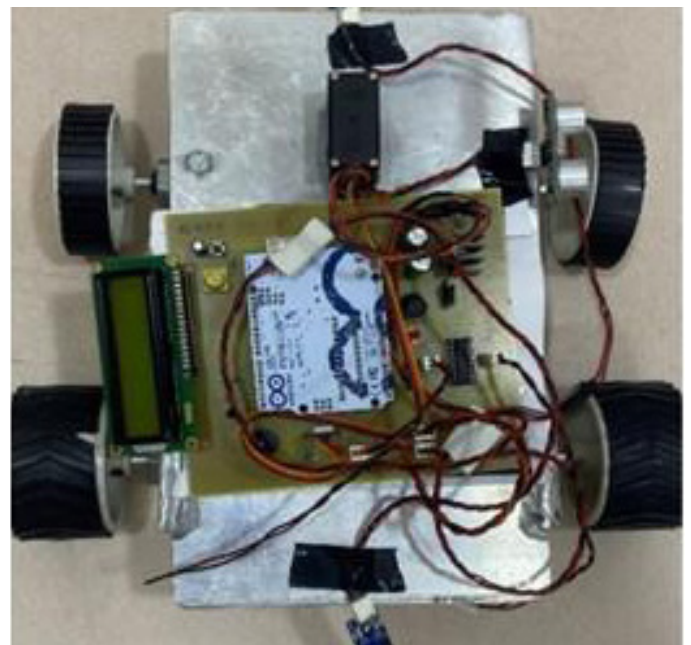
Supervisor Dr. Salwa Baserrah

## Abstract:

Considering the current situation, the problems associated with vehicle parking are becoming increasingly severe. More accidents have occurred as a result of a

lack of parking skills, particularly among new drivers. Furthermore, traffic has increased because of someone struggling to park their car. As an outcome, the design of automatic parallel parking implemented in this project using an Arduino Uno. The primary goal of this project is to assist people in parallel parking their vehicles and leaving the parking slot to reduce accidents and time spent inside the parking space.

The vehicle can locate available parking space. If the slot is empty, the ultrasonic sensor determines the distance, and the infrared sensors detect movement. The car must be able to park itself in an empty parking slot using the coded Arduino and display the parking status on the LCD.



# Variable Frequency Control For induction Motor

Supervisor Dr. S. Ali Abbas Almosawi

Project's Team:

- Mufeed Abdulhussain Alekri
- Ali Hussain Alhalwachi
- Hussain Abdulshaheed Abdulla

## Abstract:

The aim of this project is to implement and compare three different variable frequency drive methods which are bipolar PWM, unipolar PWM and Discontinuous PWM. First by using MATLAB simulation to implement the three methods using RL load then replace it with a single-phase motor. However, according to the results of simulation the three methods was compared with each other in terms of THD, efficiency and rms voltages and currents. In addition, the open loop and the closed loop systems of the



three-phase variable frequency drive will be provided in this project.

