

Industrial Engineering is concerned with the analysis, design, improvement, installation and management of integrated systems of human resources, finances, materials, equipment, energy and information

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From the Editor

(articles and responses are definitely encouraged)

G'day all IIEA'ers

This is the first of our newsletters for 2020. We are encouraging ALL members to submit articles, comments and even some humour that is of interest to the Industrial Engineering profession. DK

From the Federal President

I have just come back from Melbourne(tennis), where I met up with some of the Victorian Division including Lex Clark, Daniel Kulawiec and Craig Sutton at the Bondstore Café. Great IE discussion and meetup.



This year, the plan is to establish a superior working approach to revitalising the IIEA with respect to membership, programs, IE communications, administration and the relationship with Engineers Australia(EA).

So far the bank accounts have been setup for electronic banking and we hope to have a membership renewal option paid by credit card.

The Web site is being revamped(www.iie.com.au) .If there are any comments errors or updates, please pass onto Matteo Vinci webmaster at matteo@vincitechnology.com

The membership programs will include visits to various industrial sites as well as IE presentations.

The big challenge for us this year, is to resolve the agreement with EA so that the IIEA can manage its membership more effectively. I hope to meetup with EA's CEO Bronwyn Evans to resolve these issues.

Going forward, the IIEA is assisting Curtin University in Perth with their upcoming accreditation of their BEng in Industrial and Systems Engineering course.

All the best for the year 2020.

David Karr(FIIEA, CP Eng,)

Federal President – IIEA

11th March, 2020

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From the Divisions

NSW-John Shervington

Plans for this year's NSW member activities are the following:

1. A small group meeting in March at a mutually convenient venue with three recently identified members wanting to be kept updated about all IIEAust activities in NSW and so in addition providing an opportunity to experience our small group meetings. As convenor, the NSW Director would canvas these members' interests and needs for professional development.
2. A two day/one night trip, by the NSW Director, at a mutually agreeable time in April, to visit a professionally isolated member in rural NSW. Such a member would have demonstrated a commitment to IIEAust through membership fees and response to correspondence over several years.

NSW Div(ctd)

3. Holding yet another small group meeting in June for members within a reasonable proximity to Rhodes, a proven convenient venue for several IIEAust members over the last two years. This year I plan to select an experienced member who would agree to lead this group in a discussion about a set of mutually agreeable industrial engineering issues.

4. Finally, for interested members, to arrange a plant visit in October through a member who has proven professional and industrial experience as an Industrial Engineer. Such a member, after receiving approval from his employing organisation, would introduce a small group of six or less members to his/her workplace, lead the group around the plant, pausing to show and explain chosen items of interest to the visitors and then conclude the visit with a 20 minute session of general questions and discussion relevant to industrial engineering.

John Shervington

NSW Director/Div President MIIEA

WA-Bob Watson(FIIEA)

For WA members and any Industrial Engineer thinking of migrating to God's own country. With the assistance of Matteo da Vinci (a descendant of Leonardo) and David Karr, we have planned a top rate program for 2020.

First up is a member visit to the Roy Hill Remote Operations Centre located at Perth Airport. This centre remotely operates the fleet of driverless dump trucks at the Pilbara mine site. We have been fortunate our visit is booked for a Saturday morning, enabling most of us to attend. Because this a prime visit we have decided to invite a limited number of members from the WA Division of Engineers Aust. This is a reciprocal gesture as our members have been included in their recent member programs.

March event Roy Hill Remote Operations Centre(ROC), **Rescheduled due to coronavirus virus for a later date**

We are planning another event in April pertaining to the Circular Economy

Our second event will be in June. We are proposing to visit the Tianqi Lithium Hydroxide Plant in Kwinana.

Our third event is a proposed IE workshop in conjunction with Curtin University in September.

WA Div(ctd)

For our final fling we will arrange a social evening at a restaurant in Nov/Dec. This is after a very successful Game Theory presentation by David Karr in October 2019.

This year our Division is making a significant contribution to IIEA. David has been elected Federal President and chair of the Membership and Grading Committee. I retain the Senior Vice President portfolio, serve on the Membership and Grading Committee and represent WA as it's Director on Federal Counsel.

