POLITECNICO DI MILANO

SCHOOL OF ARCHITECTURE URBAN PLANNING CONSTRUCTION ENGINEERING
MASTER OF SCIENCE IN MANAGEMENT OF BUILT ENVIRONMENT

THE IMPACT ON CONSTRUCTION EDUCATION BY CHANGING TRENDS IN REAL-ESTATE SECTOR GLOBALLY

MASTERS THESIS

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I hereby would like to thank my supervisor Prof. Giandrea Ciaramella for his professional guidance and assistance, valuable comments, advices and criticism which helped me to complete this research work.
## CONTENTS

1. ABSTRACT
2. INTRODUCTION
3. OBJECTIVE
4. LIMITATIONS

<table>
<thead>
<tr>
<th>LIST OF COUNTRIES AND UNIVERSITY CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. AUSTRALIA</td>
</tr>
<tr>
<td>- ECONOMICAL AND TECHNICAL OUTLOOK</td>
</tr>
<tr>
<td>- UNSW SYDNEY</td>
</tr>
<tr>
<td>- UNIVERSITY OF MELBOURNE</td>
</tr>
<tr>
<td>- UNIVERSITY OF QUEENSLAND</td>
</tr>
<tr>
<td>- ANALYSIS</td>
</tr>
<tr>
<td>2. CANADA</td>
</tr>
<tr>
<td>- ECONOMICAL AND TECHNICAL OUTLOOK</td>
</tr>
<tr>
<td>- YORK UNIVERSITY, TORONTO</td>
</tr>
<tr>
<td>- ANALYSIS</td>
</tr>
<tr>
<td>3. HONGKONG</td>
</tr>
<tr>
<td>- ECONOMICAL AND TECHNOLOGICAL OUTLOOK</td>
</tr>
<tr>
<td>- CHINESE UNIVERSITY OF HONG KONG</td>
</tr>
<tr>
<td>- UNIVERSITY OF HONG KONG</td>
</tr>
<tr>
<td>- ANALYSIS</td>
</tr>
<tr>
<td>4. JAPAN</td>
</tr>
<tr>
<td>- ECONOMICAL AND TECHNOLOGICAL OUTLOOK</td>
</tr>
<tr>
<td>- NIHON UNIVERSITY, TOKYO</td>
</tr>
<tr>
<td>- MEIKAI UNIVERSITY, CHIBA</td>
</tr>
<tr>
<td>- ANALYSIS</td>
</tr>
<tr>
<td>5. USA</td>
</tr>
<tr>
<td>- ECONOMICAL AND TECHNOLOGICAL OUTLOOK</td>
</tr>
<tr>
<td>- AMERICAN UNIVERSITY, WASHINGTON DC</td>
</tr>
<tr>
<td>- ARIZONA STATE UNIVERSITY</td>
</tr>
<tr>
<td>- COLUMBIA UNIVERSITY, NEW YORK</td>
</tr>
<tr>
<td>- DEPAUL UNIVERSITY, CHICAGO</td>
</tr>
<tr>
<td>- HARVARD UNIVERSITY, CAMBRIDGE</td>
</tr>
<tr>
<td>- MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE</td>
</tr>
<tr>
<td>- NEW YORK UNIVERSITY</td>
</tr>
<tr>
<td>- ANALYSIS</td>
</tr>
<tr>
<td>6. GERMANY</td>
</tr>
<tr>
<td>- ECONOMICAL AND TECHNOLOGICAL OUTLOOK</td>
</tr>
<tr>
<td>- HTW BERLIN</td>
</tr>
<tr>
<td>- UNIVERSITY OF STUTTGART</td>
</tr>
<tr>
<td>- TU BERLIN</td>
</tr>
<tr>
<td>- EBZ BOCHUM</td>
</tr>
<tr>
<td>- UNIVERSITY OF APPLIED SCIENCES MUNSTER</td>
</tr>
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</tr>
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<td>- ANALYSIS</td>
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<tr>
<td>7. IRELAND</td>
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<tr>
<td>- ECONOMICAL AND TECHNOLOGICAL OUTLOOK</td>
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</tbody>
</table>
• DUBLIN INSTITUTE OF TECHNOLOGY ..............................................................
• ANALYSIS ......................................................................................................
8. LITHUANIA .....................................................................................................
  • ECONOMICAL AND TECHNOLOGICAL OUTLOOK ......................................
  • VILNIUS GEDIMINAS TECHNICAL UNIVERSITY ........................................
  • ANALYSIS ......................................................................................................
9. NETHERLANDS ............................................................................................... 
  • ECONOMICAL AND TECHNOLOGICAL OUTLOOK ......................................
  • UNIVERSITY OF AMSTERDAM .................................................................
  • EINDHOVEN UNIVERSITY OF TECHNOLOGY ............................................
  • EINDHOVEN UNIVERSITY OF TECHNOLOGY ............................................
  • TU DELFT (TECHNISCHE UNIVERSITEIT DELFT) ...........................................
  • ANALYSIS ......................................................................................................
10. CONCLUSION ...................................................................................................
11. BIBLIOGRAPHY ..............................................................................................
Abstract

There is a saying the more you can educate yourself, the better chance you have at being successful. As real-estate is an ever-evolving industry with constant market and trend changes it is more important to learn from the past and what changes can be made for future, which in turns proves the importance of real-estate education. This dissertation shows real-estate education in universities and impacts caused to it by changing trends of market in terms of economy or technologies. Initially this research started by selection of countries and universities to be researched around few countries in Europe and globally, each university’s data is collected in a form of table (country name, course name, duration, program details, key areas of study, career opportunities, accreditation) in the same way each country is researched on the economic and technological trends in construction. Later an analysis is performed in comparison with management field and countries trends based on this research, university education and country trends and country construction outlook, inputs are prepared for universities in the conclusion. So, when compared it to education it can be analysed whether the courses students studying are building proper career outcomes and meeting countries trends in construction.

KEYWORDS

Construction management, Real estate, Technologies, GDP, trends.

Estratto

C'è un detto che dice: “più educhi te stesso, maggiori possibilità hai di avere successo”. Poiché il settore immobiliare è in continua evoluzione, con trend di mercato in costante cambiamento, è più importante imparare dal passato per capire i cambiamenti che possono essere apportati al futuro, il che a sua volta dimostra l'importanza dell'educazione nel settore immobiliare. Questa tesi analizza l'educazione immobiliare nelle università e gli impatti generati dal cambiamento delle tendenze del mercato in termini di economia o tecnologie. In prima analisi, la ricerca seleziona i paesi e le università in pochi paesi, sia in Europa che nel mondo. I dati raccolti da ciascuna università sono poi stati catalogati sotto forma di tabella (nome del paese, nome del corso, durata, dettagli del programma, aree chiave di studio, opportunità di carriera, accreditamento). Successivamente viene eseguita un'analisi comparativa con il settore di gestione e le tendenze dei paesi basate su questa ricerca, istruzione universitaria e tendenze nazionali e prospettive di costruzione del paese. Se confrontate con l'istruzione, si può analizzare se i corsi frequentati dagli studenti siano in linea con il trend di mercato e le opportunità di carriera.

KEYWORDS

Gestione della costruzione, immobiliare, tecnologie, GDP, tendenze.
Introduction

Construction Management means the overall planning, coordinating and control of a project from the starting to end day of its completion. It is composed of five sectors- residential, commercial, heavy civil, industrial, and environmental. Studying this field will prepare students to understand, manage and control the projects in the construction industry. These days in fast improving digital innovations the companies are key interested in the people hiring whose management and technical skills are good but also aware of digital technologies to finish the project in a smart and efficient way. This thesis started by an idea of exploring different types of construction management education around world in different universities, later I had an idea to also study the situation of each country in terms of economy and construction trends. This dissertation gives an idea of what is the economic situation of the country? what are the present and future trends and technologies in the specific country? is the university education meeting the standards outside on practical field? what can be the best solution to increase career prospects of students?

Scope

- Data collection of different universities study plans, career opportunities and accreditations.
- Data collection of trends and technologies of different countries.
- Comparative analysis on education and trends.
- Concludes with inputs that impact university education by trends of country.

Limitations

- Dissertation is limited to specified countries and universities as mentioned in index page.
- Research is only on construction management courses.
- The accurate GDP are not calculated it is taken from online sources.
- The accurate percentage in analysis is not calculated for overall outlook in pie chart but an approximate values are given to understand the actual situation of construction outlook.
Real Estate Outlook – Australia

Australia’s leading construction companies are forecasting a continued solid uplift in major non-residential project work over the course of 2018 and 2019. Growth will be led by a strong pipeline of non-mining infrastructure in line with the significant growth impetus from public sector spending on transport infrastructure projects.

However, the actual value of growth is likely to be tempered by rising cost pressures, particularly escalating energy input costs and supplier price hikes related to the relative strength in commodity prices. There is also widespread reporting of difficulties in recruiting skilled labour and sourcing materials in the volumes required for major projects.

- The latest Australian Industry Group/Australian Constructors Association Construction Outlook survey indicates that after recovering by 5.2% in 2017 (current prices), the total value of non-residential construction work is forecast to rise by 9.3% in 2018 and a further 8.0% in 2019.

- Engineering construction will remain a key driver of growth with total turnover rising by 8.4% in 2018 and 12.6% in 2019. This reflects continued high levels of work done on major road and rail projects, led by various big-ticket projects across the eastern states. Solid support is also expected from telecommunications infrastructure (in line with NBN-related investment network upgrades) and “other” civil projects, including, bridges, tunnels and the construction of Sydney’s second airport at Badgerys Creek.

- While the mining investment downturn remains a drag on industry conditions, its negative impact is diminishing with a marked slowdown in the rate of decline in resource-related construction expected in 2018 followed by a modest anticipated upturn in 2019.

- Commercial building activity (including offices, retail buildings and industrial premises) is poised to experience stronger conditions over the next two years. With more projects starting to receive the go ahead, the total value of commercial work is expected to recover from a 2.9% decline in 2017 to growth of 7.8% in 2018 and 5.8% in 2019.

