

# New Engineer JOURNAL

*Servicing Manufacturing, Industrial Engineering and Engineering Societies*



## In this Issue

- ◆ 50 Years of the IIE
- ◆ Memories of an Industrial Engineer
- ◆ The Fascination of Industrial Engineering
- ◆ Looking Forward: A Possible Future for IIE in Australia 2008-2058
- ◆ Review of the National Innovation System – Submission





# New Engineer Journal

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## Front Cover: 2008 IIE AGM – 50 year celebration

Back Row: Daniel Kulawiec (IIE Director, Federal Secretary),  
Herman Bayer (FIIE), Lex Clark (IIE Director Chair, Membership  
and Grading Committee), Bill Murrell (Hon. FIIE)

Middle Row: Craig Sutton (Guest), David Karr (IIE Director),  
Damian Kennedy (IIE Director, Federal President)

Front Row: Robert Watson (IIE Director, Senior Vice-President),  
Selvarajah Radhakrishnan (IIE Director, Treasure/Company Secretary)

## FORMAL PAPER REVIEWS

Leading papers published in this Journal are usually fully refereed. This service is available through the **New Engineer JOURNAL**. Papers which are to be fully refereed for formal publication may be submitted at any time.

# *The Institute of Industrial Engineers*

**ACN 000 264 513**

**1958-2008**

2008 marks an historic event in the life of IIE. It was in 1958 that the Australian Methods Engineering Society (est. 1953) was incorporated to become the Institute of Industrial Engineers (Australia). Happy 50th anniversary to all past, present and future IIE members!

The IIE continues to best serve the professional needs of industrial engineers in Australia. With its strong association with Engineers Australia as the latter's Industrial Engineering Society, the IIE continues to represent the profession at a local, national and international level. Membership currently spans the globe and continues to grow – especially in South East Asia and many parts of the world including emerging China and India. Over the years, the IIE has established formal links to several similar national bodies including those in Japan, Europe, India, The Philippines and Ireland.

This special edition of **New Engineer** marks the 50th year of the IIE in a very special way. Several invited authors have provided both historical and reflective pieces of the times and events of the IIE over the past 50 years. The articles by Lex Clark, Robert Watson, and William Murrell make for fascinating reading! Factual, anecdotal and often personal. Lex has outlined significant events marking the evolution of IIE and, in so doing, has provided several good re-productions of photographs of historic significance. Robert Watson has relayed some telling anecdotes, about the early 'hurly-burly' days of the IIE and "East-West" relations, while William Murrell's article gives a personal history that reflects all that was going on in the world of industry, academe and the first five decades of the existence of the IIE.

A second paper by Lex Clark provides a historically-reflective piece on the evolutionary early training needs for work study/industrial engineering within Australia's defence industry – especially within the three armed forces – Navy, Army and Air Force. The article somewhat reflects what could be described as a "lifecycle" of work study within 'Australian Defence' with the latter stages of decline reflective of the reciprocal growing professionalism both within Industrial Engineering training in Australia and that of the overall Australian workforce in general.

Dr. Brian Jenney's article "The Fascination of Industrial Engineering" goes a little deeper, and is 'somewhat more historical' than the last 50 years. With a take on the 'origins of engineering', Brian clearly demonstrates how worldly-important industrial engineering effort has been – as evidenced in recorded history, and encourages us all to replicate 'past victories' into the future.

Dr. John Blakemore provides the last two of the invited papers. With a lead-in article titled "Economic Turbulence and Climate Change..." Dr. Blakemore reflects on the current world-wide issues of global financial crises and climate change. The article suggests how the two issues are possibly linked in a globalised world and, subsequently, the author suggests that what the world's economists need to know about the elimination of waste and the improvement of processes, Industrial/Manufacturing Engineers already know...

Dr. Blakemore's second article suggests that Australia needs to reinvigorate itself in both product and process innovation in order to take natural advantage of opportunities presented by the current global crises. A generalised methodology, based on practical industrial SME experiences in Australia, is presented.

Finally, as Federal President in this 50th year of the IIE, I have my say!

I want to focus on the future of the IIE by acknowledging what we have learned from the past. In my paper "Looking Forward: A Possible Future for IIE in Australia", I take up the themes and comments of the previous authors and, with many of the concerns and aspirations expressed by the IIE membership throughout my Presidency, suggest some possible ways forward for IIE. As always, however, I'm of the belief that possibly we do not even know half the questions let alone all the answers. Only time – maybe the next 50 years - will tell?

*Dr Damian Kennedy*

*Federal President*

*damian.kennedy@eng.monash.edu.au*

# A Brief History of the Institute of Industrial Engineers in Australia

*Lex Clark FIEE*

While tidying up the records of the Institute in Canberra recently, we came across the carefully bound copies of the early Work Study and Industrial Engineering publications. It would seem appropriate for this special edition of today's publication to extract some of this detailed and historical information for the interest and benefit of present members. It might also be of some interest to those many thousands of other Australians and organisations who have benefited, and continue to benefit, from the application over the last 50 years by the many past and present members of the Institute of the principles, practices and techniques of Industrial Engineering and Work Study.

The following article includes extracts which have, where practical, been selected and extracted verbatim from the original published material in order to retain some of the flavour of the times in which this information was being recorded by the people involved.

## **The Australian Methods Engineer Association**

The first issue (Vol. I, No. 1) of the Australian Methods Engineer was published in February 1955 at a price of 1 shilling. The background to this is later recorded in the first issue of The Industrial Engineer (Vol. I, Number 1) published in June 1958 for 2 shillings.

In 1953, eleven methods engineers from nine Sydney companies were contacted by Mr Colin Harrison and Mr Keith Fifer and they spent several months drafting a constitution for the proposed association. On the 1<sup>st</sup> of April 1954, the foundation meeting was convened by Mr Chris Heyde and the 20 members present adopted the Constitution. The Foundation Sydney Division Council was:

Mr K Fifer of W.W. Scott & Company.  
Mr H. Garland of General Motors-Holdens Ltd  
Mr R. Rowland of Bradford Cotton Mills Ltd.  
Mr C. Harrison of Lustre Hosiery, Ltd.  
Mr G. Matthews of Johnson and Johnson Pty Ltd.  
Mr J. Needham of Dry Glow Towels Pty Ltd.  
Mr K Reagan of Standard Telephone and Cable's Pty Ltd.  
Mr J Kirkbride of W. D. and H. O. Wills (Aust) Ltd.  
Mr H. Ross of W. D. Scott and Co..  
Mr B Walters of Standard Telephones and Cable's Pty Ltd.  
Mr C. Heyde of Unilever Australia Pty Ltd.