As you may be aware I served twenty seven years at Curtin University applying Industrial Engineering, you can imagine how satisfied I am now that Curtin is developing a graduate and master's degree IE program. David and myself have been assisting the faculty and our Institute has the opportunity to assist in the mentoring of students when they undertake practical projects and thesis in their interface with industry. It is possible, in the near future, that Curtin will host a meeting with our WA members to promote these courses.

Please contact me by email.

bobwatson@westnet.com.au. If I can be of assistance on IE (Aust) matters. On all of your other life matters, I refer you to your wife or partner. Good luck

Bob Watson(FIIEA)

Singapore O/S Div-CH Wong(MIIEA)

Singapore is only a good place if the company is an institution related to the Government. Government linked companies run 60% of the economy . And the private side has to scramble for business with little profits from the government.

Traditional IEs are now no longer active as many of the techniques are fast becoming phased out by AI, Innovation and IOT. Even the training in MTM is now a trickle partly due to the MTM Association not able to adapt to new requirements to generate new techniques. So in Singapore, many treat IE as somewhat old fashion technique. This is partially true, in view of the fact that with computer and software, it is possible to control the work of many machine and robots with just one press of a button. So to really measure productivity based on Labour Productivity yardstick is somewhat meaningless comparison if this is matched against IT and software.

Singapore Div(ctd)

To depend on traditional training and consultancy is hard and tough work as the daily rate has gone down quite a lot and companies are also depending less and less on consultancy as everyone nowadays are all MBAs everywhere. Everyone wants to be trainers and consultants too. So the industry become saturated. Many do not understand basic IE skill, such as how to conduct a time study, etc.

Of course knowledge of IEs has advantages, as one is able to go into very details.

The coronavirus has affected business sentiments and there is a slow down in meeting and training and consultancy visits.

One area that is changing the IE business is Drones(unmanned aerial vehicles(UAVs)). Drones are one of the high tech growing businesses. Drones really improve productivity by 1000% as it can do all kind of work which human alone cannot. So you are right in the high tech industry and it will be there for many years.

CH Wong Singapore Div MIEA

And Now some IE updates

THE FUTURE OF WORK FROM AN ENGINEER'S PRACTICAL PERSPECTIVE

ABSTRACT BY DAVID KARR(CP Eng, FIIEA)

Definitions:

Future-upcoming period which could be in a time frame covering anywhere from 5 years to 50 years, with a focus on 25 years.

Work-from an physics perspective-Work, is a measure of energy transfer that occurs when an object is moved over a distance by an external force at least part of which is applied in the direction of the displacement.(Encyclopedia Britannica)

Or another way, work occurs at a location or place of where endeavours are undertaken for gainful employment, home activities or other desired outcomes.

Historically work was carried by manual effort, but over time personkind has endeavoured to reduce the labour intensity by innovating

devices and exploiting animals or other human beings.

Since the 18th century with the birth of the original Industrial Revolution, machines have taken a large amount of the manual load(although creating other challenges).

With the advent of the ability to harness the power of electricity, innovation has occurred in vastly exponentially increasing surges, to modify the way work is undertaken. For example one of the basic undertakings of personkind when we became settled, was the need to produce food.

Thus we have gone from digging holes in the ground to plant seeds, to having huge agricultural machines(combine harvesters for example), that can be preprogramed to follow a pre set pathway utilising GPS. Also this equipment does not need to be staffed for most of its activity.

With the rise of the fourth industrial revolution through the convergence of digital, biological, and physical innovations(Ref Encyclopedia Britannica), there is the emergence of "thinking" machines(Artificial Intelligence). This would reduce the need to have the person to system interface in the longer term. For example in the case of intelligent roads, a traffic control system that provides real time optimal alternate routes.

Over the millennia of recorded history, personkind has progressed from manual operations to now being able to rely on technology to make "intelligent" decisions. This has had a profound effect of the way work and employment methodologies have evolved.

Manual→Device assisted/Animal→wind/waterpower→ steam power→ electrical→digital→AI→??

Intelligent information in a digital form is rapidly replacing and adapting many of the employment activities and processes that have been undertaken.

Examples include:-

Agriculture

manual sowing of seeds→basic use of tools→irrigation→use of animals to assist→introduction of more advanced animal drawn equipment→mechanised

equipment(steam/chemical powered)→use of chemicals→advanced mechanised multipurpose equipment→high yield food varieties→use of digital information to optimise operations→automated equipment→use of UAVs(drones)(multispectral photogrammetry etc)→autonomised equipment

From 1 farmer producing food for 1.1 people to a ratio of over 1:150 people

Air Travel

Gone are the days of phoning up or going to a travel agency and making a booking by another phone call or referring to a rudimentary ticketing system.

