AC 2007-308: HISTORY OF THE DEVELOPMENT OF ENGINEERING ECONOMIC REPRESENTATION WITHIN ASEE

Gerald Thuesen, Georgia Institute of Technology

GERALD J. THUESEN Professor Emeritus, Industrial and Systems Engineering Georgia Institute of Technology

DR. GERALD J. THUESEN is Professor Emeritus, in the School of Industrial and Systems Engineering at the Georgia Institute of Technology. He received his B.S., M.S. and Ph.D. in Industrial Engineering from Stanford University. His research interests include engineering economic analysis, capital budgeting and statistical decision theory. He has co-authored two college texts, Engineering Economy and Economic Decision Analysis. He served from 1981-1991 as Editor of The Engineering Economist and is a Fellow of the American Society for Engineering Education where he was a Board of Directors. Dr. Thuesen was recipient of the Eugene Grant Award in 1977 and 1989, and he received the Wellington Award in 1989 for outstanding contributions and service to the field of Engineering Economy. In 1990 he received the Outstanding Publication Award from IIE. He is a Fellow of the Institute of Industrial Engineers where he served as a member of the Board of Trustees.

History of the Development of Engineering Economic Representation within A.S.E.E

Abstract

The development of the Engineering Economy Division of A.S.E.E. was an outgrowth of the technical progress of the field of engineering economics beginning in 1877 with the publications of Arthur M. Wellington. As these new methodologies were formed, a few engineering faculty began to realize that this material should be an integral part of the engineering curriculum. This paper traces the formation in 1942 of the Industrial Engineering Division in the Society for the Promotion of Engineering Education (S.P.E.E., the forerunner of A.S.E.E.) and how these members played a critical role in the 1956 formation of the Engineering Economy Division for the Society. Particular focus will include certain individuals and events that had a significant influence on the formation of the initial Committees and ultimately the Divisions of Industrial Engineering and Engineering Economy within this Society.

The Early Development

To understand the movement within the engineering discipline that eventually leads to the acceptance of engineering economics as an important component and a separately identifiable division of A.S.E.E. requires an examination of history. The original organization of engineering educators began as S.P.E.E. in Chicago during the 1893 World's Columbian Exposition. It was an outgrowth of meetings of Division E of the World Engineering Congress that was part of this activity. There were 70 original members of this group, and 14 of them eventually became President of the Society. Dues were $3.50 per year and one could become a Life Member for $50 in 1910.

Early members had to be proposed by two members who knew the candidate and then the proposed member had to be elected by the Council (S.P.E.E.'s governing body) by at least three-quarters support. Members of the Council had 3 year terms with one-third of the Council being retired each year. By 1910 there were 121 colleges teaching engineering and 938 members of S.P.E.E. consisting of 767 teachers and 171 practitioners[1].

The *Journal of Engineering Education* began in 1910 and much of the information for this paper was obtained from this source. Since this journal was the S.P.E.E.'s means of communicating to its members and the Society was encouraging growth, this journal not only published papers regarding teaching of engineering but also presented a listing of its members each year. The information about each member included their university affiliation, when they joined the Society, their academic rank and their address. This service enabled members to communicate directly. From this source it was interesting to note that Andrew Carnegie joined the organization in 1911 as a Life Member[2]. A letter was written to S.P.E.E. by Carnegie about the Carnegie Technical Schools and their involvement in the Society[3].

To understand how dynamic the field of engineering had become, a paper "Education for Factory Management" was presented by Hugo Diemer in 1903. He was on the faculty at Penn State and he played a pivotal role in the development of the first Industrial Engineering program the country at that institution in 1908[4]. Frank B. Gilbreth joined S.P.E.E. in 1911 and he held a Symposium on Scientific Management in 1912. Another founding father of Industrial Engineering, Frederick W. Taylor received an M.E. degree at night from Stevens Institute of Technology in 1883. He died suddenly of pneumonia on March 21, 1915 and his obituary appeared in the S.P.E.E. journal[5].