- The outlook also points to a continuation of strong growth in the multi-level apartments sector during 2018 (+14.8%) supported by projects either still underway or in the pipeline. However, the value of work is set to turn down sharply in 2019 (-16.6%). • Higher workloads and increasing investment demand will also lead to further workforce expansion, with total employment expected to rise by around 2.9% in 2018 and by a further 2.7% over the first half of 2019 (after a rise of 4.3% in the year to February 2018).
OUTLOOK 2018

- For the 2018 calendar year, the value of turnover from all major construction work is expected to rise at a rate of 9.3%, following a 5.2% increase in 2017. Despite a further fall in mining-related engineering construction, a solid pipeline of publicly funded infrastructure investment is expected to drive stronger activity over the year.

- Engineering construction is expected to rise by 8.4% in 2018, underpinned by a strong lift in the value of non-mining infrastructure construction work (17.1%). Both road (+22.3%) and rail (+16.0%) projects will continue to expand from a high base. Other strong areas of growth include “other” civil projects (+15.1%) and telecommunications infrastructure (+14.6%).

- Resources-related engineering construction is expected to continue to decline in 2018. Weakness will be concentrated in the oil and gas processing sector (-55.6%) as the remaining major LNG projects under construction largely move through to completion by the end of 2018. However, a slower fall is predicted in turnover derived from mining projects (-10.1%) in 2018 after a 20.4% decline in 2017 consistent with the approaching end of the mining investment wind down.

- Commercial construction is expected to rebound by 7.8% in 2018 (after contracting in 2017) supported by stronger private and public-sector investment.

OUTLOOK 2019

- Turnover from all major construction work is forecast to continue to expand at a healthy rate of 8.0% in the 2019 calendar year reflecting further upside to public sector infrastructure works and additional gains in commercial construction.

- Engineering construction growth will lift to a higher level of 12.6%. This again reflects solid growth contributions from road (+17.9%) and rail projects (+16.6%), backed by telecommunications (+14.8%) and in other civil projects (+13.8%). Utilities construction (+12.5%) is expected to continue to receive a boost from investment in new pipeline infrastructure for gas supply, wind and solar projects, electrical sub-station upgrades and the construction of water treatment facilities.

- Resources-related engineering construction is set to continue to decline with weakness centred on the oil and gas processing sector (-35.8%). However, the mining investment downturn is likely to have run its course with a slight upturn in mining-related construction expected to emerge in 2019 (+2.7%).

- Commercial construction is projected to continue to expand in 2019, albeit at a slower pace of 5.8%. Private sector building activity is expected to rise by 6.9% while investment in education and health building projects is set to underpin a 5.0% growth outlook for public sector building activity.
EMPLOYMENT

- Reflecting renewed strength across key project areas, employment in major construction increased by 4.3% in the year to February 2018, following a decline of 1.2% during the previous 12 months. Across the industry, rises in employment were concentrated among sub-contract tradesmen (+6.9%) and employees principally engaged on-site (+1.6%) with the higher volume of total work placing the strongest demand on on-site workforce resources.

- The expected lift in activity levels in the year ahead will underwrite continued job gains on an aggregate industry basis. Over the period February to December 2018, total employment is expected to rise by a further 2.9% due the hiring of higher numbers of sub-contract tradesmen (+4.8%) and on-site employees (+2.0%). These rises will outweigh a fall in off-site employment of 3.3%.

Thereafter, in the six months to June 2019, total employment is expected to register a further increase of 2.7%. Over this period the expansion of the workforce will again be highest among subcontract tradesmen (+2.9%) and on-site employees (+2.7%). The jobs upturn is also expected to extend to off-site employment with an increase of 1.7% expected in the first half of next year.

GLOBAL INTEREST IN CONSTRUCTIONTECH IS GROWING RAPIDLY This investor interest in Australian ConstructionTech companies mirrors a rapid increase in the global interest in the sector. CB Insights estimates that the number of unique investors in ConstructionTech companies globally has increased 250% since 2012, with media interest in topics related to ConstructionTech increasing exponentially over the same period. Digital technologies have become indispensable to large-scale construction projects, enhancing safety and efficiency and helping contractors keep to their budgets.

1. **Building Information Modelling (BIM)**

BIM offers more than the ability to view 3D blueprints. These interactive models contain a wealth of detailed information that can be useful for every stage of a structure’s life cycle, from planning through construction and ongoing maintenance. The latest systems offer real-time sharing and 5D modelling, incorporating costing and time.

2. **Augmented reality (AR)**

AR isn’t just for video games. This technology has many practical benefits for construction workers, such as overlaying proposed designs onto a physical space for a handy visual guide, highlighting safety hazards in a wearer’s field of vision or simply overlaying useful information such as the time and GPS data. AR technology can only reach its full potential as it becomes more affordable and sites become better connected.

3. **3D printing**
3D printing has been manufacturing homes and apartments for several years, and this technology is now being used for infrastructure such as bridges built by autonomous robots. This production method saves materials, waste, labour and money while improving safety, and the resulting structures are just as strong as those built traditionally.

4. Robotics

Robotic arms are used in tandem with 3D printing and traditional construction methods such as bricklaying. As the technology matures, robots will be seen more widely in construction, demolition and excavation projects of all sizes.

5. Driverless vehicles

Self-driving trucks keep workers away from hazards on construction sites, controlled from a safe distance by skilled technicians. Autonomous vehicles can be used for transporting materials and personnel or for drilling, dozing and other tasks.

6. Laser scanning

Laser technology has made site assessment more accurate and efficient. Lasers use point cloud data to capture a highly detailed impression of sites that can be integrated with BIM and CAD software to streamline the design process.

7. Drones

Also used for site assessment and inspections, drones have already replaced traditional surveying practices in many Australian companies. Capable of capturing high quality images and video, drones save time and labour and reduce errors. They can also go to places workers can’t.

8. Wearable technology

Mobile phone apps have become indispensable on construction sites, but wearable devices are increasingly offering a more convenient, hands-free alternative for simple functions such as health trackers and GPS. More advanced and specialised smart equipment includes helmets with 3D overlays and 360-degree cameras, GPS-enabled vests, and smart glasses that can receive and display instructions.

9. Construction exoskeletons

Exoskeletons will become a more common sight on work sites over the next few years, with market research firm Arcluster forecasting the global exoskeleton market to grow from $225.3 million in 2016 to $3.75 billion by 2021. Both powered and unpowered versions reduce the stress and strain of lifting and other tasks involving heavy equipment, reducing the risk of injuries and improving productivity.

10. Internet of Things (IoT)

A wide range of equipment on job sites now integrates sensors that collect and transmit data on diagnostics, fuel usage and other metrics. Even workers wear sensors that enable communication and monitor their location and surroundings to help keep them safe. As more connected devices give project managers a holistic view of what’s happening on their sites, the construction industry will continue to lead the way in the Internet of Things and practical use of big data.
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<th>UNIVERSITY</th>
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<td>UNIVERSITY</td>
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<tr>
<td>Program details</td>
<td>To manage the social, technological, financial and environmental challenges facing the construction industry today. The Master of Construction Management is a 300 point or 3 year program. The first 100 points (1 year) is made up of foundation study tailored to students from non-construction backgrounds. Students from cognate backgrounds such as construction management and semi-cognate backgrounds such as Architecture or Civil Engineering will often have completed appropriate studies that will allow them to receive credit for up to the first year of the program, reducing the duration to 2 or 2.5 years.</td>
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<td>Key Areas of Study</td>
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<td>Career opportunities</td>
<td>General construction companies</td>
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<td></td>
<td>Trade specialists</td>
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<td>Institutional bodies</td>
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<tr>
<td>COURSE NAME</td>
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<td>Duration</td>
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<tr>
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<td>modern management methodologies and principles of project management and apply them across the various phases of the construction project development life-cycle.</td>
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<td>Construction Planning</td>
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<td>Risk Management and Business Analytics</td>
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<td>Infrastructure Planning</td>
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<td>Property Analysis</td>
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Career opportunities

- Construction management
- Project management
- Design management
- Value management
- International project management

Accreditation

- Australian Institute of Building (AIB) and the Royal Institute of Chartered Surveyors (RICS)

REFERENCE: [https://www.be.unsw.edu.au/degrees/postgraduate-coursework](https://www.be.unsw.edu.au/degrees/postgraduate-coursework)

**UNIVERSITY**

- **University of Queensland**

**COURSE**

- **NAME:** Master of Urban and Regional Planning

**Duration**

- 2 Years full-time

**Program details**

- Improving the quality of cities and regions. Professional planners assist communities, companies and governments to integrate the environmental, economic and social aspects of development from small sites up to whole regions. Planning deals with strategic work (long-range planning) as well as structural and statutory components in relation to built and natural environments and the legislative framework controlling land use.

- Regulatory Frameworks for Environmental Management & Planning
- Resource Management & Environmental Planning
- Climate Change and Environmental Management
- Urban Research & Evaluation Techniques
- Transport Planning
- Planning Theory
- Community Planning & Participation
- Urban Design
- Strategic Metropolitan Planning
- Foundations of Sustainable Development
- International Regulatory Frameworks for Climate Change & Environmental Management

**Key Areas of Study**

- Tools for Environmental Assessment and Analysis
- Applied Demography
- Advanced Geographical Information Systems
- Geographical Information Systems
- Planning Research Topic
- Planning Practicum
- International Field Course: Understanding Development Complexities
- Development Planning in Developing Countries: Theory & Practice
- Urban Management & Governance in Developing Countries
- Assessment of Development Projects
- International Property Investment
- Property Development
- Strategic Property Management
- Sustainable Building Construction Management and Economics

**Career opportunities**

- Urban planners mostly government sectors

**Accreditation**

- Planning Institute of Australia (PIA)

**Reference**

- [https://coursesearch.unimelb.edu.au/grad](https://coursesearch.unimelb.edu.au/grad)
ANALYSIS

Universities researched

- UNSW SYDNEY
- UNIVERSITY OF MELBOURNE
- UNIVERSITY OF QUEENSLAND

COURSES

- Construction project management
- Construction informatics
- Risk management and business analytics
- Infrastructure planning
- Urban Research & Evaluation Techniques
- Sustainable Building Construction Management and Economics

Urban Design

TECHNOLOGY TRENDS

- BIM
- machine learning
- artificial intelligence
- smart building
- Drones
- 3D printing
- Robotics

SWOT ANALYSIS

Focus on technological trends are missing in education

CONCLUSION

Australian system of construction education is very competitive and practical also the demand for construction job sector is vitally increasing in the country, if the awareness technology part is also added as a sub course/short term in study plan the career outcome of the student increases.
OVERVIEW OF CONSTRUCTION INDUSTRY IN HONG KONG

The gross value of construction works performed has registered a robust growth from 2012 to 2017, with a CAGR of 13.3%. This is primarily due to the continued growth in redevelopment plans of office buildings, urban area and the raising buildings safety standards in Hong Kong. Benefited from the speeding up of the land supply for residential units and policies in urban renewal, the gross value of construction work is forecasted to reach HK$741.2 billion in 2022, with a CAGR of 10.9% from 2018 to 2022. The sustained development of the construction industry supports the optimistic outlook for RMAA works market in Hong Kong.