The Guest Speaker at the inaugural meeting of the Association was Mr J Harold Kaye who had been the president of the Institute of Personnel Management for number of years. Some twelve months before, Mr Kaye had encouraged Mr Fifer, the Foundation President, to establish a Methods



*A Scan of the cover of the First Edition of the Industrial Engineer Vol. I No. 1 June 1955*

Engineers' Association along similar lines to the Institute of Personnel Management. It was believed that this would assist in striving for the professional status recognised overseas, to foster a wider appreciation of work study and to promote facilities for the interchange of ideas of persons engaged in the profession.

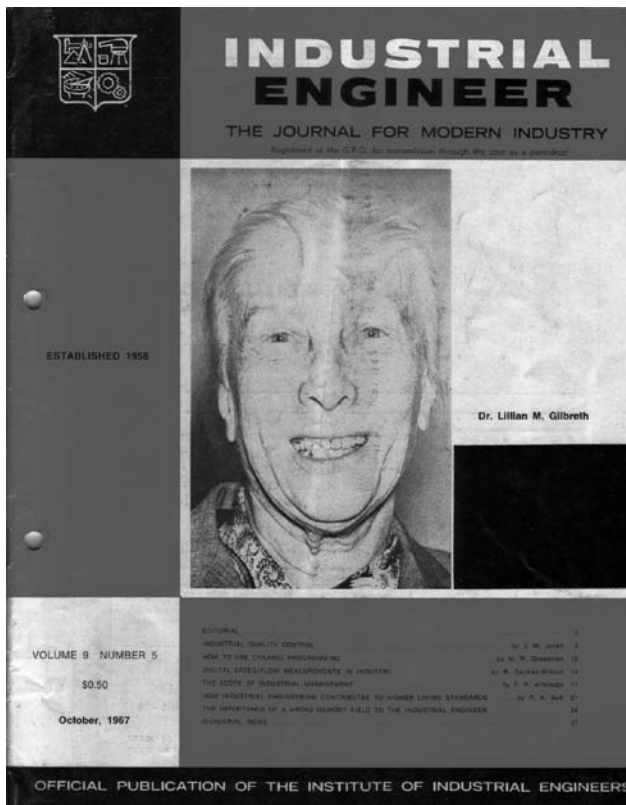
The objectives of the Association (as listed in the new magazine in 1955) were thus to encourage the appreciation and use of work study, the development of the status of the profession of methods engineering, and to disseminate data related to work study.

The First Edition of The Methods Engineer listed some 50 Associate Members as at 12 January 1955. One of its first articles was an AME Exclusive Feature by Dr. Lillian Gilbreth on Education and Training in Management. Lillian Gilbreth, who visited Australia in 1953, was the equally famous wife of Frank Gilbreth of Work Measurement fame. In her Special Feature article in the AMEA journal, Dr Gilbreth noted that the Methods Engineer must find better and more satisfying ways of doing work with the help of the engineer's poet,

Kipling, who said:

*“I keep six honest serving men.  
(They taught me all I knew)  
Their names are What and Why and When  
and How and Where and Who.”*

These types of simple but powerful questions have always been an important part of the Methods Engineering, Work Study, Organisation and Methods and Industrial Engineering Practitioner’s toolbox. It might also appear that Dr Gilbreth’s visit and lectures in 1953 was connected somehow with the first moves by the eleven Methods Engineers in 1953 to start the formation of what was to become first the Australian Methods Engineers Association and then the Institute of Industrial Engineers, Australia.



*Dr Lillian M Gilbreth on the cover of Vol. 9 No.5 October 1967*

In August 1955 the Melbourne Division was formed by the efforts of Mr J. Bromwich and his associates, while the foundation (Victorian) President of the Melbourne Division was also to be the future first Federal President of the Institute of Industrial Engineers, Mr G Homan.

August 1957 saw the formation of the Adelaide Division, largely through the enthusiasm of Mr Martin Stone of the Melbourne Division, who was fortunately transferred to Adelaide. Later in 1957, Sydney Division successfully launched the Newcastle Branch, which was operated by Mr A Fairhall as President.

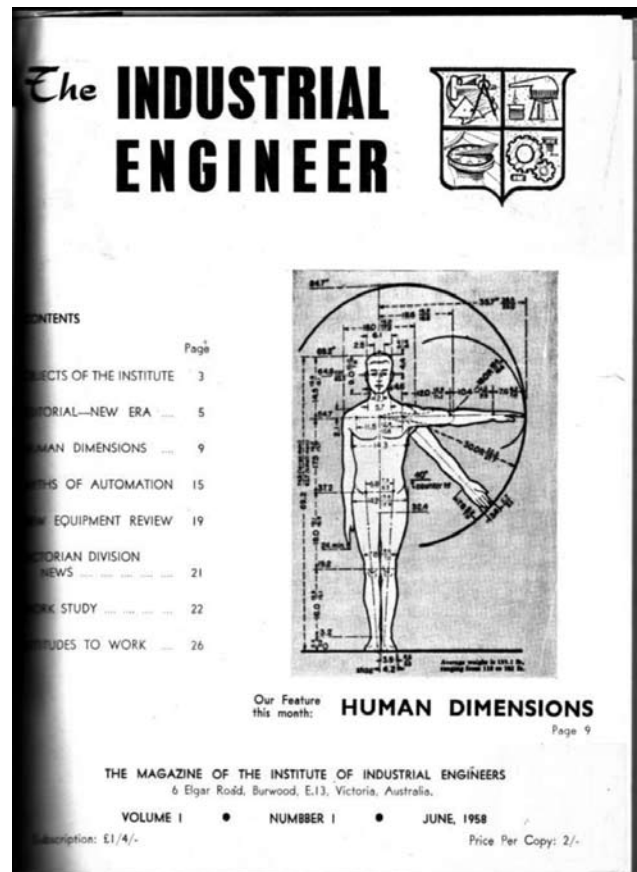
In the Vol. I, Number 1 first Edition of the June 1958 new Industrial Engineer, the then Federal President, Mr. G Homan notes that “the membership has grown from the 20 in 1954

to nearly 500 today. These are dispersed in the following States: NSW (270), Vic (140), SA (60) and Overseas (10)”.