Nowadays one can go "online" select the optimal flight with reference to cost, time, route, number of stops. Then one can pre check in, select a seat and even obtain an eboarding pass. The physical component of checking in the bag is undertaken by the passenger and loaded onto the conveyor belt. The only staffing component in the main, is to answer or sort out any queries. Another benefit is the travel planning process is available 24/7 365 days a year. From the point of view of travel industry, staffing levels are drastically reduced from the landside point of view.

(Ref <https://insight.futurestudents.csu.edu.au/work-beyond-2020-future-agriculture/>)

Manufacture

This is the traditional core of the impact of innovation and technology on work in this area. There have been massive changes from having 100's or 1000's of employees toiling away at monotonous productivity driven work to semi and automated manufacturing processes.

The impact of automated robots undertaking tasks that replaced employees or the lack of employees(Japan), is becoming more prevalent.

Autonomation will be more and more prevalent in the near future.

Medical Research

The traditional process of undertaking endless experiments taking years and costing tens of

millions of dollars, will be replaced eventually by undertaking millions of cyber experiments utilising quantum computing.

Software Development

The conventional method of developing applications by utilising traditional coding will be augmented and eventually superseded by artificial intelligence systems. By utilising AI and quantum computing , massive amounts of coding will be generated from existing and "cloned" software

Autonomous Vehicles and systems

The advent of digitalisation and miniaturisation, has allowed for devices to be made smaller and have extremely powerful data processing capability(mobile phones). This will lead directly to systems that are more compact but also cheap.

The effect of electric private vehicles that are autonomous, will have one of the most influential impacts on modern day living. The concept of vehicle ownership will be reduced dramatically. It will be replaced by the need for transportation from place to place on demand. The situation of having vehicles sitting in a garage for most of the time(and the inherent costs), will be supplanted by affordable, safe transport on demand.

The massive impact on car manufacturing will be reduced dramatically.

Astronomy

The Square Kilometre Array(SKA) telescope project will generate more data per day than the entire internet. This will result in massive data storage and data processing requirements. The applications, equipment etc will need to be innovated, manufactured, skills generated to operate this massive project

Delivery of Tertiary Education

Education has moved from the traditional lecturer(teacher) student face to face classroom delivery method following a prescribed syllabus, to one whereby the delivery can be online or remote.

Due to the specific skillsets that companies(eg Woodside) require, the need for customary qualification is evolving. Companies will now determine their skillset requirements, and then

choose to either to get their employees trained in certain specialties or disciplines or develop their own curricula. This will impact on the tertiary training institutions and the qualifications they deliver.

The above assessment can also be applied to below to name a few scenarios with respect to the future of work:-

Finances

Travel

Education delivery especially at tertiary level-company specific skills

House cleaning

Flying aircraft

Collecting, collating, analysing outputting data and the leveraging of this data

Additive manufacturing

Energy Storage

So where to next

Impact of Intelligent information, Intelligent machines, robots, Quantum Computing , autonomous systems, different modes of manufacture, all within the impact of climate change.

The impact of confluence of technologies will also impact further the convergence of work. From truck driver to remote autonomous vehicle operator 2000km from the physical workplace to observing the universe.

As an Industrial Engineer, systems and process are considered with an holistic approach. Thus the link between people, information, equipment, finances energy, safety and the environment are considered when undertaking processes.

David Karr(CP Eng, FIEEA)

HOW TO CONFIGURE YOUR PRODUCTION WORKFLOW TO ACHIEVE LEAN PRODUCTION

By C. H. Wong(MIIEA)

Principal Consultant, Asia Pacific Research Centre, Singapore Instructor Member, Accenture LLP, USA and UK MTMA 2000 Ltd

Takt Time¹ and Pitch Time²

One of the most fundamental principles of Lean is for material to be pulled and flow down the value stream at the Takt Time throughput rate. Takt Time is calculated based on the delivery quantity to be made, say 10000 units in a typical month of 21 working days of 8

hours per day (excluding lunch and tea breaks).

