

Defining a Curriculum for Service Systems Engineering

Sheryl A. Sorby, Leonard J. Bohmann, Tom Drummer, Jim Frendewey,
Dana Johnson, Kris Mattila, John Sutherland, & Robert Warrington
Michigan Technological University

Abstract

The U.S. economy has gradually changed from one based in agriculture, to one focused on manufacturing, to one now that relies heavily on the service sector. The service sector, including governmental agencies, retail stores, the entertainment business, public utilities, and providers of similar services, now makes up more than 80% of the total U.S. economy. Engineering programs, which typically have their roots in the era of manufacturing, have a focus on the design and fabrication of “products” rather than the design and creation of service systems. While curricula such as engineering management and industrial engineering provide some support to service systems engineering, their legacies are tied to the manufacturing sector, and as a result, they are not optimized to support the service sector. With this in mind, a Delphi Study was performed to identify the features, characteristics, and topics relevant to a service systems engineering curriculum. This paper describes the planning, conduct, and results of the service systems Delphi Study and how this information is being used to establish a new engineering degree program at Michigan Tech.

Delphi Study

In September 2003, Michigan Tech received a planning grant from the Department-Level Reform program of the National Science Foundation (NSF) to define a Service Systems Engineering (SSE) curriculum with the help of industry leaders. Using our recently completed Delphi study we have identified several components of a curriculum for this new discipline that are presented here.

Panel of Experts

A key to conducting a Delphi Study for curricular design is to identify and recruit an appropriate panel of experts. For our planning grant activities, we contacted program officers at NSF, attended an NSF-sponsored conference on engineering the service sector, met with individuals from various industrial advisory boards associated with Michigan Tech, and networked with others identified through our efforts. We sent a letter to potential panel members asking for their assistance in defining the curriculum.

Approximately 21 leaders from a range of service industries agreed to participate as members of our panel of experts. The major service sectors represented were: 1) universities, 2) health care services, 3) banking, insurance, and legal services, 4) technology and engineering services, 5) shipping and transport, 6) consumer and retail services, 7) utilities and communications, and 8) community services. It should be noted that not all panelists returned all survey rounds, so the sample size (n-values) differed slightly from one survey round to the next. The years of experience for the panelists ranged from 6 to 43 years with a mean of 22 years. Consultant was the most frequently checked occupation category (n = 4).

Brainstorming Session

In December 2003, we conducted a brainstorming session with several industry leaders on the campus of Michigan Tech to help identify topics that might be important for the curriculum. The authors of this paper also participated in the day-long session.

Round 1 – Delphi Study

After establishing our panel of experts and identifying potential curricular topics through our brainstorming session, we began the Delphi Study. For the first round of the study, we developed a survey instrument that was based on examples from previously successful curricular Delphi studies. This instrument contained several categories and characteristics that might be relevant to a Service Systems Engineering curriculum. In the first round, experts were asked to accept, modify, delete, or add to the list of categories and characteristics on the instrument. Panel members then had several options: 1) they could state that an entire category should be deleted, 2) they could select individual characteristics from each list for deletion, 3) they could add to the list of characteristics within a category, or 4) they could rename individual characteristics. Panel members were also allowed to move characteristics from one category to another if necessary. In developing our instrument for round one, we took care to ensure that all categories and characteristics were listed randomly.

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