**The Australian Institute of Industrial Engineers**

By 1957 it had become apparent to the Federal Council that the first objectives of setting up the Australian Methods Engineer Association had been met and that the next development should be taken. Opinion polls among members indicated an overwhelming support for the proposal to turn the Association into an Institute which happened in 1958.

There were many factors to be considered. The most important was the perception that “members were apparently catering for only a limited section in that “methods study”, like its illustrious colleague “work measurement”, were only two of the sub-sciences making up the whole professional range of Industrial Engineering”. It was accordingly decided to fall into line with overseas practice and create an Institute of Industrial Engineers, similar to those existing in the USA, England and other countries.



*A Scan of the cover of the First Edition of The Industrial Engineer Vol.1 No.1 June 1958.*

This was done by the formation of a Proprietary Company, limited by guarantee, under the name of the “Australian Institute of Industrial Engineers”, incorporating the “Australian Methods Engineers Association”. Application was made in the usual manner to delete the words Pty Ltd from the title. Under this arrangement, all members became shareholders of the company and when the final formal-

ties of registration were completed, copies of the Articles of Association and details of their rights were sent to all members. From 13 April 1959, the Institute officially became a Company Limited by guarantee, not conducted for profit, under the NSW Companies Act of 1936.

Overall membership of the IIE peaked in 1974 at 1,365. By 1993, when negotiations began with the Institution of Engineers, Australia (IEAust) for IIE to become their Industrial Engineering Society (IES), membership was back to a core of some 784. Over the years, membership turnover has been relatively high with, for example, 91 new members joining in 1985/86 and 87 leaving with the recorded membership for 1985 being 1089. Members join IIE for a wide range of reasons, with three so called levels of entry being graded in 1986 as Vocational, Para-professional and Professional. These levels tended to be an early form of what has become known today as Competencies, being a mix of practical and academic skills and qualifications.

Methods Engineering and Work Study were, and perhaps still are, closely connected with the Vocational and Para-professional levels of application and qualification. From its beginning in 1953/54, the AMEA and then the IIE offered and conducted a range of technique training courses, knowledge of which was also required for membership. The IIE in particular from its formation in 1958/59 conducted a range of Work Study level courses, while from the mid 1950's various Universities also commenced to introduce full Degree courses, typically in their Engineering Departments.

The IIE at its formation in 1958 stated that the required basic professional (Vocational and Para-professional) standards were to be established by means of examination in the techniques of:

- **Methods Engineering** – Process Analysis; Operations Analysis; Activity Analysis; Plant Layout; Production Planning; Industrial Statistics.
- **Work Measurement** – Time Study; Predetermined Elemental Time Standards.
- **Wage Payments** – Job Evaluation; Merit Rating; Incentive Administration.
- **Controls** – Cost Control; Production Control; Quality Control.

By June 1961, the NSW Division of the Institute was able to report that in 1960 it had run some 68 Courses in these subjects which had been attended by 676 participants from around 120 Companies. The associated reference texts for Institute examinations in these disciplines were listed in September/October 1962 as:

- **Graduate Examinations** – Work Study (Curry); Engineered Work Measurement (Kager and Bayha); Work Sampling (Barnes); Introduction to Work Study (ILO); Payment by Results (ILO); Social Psychology of Industry (Brown).
- **Associate Examinations** – Work, Workers and Work Measurement (Abruzzi); Social Psychology of Industry (Brown); Psychology of Industry (Maier);

Industrial Engineering Handbook (Maynard).

By 1961 the IIE was listing University level Bachelor of Science and Bachelor of Engineering Degree courses which, while advised and supported by the IIE, were also required to meet Professional academic study requirements such as those set by the Institution of Engineers, Australia. A Professional level course outline said to be desired by IIE in 1961, including lectures and tutorials, again illustrates the powerful mix of technology and people skills found to be required by Industrial Engineers at all levels:

- **Year 1** – Mathematics I; Physics I; Chemistry I; Psychology I.
- **Year 2** – Psychology II; Mathematics II; Physics II; Work Study I; English.
- **Year 3** – Psychology III; Work Study II; Statistics I; Workshop Technology; Economic History.
- **Year 4** – Work Study III; Control Procedures; Industrial Training; Introduction to Operations Research and Automation; Elective Humanity or Economics.

### **Back to the Future**

This article has been based on a somewhat random and very limited selection of extracted historical information from the early published records (1955 – 1962) of the Australian Methods Engineers Association and the Australian Institute of Industrial Engineers. It includes some facts which seem to have been forgotten over the years. There is much more information in these IIE records, including that from the following years of 1963 – 2008, which might help as the Institute and its members consider the future. Nothing much sometimes seems to change while at the same time everything seems to be changing. History has its lessons.

The June 1958 issue of *The Industrial Engineer* includes an article titled "Is there a Future in Work Study?" This article was a reprint from a British publication "Time and Motion Study, April 1957" whose author is identified only as "a fully experienced man of consulting status whose credentials we do not question". The Australian Editors of *The Industrial Engineer* invited readers to send in their views. As with the rest of today's article, only a few sentences have been selected (with apologies to the author if he is alive today) from the original three pages in order to provide an overview of a topic which seems to be as relevant today as it was 50 years ago. A little updating has been added in brackets.

"I've been considering getting off the works study bandwagon for some time now and daily my intensions are becoming more crystallised by constant reminders of the insecurity of my position.

Although increased productivity is recognised as the only means by which British (Australian) industry will hold its existing low position or have any hope of improving it, and although improved methods and increased production are the avowed objects of both the unions and the employers, there has not yet been established any standards of qualifica-

tions, or any recognisable status for the key men ( people) who are (can help) to push industry (the Nation) up the ladder and lead us all to a higher standard of living.

In ten years the status of works study engineers has deteriorated to its present level and it is quite plain that in the absence of a successful attempt stopped the rot, it will continue to decline. I do not intend to sink with it. I am getting out.

My main worry is that whereas I set out feeling I had a burning message of hope for workers and management alike that would produce a job well done, I now find that management require results too quickly to do the job properly and will not have the patience to await the value of their investment that is rightly due to them. Unless, therefore, one can lower one's standards, and do "quick and brilliant" applications, one is likely to be left behind by the career men and fortune hunters.