The Constitution of S.P.E.E. required that a group of members that desired official recognition be first formed as a Committee when allowed by the Council. Once a Committee was officially established the Committee had to petition each year and if approved by the President, the Committee could continue for another year. Eventually a Committee could request Division status if the past level of activity of the Committee was deemed appropriate by the Council. Division status was the ultimate goal of most interest groups within S.P.E.E.

The first mention of Industrial Engineering was in 1912 when an Industrial and Efficiency Engineering Committee was established. There were only 3 teachers and 8 practitioners, including Frank B. Gilbreth, listed for this group. In 1913 there were 12 teachers and 13 practitioners comprising this Committee. Also in this year there was a History and Economics Committee with 2 teachers and 3 practitioners. Hugo Diemer was one of the teachers and Alexander C. Humphreys of Stevens Institute of Technology was listed as a practitioner[6]. The term Economics for this Committee generally referred to traditional economics rather than engineering economics as was being developed during this period. J.C.L. Fish's first book, *Engineering Economics*, was published by McGraw-Hill in 1915 while he was Professor of Railroad Engineering at Stanford University. He became a member of S.P.E.E. in 1919.

During World War I (1916-1917) there were no committees with the Industrial and Efficiency Engineering title or the History and Economics title. However, the Industrial Engineering (I.E.) Committee reappeared in 1917 with 4 members, Hugo Diemer, J. O. Keller, D. S. Kimball and C. C. Myers[7]. It continued to be re-approved until it became the Industrial Engineering Division at the Annual Meeting, June, 24-28, 1940, on the University of California-Berkeley campus[16]. Thus the earliest use of the term Industrial and Efficiency Engineering occurred in 1912 but the continuous use of the Industrial Engineering title for a Committee began during 1917.

The 1919 Annual Meeting was at Johns Hopkins and there were only 3 faculty listed in the I.E. Committee of S.P.E.E. at that time[8]. J. O. Keller, the first graduate from the I. E. program at Penn State in 1911 was on the Mechanical Engineering faculty at Iowa State College by 1919. My father, H. G. Thuesen, was strongly influenced by Keller in his senior year in Mechanical Engineering (M. E.) at Iowa State during 1921-22 when he studied four courses that were I.E. courses based on Professor Keller's experience at Penn State. Graduating in 1922, he worked as a mechanical engineer and in 1925 he accepted

the appointment as Assistant Professor of Industrial Engineering at Oklahoma A & M College. He worked in that department alone until he became the Department Head and hired M. R. (Pete) Lohmann in 1941 as the second member of the I. E. Department. His first graduate (Earl Knightlinger) received his degree in 1926 and he was the first graduate in the U.S. from an I. E. titled program located west of the Mississippi River.

By 1926, Eugene L. Grant, Assistant Professor of Civil Engineering at Montana State College, Paul T. Norton, Instructor in Mechanics at the University of Wisconsin, and H. G. Thuesen, Assistant Professor of Industrial Engineering at Oklahoma A & M College were members of S.P.E.E. J. O. Keller who joined S.P.E.E. in 1916 was now Professor and Head of Industrial Engineering at Penn State and with him there was C. E. Bullinger. These individuals played important roles in the early development of the Industrial Engineering Committee which had 36 members at this time[9].

Also at this time, there was a special Committee on the Economic Content of Engineering Education in S.P.E.E. The chairman was H. E. Riggs from the University of Michigan and one of the members of this committee was J. C. L. Fish, who authored one of the first textbooks in engineering economics and began teaching this material in 1904. There were only 8 members of the Economics Committee in 1926.

By 1930 the Great Depression was underway. The Economics Committee had 10 members and the Industrial Engineering Committee had 43 members. During this time E. L. Grant had moved to Stanford University as Associate Professor of Civil Engineering (C. E.). His new book, *Principles of Engineering Economy* was published by Ronald Press and was reviewed in Vol. 21, p. 424 of the *Journal of Engineering Education* [10]. The price of this book was $3.75 while it contained 387 pages, 12 charts and 32 tables. This textbook became a best seller in its field and it defined what material was important for considering the economic impact of engineering projects.