- The land area of real estate projects grew steadily from 1,639 thousand sq.m. in 2012 to 2,520 thousand sq.m. in 2017, at a CAGR of approximately 9.0%.
- From 2012 to 2017, the gross floor area of buildings also recorded the growth from 7,055 thousand sq.m. in 2012 to 8,990 thousand sq.m. in 2017, representing a CAGR of approximately 5.0%.
- The increase of land area of real estate projects and gross floor area of buildings contributes to the development of property market in Hong Kong.
- The number of newly completed residential building projects in Hong Kong increased from 38 units in 2012 to 46 units in 2017, at a CAGR of approximately 3.9%.
- The usable floor area of newly completed residential buildings increased from 558 thousand sq.m. in 2012 to 659 thousand sq.m. in 2017, representing a CAGR of approximately 3.4%.
The residential property market in Hong Kong has experienced the expansion during 2012 to 2017, which in turn acts as the driver to the construction market, including RMAA works market.

OVERVIEW OF RMAA WORKS MARKET IN HONG KONG

RMAA works refers to repair and maintenance as well as alteration and addition works for the existing buildings. Repair and maintenance works generally encompass the upkeep, restoration and improvement of existing facilities and components of the buildings and their surroundings. Alteration and addition works mainly involve the conversion and extension of building layout and structural works and decoration works to the interior spaces to the existing premises.

The major types of clients for RMAA works include Hong Kong Government departments, private land owner and property developers. The tender processes of the RMAA projects in the public sector are conducted through the public bidding. In the public sector, only the companies on the tender list for public construction projects can join the bid. The RMAA projects’ tender process in the private sector can be divided into open tender and selective tender. Open tenders are usually advertised on newspapers and are open to public. Selective tenders are usually done via invitations by clients or construction consultants. In the private sector, most of the companies join the bid of RMAA projects are registered as Registered General Building Contractor. For RMAA projects which the building having slopes in their vicinity, the sub-register of site formation works category may be required in the tendering.

Market size

The estimated market size of RMAA works in Hong Kong increased from HK$57.0 billion in 2012 to HK$74.6 billion in 2017, representing a CAGR of approximately 5.5%, primarily due to the sustained growth in redevelopment plans of aged buildings in urban areas and increasing awareness of building maintenance. With the launching of policies in speeding up redevelopment process and raising buildings safety standards, as well as the revitalisation of industrial buildings, the needs for RMAA works are forecasted to rise. Combined with the shortening repair lifecycle of commercial property, the market size of RMAA works in Hong Kong is expected to grow, reaching HK$91.7 billion in 2022, at the CAGR of approximately 4.5% from 2018 to 2022.
The estimated market size of repair and maintenance works in Hong Kong increased from HK$36.7 billion in 2012 to HK$44.3 billion in 2017, representing a CAGR of approximately 3.8%. In 2017, the repair and maintenance works in Hong Kong took up approximately 59.4% of the total revenue generated in RMAA works market.

Going forward, the estimated market size of repair and maintenance works is likely to maintain a steady growth. The estimated market size of repair and maintenance works in Hong Kong is likely to reach HK$52.3 billion in 2022, with a CAGR of approximately 3.7% from 2018. Meanwhile, the estimated market size of alternation and addition works increased from HK$31.7 billion in 2018 to HK$39.3 billion in 2022, at a CAGR of approximately 5.5%, primarily due to the increasing number of redevelopment plans in urban renewal.

The estimated market size of RMAA works in public sector increased from HK$19.7 billion in 2012 to HK$25.3 billion in 2017, representing a CAGR of approximately 5.1%. In 2017, the private sector contributed to approximately 66.2% of the total market size of RMAA works in Hong Kong. The estimated market size of RMAA in private sector increased from HK$37.3 billion in 2012 to HK$49.4 billion in 2017, at a CAGR of approximately 5.9%.

The estimated market size of RMAA in private sector is likely to maintain the market share in the near future and reach HK$61.1 billion in 2022, at a CAGR of approximately 4.7% from 2018 to 2022. Meanwhile, the estimated market size of RMAA in public sector is forecasted to increase from HK$25.9 billion in 2018 to HK$30.5 billion in 2022, at a CAGR of approximately 4.2%.

Market driver

Ageing buildings and rising needs for building safety — As set out in the mandatory building inspection scheme, owners of buildings aged 30 years or above (except domestic buildings not exceeding three-storeys) and served with statutory notices are required to appoint an Registered Inspector to carry out the prescribed inspection and supervise the prescribed repair works found necessary of the common parts, external walls and projections or signboards of the buildings. Accordingly to the Planning Department, there are approximately 16,650 buildings aged over 30 years in Hong Kong in 2016, and the number is set to rise in the near future. The Hong Kong Government has also introduced a number of policies to encourage building maintenance and renovation, such as the Mandatory Building Inspection Subsidy Scheme, Integrated Building Maintenance Assistance Scheme and Operation Building Bright Scheme. Together with the rising building safety requirements, increasing number of aged buildings, therefore, would create a huge demand for RMAA works.

Technologies Adopted in Hong Kong

Prefabrication and Modular Construction

Being one of the most densely populated metropolitan cities in the world, Hong Kong’s housing supply is definitely a key element of the sustainable urban development. Hong Kong Housing Authority (HA) is the main provider of public housing for about half of the Hong Kong population, which plans, builds, manages and maintains different types of public housing. The HA has been actively pursuing the mechanised prefabrication construction system in its public housing developments with an aim to upgrade building quality, improve construction safety, enhance environmental protection and increase cost effectiveness. Building elements such as facades, slabs, staircases, partition walls and beams are prefabricated in the construction of public housing blocks for better workmanship and to maximise construction efficiency. With over two decades of experience being the pioneer in the use of prefabrication in Hong Kong, the use of precast concrete in domestic blocks has reached about one-fourth of total concrete volume in a typical public housing project. With the prefabrication of volumetric precast bathrooms for domestic flats in some of the projects, the ratio
can increase to 35%. More recently, the HA piloted the construction of a precast roof water tank, and also began exploring the feasibility of precasting lift machine rooms, roof parapets, manholes and drainage channels, as well as prefabricating electrical trunking.

Construction IT

IT technologies such as Building Information Modelling (BIM) may help improve construction efficiency through better information management, construction process control, cross-disciplinary collaboration, internal coordination, problem solving, and risk management. BIM is currently one of the Hong Kong construction industry’s key initiatives for enhancing the overall performance of the projects and the construction management. Since 2006, HA introduced BIM in its development of public rental housing projects, more than 19 projects have already adopted BIM at various project stages, ranging from feasibility study to construction stage. To facilitate the BIM implementation process, HA has prepared its in-house BIM standards, user guide, library component design guide and references for infrastructure projects. Highways Department was the first to use BIM on the Central-Wan Chai Bypass and Island Eastern Corridor Link in 2009 followed by a number of complex public works. Apart from the public sector, majority of major developers have adopted BIM to different extents such as development project planning, setting the use of BIM as a mandatory requirement for the design of particular developments.

Construction Automation and Robotisation

The Hong Kong construction industry has earned a reputation over the years in rapid construction of quality high-rise apartment blocks and office towers. The adoption of specialised construction techniques has made Hong Kong a regional leader. Faced with high labour cost, any machinery that could save labour usually will be welcomed by industry players. Thus, adoption of mechanisation in construction is one feasible and effective mean to achieve high productivity for the industry.

Machinery could enhance the efficiency of specific work trade on-site, but more desirable is the effective management approach for increasing productivity and project workflow throughout the entire development processes. The application of the aerial cinematography technology or Unmanned Aerial Vehicle (UAV) for site progress recording and monitoring has been studied and tested in Hong Kong’s real construction projects which could provide aerial overview at different stages of the site progress for site daily record. The system could conduct volumetric survey, assist site logistic planning and energy simulation, and help generate conceptual 3D modelling which saves the time and manpower as well as increases the productivity. To better control the as-built quality of projects, the laser scanning technology has been applied by Hong Kong contractors during the construction stage which provides more accurate project information and avoids multiple manual site visits for checking.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>Hong Kong</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIVERSITY</td>
<td>University of Hong Kong</td>
</tr>
<tr>
<td>COURSE</td>
<td>Infrastructure Project Management</td>
</tr>
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<td>NAME</td>
<td></td>
</tr>
<tr>
<td>Duration</td>
<td>1-2 years</td>
</tr>
<tr>
<td>Program details</td>
<td>conceptualisation and feasibility studies, through financing, contract administration, design, construction, commissioning, operation &amp; maintenance, evaluation and decommissioning.</td>
</tr>
<tr>
<td>Key Areas of Study</td>
<td>construction engineering and management, transport and development, environmental engineering, structural engineering and geotechnical engineering, as well as relevant industry expertise.</td>
</tr>
</tbody>
</table>
Career opportunities

Construction engineering and management, transport and development, environmental engineering, structural engineering and geotechnical engineering, as well as relevant industry expertise.

Accreditation

ICE, IStructE and IHT as meeting the requirements for Further Learning for a Chartered Engineer under the provisions of UK-SPEC for intakes 2002-2020, for candidates that have already acquired a CEng accredited BEng(Hons) undergraduate first degree.

REFERENCE

http://www.aal.hku.hk/tpg/programme-information

COUNTRY

Hong Kong

UNIVERSITY

Chinese University of Hong Kong

COURSE NAME

MSc in Management of Real Estate and Hospitality Assets

Duration

1 year

Program details

Integrate real estate and hospitality asset management with a business focus, this programme equips you with solid knowledge and skills in real estate development, asset management, market analysis, financing, valuation, and investment.