I see a large number of work study applications in the course of my normal work, and I am astonished at what has passed today as "work study". Time and time again applications can be found to have gone forward without the

basic method and organisation study, the setting up of job specifications, and without any real attempt to ensure the methods used during the study period will be maintained when the study man (person) leaves the operator.

The work study men (people) themselves – how do they feel about it? Are they satisfied with their position, salary and status, or do they feel the need for a suitable label by which they can peddle their skills in any district or in any country? Of those to whom this question was addressed recently, most were not particularly interested. Those who did take an interest were the younger trainees who had hopes of a career in work study, and who would be glad of a prolonged series of examinations that would set the seal of their achievements and give them the feeling that they had either learnt a trade or entered a profession.

There must be some amongst us who can see the red light and who have the courage and initiative to take the first steps towards a suitable institution. Where are you?"

It seems like it was only said yesterday.

**ALGC**  
**August 2008**



**First National Industrial Engineering Conference June 1966** – titled "Conference in Session", this rather daunting photograph illustrates some of those Industrial Engineers and Work Study Practitioners who helped build up the reputation and influence of Industrial Engineering since they formed the Australian Method Engineers Association in 1954 and the Institute of Industrial Engineers in 1958 – respectively just 12 and 8 years before. It was obviously serious business but where are all the woman who also helped to build Work Study and Industrial Engineering from the beginning?



# IIE Memoirs

*Bob Watson FIE*

At the invitation of the Federal President I offer members a few of my cherished memoirs of a long serving but not suffering Federal Delegate.

As this communiqué is being offered to our folk on the other side of Australia it is wise to caution you that since my graduation to the rank of IIE Federal Delegate we have in the West learned a great deal from the wise Industrial Engineers from the East. On reflection, now that I am sixty four and not the new WA delegate on the Federal scene as I was at around twenty five years of age, I now realise that my fellow delegates from the other side of the Rabbit Proof Fence were really trying to help us back wood members in good 'ole WA'.

Maybe I should have told the Federal Delegates when I attended those early meetings that we had running water, electricity, radio, trains, boats and even aeroplanes. I think you may have my drift by now that there were some heavy egos, plenty of bulldust and much politicking to benefit the status of high strutting delegates who from time to time arrived with their carpet bag bearing travel tickets from Victoria and NSW. Now if you hail from these states please do not take this the wrong way, as from time to time quality delegates did appear and after all this is a sentimental journey for me to share. Most important, even though the 'great divide' existed, it is correct to say that all the Federal Delegates were proud of our Institute and each of us had the best interests of our profession at heart.

With the above preface I have prepared your mind with the canvas that I can now paint three of these characters who to this day live in my memory.

Peter Forrest, Ernest Punched and Neville Hansford have left us now and work alongside God the Chief Industrial Engineer in Heaven.

Neville Hansford represented Queensland, he was our Federal President who had the greatest imagination for Federal Council meeting venues, agenda, entertainment, fellowship, catering and grand entrances. Here was a smart man who could drink every delegate into the ground, his strategy was simple, keep every body happy and drunk, if not drunk then the back up plan was to have delegates that sick with hangovers that Neville's agenda dominated. Here was a Federal President who was that thoughtful he would arrive at meeting venue a day before the delegates to stock up every fridge in our motel rooms with a plentiful supply of beverage. In fact any fridge he could find would be choc a block. I must hurriedly say that each delegate upfront paid for the beverages, Neville provisioned the fridges free of charge. The next thoughtful action was his choice of meeting room, there was of course the mandatory bar always and for the three years he was President always the same room which was carefully selected to provide sizzling distractions

to delegates so that Neville could eliminate any intelligent opposition to his agenda. What brilliance to hold the Federal Council meetings in a 3rd story room overlooking a dance studio with not only a view to the dance floor but also the change rooms. Neville ensured that delegates did not consume the jungle juice during council meetings.

If by chance you succumbed to over consumption, Neville would care for you in sick bay. I experienced his nursing and doctoring when I myself became very ill with a gastro bug. Not only did he summon a doctor to my room he also instructed each delegate to visit and comfort me. Thinking back now I realise that the visits were arranged to enable delegates to drink my fridge dry. That plane trip back to the West was memorable as I had not quite got rid of the gastro bug.

In the course of time I was elected Neville's Federal Secretary, we became very good friends, he took me fishing in Queensland at the Stradbroke Islands, Even though it was the truth, I regret my comment when he pulled into the boat a flathead about eighteen inches long, I informed him that in the West we use that size fish for live bait.

The best memory of all was the grand entrances to those many important Federal Council Meetings where the NSW and Vic councillors would present in flamboyant suits and serious ties. In classic Queensland style Nev would mount the Presidents chair wearing simply a lairy beach shirt, grey shorts and sandals that Jesus discarded.

The Victorians: Peter and Ernest

My simple life in Western Australia and my public school up bringing did not prepare me for these two. They were sensationally cool, they were worriers, they excelled in verbal warfare, they planned and plotted brilliantly, they created smoke screens, they were dramatic, they were Victorians who were on a mission from God, just like the Blues Brothers.

Before continuing you need some background, prior to representing the great WA Division at Federal Council I spent one year working at Caterpillar Tractors in Tullamarine, I was a member of the Vic Division. Earnie and myself were work buddies at Caterpillar. So in a way I was an annoyance to them with my ability to remind them when they were in 'full flight' at Council meetings that 'after all were just Victorians'.

It came to pass that Peter was elected Federal President, Earnie Federal Secretary and on the proposing and seconding by Peter and Ernest I was elected Senior Vice President. This was a marvellous moment for me sitting in the winners circle at the Menzies hotel at the invitation of the Federal President and Federal Secretary to indulge in a congratulatory whiskey and as advised by these two learned Victorians to be informed as to my Senior Vice Presidents duties and

key role. There I was, seated in this plush red leather lounge chair whisky in the glass, Peter congratulates me on my election, then Earnie says Bob as Federal Senior VP this will be your role. At this stage Earnie and Peter lay their lips on their glass of whiskey and consume the contents, they then beckon the drinks waiter and order another round. I seize the moment and say, "Well then what will be my Senior VP role?" There is silence and then the new round of whisky drinks are positioned on the occasional table in between our lounge chairs. Peter and Earnie lift their glasses and take their time to consume the contents. With appropriate politeness I further inquire "what will be my projects and official duties?"