Also in 1930 the Division of Mechanics was approved based on the high level of activity of the Mechanics Committee. Now, there were 4 Divisions in S.P.E.E. (Engineering Drawing, Mechanics, Physics and Institutional).

In 1931, at the Annual Meeting, it was proposed that the name of the Society for the Promotion of Engineering Education (S.P.E.E.); be changed to the Engineering Education Society (E.E.S.). No change occurred[11] due to lack of support at the Council meeting.

At the Annual Meeting during June, 1932 at Oregon State College there were now 5 Divisions in the Society with the addition of the Cooperative Education Division. The membership in the Industrial Engineering Committee was 39 including Ralph Barnes, C. E. Bullinger, E. L. Grant, P. T. Norton, J. W. Roe, H. G. Thuesen and W. M. Towle. The Economics Committee had 12 members[12].

Between 1927 and 1952 S.P.E.E. conducted a series of Summer Schools to permit a greater exchange of ideas. The first year that Economics was the subject of discussion was 1932 at Stevens Institute of Technology. Stevens was selected to host this event since it was the first college to include the subject in its engineering curriculum. Total enrollment for the session was 37, representing 19 different colleges[13].

From the document, "History of the Engineering Economy Committee of A.S.E.E." prepared by Arthur Lesser, Jr. with assistance of Ester R. Lawrence at the Stevens Institute of Technology, October, 1952, the following information has been obtained regarding the founding of the Committee on Engineering Economy[20]. This document was initiated because of an earlier paper prepared by Paul T. Norton, Professor of I.E. at Virginia Polytechnic Institute[17].

Inception of the S.P.E.E. Committee on Engineering Economy

The story of the early days of the S.P.E.E. Committee on Engineering Economy are told in an article by P.T. Norton, Jr., in the Journal of Engineering Education, September 1945 as follows:

"The S.P.E.E. Committee on Engineering Economy was created by the Council during the 1936 annual meeting, but the man really responsible for the Committee was William E. Wickenden, who as President of S.P.E.E. suggested that a joint conference on the teaching of engineering economy be held during the 1934 annual meeting. President Wickenden's letters of March 17, 1934 to the Chairmen of the Committees on civil, electrical, industrial and the mechanical engineering follow:"

> *'I am writing to inquire if the four Committees on civil, electrical, mechanical and industrial engineering might be interested in jointly sponsoring a conference on the teaching of engineering economy with particular reference to a larger introduction of these considerations into the engineering subjects of the senior year. It might be a marked advantage to have four departmental viewpoints represented with some chance for a breakdown into separate groups in each of the four fields.'*

The report of the conference may be found on Page 141 of the October 1934 issue of the Journal of Engineering Education.

While there was no formal committee until after the 1936 annual meeting, there were joint conferences on engineering economy at both the 1935 and 1936 annual meetings, the 1935 conference being sponsored by the industrial and mechanical engineering groups and the 1936 conference being sponsored by the chemical, civil, electrical, industrial, mechanical, mining and cooperative engineering education groups.

Investigation shows that the conference on the Teaching of Engineering Economy, held in Atlanta on June 25, 1935, under the joint sponsorship of the Industrial and Mechanical

Engineering groups, referred to by Dr. Norton, was particularly interesting. The attendance was about 80[15].

The papers presented included:

Treatment of the Cost Aspects of Engineering in School
Prof. Edmund D. Ayres, University of Wisconsin

Engineering Economics, Why? Where? What?
Prof. George W. Barnwell, Stevens Institute of Technology

A Course in Engineering Economics
President Donald B. Prentice, Rose Polytechnic Institute

Economics of Engineering Economy
Prof. Lawrence R. Guild, Carnegie Institute of Technology

These papers are presented in the Journal of Engineering Education in Vol. 26, pp. 477-493.