Core courses

Real Estate Finance
Property Development and Investment
Chain Development and Management
Managerial Communication
Strategy and Competitive Advantage
Real Estate Valuation
Facilities Development and Management
Big Data Strategy in China Market

Elective courses

Revenue Management
Shopping Mall Development and Management
Revitalisation of Historic Buildings
Land Conversion Process and Development Control

Career opportunities

Property planning, development, financing, investment, valuation, asset management, facilities management, leasing, marketing, and consultancy.

Commercial and residential properties are the most significant real estate assets. While hospitality-related properties

Accreditation

Royal Institution of Chartered Surveyors (RICS).

REFERENCE

CANADA

In the fall, Bank of Canada Governor Stephen Poloz characterized the country’s economy as having its head in the oven and feet in the freezer. Going into 2018, Dodge Data & Analytics Senior Economist Richard Branch agrees, noting during the Dodge Construction Outlook Executive Conference held in November that a mixture of positive and negative macroeconomic factors should lead to a 2.5 percent annual increase in GDP this year.

Positive drivers include increased business investment, the stabilization of oil prices, a strengthening labor market, federal stimulus spending, small business tax cuts and healthy demographic growth, while headwinds include tightening monetary policy, a slowing housing market, high levels of consumer debt, a stronger Canadian dollar and the potential demise or renegotiation of the North Atlantic Free Trade Agreement (NAFTA).

Following Canadian GDP growth in the neighborhood of 4.7 percent in the first half of 2017—leading every G7 nation—Branch forecasts a broad-based easing of economic growth in 2018. For the construction industry specifically, total permit values are expected to fall 4 percent in 2018 after rising 1 percent in both 2016 and 2017.

On the residential side, Branch reports single-family permits will weaken through 2018 due to overheated multifamily markets, with British Columbia and Ontario bearing the brunt of the decline. Meanwhile, home prices are cooling in Toronto and moving higher in Vancouver.

Setbacks in the commercial market in 2017 will lead to 2 percent growth in 2018, while the institutional market will remain flat this year on the heels of a steep 10 percent increase last year.
Notably, the institutional sector would be up 2 percent if not for a pullback in health care construction.

In the construction industry alone, we’re talking almost 250,000 of them retiring over the next decade, Companies have sent out the call that they will need to look to foreigners to come in and do the jobs they require, which are often multimillion dollars projects already underway. There are numerous opportunities in many areas of construction, although some regions are much more active than others. For the unemployed willing to learn a trade, it can be a rewarding job.

1. Aging Workforce

We’re not getting younger. As workers retire, they’re taking vast stores of knowledge with them.

2. Relentless Technological Change

Augmented reality, 3D printing, driverless equipment and more stand to change the way we plan, design and build. New skill-sets are constantly needed.

3. Project Size and Complexity

Bigger isn’t always better, but it’s going that way, especially with massive hydroelectric and mining projects involving broad consortia in far-flung, remote locations.

4. Globalization

Firms from outside Canada are increasingly getting in on the action here.

5. Gobble-ization

Mergers and acquisitions are involving all segments of the industry. These pressures are contributing to the slow death of the small and medium size firm.

6. One-Stop Shopping

Clients often want to integrate the entire plan-design-build process, plus property maintenance.

7. Deteriorating Designs

Documents, specs, drawings and plans are becoming increasingly ambiguous, contradictory and lacking specific important details and coordination.

8. Deteriorating Payment Practices

Contract terms are being extended, with 30 days becoming 60, 90, even 120 days. Will this lead to a new trend — demand for legislation reform?

9. Procurement Helter-Skelter

Owners are turning to non-traditional ways to obtain design and construction services. Because of the growing lack of capacity, knowledge and experience within their own ranks, some owners and clients
are looking to be less involved in the process. The risk? New practices might not be appropriate or even applicable.

10. Risk Adversity

Risks and responsibilities traditionally borne by clients are being transferred to contractors.

Compound Canada’s aging workforce with rapid technological change, for instance, and companies might find it challenging to anticipate the skills new personnel will need.

But technological changes tie in, too. There are also links between project size and complexity, increased foreign competition and a rise in mergers and acquisitions. “They manifest themselves in different ways but they’re all trends our members are seeing.”

Technology is evolving at an exponential rate. Each year there are more impressive advancements than the last, and the time between a technology being born and its practical application will continue to become shorter. Today, it is more important than ever to pay attention to emerging trends and identify how they will impact our industries.

Construction innovation is happening in relation to materials, building processes and communication. Here's a look into how a few growing residential construction technology trends are working together to improve the communities we build.

Real-Time Construction Collaboration

This past year, more construction-focused technology companies were launched than ever before and the majority of them are focused on improving construction collaboration through the use of mobile apps and cloud-based web platforms. Several companies are catering specifically to the residential construction industry and are focused on workflows like managing deficiencies, pre-installation checklists and pre-delivery inspections. The options for construction collaboration software are plentiful and include Canadian products such as RENOMii (renomii.com), a change order management app for renovation contractors, and Closeout (www.gobridgit.com), a comprehensive subcontractor management software for larger residential developers.

Whether it's a single-family home or a large condo, residential construction projects always bring together a multitude of stakeholders who are all on the go and either spread out across a single project or around the city. Moving forward, communication practices that allow people to get all of the project information and updates they need-on the go and in real-time-will be a non-negotiable in construction.

The Internet of Things Is Coming Home

In the past few years, the concept of a smart home has gone from an exciting idea to an accessible option for many Canadians. Starting with the Nest (www.nest.com) thermostat (launched in 2011), which allows users to control their home's temperature from their smartphone, the integration of smart home technologies is now a simple process and includes everything from controlling heating/cooling to home monitoring and keyless entry.

Despite the simplicity of setting up smart home technologies, it is still something that many home owners take on post-construction, replacing builder-grade thermostats, locks and switches with new, smartphone powered devices.

However, we are currently seeing a trend toward including smart home technologies in the initial construction plans for both single and multi-family projects. Companies specializing in smart home technologies, such as Toronto-based True Marque (www.truemarque.com), are partnering with leading developers to create homes that are smart from day one.

With the introduction of smart home technologies into the construction process, a new range of skills are going to be required from construction teams in order to support the installation and technical testing needed to ensure proper performance. It's time to start preparing for the day when we will literally need to test a home the same way we test a software-before launching it to the owner.
<table>
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<tr>
<td>UNIVERSITY</td>
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<tr>
<td>COURSE NAME</td>
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<tr>
<td>Duration</td>
<td>one-year full time</td>
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**Program details**
The MREI integrates leadership development with a focus on development, investment and financing of real estate and infrastructure.

The MREI integrates leadership development with a focus on entrepreneurial thinking and development, investment and financing of real estate and infrastructure. It combines classroom learning with a one-of-a-kind co-curricular experience, creating strong linkages between theory and practical application and capitalizing on a diverse network of alumni and other industry participants.

**Key Areas of Study**
real estate and infrastructure development, investment and portfolio management, project finance and consulting. They are employed by developers, real estate investment trusts, pension funds and advisory firms, financial institutions, brokerage and consulting firms. Some are entrepreneurs launching their own firms.

**Career opportunities**

**Accreditation**

**REFERENCE**
http://futurestudents.yorku.ca/graduate/programs/real-estate-infrastructure
JAPAN

Japan's construction growth, creating opportunities for higher construction equipment sales, is likely to be supported by factors such as low unemployment rates, new public transport infrastructure, improvements in consumer and investor confidence and positive developments in regional economic conditions.

country's growing urbanisation will create fresh demand for the residential construction market over the forecast [2015-19] period. Consequently market output to record a CAGR of 2.25% in nominal terms, to value JPY20.7 trillion (US$223.3 billion) in 2019."

Overall, Japan's construction industry is expected to reach a nominal value of JPY64.2 trillion (US$691 billion) in 2019, up from JPY56.3 trillion (US$587 billion) in 2014. However, there are risks to the positive outlook for construction industry growth in Japan in rising labour and construction materials costs.

Japan boasts around 1.2 million kilometres of roads, giving it the world’s fifth-largest network. One of the current major Japanese highway network expansion projects is the $32billion construction of a second Tomei- Meishin Expressway, connecting Tokyo and Kobe via Nagoya. Japan is also reported to have 680,000 bridges, almost 10,000 tunnels, 250 bullet trains and 98 airports. Some critics have talked of the country’s new infrastructure ‘white elephants’, citing, for example, the airport in Ibaraki, 85km north of Tokyo, which opened in 2010 at a cost of about $225 million as a hub for low-cost carriers. Now it is said to handle just six flights a day.

With further research indicating a declining number of motorists on Japanese roads, the huge but not indefinite spending on infrastructure by Abe may have provided only a short-term boost to construction equipment demand.

Adding further fuel to critical voices is the latest trading results of Japan-headquartered Komatsu, the world’s second-biggest manufacturer of construction and mining machinery after Caterpillar, who reported a 19% fall in Q2 2015 profit.

The construction equipment manufacturing giant’s net income in Q2 (July-September) 2015 fell to
32.6 billion yen (US$271 million) for the three months to September 30 from a revised 40.3 billion yen ($334.27 million) a year earlier.

Productivity performance

The overall productivity of the sector is estimated at 45 percent of the US level. Productivity in single-family housing (SFH) is at 33 percent of the US level, compared to multifamily housing (MFH) at 60 percent.

Industry Dynamics

The residential construction industry in Japan is very static, with little change in market share across construction types or players. Companies are reasonably profitable and wages are relatively high, so there has been little pressure to change. There have been very few new, productive, successful, entrants—either foreign or domestic. Price competition is quite limited; instead, firms compete on customization and reputation.

Important, external barriers to productivity and output growth

In 2013, around 12.9% of new houses were prefab or modular, compared with Australia, at only 3%. Sekisui House, one of the largest pre-fab housing companies, produces 15,000 detached houses a year, with its factory in Shizuoka producing around 20 houses per day.

The demand for professional design services is growing in major construction and renovation projects in Japan. The development projects related to the future 2020 Tokyo Summer Olympics play a key role in the rising demand. Design expertise is wanted especially in the contract sales market, where innovative design, material, and interior solutions are sought for private and public building and renovation projects.
Economic impact of the 2020 Tokyo Summer Olympics

The development projects related to the future Olympics are expected to generate major economic benefits for involved parties. According to Tokyo Metropolitan Government, 2020 Tokyo Summer Olympics and Paralympics will create economic benefits totaling 32.3 trillion yen ($ 283.50 billion) across Japan. The estimate of economic effects covers the 18 years starting from 2013, when Tokyo was chosen to host the Olympics and Paralympics, to 2030. The estimate is a combination of direct and legacy effects that will be created by staging the events.