With the question presented yet again Peter and Earnie ordered another round of whiskey and we await the arrival of the 3rd round with no response from either the Federal President or the Federal Secretary as to what my Senior VP roles was to be.

OK, I am the boy from the West, I finally realise what is happening, these two scallywags do not want me to do a damned thing, they planned the whole facade they wanted all the glory and power.

Time went by and suddenly the roles are reversed. I am elected Federal President, Ernest is still Federal Secretary and Bill Murrell, a WA delegate, is Senior VP.

Bill, a kindly sensitive man, could not see through many of the manoeuvres and plots that Ernest and Peter would hatch, Ernest was highly dramatic at times when he could not win his way, one brilliant stunt played once too often at a meeting in NSW was for him to stamp his foot and announce that he was going to leave the meeting and fly

back to Victoria. Bill was aghast and did his best to placate, knowing this was a classic Ernest tactic I handed him his airline ticket and wished him a safe journey.

There are so many delightful incidents I could record, one more I must share. Earnie loved travel he adored planes, he liked extravagance. Earnie had acquired Ansett Golden Wings lounge passes for us both for a flight from Melbourne to Sydney. I was keen to get through some Federal paperwork with Ernest on the plane. Somehow I lost sight of Ernest as we boarded and his seat beside me was vacant when we took off. I was quite concerned that he was still enjoying the free drinks at the Golden Wings bar. The plane levelled out, the seat belt sign was switched off and suddenly Ernest appeared walking down from the first class compartment.

It took me sometime to 'level out' myself from the first class and economy seating incident, however when Ernest travelled on his last plane on IIE business he travelled in a brown paper bag in the economy section. Ernest organised the one and only off shore IIE conference. At the planning stage Ernest and I did not agree with the viability of holding the meeting in Singapore at the level of attendance estimated. I therefore, as Federal President, declined to attend. Ernest encountered problems in Singapore with the Manager of the venue hotel. There was a huge argument and Ernest suffered a fatal heart attack. He was cremated in Singapore and his ashes were carried back to Aus in a brown paper bag. Ernest lived and breathed the IIE, he worked his heart and soul out for our membership in good faith. Dearly I miss Ernest, Peter and Neville.

**Bob Watson FIIE**

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# Memories of an Industrial Engineer

*Bill Murrell Hon FIIE (Retired)*

My first exposure to any Industrial Engineering (IE) principles was while attending Engineering Management lecturers at the University of Adelaide in 1949 by Alvia Barker (later Sir) MD of Kelvinator Australia Ltd.

Later in 1950, I joined GM Holden Ltd as a Technical Clerk and became acquainted with Jack Bourne who was in charge of the Standards Department employing Time Study Analysts.

In 1952, I was awarded a GMOO scholarship and enrolled in the Method and Process option of GM Institute of Technology's Industrial Engineering Diploma course. My major subjects were: Methods Analysis, Planning, Work Standards, Process Engineering, Plant Layout and comparative predetermined Motion-Time Systems.

Over the two years in the USA, I worked in the Standards and Process Planning Departments of both Buick Motor Division and Fisher Body-Pontiac.

On return to GMH Woodville South Australia, I was able to use various IE techniques in cost studies, engineering changes and suggestion analysis.

Late in 1954, I attended a Methods Engineering Society meeting in Adelaide with Jack Bourne and Merv Mueller (Standards Manager at Kelvinator) and some others. This Society was the predecessor of the Institute of Industrial Engineering Branch in SA.

Both Jack and Merv lectured in Industrial Engineering part time at the South Australia School of Mines, later South Australian Institute of Technology (SAIT) and now the University of South Australia. I too lectured the 4th year BE's at University of South Australia in Engineering Management 'C', circa 1981-90, in the principles of IE, using many films produced by the British Productivity Council and the BBC. I also introduced IE principles to the Information Technology students at SAIT.

In 1958 I left GMH and joined a firm of management consultants to set up the SA office. Here I learnt the value of stringent time study and incentive system based on the Bedaux System. I helped in applying incentives and Methods Management systems to various industries viz; coopering, dry cleaning laundry, muffler and venetian blind manufacturing.

In 1960, I returned to the automobile industry as Production Engineering Manager at Australian Motor Industries (AMI) in Port Melbourne (later Toyota). Here IE technologies such as assembly line balance, layout, material handling and better methods were used.

Then in 1961 as Standards Manager at New Holland Australasia, I introduced significant improvements using IE techniques including motion analysis using my 8 mm movie camera and projector. I was quite 'chuffed' on leaving after two years of time study and methods, improvements when the Union Rep presented me with an electric razor and said, "Bill, when you started timing us and changing things, we disliked it, but now we know that you made our work much easier – thank you".

I had exposed the workers to a course of 'Ineffective Worker Movements' that I had developed at GMH previous.

During this period I was asked by RMIT to develop a course in Work Study which I based on the ILO and RM Currie books.

Early 1962, I was appointed supervisor, Methods and Processes at Chrysler Australia Ltd (CAL). Here I could employ as many work study analysts as I wanted providing I could prove they saved six times their salary. We ended up with eight analysts in four different plants easily beating our savings targets!

After two years, I was promoted as Industrial Engineering Manager, controlling eventually forty-four Work Study and motion Handling Analysts over five plants.

