

School of Industrial Engineering and Management

Research Methodology

Research is an activity resulting in the creation of knowledge that was not previously available. Regardless of the specific nature of the research effort, proper research methodology should be followed. The following sections discuss classical and developmental research and the proper research methodology for each. Research topics that are classical, developmental, or a combination of both are satisfactory for research in the School of Industrial Engineering and Management.

Classical Research

Classical research efforts involve experimental investigations of various physical phenomena and are usually linked with scientific analysis. The following guidelines apply to classical research:

Statement of the Problem. This section should include a clear and complete statement of the proposed problem.

Statement of the Hypotheses. This section should include a list of the null and alternative hypotheses and the levels at which the null hypotheses are to be tested.

Statement of Assumptions. This section should include a list and justification of the assumptions.

Design of the Experiment. This section should include a list and justification of each of the experimental design elements that will be used, e.g., strategies, experimental conditions, control variables, response variables, models, methodologies, data measurement and collection procedures and analysis techniques.

Conduct of the Experiment. This section should include a discussion of the controlled conditions under which the experiment will be conducted.

Analysis and Evaluation of the Research Results. This section should include a discussion of how the statistical analysis procedures specified in the experimental design stage will be applied to the experimental results in order to arrive at decisions regarding the stated hypotheses.

Statement of Conclusions and Recommendations. This section should include a discussion of the research results, how they contribute to the solution and understanding of the originally stated research problem, a critique of the research effort and recommendations for further research.

Developmental Research

Developmental research efforts are often associated with engineering design and may include such activities as the design of a new computational algorithm, an innovative computer simulation or a person-machine system. The following guidelines apply to developmental research.

Statement of the Problem. This section should include a clear and complete statement of the proposed problem.

Statement of Goals and Specific Objectives. This section should include a list of the quantifiable performance expectations and aspiration levels.

Statement of Assumptions. This section should include a list and justification of the assumptions.

Design of Approach. This section should include a list and justification of the methodologies and techniques that will be used.

Verification and Validation of Tasks. This section should include a discussion of the development tasks. The discussion should ensure that the development is internally correct (verification) and that it yields results which relate to the problem environment with a measurable and acceptable degree of conformity (validation).

Analysis and Evaluation of Research Results. This section should include a discussion of the methods specified in the design approach with reference to the stated goals and specific objectives.

Statement of Conclusions and Recommendations. This section should include an interpretation of the research results, how they contribute to the solution and understanding of the originally stated research problem, critique of the research effort, and recommendations for further research.