

Theories and their discipline orientation

Research questions and natural science, social science

Research objectives and sciences of the artificial

Types of science

- Natural science, social science, sciences of the artificial
- Whereas the primary task of the natural sciences is to arrive at law-based explanations, the core task of the human sciences is the understanding of human and historical life (Dilthey)
- The contingency of artificial phenomena has always created doubts as to whether they fall properly within the compass of science (Simon)
- In no branch of science outside the artificial sciences does theory building involve the researcher or others actually constructing the objects of study (Gregor)

Table 2: Scientific development in Western culture

Epoch	Science	Philosophy of science
Early science	Primitive, with some steps towards experimentation (Aristotle).	Science not distinguished from philosophy. Epistêmê distinguished from technê.
Natural Science (17th - 18th century)	Age of Enlightenment/ Age of Reason. Advances in natural sciences (Gilbert, Galileo, Newton, Hooke, Boyle).	Word "scientist" coined (Coleridge/Whewell), Galileo and Bacon and the scientific method (experiments).
Human Science (19th century)	Sociology (Comte), Psychology (James), Psychiatry (Freud).	"Human science" distinguished by Dilthey (1883) (early interpretivism).
Artificial/ Practical Science (20th century)	Increasingly complex artifacts with invention of computers.	Herbert Simon "Sciences of the Artificial" (1969), Strasser "Practical Sciences" (1985).

Gregor, S. (2009). *Building theory in the sciences of the artificial*. Paper presented at the Proceedings of the 4th international conference on design science research in information systems and technology.

Natural science, social science, artificial science – where's your discipline?

- NS claims the most mathematical theory forms: syntactic, semantic
- SS broadens the available forms to include the pragmatic
- S of the A may include the above, may need special consideration
- Identify crossovers for your discipline

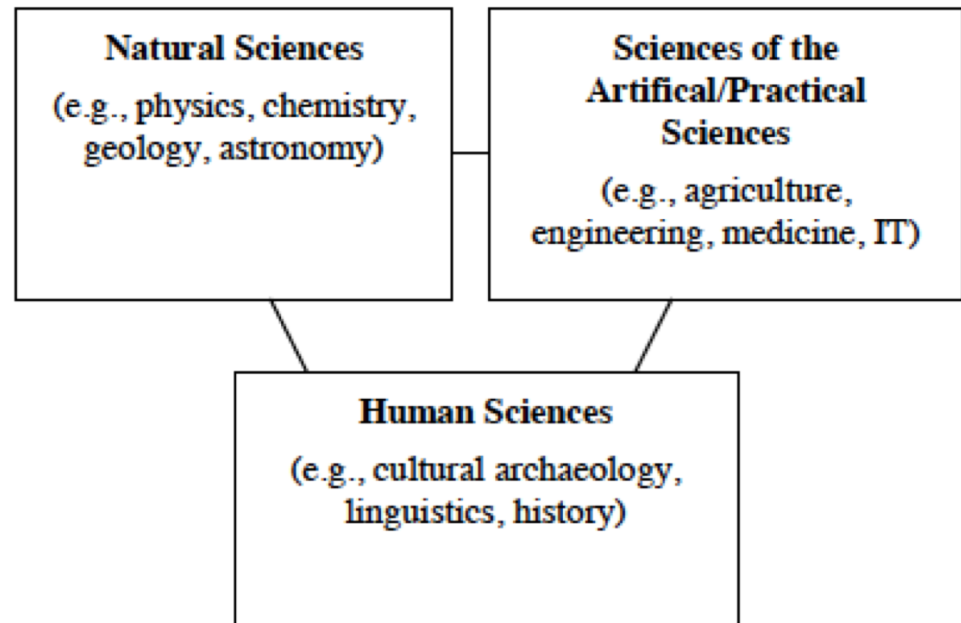


Figure 1: Three interrelated forms of science

Natural science paradigm

- E.g. physics, chemistry, biology
- Leans towards positivism
- The scientific method, experimentation
- Leans towards mathematical theory forms
- Correspondence theory (observed facts match theory)
- Concerned with causality
- Typical language: laws (of nature), prediction, facts, observation, model, theorem, axiom

Social science paradigm

- E.g. sociology, psychology, anthropology, politics, history, organization science
- Inherits the natural science tradition
- Inherits positivism, adds interpretivism (social constructivism) to cope with difficulties
- Leans towards Popperian hypothetico-deductive method
- Inherits mathematical (syntactical, semantic) theory forms, adds pragmatist (anything goes)
- Pluralist theory tolerance rather than cumulative theory building
- Typical language: concepts, constructs, variables, model, framework, testable predictions

Science of the artificial paradigm

- E.g. medicine, engineering, management, the information technology (informatics) disciplines
- Inherits both previous paradigms – individual disciplines often associate strongly with one or the other
 - E.g. engineering and computer science associate with natural science; information systems with social science
- More recent tradition with less strongly developed ideas of theory
- Adopts methods, theory traditions, and language from the paradigms it associates with; however this is not a case of anything goes – rather know your discipline and where it comes from
- Some explicit study of theorising (e.g. design science), but not given that previous paradigm understandings of theory will fit