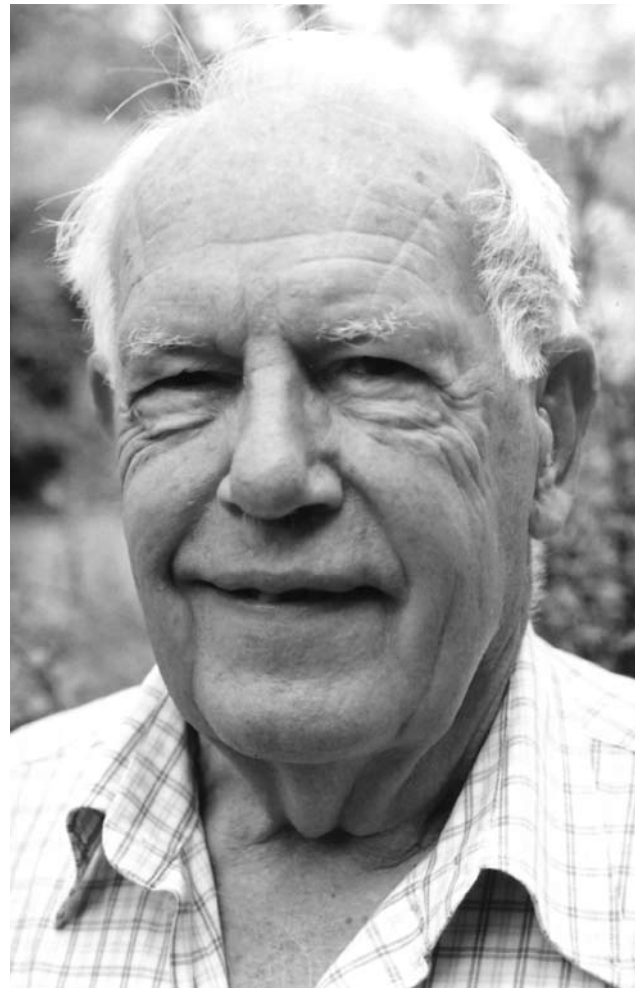
We had a very high degree of influence at top management in the amount of assembly and manufacturing labour, indirect labour staffing via strict move assignments and monitoring tables respectively.

Other manufacturing expenses and material handling equipment and dunnage applications were also controlled by the IE department. Comsoal (Computer Sequencing of Assembly Lines) was introduced with some difficulty as this was the first application outside the USA.

Major cost reduction programmes were undertaken. We were able to reduce the actual Valiant assembly time from an initial 85 to 29 hours over a 7 year period.

They were exciting times for Industrial Engineers at CAL!

Circa 1965, I joined IIE SA Branch with the then SA President, David Scarborough and Treasurer, Graham Hill.



*Bill Murrell Hon FIIE (Retired)*

After a few years serving on our SA Council, I was elected SA President Circa 1980. Bob Watson and I were sponsored by Federal IIE to attend the US IIE Conference in Detroit. I also attended the World Productivity Congress and later the American Human Resource Training Conference in Boston.

While Federal President, circa 1983, we had a severe financial crisis after our exorbitant Singapore Conference so I had to rein tightly in all Federal expenses for several years.

In 1990, I was contracted for 12 months as IE for the Water Authority of WA and was met on the Perth Station by Bob Watson, the only person I knew in WA. I ended up working for the WaterCorp for 9 years and introduced many IE productivity uses including MODA. In this time Bob directed me onto the WA IE Council then later I was elected President of the WA Branch.

So the foregoing is a few memories of an old bloke who has been:

- IIE SA Branch Councillor and SA President
- Federal IIE Councillor and Federal President
- IIE WA Branch Councillor and WA President

# Fifty Years of Work Study and Industrial Engineering in Australian Defence 1950 – 2000

Lex Clark FIEE

The somewhat arbitrary period of 50 years between 1950 and 2000 was chosen for this article to help illustrate the somewhat similar developments of Work Study and Industrial Engineering in Defence and Australian Industry as reflected through the Australian Institute of Industrial Engineers. It also seems appropriate in this year 2008 when the Institute is celebrating its 50th year since incorporation.

While Industrial Engineering has its beginnings in the development of Scientific Management back at the turn of the 20th Century, the last 50 years, saw the evolution of a wide range of management systems which very often had their origins in what was first known as Work Study and then Industrial Engineering.

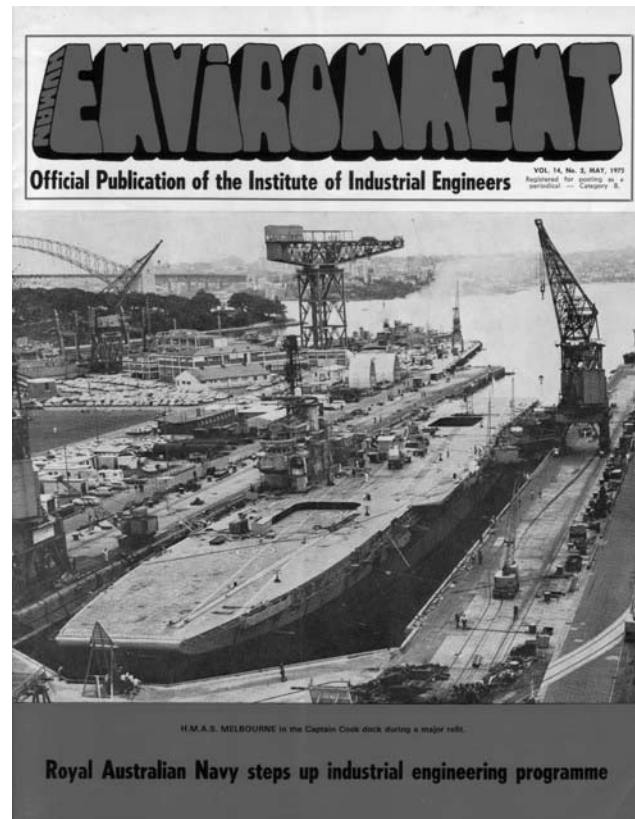
The Australian Department of Defence has utilised the techniques and skills of these disciplines, drawing very often on developments from Defence organisations overseas as well as from local Australian Industry. However, as a very large Australian organisation, it also developed its own approach best fitted to the requirements of the Department over time. This article attempts to briefly illustrate some of this development.

## Background

There is roughly a period of some fifty years between the formation of the Australian Methods Engineers Association (AMEA) in 1954 to the incorporation of the Industrial Engineering Society (IES) in the Institution of Engineers, Australia (IEAust) in 1997. This same period also coincided with the growth of Work Study and Industrial Engineering activities in the various Australian Defence Departments.

In 1950, following World War II, there were basically five Defence Departments operating within the Federal Government. These were the Department of Navy, the Department of Army, the Department of Air, the Department of Defence and the Department of Supply. Following the Tange Report in 1973, these five separate Departments, each with their own Minister, were integrated into the one Department of Defence and the Department of Defence Support (DDS). The DDS then became the Office of Defence Production (ODP) within the Department of Defence.

The greatly reduced finances in peacetime, together with the reorganising required after the end of World War II, resulted in a change of priorities in the large and complex Defence organisation. Increased emphasis on inputs (resources used) rather than outputs (military operations) tended to focus management on increased efficiency and productivity of Defence facilities in ways that were more aligned to those



*Institute of Industrial Engineers magazine Vol.14 No.2 May 1972 announcing increased IE in Naval Dockyards*

already required in Industry and Commerce. The Department of Supply already had experience in the Defence factories and in their contractual arrangements with Defence contractors. The integration of Defence starting in 1973 placed even more emphasis on implementing these changes.