Increasing number of construction and renovation projects of hotels and other facilities will create major opportunities for companies offering building materials, furniture, interior products and other items for the contract sales market. In Japan, Finnish design has already an excellent reputation thanks to its high quality and modern design features. Therefore, Finnish companies now have an excellent opportunity to offer their world-class design expertise to Japanese professionals in charge of these major projects. There are opportunities for new sales in following product categories:

- Furniture
- Interior items
- Building materials for public spaces, such as hospitals, elderly care facilities, shops, offices, etc.
- Turnkey design services including total coordination of interior works

<table>
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<tr>
<th>COUNTRY</th>
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<tr>
<td>UNIVERSITY</td>
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<tr>
<td>COURSE NAME</td>
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<tr>
<td>Duration</td>
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Program details
The MREI integrates leadership development with a focus on development, investment and financing of real estate and infrastructure.

Key Areas of Study
The MREI integrates leadership development with a focus on entrepreneurial thinking and development, investment and financing of real estate and infrastructure. It combines classroom learning with a one-of-a-kind co-curricular experience, creating strong linkages between theory and practical application and capitalizing on a diverse network of alumni and other industry participants.

Career opportunities
real estate and infrastructure development, investment and portfolio management, project finance and consulting. They are employed by developers, real estate investment trusts, pension funds and advisory firms, financial institutions, brokerage and consulting firms. Some are entrepreneurs launching their own firms.

Accreditation
http://futurestudents.yorku.ca/graduate/programs/real-estate-infrastructure

COUNTRY: Japan
UNIVERSITY: Meikai University, Chiba

COURSE NAME: Department of Real Estate Sciences
Duration: one-year full time

Program details: The Department of Real Estate Sciences offers three courses designed to deepen specialized knowledge in the fields of real estate sciences. The Business Course covers everything from the fundamentals of real estate sciences to business practice. The Finance Course prepares students for certificate examinations in real estate appraisal and the field of finance. In the Design Course, students learn about real estate development, architecture, and interior design.

Key Areas of Study: Seminar in Introductory Real Estate Science / Introduction to Property Law / Microeconomics / Introduction to City Planning / Basic Building Technology / Real Estate Science Graduation Workshop / Seminar in Real Estate Marketing / Real Estate Law / Basic English for Real Estate Business / Advanced English for Real Estate Business / Housing Theory / Real Estate Finance / Introduction to Design Workshop


CONSTRUCTION OUTLOOK

- PRE FABRICATED
- NEW CONSTRUCTION
- MAINTANANCE
- TRANSPORTATION
USA

Real GDP increase again by 2.1% in 2018, according to the International Monetary Fund (IMF) The first two quarters in 2017 have been 60 and 90 basis points above the same quarters in 2016, so a stronger annual 2017 number is expected (2017 Q1 GDP was 1.2% and Q2 GDP was 3.1%). Third quarter GDP numbers will mostly likely be lower than originally expected because of the effect of hurricanes, but that dip should recover by the fourth quarter. 2018 is expected to stay at the same 2.1% growth level based on the assumption that fiscal policy will be less expansionary. The unemployment rate is projected to be 4.7% by the end of 2017, slightly above the 4.4% rate reported in August. Since October 2009, the unemployment rate has continued to decline, falling below its pre-recession average, reflecting the continuous strength of the economy. For 2018, the rate is expected to be stable at 4.6% with over 155 million people employed

For 2017, inflation, which is measured by the consumer price index (CPI), is expected to be 1.9%. Since the recovery of oil prices, which began in 2015, inflation has slowly rebounded, as you can see in Graph 2. CPI is expected to continue to increase another 2.3% in 2018. Key factors to watch affecting the economy are: • Policy changes by the executive and/or legislative branches of government • Federal Reserve’s interest rate increases • Global instability (North Korea, terrorism)

NATIONAL FORECAST

Our consensus forecast shows total construction likely growing 5% in 2018 in nominal dollars. This growth is slightly higher than the expected growth for 2017 (4%). See Table 2 for our consensus forecast by end-market.

Residential Forecast In the Residential segment, we expect to see a 6% increase in construction in both 2017 and 2018. This growth will be sustained by a pick-up in Single-family, which will have 9% growth this year and next. Multi-family’s growth is tapering off and will reach its peak in 2017. It will still grow 1% in 2017 and start declining in 2018. The August 2017 Single-family (private, new) Put-in-Place figures show a 11.6% increase from the previous year, and the start figures show a 17.1% increase from a year ago. Multi-family, on the other hand, only grew 2.3% in Put-in-Place spend. Multi-family starts have started declining, with starts figures for the past six months averaging 345K units, while the six months before that averaged 392K units. Several urban Multi-family markets are at peak and now apartment developers are seeking growth in secondary and suburban markets. In Single-family, the builders are struggling to find land, and lot prices are increasing, which in turn
limits their ability to provide entry-level housing (under $200K homes). In fact, the main risk factors for residential construction continue

<table>
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<tr>
<th>Year</th>
<th>Consensus 2017</th>
<th>Consensus 2018</th>
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<tbody>
<tr>
<td>Total</td>
<td>4%</td>
<td>5%</td>
</tr>
<tr>
<td>Residential</td>
<td>6%</td>
<td>6%</td>
</tr>
<tr>
<td>Single-family</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Multi-family</td>
<td>1%</td>
<td>-1%</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>2%</td>
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</tr>
<tr>
<td>Commercial</td>
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</tr>
<tr>
<td>Hotels</td>
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<td>Office</td>
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<td>Retail</td>
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<tr>
<td>Education</td>
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<tr>
<td>Healthcare</td>
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</tr>
<tr>
<td>Public Buildings</td>
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<tr>
<td>Industrial</td>
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<tr>
<td>Other Non-Residential</td>
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<td>Non-Building</td>
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<tr>
<td>Roads and Bridges</td>
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<td>6%</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>3%</td>
<td>3%</td>
</tr>
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</table>

1. Building information modeling (BIM)

Building Information Modelling takes into account the most crucial thing in a construction project: Collaboration. After its initial launch, BIM tech has been evolving and has introduced many maturity levels that take into account the level and extent of collaboration it offers.

So far, BIM has held a lot of interest from the construction industry. More and more, contractors are implementing BIM technology in their work processes. The BIM Level 2 mandate in UK has also started the ball rolling towards this direction.

2. Project management software

Like various other industries, construction has realized the potential of implementing a project management software. Real-time project management software has been continuously advancing in order to draw more insights from data.

The software provides the construction industry with three fundamental advantages: Efficiency, Transparency and Accountability. The latest software provides real-time communication, project overview, trackability and integrations with other software.

A project management software is not as glamorous as BIM, and it’s not trying to be! What it is doing is improving and optimizing the basics of how construction projects get the job done. Its existence is due to lack of efficiency and waste in the construction industry.
3. VR and AR

Compared to augmented reality, virtual reality is a much more common tool in construction. It is often used in BIM. Its biggest benefit is the ability to provide virtual walk throughs in order to sell property and pitch architectural ideas to clients. The possibility to virtually show clients what their investment will look like beforehand, makes VR a very sexy technology.

4. Robotics

Robots and automation have revolutionized various industries. Its arrival in construction has been slow but it’s here now and rapidly spreading. There has been much technological advancement made in robotics. One such example is MIT’s Digital Construction Platform which uses 3D printing to create form structures.

5. Drones

There has been much talk about Drones and the numerous advantages they provide to a construction project. It is extensively used in mapping the construction site (thereby gathering data of the entire site), reporting the changes and updates of the project to clients, and monitoring and inspecting job sites.

6. Modular construction

Modular buildings or prefabricated buildings is the development of a building structure off-site, and then transporting it to the desired site without compromising on quality. There is no change in building materials and supplies, and the job is done in less time. According to Westchester Modular, through modular construction the job can be done 65 times faster.

7. Green construction

One of the most significant change observed in the construction industry is the growing interest in green construction. There has been a global change in the way people consume. Consumers have started to change their lifestyles – reason behind Airbnb’s popularity. The reduction in waste and purchase of disposable goods, and an increase in collaborative consumption has set a trend where people are actively influencing major industries.

8. Improved labor

With technology comes the possibility that there will be a shortage of jobs in the construction industry. It is true that manual labor will be replaced by robots – which is what advancement is all about! But robots will create more job opportunities for many. There will be more intelligent labor in construction.

<table>
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<th>COUNTRY</th>
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<tr>
<td>UNIVERSITY</td>
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<td>COURSE NAME</td>
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<tr>
<td>Duration</td>
<td>one-year full time</td>
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</table>
study both the financial and business aspects of the industry, equipping you with the hard and soft skills you need to excel as a real estate professional. training in underwriting and financial modeling.

Key Areas of Study

financial analysis and urban planning and sustainability, including LEED certification. Faculty provide instruction in Argus, CoStar, Bloomberg, and other industry-specific software.

Employers of our MSRE graduates include, but are not limited to:

- Fannie Mae
- Accountemps
- Bentall Kennedy
- Boubyan Capital
- JGB Companies
- John Lang LaSalle
- Spirit Realty
- Vornado/Charles E Smith

Accreditation

National Association of Industrial and Office Professionals (NAIOP), International Council of Shopping Centers (ICSC) and the Urban Land Institute (ULI)

REFERENCE

https://www.american.edu/programs/graduate/listing.cfm#/degrees/MS.RLE

COUNTRY

USA

UNIVERSITY

Arizona State University

COURSE NAME

Built Environment (Energy Perf/Climate Responsive Arch)

Duration

one-year full time

Program details

program's focus is the relationship between climate and site, thermal and visual comfort in buildings, and the demand and consumption of energy.

Key Areas of Study

basic core of knowledge of the principles of the natural energies available at the building boundary due to climate and site; thermal and optic behavior of building materials and components; passive and low-energy architectural systems for heating, cooling and lighting; and appropriate integration with mechanical systems.