The papers were discussed by Professor J. R. Banks, Jr., Cornell University; G. H. Shepard, Purdue University; C. E. Bullinger, Pennsylvania State College; E. E. King, University of Illinois; C. H. Casberg, University of Illinois; G. W. Barnwell, Stevens Institute of Technology; C. A. Keopke, University of Minnesota; P. A. Cushman, Valparaiso University; and Dean G. W. Case, University of New Hamshire.

The first year that a Committee on Engineering Economy was appointed was for 1936-37. The membership was as follows:

E. L. Grant Stanford University, California
G. W. Barnwell
Walter Rautenstrauch
J. W. Roe
J. W. Hallock
Hugo Deimer
E. D. Ayres
L. R. Guild
W. E. Hotchkiss
W. D. Ennis

Dr. Norton concludes with this statement: "It would seem that the chairmanship of the Committee should be a rather easy task, because all engineering teachers agree that engineering economy should be accorded an important place in all engineering curricula. Unfortunately, the agreement rests at that point, and after having observed the discussions on engineering economy which have taken place during the past ten years I

can only say that I marvel that Professors Grant and Ayres have been able to do as well as they have in defining the subject itself and in keeping the various discussions fairly well in line with the definition."

Chairmen of the Committee on Engineering Economy

		From	*Through*
Eugene L. Grant	*Stanford University*	*1936-37*	*1939-40*
E. D. Ayres	*Ohio State University*	*1940-41*	*1943-44*
C. E. Bullinger	*Penn State*	*1944-45*	*1947-48*
H. E. Nold	*Ohio State University*	*1948-49*	
W. D. McIlvaine	*University of Alabama*	*1949-50*	*1950-51*
H. S. Osborne	*American Tel & Tel Co.*	*1951-52*	

In 1935, the Industrial Engineering Committee had P. T. Norton from Virginia Polytechnic Institute as Chairman. Other officers of that group included C. E. Bullinger, E. L. Grant, R. M. Barnes, H. G. Thuesen and J. R. Banks, Jr.[14]. When comparing this list with the list of the Chairman of the Engineering Economy Committee and the future authors of textbooks presenting engineering economy principles, it is clear why Industrial Engineering programs include engineering economy as a basic course.

During 1937, a proposal to include a regular page on Engineering Economy in the *Journal of Engineering Education* was approved. Edmund D. Ayres, Associate Professor of Engineering Economics at the University of Wisconsin was appointed Editor of the Engineering Economy Page. This activity was continued for 6 years until it was discontinued in 1943[20].

In 1940, a proposed constitution for the Industrial Engineering Division appeared in the *Journal of Engineering Education*, Vol. 31, pp. 623-625. The Division was approved by the Council in June, 1940. The first chairman of this Division was C. E. Bullinger from Pennsylvania State College. His officers for this new division included A. S. Knowles, Northeastern University; G. W. Barnwell, Stevens Institute of Technology; C. W. Beese, Purdue University; H. J. McIntyre, University of Washington and H. G. Thuesen, Oklahoma A & M College. At this time the Industrial Engineering Division had 83 members while the Engineering Economy Committee had 23 members[16].

At the end of World War II, 1945, there was no Annual Meeting of S.P.E.E. The 54th Annual Meeting during June, 1946 in St. Louis saw a report of the Committee on Revision of the Constitution and By-Laws. This report printed in the April, 1946 issue of the *Journal of Engineering Education* was unanimously accepted by the Council to change the name of the society to the American Society for Engineering Education (A.S.E.E.).

On September 1, 1947, William E. Wickenden died at age 65 only a few hours after his retirement from Case Institute of Technology. He had been President of that school and he was the 40th President of A.S.E.E. His critical support for the Engineering Economy Committee was reviewed in this historical record during the events of 1934[17]. Presently, he is remembered through the Wickenden Award presented by A.S.E.E. each year to members for outstanding publications.

The number of members identified as belonging to the Industrial Engineering Division was 165 by 1948. The Engineering Economy Committee had a membership of 25[18]. By 1956, the Engineering Economy Committee had 36 and these members included E. L. Grant and Arthur Lesser Jr.[19]. Art Lesser became the founding Editor of *The Engineering Economist* and he published the first issue in the summer of 1955. This technical journal was published by the Engineering Economy Committee of A.S.E.E. under the leadership of Art as its Editor until 1974. His 19 year involvement as Editor remains the longest editorial term over the 51 year life of this journal. There have been 6 other Editors since 1974.