Work Study Practitioners and Teams in the three Services were organised and trained along the lines established in their respective Services in the United Kingdom. Initially, Royal Australian Navy (RAN) and some Army personnel were also trained in the United Kingdom until Work Study training in Australia was established by the Army within the Royal Australian Army Ordnance Corps (RAAOC).

Industrial Engineering was the term generally employed within the Department of Supply and, after integration, the Office of Defence Production. Activities tended to follow along lines that had been established in Australian Industry and incorporated in the principles outlined by the Australian Institute of Industrial Engineers (IIE) in 1958. There was an increased emphasis on IE practices operating in the United States of America.

By 1985, with the final integration of the civilians of the DDS, the Department of Defence had some 144,000 personnel (including Reserve Forces) which included around 200 identified Work Study and Industrial Engineering positions, both Service and Civilian. While relatively small in number, the effect of this WS and IE activity was increased in effectiveness as a result of:

- The number of project studies carried out by individuals and teams across Defence which resulted in improved management and organisations with targeted returns of at least 10:1 on costs incurred where appropriate. For example, one Industrial Engineering supported project resulted in an estimated \$20million savings per year. In another coordinated project, Work Study Teams in all three Services carried out over one million direct observations to measure productivity across Defence engineering dockyards, workshops and aircraft depots.
- Work Study and Industrial Engineering personnel, particularly in the Services, posted through the Work Study positions during their career progressions and then carried their newly acquired management and investigative skills back into their own and other areas of Defence.
- The ability of Work Study and Industrial Engineering personnel to work as inter-Service teams made up of both Service and Civilian members.
- A number of new management improvement techniques were introduced and/or assisted in their implementation throughout Defence as a result of their application and support by WS and IE personnel.
- Defence personnel leaving Defence helped to carry these techniques and management systems back out into Australian Industry and Commerce.

The following very brief outlines can only give a feel for the wide range of activities across the Department of Defence, but perhaps they can help to illustrate the practical ways in which the Department attempted to adapt Work Study and Industrial Engineering disciplines and techniques to its requirements.

### **Work Study in the RAN**

Work study was adopted by the RAN and its Naval dockyards in 1959, after its successful adoption by the Royal Navy in the United Kingdom. Uniformed (Service) Work Study operations were temporarily disbanded in 1966 due to a shortage of manpower, particularly Officers. The RAN Work Study Branch was then reformed in 1970 under the command of a Lieutenant Commander, with project teams typically made up with Lieutenants, Warrant Officers, Chief Petty Officers and Petty Officers.

At one point there was also a small Fleet Work Study element.

Navy experience was that small Work Study Teams operating in line functions (e.g. in-house teams in Naval Technical Services and Naval Personnel Divisions) became narrowly tasked and were not typically available for utilisation on wider and larger projects. Large teams such as the Navy Supply Centre Work Study operated much more effectively.

Uniformed Work Study training was originally conducted with the Royal Navy in the UK. After the Australian DoD integration started in 1973, the setting up of the Defence Work Study Wing based on the Army RAAOC Centre in Bandianna (Albury Wodonga) resulted in all further Navy Work Study training, both Service and Civilian, being carried out at this training centre.



*Meeting of tri-Service Work Study Officers and DIEVA, Canberra in late 1970's.*

## **Work Study in the Army**

Army Work Study Practitioners also commenced operation in the 1950's where they were trained and initially employed in Planning Sections within Supply Units. Work Study sections operated in larger units such as Supply Battalions and were staffed at Major, Warrant Officer 1 and Staff Sergeant levels. However, like the Navy, these small teams carried out projects which were generally confined within their respective Supply Units.

In 1972, three Army Work Study Teams were established to carry out Army wide projects. Two Teams were initially established in Sydney and one in Melbourne, with one of the Sydney Teams being later transferred to Brisbane. These Teams were established with a Major, Warrant Officer 1 and a civilian Technical Officer 2.

In 1974, control of these three Army manned Teams was transferred to the new Directorate of Engineering Analysis (DEA) in the Management Advisory Services Branch (MASB) in Defence Central of the newly integrated DoD. From 1975, DEA also controlled the technical content, equipment and materials utilised at the Defence Work Study Wing, RAAOC Centre.

In 1984, these three Army manned Work Study Teams were disestablished and a new Work Study cell was established in the Directorate of Organisation – Army in Army Office, Canberra. Manning levels remained the same.

## **Work Study in the Air Force**

The Royal Australian Air Force (RAAF) established its first Work Study Team in 1981 composed of a Squadron Leader, Flight Lieutenant and Warrant Officer.

This Team was disestablished in 1985, and a Unit based Industrial Engineering Section was set up within No.2 Aircraft Depot. This Section, known as the Management Development Section, utilised other RAAF personnel who were also trained at the Defence Work Study Wing, RAAOC Centre as required.

## **Navy Supply Centre Work Study**

The Navy Support Command Supply Division Work Study Section was formed in the early 1960's. Staffed with civilian Technical Officers, this relatively large section tended to specialise in material handling, storage and inventory control across the Supply Division's network of store depots. These activities were somewhat similar to the early activities of the Army Work Study teams in their Supply Battalions.

The Section increased in size in the 1970's as it also became involved in Defence Regional Office accommodation planning in Sydney, then later in Brisbane and Melbourne. This was part of the integration of Defence. In the 1980's, the Section became involved with the development of new Navy Supply Depot and Defence Warehouse requirements and planning.

## **Industrial Engineering in the Defence Factories**

As indicated above, the greatly increased demand for military equipments during World War II resulted in the expansion of a wide range of manufacturing facilities under the then Department of Supply. With the integration of Defence in the 1970's this became the Department of Defence Support and in the 1980's the Office of Defence Production within the Department of Defence.

Subsequently, most of these facilities were sold off to Defence contractors, except for Garden Island Dockyard and its associated Fleet Base. Williamstown Dockyard, for example, was sold to the Australian Marine Engineering Corporation in 1987 for \$100million.