Career opportunities

Accreditation

North Central Association Higher Learning Commission

REFERENCE

https://webapp4.asu.edu/programs/t5-majorinfo/ASU00/ARENERGYMS/graduate/false

COUNTRY

USA

UNIVERSITY

Arizona State University
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<td>Students learn how to locate, analyze and consider the physical, legal, economic, political and financial conditions impacting the use of property and the critical analysis required for a successful project.</td>
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<td>Career opportunities</td>
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| COUNTRY | USA |
| UNIVERSITY | Columbia University, New York |
| COURSE NAME | M.S. REAL ESTATE DEVELOPMENT |
| Duration | one-year full time |
| Program details | coursework immerses students in the three core tenets of urban real estate development: the financial, the physical, and the legal, arming students with the full range of professional and intellectual skills needed to tackle the complex demands of global urban real estate development. The introduction to the program begins with immersion in real estate finance, construction technology, market analytics, and other foundational subjects. Electives are limited to allow students with diverse background experiences to build essential financial, graphic, and analytical competencies. |
| Key Areas of Study | |
| Career opportunities | Real Estate Finance, Construction Management and Technology |
| Accreditation | |
| REFERENCE | https://www.arch.columbia.edu/programs/8-m-s-real-estate-development |

<p>| COUNTRY | USA |
| UNIVERSITY | DePaul University, Chicago |
| COURSE NAME | REAL ESTATE (MS) |
| Duration | one-year full time |
| Program details | The Master of Science in Real Estate equips you with the skills necessary to help you launch your career in real estate investment analysis and finance |</p>
<table>
<thead>
<tr>
<th>Key Areas of Study</th>
<th>Career opportunities</th>
<th>Accreditation</th>
</tr>
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<tbody>
<tr>
<td>REAL ESTATE INVESTMENT AND FINANCE</td>
<td>REAL ESTATE DEVELOPMENT, MULTIFAMILY HOUSING POLICY AND FINANCE, Sustainability and the Built Environment</td>
<td><a href="https://business.depaul.edu/academics/real-estate/graduate/real-estate-ms/Pages/default.aspx">https://business.depaul.edu/academics/real-estate/graduate/real-estate-ms/Pages/default.aspx</a></td>
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<td>Key Areas of Study</td>
<td>Career opportunities</td>
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<td>Design and Innovation in Real Estate</td>
<td>Leadership and Entrepreneurship</td>
<td><a href="http://www.gsd.harvard.edu/design-studies/real-estate-and-the-built-environment/">http://www.gsd.harvard.edu/design-studies/real-estate-and-the-built-environment/</a></td>
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<td>Key Areas of Study</td>
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<td>Program details</td>
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<td>In the contemporary global economy, architecture, landscape architecture, and urban planning and design must confront the complex mechanisms of finance and economics. Real Estate and the Built Environment engages both by considering design and investment as integrally connected.</td>
<td>MSRED program investigates every field that impacts the real estate industry — from design and development to construction, management, finance, and law.</td>
<td></td>
</tr>
</tbody>
</table>
Key Areas of Study

Real Estate Economics, Real Estate Finance and Investment, Real Estate Products and Development, Real Estate Building Systems, Real Estate Ventures I: Negotiating Development - Phase Agreements: 12 Units
Introduction to Urban Design and Development
Financial Decision Making for Real Estate and Other Markets
Leadership
Entrepreneurship

devopers, entrepreneurs, financiers, legal professionals, real estate managers, etc., our graduates serve throughout the domestic and international industry, holding positions of leadership in the real estate profession worldwide.

Accreditation

REFERENCE http://gradadmissions.mit.edu/programs/cre

COUNTRY USA
UNIVERSITY New York University
COURSE NAME Real Estate
Duration one-year full time

Program details

specialization in Real Estate provides rigorous training in the development, investment, and financing of real estate projects. Students learn to think strategically about the workings of real estate primary and secondary markets by understanding the roles of various market participants as well as the legal, taxation, and regulatory environment that these markets present.

Key Areas of Study

Real Estate Primary Markets
Real Estate Capital Markets
Real Estate Development and Entrepreneurship
Real Estate Transactions
Real Estate Investment Strategies
Urban Systems

Career opportunities

Real Estate Development
Real Estate Brokerage
Real Estate Project Investment
Equity and Fixed Income Research
Sales & Trading
Hedge Funds
Sovereign Wealth Funds

Accreditation

REFERENCE https://www.nyu.edu/academics/academic-programs.html#R
GERMANY

GERMAN CONSTRUCTION MARKET AND OPPORTUNITIES

Germany is Europe's driving development market and home to the landmass' biggest building stock. Various drivers have prompted a blast in German development speculation and this is generally anticipated that would proceed soon.

As a feature of its progressing change to a manageable vitality framework, Germany intends to have a near atmosphere unbiased building stock by 2050. Three quarters of structures in Germany were worked before 1980, making the remodel of existing stock key to meeting vitality productivity targets. With light request and tight construction standards, Germany offers suppliers of vitality effective building items and administrations a unique market.

Development of Germany’s Construction Market

The development of construction division is growing in Germany. Growth in population, demographic changes and a great favourable socio-economic environment have a high demand on residential buildings. There are also interesting niches, such as multigenerational houses, micro-apartments, and prefabricated buildings. Green building technologies - from the modeler's office to building materials and segments - will be principal in accomplishing the nation's atmosphere assurance targets. There is no better time to approach Germany's developing and green construction market development.

**Under construction**

Strong growth in residential builds to continue in the mid-term

![Graph showing construction volume and building permits in Germany](image)

Digitizing the Construction Industry: Building Information Modelling (BIM)

Whether it is tracking systems for construction machinery, digital construction files, or drones flying above a building site to control the construction status – digitization has arrived in the German construction industry. The Federal Ministry of Transport and Digital Infrastructure (BMVI) has developed a “Road Map for Digital Design and Construction”, which promotes the development and utilization of Building Information Modelling (BIM) as a standard planning tool for all federal infrastructure projects as of 2020. The goal is to clarify legal and technical requirements and develop standards for BIM [2].

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The innovation guarantees a coordinated planning process, effective and sustainable utilization of asset resource’s in building, and the quick exchange of data between all stakeholders in the planning and construction process. However, an investigation by the Fraunhofer Institute for Industrial Engineering found that 41% of the construction firms and organizers overviewed had never utilized BIM. To change these architects, engineers, construction organizations, researchers, and different stakeholders are working together and trading learning in 16 BIM bunches (as of May 2017) over Germany. Innovative foreign organizations are invited to join the way toward turning integrated digital planning and construction from a vision without bounds into a standard in development.

Public infrastructure spending

Germany has adopted an aggressive approach in regards to construction investment. That’s due to the increased spending for roads and bridges. Based on Euribor.com, the German State is intending to spend €32,900M on public infrastructure. This decision is inextricably connected with the substantial increase of the population in Germany. Many people are choosing, at the moment, to pursue a career in the country due to its financial and societal stability.
Prioritize innovation

The use of digital tools can truly open up the construction process and allow for faster and data-driven decisions. In the German building industry, the biggest advantage of digital solutions (eg. construction software) could be the collection and scientific management of big data.

For instance, predictive analytics can help with the faster analysis of the impact that a new building/road could have on an area. The ability to identify potential risks and patterns depending on the building location could eventually lead to the generation of a construction road-map for certain types of areas or projects. It goes without saying that this could save German construction a good amount of time and resources in similar future projects.

Modular construction

We recently identified modular buildings, as one of the hottest trends in construction for 2018. Germany could be no exception to that. By investing in the industrialized building, the sector could save valuable time and skip some extremely costly and time-consuming steps during the construction process. In the long run, such strategy could have a considerable impact on the housing prices. The less money spent during the building phase, the more affordable housing prices.

GenieBelt steps in

The year 2018 seems to be both challenging and promising for German construction. With the right plan and a brave investment in innovation, the sector has a unique opportunity to rise above the difficulties and build on its positive momentum. GenieBelt could be a valuable ally in this endeavor. Through real-time project management, a more transparent and accountable future for German construction could be closer than everybody might think.

- COUNTRY : Germany
- UNIVERSITY : EBZ Bochum
- COURSE NAME : MA 'Real Estate Management', Distance learning.
- Duration : 5 semesters (6 to 10 semesters possible)
- Program details : The master's program Real Estate Management is particularly interesting for graduates of economics courses. In addition, students who specialize in architecture, urban and regional planning, construction and engineering, law or social sciences can also be admitted to study.
- Key Areas of Study : Business & Management,
  • Accounting & Controlling,
  • Business Environment,
  • General Competencies and
  • Options
- Career opportunities : Construction management
  Project management
  Value management
  Accreditation :

- COUNTRY : Germany
- UNIVERSITY : University of applied sciences Munster
- COURSE NAME : Subject area of 'Design and Architecture', more than one MSc
- Duration: 4 semesters
- Program details: The programme focuses on business and engineering expertise as well as creativity in the development and implementation of strategies. You will be in a position to actively manage large real estate portfolios, develop and implement strategies, and procure and manage services, making an active contribution to the company’s value chain. Other key transferable skills will be further developed in interdisciplinary project teams with project companies, many of which are well-known.
- Key Areas of Study: Real Estate and Facility Management
- Career opportunities: The course of study is a fundamental component for future specialists and managers in real estate and facility management, whether they are consulting firms, corporate (CREM) or property (asset) managers, service providers or institutional investors.
- Accreditation:

- COUNTRY: Germany
- UNIVERSITY: HTW Berlin
- COURSE NAME: MSc - Construction and Real Estate Management
- Duration: 2 years
- Program details: Provided by two renowned universities of applied sciences, HTW Berlin and Helsinki Metropolia, the Master’s programme in Construction and Real Estate Management (ConREM) not only covers the central issues based on cutting-edge research, but also guarantees a consequently international approach
- Key Areas of Study: Life cycle management, real estate development, construction and real estate technology, business and management science, international and intercultural collaboration and leadership competence
- Career opportunities:
- Accreditation: ACQUIN
- Reference:
IRELAND

The Celtic Tiger economic boom was driven in part by the country’s house building industry. Equally, the financial crisis that followed was a result of the debt that homebuilding and buying engendered. As the financial crisis unfolded, the construction industry collapsed and pictures of unfinished developments became emblematic of Ireland’s economic failure.

Challenges of the Current Market Whereas at the peak of the boom in the region of 90,000 homes a year were being built, in 2015 the number was less than 13,000. The consequence, particularly in Dublin, is a chronic housing shortage that poses a problem not only for potential homeowners and renters but is seen by the government as a direct challenge to Ireland’s economic future. While its rapid rebound from the crash has seen the Irish economy become one of the fastest growing in the Eurozone, the country’s attraction for foreign investment is threatened by the absence of high-quality housing and associated infrastructure, both economic, such as roads and broadband, and social, such as schools and healthcare (a problem recognised by the government in the 2018-2027 National Development Plan which promises massive infrastructure upgrades over the next decade).