Because the Engineering Economy Committee now had a significant technical publication and the size of the group was increasing they continued to seek Division status. The Minutes of the General Council Meeting during the 64th Annual Meeting at Iowa State University during June 1956 includes the following passage[19]:

> "E. L. Grant, representative of the Pacific Southwest Section, reviewed the requests for Division status made by the Engineering Economy Committee during the past two years. The General Council voted to change the Engineering Economy Committee to a Division, the details of officers, etc., to be worked out with the Secretary."

It appears this vote occurred Thursday, June 29, 1956.

To summarize, the earliest appearance of Industrial Engineering as a Committee occurred in 1912 when the Industrial and Efficiency Committee was established. However; there was no mention of this committee in the 1915-1916 period, but the Industrial Engineering Committee appeared again in 1917. It was continuously re-approved until it became the Industrial Engineering Division during the Annual Meeting, June 24-28, 1940 at the University of California. Many of the leaders of this evolving profession have served as officers and members of this Division.

A portion of those active in the Industrial Engineering Committee and Division also assisted in the development of the Engineering Economy Committee in 1936. This collaboration continued through the establishment of the Engineering Economy Division in 1956 and continues today.

Over a 114 year time-span from 1893 until the present; this organization (S.P.E.E. and A.S.E.E.) has provided a supportive environment for the growth of the Industrial Engineering and the Engineering Economy fields. The critical forum for the exchange of

technical ideas and providing insights regarding the teaching/learning process at the university level were made available. The resulting development of these two fields as unique, highly technical disciplines with widespread applications can certainly be directly linked to A.S.E.E. and its influence on engineering education.

References

1. *Journal of Engineering Education*, Vol. 1 (1910-11), p. 380.
2. *Journal of Engineering Education*, Vol. 3 (1912-13), p. 14.
3. *Journal of Engineering Education*, Vol. 1 (1910-11), p. 556.
4. *Journal of Engineering Education*, Vol. 4 (1913-14), pgs. 35-49.
5. *Journal of Engineering Education*, Vol. 5 (1914-15), pgs. 14-15.
6. *Journal of Engineering Education*, Vol. 4 (1913-14), p. 91, p. 85, p. 88.
7. *Journal of Engineering Education*, Vol. 8 (1917-18), p. 357.
8. *Journal of Engineering Education*, Vol. 10 (1919-20), p. 322.
9. *Journal of Engineering Education*, Vol. 17 (1926-27), p. 129.
10. *Journal of Engineering Education*, Vol. 21 (1930-31), p. 424.
11. *Journal of Engineering Education*, Vol. 22 (1931-32), minutes of the Meetings of the Council at Purdue University, June 17-19, 1931, p.15.
12. *Journal of Engineering Education*, Vol. 23 (1932-33), supplement to (November, 1932) p.5, 8.
13. *Journal of Engineering Education*, Vol. 23 (1932-33), pgs. 46-49, 543-549, 602-609, 699-700.
14. *Journal of Engineering Education*, Vol. 26 (1935-36), p. 294.
15. *Journal of Engineering Education*, Vol. 26 (1935-36), pgs. 266-269.
16. *Journal of Engineering Education*, Vol. 31 (1940-41), p. 714, pgs. 623-625, p. 80, p. 185, p. 190.
17. *Journal of Engineering Education*, Vol. 36 (1945-46), pgs. 79-80.
18. *Journal of Engineering Education*, Vol. 39 (1948-49), p. 317, pgs. 327-328.
19. *Journal of Engineering Education*, Vol. 47 (1956-57), p. 39, pgs. 250-251.
20. Lesser, Arthur Jr., "History of the Engineering Economy Committee of American Society for Engineering Education," Oct. 1952, sent to Gerald J. Thuesen, March 2, 1979.