At the time of the incorporation of the Office of Defence Production, the then Manufacturing Consultancy Section (MCS) had been concerned with Industrial Engineering and Work Study since 1958. Commencing in 1960, Industrial Engineering courses were run annually into the 1970's, and their Industrial Engineering Handbook was the standard publication used by the Public Service Board across the Australian Public Service. Training courses and resources run by the Institute of Industrial Engineers were also drawn on at times as required.

By 1985 the Defence manufacturing and support activities with their considerable numbers of Industrial Engineers and Work Study Practitioners were active within, or available to, the Defence organisations of:

- Government Aircraft Factory (GAF).
- Albion Explosives Factory (AEF).
- Explosives Factory Maribyrnong (EFM).
- Ammunitions Factory Footscray (AFF).
- Ordnance Factory Maribyrnong (OFM).
- Mulwala Explosives Factory (MEF).
- Small Arms Factory (SAF) Lithgow.
- Munitions Filling Factory (MFF).
- Garden Island Dockyard (GID).
- Williamstown Dockyard (WD).
- The Guided Weapons and Electronics Support Facility (GWESF).
- Aircraft Engineering Workshop (AEW).
- Australian Government Clothing Factory (AGCF).

## **Defence Work Study Training**

As noted a number of times above, centralised Work Study training was carried out in Defence from 1975 to 1995 at the Defence Work Study Wing, RAAOC Centre on the Army base of Bandianna in Albury Wodonga. With an establishment of tri-Service staff under a Major equivalent on 2-3 year rotation (i.e. Navy, Army and Air Force alternatively provided the Officer-in-Charge), two to three Work Study Practitioner courses were conducted each year.

Courses were residential over three months and included a four week live project which could be for sponsors either in Defence or outside in Industry to give Practitioners some commercial experience. The Course was granted civilian recognition in the 1980's by the ACT Accreditation Agency when Defence Practitioners who had successfully completed the full Course, both Service and Civilian, were awarded an Associate Diploma of Management Systems Analysis (Work Study). This recognition was made retrospective for all Defence personnel who had completed the Course since 1975.

A special four week Advanced Work Study Course was also developed and run on an as required basis where some of the more advanced management techniques and systems were taught. Work Study Practitioner Courses were also introduced in Indonesia, Malaysia and Thailand under the Defence Cooperation Program. The Defence Work Study Wing supplied full packages of training materials (and support lecturers initially) to these overseas programs, which were conducted by overseas Service personnel who had graduated from the full Australian Practitioner Course

Graduates, both Australian and Overseas, were also granted membership in the Institute of Industrial Engineers which took into account their usually considerable experience and training gained in people and management skills as their careers had progressed in Defence. Young Commissioned Officers early in their careers together with older Non Commissioned Officers (usually Warrant Officers and Sergeants) helped to provide a wide mix of experience and skills.

Each Practitioner Course was made up of some 20 students, both male and female, largely from the three Services but with Civilians as well when required. The Services were mixed on Course in order to give tri-Service Team experience and to provide members with training more in line with the integrated Department of Defence. With up to three Courses per year, around 40-60 Work Study Practitioners were fed back into Defence to work often as Team members, but with management skills, techniques and qualifications which were of value to them for the rest of their Defence careers and eventually out into their civilian lives. Ex Defence Work Study Practitioners have continued to be a valuable resource out in Australian industry and commerce.

### **Industrial Engineering**

The term Industrial Engineering in Defence was often used to cover both Para-professional Work Study activities and Professional Engineering qualified positions and activities. This was particularly so in the Defence factories and facilities with their mainly civilian staff.

From 1975 onwards, a distinction was further made along the lines outlined by the Institute of Industrial Engineers. Work Study was considered as a Para-professional activity while Industrial Engineering, while also incorporating basic Work Study skills, also required Professional Engineering qualifications as recognised by the Institution of Engineers, Australia (IEAust now known as Engineers Australia). The two Naval Dockyards in particular developed this distinction with their Industrial Engineering Sections being upgraded with Professional Industrial Engineering positions.



*Work Study Practitioner Course 1/1991 at the Defence Work Study Wing, RAAOC Centre, Bandianna*

## **50 Years**

The start of this article drew a comparison of some 50 years of Work Study and Industrial Engineering development between:

- 1954 to 1997 (actually 43 years but rounded from 1950 to 2000) when the Institute of Industrial Engineers evolved from the Australian Methods Engineers Association to become the Industrial Engineering Society within Engineers Australia.
- 1950's when Work Study started to develop in Defence organisations and 1990's when formal Work Study training ceased within Defence. Work Study activities became absorbed into more general Management Service sections and Industrial Engineering activities tended to move out of Defence.

Over these fifty or so years, Work Study and Industrial Engineering in Defence contributed in ways considerably more than the relatively small numbers of personnel involved might seem to indicate:

- They first contributed to the streamlining of the Defence organisations as they restructured after World War II and resources (both financial and human) became greatly reduced.
- They continued to contribute as the Defence organisations integrated from 1973, both in terms of tri-Service management improvement activities and their continued emphasis on efficiency and productivity improvement.

The contracting out of many of the skills formally supplied by these Defence Work Study and Industrial Engineering organisations has apparently reduced, and in many cases eliminated, the apparent need for many of these in-house establishments today.

Many of the original Work Study and Industrial Engineering techniques are now also found as a normal part of modern management practices. A more educated workforce

and a move to more participative management styles have also enabled a number of these systems and techniques to be applied by the workforce itself, rather than by specialist management improvement individuals and organisations.

However, this has resulted in many techniques being simplified to the extent that their potential has been minimised, and what has been gained on the swings has been lost on the roundabout.

It should also be remembered that the original requirements for these in-house consultancy skills can still apply. Simply stated, they are:

- To provide in practice understanding of existing and new management principles and techniques in the context of special organisational requirements.
- To provide a rapidly available skilled resource which can be applied where other resources may not be appropriate or available.
- To provide an impartial resource which can be applied to assist in the evaluation of both internal and external problems and developments.

**ALGC**  
**29 Sept 2008**

## **Author Details**

Lex Clark was recruited from Industry in 1970 as the Director of Value and Industrial Engineering (DVIE) in the then Department of Navy. With the integration of the various Defence organisation in 1975, Lex became the Director of Industrial Engineering and Value Analysis (DIEVA) in Defence Central, which title was later shortened to become the Director of Engineering Analysis (DEA) mentioned in the article. He left the Department of Defence in 1995 to set up a consultancy in Industrial Engineering and Value Management.

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