So, in this case, Takt Time is about 60 seconds:

$$\text{Takt Time} = \frac{21 \text{ days} \times 8 \times 3600 \text{ seconds}}{10000 \text{ units}} = 60.48 \text{ seconds}$$

This Takt Time is the basis for configuring all production flow processes to about 20% less to provide a Pitch Time of 48 seconds. This 20% is the contingency factor for downtime, yield losses, rework and occasional material shortage.

Therefore, in this case, **Pitch Time = 48 seconds**

Lean 1st Principle

From the above, it can be said that the Lean 1st Principle is to establish the Takt Time.

Lean 2nd Principle

The 2nd Principle of Lean is to configure all process cycle times on the production line to about 20% less than Takt Time. This is the **Nett Pitch Time**

Configuring The Workstation Layout

In the concept of Lean, one-piece-flow is emphasized. Therefore, production lines with many processes should have one workstation each to work on the one piece flow.

If for some reason, the Pitch Time of a Capacity Constraining Resource (CCR) is more than Takt Time, the following formula can be applied to calculate the number of CCR workstations required to balance production.

1 Takt time is the average time between the start of production of one unit and the start of production of the next unit, when these production starts are set to match the rate of customer demand.

2 Pitch Time specifies the number of Standard Minutes to be performed by each operator if the work is to be evenly distributed within the team.

Pitch Time = (Total Standard Allowed Minute(SAM))/(Number of Team Operators)

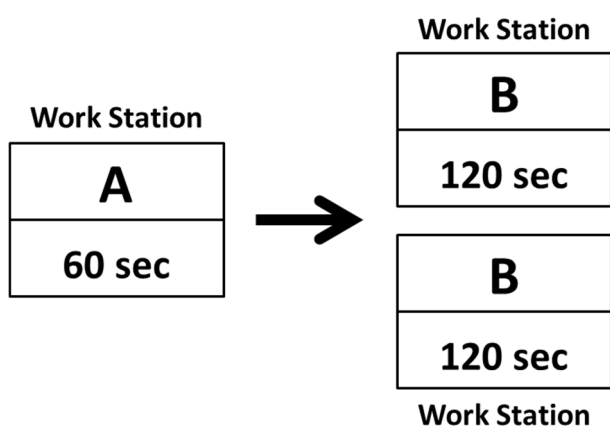
Standard Allowed Minute (SAM):

Standard allowed minute (SAM) means how much time is required to make one complete item including allowances. SAM is used to measure the task or work content of an item.

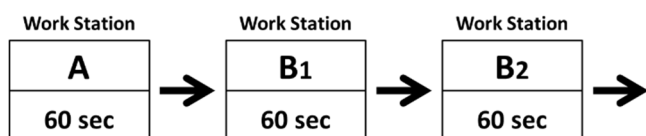
$$\begin{aligned} \text{No. of CCR Work Stations} &= \frac{\text{Gross Pitch Time}}{\text{Takt Time}} \\ \text{Required To Balance Production} &= \frac{120 \text{ sec (for example)}}{60 \text{ sec}} \\ &= 2 \text{ Work stations} \end{aligned}$$

How Should Work Stations Be Redesigned To Distribute Workload

The traditional Line Balance approach is to layout the production line as follows:



Although time is balanced, space, however, is not balance. In Lean, the recommended redesigned layout should be as follows:



Conclusion

In order to achieve Lean Production Line design, the 3rd Principle of Lean is stated as follows:

Lean 3rd Principle

The 3rd Principle of Lean states that only one piece flows through each separate process in Gross Pitch Time, matching that of the Takt Time.

Applying the 3 Principles as explained above would provide the understanding on how to configure production workflow to achieve Lean production.

C. H. Wong(MIIEA)

Excerpt from **Entrepreneurs and Start-Ups**
By W.D. Ferme **New Engineering Journal** May 2014

Why become an Entrepreneur?

The reason for young Australians looking towards start ups is because the future of work is becoming a career concern. A recent article stated that 47% of US jobs are at risk of being automated in the next 20 years . Jobs are not permanent, locations are not permanent and workers are returning back to what is known as a "free-agent" type of work style . These are the independent contractors, part-time employees who move in and out of the workforce, temporary employees, consultants, including engineers – that group of individuals in most of the industrialised world is already at 25 to 35% of the workforce.

Crossroads Tech Start-up Report (April 2014)

As a nation we need to affect systemic change now.

