Challenges and Opportunities for Industrial Engineering in Australia

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Abstract

Industrial Engineering (IE) has been active in Australia prior to and since 1959. Initially IE focused on basic IE tools such as Time & Motion and Work Study, as well as Operations Research Techniques, Project Management etc. The practitioners of IE were mainly vocationally trained in the Technical and Further Study (TAFE) system. Since the 1990's, the majority of IE practitioners have been University Trained usually outside of Australia. There are now 3 universities that deliver degree-based IE training, 2 of which are accredited by Engineers Australia.

Please note that this is an observational finding presentation and not an academic research paper.

Keywords
Keywords: industrial engineering in Australia, industry recognition, area of practice, IE techniques, AI

1. Introduction
In most developed and even developing countries, Industrial Engineering (IE) has been a major recognised component of engineering and business management. IE's are employed in traditional manufacturing enterprises as well as in service, finance, hospitality, health care, aviation, planning, supply chain and digital and automation industries.

In the case of Australia, the impact of decreasing industrialisation and value adding, especially since the 1980's, the need for employing IE's has been reducing. The requirement for undertaking traditional time and motion and work studies has been replaced by other IE techniques. Many of these techniques such as Lean, Six Sigma and Operations Research, have been delivered by organisations specialising in these management tools. These organisations in most cases are unaware of IE or utilising IE based techniques.

Industrial Engineers Australia (IEA) the professional body representing IEs in Australia (incorporated in 1959), has seen it membership fall from a high of over 1300, to a present of approximately 120. Membership in the past 4 years has doubled.
The IEA, over the past four years, has endeavoured to co-ordinate the training of industrial engineers, promote IE in industry and represent IEs in Australia. This has been achieved to some extent. The requirement for IEs in industry is still a challenge. This is evident, since many companies in Australia are not knowledgeable of industrial engineering especially in Western Australia. Victoria with a larger base of larger industries, does provide more opportunities for industrial engineers.

1.1 Objectives
The objectives of this paper are to highlight the history of Industrial Engineering in Australia from the 1950's until 2023, including the methodology followed to promote IE in Australia.

2. Training of Industrial Engineers
There are 3 universities training IEs in Australia, 2 of which are accredited engineering qualifications by Engineers Australia. These include Curtin University in Perth, Western Australia, University of Melbourne in Melbourne, Victoria. Recently La Trobe University, also based in Victoria has initiated IE training.
The number of students and graduates, please Reference 1 (Table 1).

Table 1. Students Studying Industrial Engineering at Australian Universities

UNIVERSITY			
	University of Melbourne Ref 1	Curtin University Ref 2	Curtin University Ref 2
UNDERGRADUATE STUDENTS			
YEAR	**STUDENTS**	**STUDENTS**	
2023		18	
2022		15	
2021		10	
Master of Industrial Eng Yr1	10		
Master of Industrial Eng Yr2	30		
GRADUATES			**MSc STUDENTS**
2023			18
2022	2	5	7
2021			
2020			

Student details from La Trobe University were unavailable
It should be noted that Monash University delivered a BEng IE training up to about 2014. Over 650 IE students were trained.

Another observation regarding the membership of the IEA, is that the qualifications of the members has decidedly changed from vocationally trained in the 1990's, to university level academically qualifications today.
Since the training of IEs has only been reactivated in the past 2 years, most of the new members of the IEA are overseas trained. This is especially the case from South America.

The IEA is also endeavouring to promote industrial engineering to school students via a STEM program(Science Technology Engineering and Mathematics)

3. Employment of Industrial Engineers in Australia

Companies that employed IEs, were usually Overseas based organisations, already aware of industrial engineering, and thus setup with IE departments employing Industrial Engineers.
Employment opportunities for IEs, has been increasing in Australia in recent times. Qualified employed IEs position titles include (Reference 2 (Table 2):

Table 2. Industrial Engineering Position Titles Used in Australia

Risk Management Consultant	QA Coordinator
Systems and Process Engineer	Operations Improvement Manager
Customer Solution Engineer	Engineering Consultant
Business Operations Advisor/Analyst	Operations Team Leader
Process Engineer	Engineering Manager
Continuous Improvement Analyst- Customer	Technical Operations Manager
Operations & Continuous Improvement Engineer	Relationship Management
Quality Engineer	Mining Logistics Officer
Production Engineer	Industrial & Productivity Engineer
Senior Lecturer Mech & Manufacturing Engineering	Maintenance Supervisor

Reference 3.
A recent search on SEEK, an Australian online employment marketplace, resulted in the following IE positions being advertised (Refer Table 3):

Table 3. Companies in Australia advertising for Industrial Engineers

Alstom	L3Harris
Assa Abloy	NILFIRE
BAeSystems	PACCAR
Boeing	RPC Technologies
Hanwha Defense Australia	Schneider
Journe Brands Pty Ltd	Thales

Reference 4 Reference 5

-According to Australian Government Jobs and Skills website, there are 3800 (Reference 6) individuals in Australia employed as Industrial Engineers as per the ANZSCO ID 233511 designation. (Reference 7)

Investigates and reviews the utilisation of personnel, facilities, equipment and materials, current operational processes and established practices, to recommend improvement in the efficiency of operations in a variety of commercial, industrial and production environments

As a comparison the IEA definition of Industrial Engineering is:-

Industrial Engineering is concerned with the analysis, design, improvement, installation and management of integrated systems of human resources, data(AI), finances, materials, equipment, and energy as safely as possible with minimum impact on the environment, delivered within a holistic methodology.
(Reference 8)

The employment (and qualifications) of Industrial Engineers can vary substantially in Australia.

4. Promotion of Industrial Engineering in Australia

The IEA has undertaken various strategies to promote industrial engineering in Australia.

Training
-The training of Industrial Engineers in Australia in universities
-Promoting IE to first year engineering students. This being undertaken by delivering presentations to the students promoting aspects of Ien and its benefits.
-The IEA has been working with Curtin University to upgrade the Industrial Engineering Degree by identifying the required IE skill requirements.
-There are plans to promote IE to school students via **STEM** learning activities as well as introducing IE to the various State and Federal bureaucracies.

STEM- science, technology, engineering and mathematics

Promoting Industrial Engineering in industries in Australia
-This has been undertaken by inviting various organisations to deliver presentations about their industry with an industrial engineering influence.
-Also on site visitations with a focus on IE, have been undertaken
-Promotion of IE at associated professional engineering organisations such as Engineers Australia.

Promoting Industrial Engineering within professional Engineering Bodies(Engineers Australia)(EA)
-The IEA has been very active in promoting industrial engineering within Engineers Australia.
-This has been a challenging endeavour especially with the every changing personnel within the organisation.
-The other challenge within EA is overcoming the challenges in getting Industrial Engineering recognised as an Area of Practice(**AoP)**

5. Obstacles to Recognising Industrial Engineering

-A major challenge is getting IE fully recognised as an Area of Practice(AoP)(as mentioned previously) in Engineering in Australia by Engineers Australia.
-Accomplishing Industrial Engineering becoming a mainstream element of engineering in Australia
-Universities recognising the importance of IE as a major contributor in the engineering profession.
-Other unrelated consultative operations “high jacking” IE techniques such as LEAN, SIX SIGMA, Circular Economy and even business management….

6. Challenges and Opportunities

As with other professional practitioners, technology and other new methodologies, impacts on the workplace and workplace practices. Computerisation, digitisation, autonomation and now AI have had major influences in the way IEs in Australia and around the world undertake their profession. Undertaking time and motion studies, method studies etc have been replaced by workplace electronic observations and sensors over the decades. Accurate, timely and pertinent data, is now the most beneficial and necessary tool, allowing IEs to undertake their tasks far more efficiently. AI will impact immensely in this area and can be called Industry 5.0. IEs, utilising consensus decision making tools such as Game Theory, will be at the forefront, guiding organisations to effectively implement optimal solutions.

7. Conclusion

Industrial Engineering has a great future in Australia. Together with academic, industry and professional recognition, Industrial Engineering graduates, will be well placed to take the lead in moving Australia into a more productive value adding economy.
The challenges recognising Industrial Engineering as a mainstream aspect of Engineering, will continue, Great strides are being made by Industrial Engineers Australia to correct this situation.
Thus Industrial Engineers communicating effectively their ideas, will be in the forefront in the future, to lead to making the world a better place.

References

Reference 1 Department of Industrial Engineering, University of Melbourne, 2023
Reference 2 Industrial and Systems Engineering Department, Curtin University, 2023.
Reference 3 Database IEA Membership 2023.
Reference 4 Seek, 2023 https://www.linkedin.com/jobs/manufacturing-engineer-jobs/?currentJobId=3699938696&originalSubdomain=au
Reference 5, 2023 https://www.seek.com.au/jobs-in-engineering/industrial-engineering
Reference 6, 2023 https://labourmarketinsights.gov.au/occupation-profile/industrial-engineers?occupationCode=233511
Reference 7, 2023 233511 INDUSTRIAL ENGINEER
Investigates and reviews the utilisation of personnel, facilities, equipment and materials, current operational processes and established practices, to recommend improvement in the efficiency of operations in a variety of commercial, industrial and production environments
https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/9C5DFE35140635F7CA2575DF002DA72C?opendocument#:~:text=or%20Plant%20Engineer-,233511%20INDUSTRIAL%20ENGINEER,commercial%2C%20industrial%20and%20production%20environments.
Reference 8, IEA Industrial Engineering definition is Industrial Engineering is concerned with the analysis, design, improvement, installation and management of integrated systems of human resources, data(AI), finances, materials, equipment, and energy as safely as possible with minimum impact on the environment, delivered within a holistic methodology.

Biography

David Karr Graduated as an Industrial Engineer BSc (Eng Mech in the Industrial Option) in 1976 at University of Witwatersrand (Wits), Johannesburg, South Africa in 1976. He received a Graduate Diploma in Engineering at Wits 1979. David has worked in various Production and Industrial Engineering roles in manufacturing, service industries and consultancy for over 45 years in South Africa, Canada and Australia. He also has training experience as a lecturer(casual) at TAFE (technical college) for 13 years delivering training in various aviation business units.
He has worked for Siemens(Routing Eng) and Colgate Palmolive(IE) (South Africa), Pirelli Cables(IE) and Canada Post(IE) (Canada), BOC Gases (Australia)(Production & Project Manager) across production quality, project management, supply chain management, design and improvements of production line and layouts of work area and data optimization.

Industry experience included batch and process type manufacturing as well as large and small sites mainly with large multinational or national companies.
He has its own Business Consultancy undertaking passenger surveys, time and motion studies, setting up preventative maintenance systems for various clients and introduction of digitised autonomous processes. David has been very active in professional organisations in Canada (Canadian Society of Industrial Engineers (CSIE) and in Australia (Industrial Engineers Australia (IEA) and Engineers Australia (EA)
He is a fellow and Federal President of Industrial Engineers Australia and Chartered Professional Engineer of Engineers Australia.