Without housing for their workforce the attraction of Ireland to overseas companies is compromised but in any event concerns exist regarding the adequacy of supply of office space. While Dublin has already established itself as an attractive outpost of Silicon Valley within Europe, with companies such as Facebook, Google and LinkedIn employing thousands of people, and is an established base for pharmaceutical and service businesses, its ability to meet increasing demand is uncertain. Projects that were started after the recession are only just reaching completion and a lot of old stock is in the process of being demolished to make way for new buildings. The consequences are very low vacancy rates and limited options for companies looking to set up a base in Dublin.

Given the shortages in commercial and residential property it is no surprise that Ireland is experiencing a new boom across the construction sector. According to the latest Construction Purchasing Managers’ Index from Ulster Bank, housing and commercial activities both showed strong growth in 2017. Construction is set to expand again in 2018, with Aecom Ireland estimating 14% growth. The strong economy, shortage of housing and the rapid rise of house prices have all conspired to bring Ireland back to the attention of global institutions, private equity and real estate investment trusts seeking to invest in real estate. Brexit has, of course, also fuelled interest. While Ireland has the largest trade exposure to the UK of any EU country and has the potential to be negatively impacted, there is considerable optimism that Brexit offers a wealth of opportunities for investors who might see London as overpriced and who also want to retain a foothold in the European Union.

PRS There is also an increasing appetite among investors towards "alternative" sectors such as the Private Rented Sector (PRS) and Purpose-Built Student Accommodation (also known as PBSA). These
sectors are seen to have less volatile income characteristics, potential for capital growth and provide diversification. According to Jones Lang LaSalle, PRS in Ireland was of particular interest to investors in 2017 and they expect continued activity in this sector in 2018. Property consultants, Savills, estimate that approximately 18.9% of people currently live in private rented accommodation in Ireland (24.5% in Dublin) and that figure is anticipated to rise. Scarcity of accommodation means that vacancy rates are being driven lower (currently estimated at being in the region of only 1.3%), which, together with strong rents (despite rent controls in certain areas), adds to the attraction of PRS as a stable investment opportunity. The fact that property prices continue to advance faster than earnings means that the rental sector is unlikely to slow down any time soon.

Technical Innovation Both PRS and PBSA have the potential to help alleviate the chronic under-supply of housing, particularly in Dublin. Ireland also has technical capability, for example, in the offsite manufacturing (also known as modular building) sector, which could help solve the housing problem. Certainly, in the UK, the government sees it as a potential solution to its own housing crisis: in November 2017, UK Chancellor, Philip Hammond, acknowledging the importance of modernisation and innovation to the future of the industry, stated that the government will drive adoption of modern methods of construction, such as offsite manufacturing. Historically, poor durability and structural performance contributed to a perception of prefabricated construction as inferior to more traditional methods, but in recent years an incremental approach has seen an increase in the successful use of modular construction, for example, bathroom pods and façade manufacture. Innovative strategies can alleviate the challenges Ireland faces in other ways too. For example, Aecom, in its Annual Review 2018, draws attention to the potential of brownfield sites and cites the successful development of Dublin Docklands. Agricultural land also offers opportunities. Facebook is expanding with a new data centre in County Meath. The centre is one of the most energy-efficient in the world being 100 per cent powered by wind energy.

- COUNTRY : Ireland
- UNIVERSITY : Dublin Institute of Technology
- COURSE NAME : Real Estate
- Duration : delivered over 2 ½ years (Part-Time)/ 1 year (Full-Time) (5 Semesters)
- Program details : The programme is presented within the School of Real Estate and Construction Economics in the Faculty of the Built Environment in DIT. The need for competitiveness and efficiency in both the private and public sectors has resulted in a growing awareness of the role of real estate as an economic and business resource
- Key Areas of Study : The programme’s focus is strongly oriented to real estate valuation, appraisal and investment.
- Career opportunities : The programme has full accreditation from the Society of Chartered Surveyors, Ireland (SESI) and The Royal Institution of Chartered Surveyors (RICS).
- Accreditation :
- REFERENCE : http://www.dit.ie/studyatdit/postgraduate/taughtprogrammes/allcourses/dt9124f1dt124ptreales tatemsc.html
CONSTRUCTION OUTLOOK

- Residential
- Commercial
- Transportation
Lithuania

This forecast statistic shows the revenue of building construction in Lithuania from 2009 to 2014, with forecasts up until 2020. By 2016, revenues of building construction in Lithuania are projected to reach approximately 2.6 billion U.S. dollars. Figures include residential and non-residential building construction.

The highest-ranked construction products relative to their level of domestic consumption in Lithuania accounted for 47.7% of domestic sales in 2015. The ranking of the five most domestically sold product groups has been relatively constant since 2010, except for “Portland cement, aluminous cement, slag cement and similar hydraulic cements (group 2351112), which was replaced by “Prefabricated buildings of metal” in 2015. The structure of domestic sales in Lithuania differs to the EU average and only three similar product groups lead the sales in both markets.

The top-five most exported construction products account for 65.8% of all construction products exports in 2015. According to the European Innovation Scoreboard 2017, Lithuania is classified as a Moderate Innovator, with an overall performance in terms of innovation and R&D below the EU average. Despite some minor fluctuations, the country’s overall innovation performance has been improving, with an average annual growth rate of 2.4% during the period 2010-2015, the third largest increase in the EU after Malta (3.6%) and Latvia (4%). Lithuania performs below the EU average for most dimensions including Innovation-friendly environment, Human resources and Linkages. Relative weakness was recorded in Sales impacts, Attractive research systems and Intellectual assets. Lithuania scores above average for R&D expenditures in the public sector and venture capital investments. It also performs well in terms of non-R&D innovation expenditures.

1. More Technological Integration
Technology is one of the main factors pushing change in nearly every industry, but in some ways, the construction industry has managed to partially avoid this. However, recent advancements have resulted in technology that is specifically suited to construction; with more drone usage and 3D printing than ever before, it is likely the construction industry will embrace both these forms of technology.

After all, both will make construction work safer and easier; drones can be used to ensure materials are placed exactly how they should be, and 3D printing can be used to make sure every material is the perfect size. Self-driving vehicles may also become more popular within the construction industry, as well as mobile and cloud applications that make the whole construction process more straightforward.

Another form of technology that people can expect to see more of is Building Information Modeling (BIM). BIM will make the collaboration aspect of construction easier. Most construction projects require tens (or even hundreds) of people to come up with essential aspects of the plan, but it can be difficult for all these people to stay in communication.

Many construction companies are already starting to use BIM technology, and it isn’t hard to see why. There are lots of benefits to using BIM; it makes resource management easier, it helps people to stay in touch throughout the project, and it enables enhanced collaboration. In fact, the National BIM report of 2017 by the NBS found that people are having a very positive response to the technology. The report found that nearly 80% of the participants believe BIM is the future of project management, and a further 60% believe the technology has the ability to make projects more time efficient.

2. Increase in Prefabrication and Modular Construction Projects

Prefabrication and modular construction have both become more popular over the last year or so, and it isn’t hard to see why. Both trends are energy efficient and cost-effective, which is ideal at a time when most material prices are rising, or high already! This popularity is likely to increase even more over the next few months, especially for construction companies looking to cut overall costs. And with the help of effective hot melt adhesives and the overall ease of design, the actual construction of the homes is quite quick. So, you can expect to see a lot more permanent modular buildings in the future, as well as pop-up buildings and prefabricated homes.

3. Additional Focus on Sustainability

Increasingly, people are focused on sustainability, so the most successful companies are also focusing on sustainability. This is a terrific way to appeal to the Millennials, and of course, it is also much better for the world as a whole. For this reason, it is very likely that most, if not all, construction companies will place a strong focus on sustainability. While it is still important to find the best product for the job, it is likely managers will look for products that have a focus on ecological benefits, such as living walls that provide an area with fresh oxygen.

4. Improved Safety Procedures

Most people understand construction isn’t the safest job in the world, especially when compared with an office job. After all, the industry suffers far more workplace accidents and fatalities, and this knowledge has resulted in an increased level of scrutiny on the industry. This scrutiny has resulted in the development of technology designed to make construction sites safer. New mobile apps and computer programmers make it easier for employees to adhere to safety measurements when they are working.

COUNTRY : Lithuania
UNIVERSITY : Vilnius Gediminas Technical University
COURSE NAME : MSc 'Real Estate Management'
Duration : 3 semesters (one and half year)
Program details: The purpose of the Real Estate Management Study Programme is to prepare strategically minded highly qualified real estate management specialists - Masters of Business Management, who are able to apply theoretical and practical knowledge based on the recent research results, real estate valuation and management methods, perform scientific research, apply information and intelligent technologies, evaluate the market and business prospects, plan real estate investments, manage real estate development projects, work individually and in a team, formulate and implement innovative decisions, assess their environmental impact, ready for lifelong personal development.

Key Areas of Study:

Career opportunities: Graduate can work in real estate valuation, trading, rental, development companies, banks, municipalities, insurance companies, facility management organizations and other institutions in various fields and (or) can continue his studies in PhD level.

Accreditation:

The Netherland’s construction industry is expected to reach a value of US$144.5 billion in 2021 in real terms, measured at constant 2010 US dollar exchange rates, according to Timetric’s Construction Intelligence Center (CIC). According to the report, construction sector growth over the forecast period to 2021 will be supported by investments across infrastructure construction, healthcare, the manufacturing industry, educational facilities and housing projects continuing to drive growth. Under the National Reform Program (NRP) 2016, the government plans to spend EUR3.5 billion (US$3.9 billion) on renewable energy infrastructure by 2020. Growth will also be driven by the country’s Operational Program (OP) 2014–2020, under which the government aims to develop the country’s infrastructure.

In real terms, the Netherland’s construction industry is expected to register a compound annual growth rate (CAGR) of 3.6%, an improvement over the 2.5% CAGR registered over the review period (2012-2016).

Residential and Infrastructure Construction to Boost Market

Residential construction was the largest market in the Dutch construction industry during the review period, accounting for 48.9% of its total value in 2016. The market is expected to retain its position over the forecast period, constituting a 52.5% share of the industry’s total value in 2021.