Entrepreneurialism is at the heart of this retooling. The report points out that Australia has one of the lowest rates of start-up formation in the world and also one of the lowest rates of venture capital investment in the world. The report makes the case that as a nation we need to take immediate and far-reaching steps to address market failures that are impeding the maturation and growth of our start-up ecosystem.

Entrepreneurs

What is an entrepreneur? He/she is somebody who has a business idea and commercialises it. The success level of entrepreneurs is low as about 80% fail. World-wide research on entrepreneurs indicate that about 6.5% of them will employ up to 30 employees where only 1.6% of them will employ about 100 employees. 75% of entrepreneurs are aged between 20 and 39. The Kauffman Foundation in a 2009 survey of 549 company founders came up with the following factors of success:

The full version of this article can be found at <http://iie.com.au/resources/journals/>
New Engineer 2014 May

Vedic Sayings

Author: Veda Quotes Category: Direction Quotes

"One should strive to improve one's capabilities. One should enhance his abilities only in the positive direction."

"One should eat nutritious food and exercise regularly to have sound health.

"The leader who cares for his subject cannot be vanquished even if all his enemies become united."

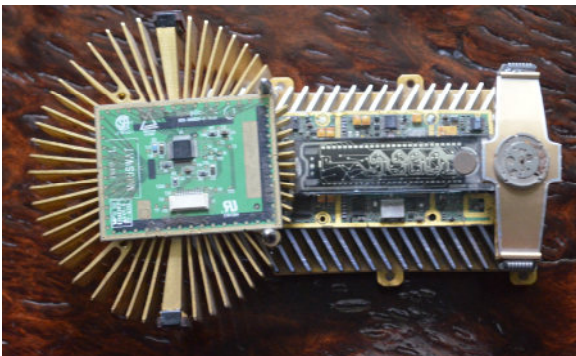
Industrial Engineers at Play (IEAP)

And now for our very first IEAP, yep you guessed it our very own Federal VP **Bob Watson** (FIIEA) at play or should I say at Art play



What an Industrial Engineer can do after retiring and keep him far from the madding crowd and the warring wife?. You have many options including volunteer work, cruising the world, serious fishing, the list is endless. Whatever you settle on, my advice is, you must decide what will be the best for yourself. Before you enter into the old age of senility, where you can no longer remember your Industrial engineering training and experience, you must sit yourself down and industrial engineer yourself. About fifteen years back I followed my own advice.

On examining your attributes, do not ask your wife to assist you with this examination as you will lose confidence and give up at this point. Make the usual shortlist. Then apply the appropriate IE technique including cost benefit analysis, project planning, facility planning, resource analysis, transport algorithms. Be careful not to spend too much time in the critical examination of your options as the overriding priority must be what you enjoy doing and what will keep you out of trouble with the law and the camp commandant.



Once the decision is made on your retirement activity, start setting yourself up, In my case I chose my garage, I had (past tense) plenty of storage space, my stereo, my computer with access to 'Spotify Music' and a beer fridge; a friendly space where old mates can visit.

My retirement is spent sculpturing models out of

electronical and mechanical components retrieved from watches, mobile phones, computers, typewriters, sewing machines, radios, record players, cameras etc. Fortunately I had my boyhood Meccano set mostly intact. This precious set gave me the ability to set up frames and provide joiners for the various models I was building. Included in my assemblage art pieces are ten Harley Davidson motor bike replicas, each one distinctly different in design, Dr Who's Tardis, the Star Wars Millennium Falcon, many cars, trucks and spaceships. From an IBM golf ball typewriter I managed to construct a model of the moon craft that landed on the Sea of Tranquillity during 1969.



I have used up all my garage storage space with componentry awaiting my next sculpture. Most of my art pieces have been sold or given away to my mates and grandchildren.

Even though I try my best to tidy up my garage space, my wife is never happy. Gloria threatens to order in a waste skip bin to dump my treasured stock pile of components. One day, I know she will.

At this stage my meccano set is now almost depleted. David Karr our Institute Federal President, a good friend, realising my plight gave me his treasured Meccano set, however I need more of our members to reach out to me and give me access to all or part of their precious Meccano. Email bobwatson@westnet.com.au if you can help me out, or if you need to talk to me about your retirement activity planning Good luck Bob Watson(FIIEA)

