



Research Methods for Engineering and Technology

Dr. Seth Bates

College of Engineering

Department of Aviation and Technology

Industrial Research is about Decisionmaking

Problem Definition

Data Identification

Data Gathering

Data Analysis

Data Presentation

Information

Decision Making

Overview of Course

- Delivery format
- Textbook and Style Manual
- Web and email
- Principle assignments:
 - Web activities and homework, web quizzes
 - Research Analysis
 - Précis
 - Final Exam

-
- Requirements and expectations
 - Importance of statistics
 - Goals of course: why do YOU need this course?
 - “Academic Integrity”
 - Definitions of plagiarism
 - Consequences of plagiarism
 - How to avoid...

Why do we do research?

Motivation

- Solve a problem
- Satisfy an itch
- Gain more market share
- Make a better widget
- Make some money
- Make more money

Intuitive and Rational Learning

How do we know things?

Epistemology:

The study of the nature and scope of knowledge

(Wikipedia, 1/10/08)

Intuitive knowledge relates to things that we “know” without having a reasoned understanding or explanation

Empirical knowledge relates to things we know because they are supported by other things that we can sense (five senses) or knew already.

It is the nature of industry and business in the western world, that most of the decisions they make will be based on empirical knowledge.

Empiricism and Research

Research

Research is the process of using tools and techniques to discover new truths and relationships in the world we live in, by sophisticated empirical study.

These new truths and relationships can be used to make decisions and to further the goals of the company.

Problems in Research and Development

There are a lot of ways in which R & D can result in confusion and lead to poor decisionmaking.

- Irreproducible results
- Unstated assumptions mixed with supported findings
- Mindsets or paradigms interfere with clear vision
- Poor records result in unverifiable conclusions
- Statistical analysis is badly selected, inappropriate, or simplistic
- Documentation is unclear and disorganized

How do we establish new knowledge?

The Scientific Method

A sophisticated and systematic method of turning ideas into 'facts'

Based on the philosophy of empiricism: what you see or sense is real

February 4th

- The Scientific Method
 - Textbook
 - Internet sources
- The vocabulary of research