“The market will be supported by urbanization, population growth, affordable housing projects, and positive developments in regional economic conditions. Additionally, the low housing interest rate is expected to attract investment in residential properties, which in turn will drive the growth of the market over the forecast period,” comments Danny Richards, Lead Economist at Timetric’s CIC.

Accounting for 20.3% of the construction industry’s total value in 2016, infrastructure construction was the second-largest market in the Dutch construction industry during the review period. The market is expected to remain the second-largest over the forecast period, supported by government and private sector investments in transport infrastructure. With an investment of EUR4.0 billion (US$5.6 billion), the government is planning to increase the capacity of highways under the Schiphol-Amsterdam-Almere program by 2020. In addition, the government plans to invest EUR2.5 billion (US$2.8 billion) for the expansion and renovation of the country’s railway lines by 2020.

1. Greener Asphalt
Beginning in the 1960s, the construction industry began successfully using recycled rubber—mainly from used car tires—as an asphalt admixture that improved quality, lowered material costs, and reduced landfill waste. In recent years, that practice has extended to using recycled bottles and other single-use plastics in asphalt.

In fact, the Dutch city of Rotterdam has even proposed building a new bike path entirely out of recycled, LEGO-like, plastic blocks that snap together. And plastic and rubber are not the only recycled materials being mixed into asphalt: Researchers at RMIT University in Melbourne, Australia, have shown that adding cigarette butts can improve roadway quality while safely containing heavy metals; and in Sydney, recycled printer toner is incorporated into an environmentally friendly asphalt mix.

2. 3D-Printed Concrete Bridges

Additive-manufacturing concrete printers aren’t exactly new (Redshift first mentioned the technology in 2014), but 2017 saw a major milestone as not one but two bridges were constructed on-site using commercial 3D printers.

The first, a Gaudi-inspired pedestrian footbridge in Madrid, was designed by the Institute of Advanced Architecture of Catalonia. The second, a cyclist bridge in the Netherlands, was designed and built by engineers from the Eindhoven University of Technology and construction company BAM Infra.

3D printing offers many advantages here: Structures require only the amount of cement that will be used (lowering carbon-dioxide emissions), require no formwork (lessening waste), and can be built into shapes previously possible only with extensive CGI movie magic.

3. Construction-Site Robots

The proven ideas behind machine-controlled equipment—graders, loaders, backhoes, and so on—have been expanded in 2017 to focus on autonomous control and robotic technology.

Several new applications are already deployed on construction sites. Examples include SAM (Semi-Automated Mason), the bricklaying robot that works alongside human masons to increase productivity and reduce physical strain on workers. And then there’s Built Robotics’ autonomous track loader, which uses LIDAR, GPS, and digital files to guide itself around construction sites, cutting and filling as needed.

Other construction robots in use include trucks; dump trucks; and a self-driving, 320-ton “mega machine.” A fleet of these behemoths is currently deployed by Australian company Rio Tinto for its mining operations—controlled from the company’s Perth headquarters, a thousand miles from the site.

4. Virtual Reality (VR) in Preconstruction

Until recently, virtual environments were confined to video games and training simulations. But VR and immersive design are starting to make waves in the construction industry. For example, in 2017, Layton Construction created 20 virtual mockups to conduct user tests of operating theaters and other critical medical facilities for a 485,000-square-foot, 280-bed medical center in Florence, Alabama.
By replacing physical mockups, the hospital’s owners avoided about $250,000 in costs, while improving efficiency in the constructed rooms. Layton has since used the same technology at larger scales, improving its realism with sound cues, tactile feedback, and augmented reality.

5. Augmented Reality (AR)

Like virtual reality, AR applications for construction have been more theoretical than actual for years. That’s changing—there’s even an iOS app called AirMeasure, the “ultimate augmented-reality measuring toolkit,” which offers 15 modes to capture accurate on-site measurements using just a smartphone.

And speaking of AR, remember Google Glass? The eyeglass-mounted system never caught on as a consumer product, but has quietly proved itself indispensable in manufacturing applications, and will presumably find a place in construction applications as well.

6. Circular Business Models

More a philosophy than a technology, circular business models, which consider the entire lifecycle of a project, gained traction in 2017. Circl, built by European construction group Royal BAM as a pilot project, is a large pavilion intended for deconstruction from the outset. The idea is that modular building techniques and careful tracking of resources should make it possible to reuse virtually all of Circl in other buildings.

“Some of the materials used should actually increase in value,” said BAM’s Group Director of Sustainability, Nitesh Magdani. “In effect, we’re trying to create ways to lease materials, so that this future value can be captured.” To that end, BAM is developing an online marketplace to enable 100 percent reuse, as well as new contracting methods that will better account for reuse.

7. Self-Healing Concrete

In infrastructure, it all comes down to concrete—it is, after all, the world’s most commonly used construction material. What if all that concrete could fix itself when cracks form? It might sound crazy, but the Romans used self-healing concrete more than two millennia ago, and modern-day scientists are finding ways to do the same. One approach relies on limestone-producing bacteria. And materials scientists at Rutgers University are using a limestone-producing fungus called Trichoderma reesei as a concrete admixture that will fix fine cracks as they form.

8. Solar Roadways and Smart Highways


But backlash was intense. Citing engineering concerns and pilot test results, critics labeled the venture a crazy idea and a “freakin’ failure.” But in 2017, the Missouri Department of Transportation adopted a solar roadway pilot project, and the Federal Highway Administration granted Solar Roadways $750,000 for development and testing.

- COUNTRY: Netherlands
- UNIVERSITY: University of Amsterdam
- COURSE NAME: MSc 'Finance', track in Real Estate Finance
Duration: one-year programme of 60 ECTS credits.

Program details: This programme consists almost completely of compulsory courses only, to provide a solid grounding in all aspects of the discipline. Starting with Real Estate Valuation and Real Estate Markets and Analysis, you will acquire the fundamental methodology to assess real estate values. Applied Financial Econometrics enhances your mathematical skills and understanding of the metrics involved, while Empirical Methods in Finance increases your scientific research skills in the relevant context. It is only in the last semester that students can choose either International Housing Markets or Real Estate Investments. This is followed by Ethics and Professional Skills in Finance and the thesis seminar to pave the way for completion of the programme in the form of a master’s thesis, for which we provide ample guidance.

Key Areas of Study: Real estate valuation, Applied Financial Econometrics, Empirical methods in Finance, International housing markets

Career opportunities:

Accreditation: The quality of this master's programme has been assessed by the Accreditation Organisation of the Netherlands and Flanders (NVAO). This means that upon successful completion of the programme, you will receive a legally accredited Master's degree in Business Economics and the title Master of Science (MSc).


COUNTRY: Netherlands
UNIVERSITY: Eindhoven University of Technology
COURSE NAME: MSc 'Construction Management and Engineering'
Duration: 2 years

Program details: The master’s degree program Construction Management and Engineering (CME) is offered by the Built Environment (BE) and Industrial Engineering & Innovation Sciences (IE&IS) departments, with their distinctive research-driven and project-oriented approach to education. In this interdepartmental program the focus is Smart Cities: using urban/building sciences and management and innovation sciences to develop solutions for smart urban development. CME graduation projects are closely related to ongoing research projects in the BE and IE&IS departments.

Key Areas of Study: The vision of the Graduate School (the Masterprogram is part of it) is that students develop a personalized education program. Therefore the Masterprogram CME offers you a series of courses and projects with a lot of flexibility and multidisciplinary opportunities the possibility to gain international experience educations in soft skills, such as creativity and communication skills in the curriculum.

Career opportunities: In recent years, mainly the following companies have contributed to the realization of graduation projects and other educational activities: Major international consultancies such as Arcadis, DHV, Royal Haskoning, AT Osborne, Grontmij

- Provincial Development Company (BOM)
- Housing corporations
- Government agencies
- Building companies

Accreditation:

• COUNTRY : Netherlands
• UNIVERSITY : Eindhoven University of Technology
• COURSE NAME : Subject area of ‘Architecture, building and planning’, more than one program
• Duration : 2 years
• Program details : Within the master’s program Architecture Building and Planning, we offer four core programs:
  • Architectural Urban Design and Engineering (AUDE): Design the Buildings and Cities of Tomorrow
  • Building Physics and Services (BPS): Make the buildings and cities of tomorrow energy neutral, sustainable, healthy and comfortable
  • Structural Design (SD): Innovative structural design, material related research and mechanics applied on structural aspects
  • Urban Systems and Real Estate (USRE): Creating healthy, safe and viable urban environments to live, work and recreate
• Key Areas of Study : The master's program in Architecture, Building and Planning trains you as an architectural engineer, which means that you are looking for the optimal combination of science, technology and design. From your own discipline, you learn to understand the problems of other disciplines in the master's program in Architecture, Building and Planning. You develop a design-focused approach and learn to think analytically. A healthy dose of creativity is a must.
• Career opportunities : The education at the Department of the Built Environment focuses on research and design. This means that the education does not lead you to any specific profession. The master's degree programs in Architecture, Building and Planning gives you a good basis for a future career in construction.

Depending on your specialization, you will be given design, consulting, management, administrative and/or research tasks. Both in the Netherlands and abroad, there is continuous demand for architectural engineers.
• Accreditation :
• REFERENCE : https://www.tue.nl/en/education/tue-graduate-school/graduate-programs/graduate-program-built-environment/architecture-building-and-planning/once-you-graduate-then-what/

• COUNTRY : Netherlands
• UNIVERSITY : TU Delft (Technische Universiteit Delft)
• COURSE NAME : MSc - Architecture, Urbanism and Building Sciences, more than one track.
• Duration : 120 ECTS, 24 months
• Program details : The MSc Architecture, Urbanism and Building Sciences programme at TU Delft is underpinned by the renowned Dutch experience in architecture, spatial planning and the built environment professions and has an international orientation drawing on the multinational faculty of staff and students. The teaching approach borrows from the Dutch tradition of working in a multi-disciplinary way with students working in groups to create integrated solutions for the built environment.
• Key Areas of Study : This programme sets itself apart from other architecture programmes in the diversity of directions available. Blending knowledge and skills from design practice, from the physical and social sciences, technology and engineering, this programme explores innovative ways to create more sustainable development
Career opportunities: With a diploma of the Architecture, Landscape Architecture or Urbanism track you can - after completion of a professional traineeship (beroepservaringperiode).

Accreditation: