# Second Order Science: The Effect on Business and Social Science Research

Stuart A. Umpleby
The George Washington University
Washington, DC
www.gwu.edu/~umpleby

# The theme of my talk

- Science is changing
- Knowing how and why science is changing will enable us to assume a leadership role

# Assumptions

- There are different ways of describing social systems
- Descriptions operate at different levels of abstraction
- The long term trend is toward a more scientific approach to business similar to the history of medicine and engineering
- When we do research, we are using the philosophy of science

# Four levels of conceptualization

- Philosophy of science
- Systems science – cybernetics, system dynamics, process improvement
- Social science disciplines – psychology, sociology, anthropology, economics
- Professional disciplines – management, marketing, finance, accounting

# A general theory of regulation

- Two analytic elements – regulator and system being regulated
- In biology – iris in the eye, hunger, thirst, hormones
- In social systems – manager and corporation, regulatory agency and regulated industry, government and society

# A general theory explains

- Perception, cognition, learning, adaptation
- A model of a viable system can be used at the level of an individual, a group, an organization, a nation, the world, or machines
- Structures and processes which are needed to produce an existing product or service and to develop new produces and services

# The effect of descriptions

- In social systems descriptions, when accepted and acted upon, change the system described
- This is the purpose of creating social science theories, to change the system
- However, theories do not change the way that physical systems operate

# In social science

- The observer can be thought of as a regulator
- Descriptions are used to regulate the system described
- Hence a scientist and the system described is another example of regulation

# How social systems change

- Study a social system (variables) and generate a reform proposal (idea)
- Persuade and organize people to support the idea (groups)
- Produce some change, for example pass a law (event)
- Study the effects of the legislation on the social system (variables)

# What would be different

- In addition to creating literature reviews we would describe the consequences of previous theories
- Instead of looking for linear causal relationships, we would look for positive and negative feedback loops
- We would pay more attention to methods as well as theories

# From literature reviews to consequences of theories

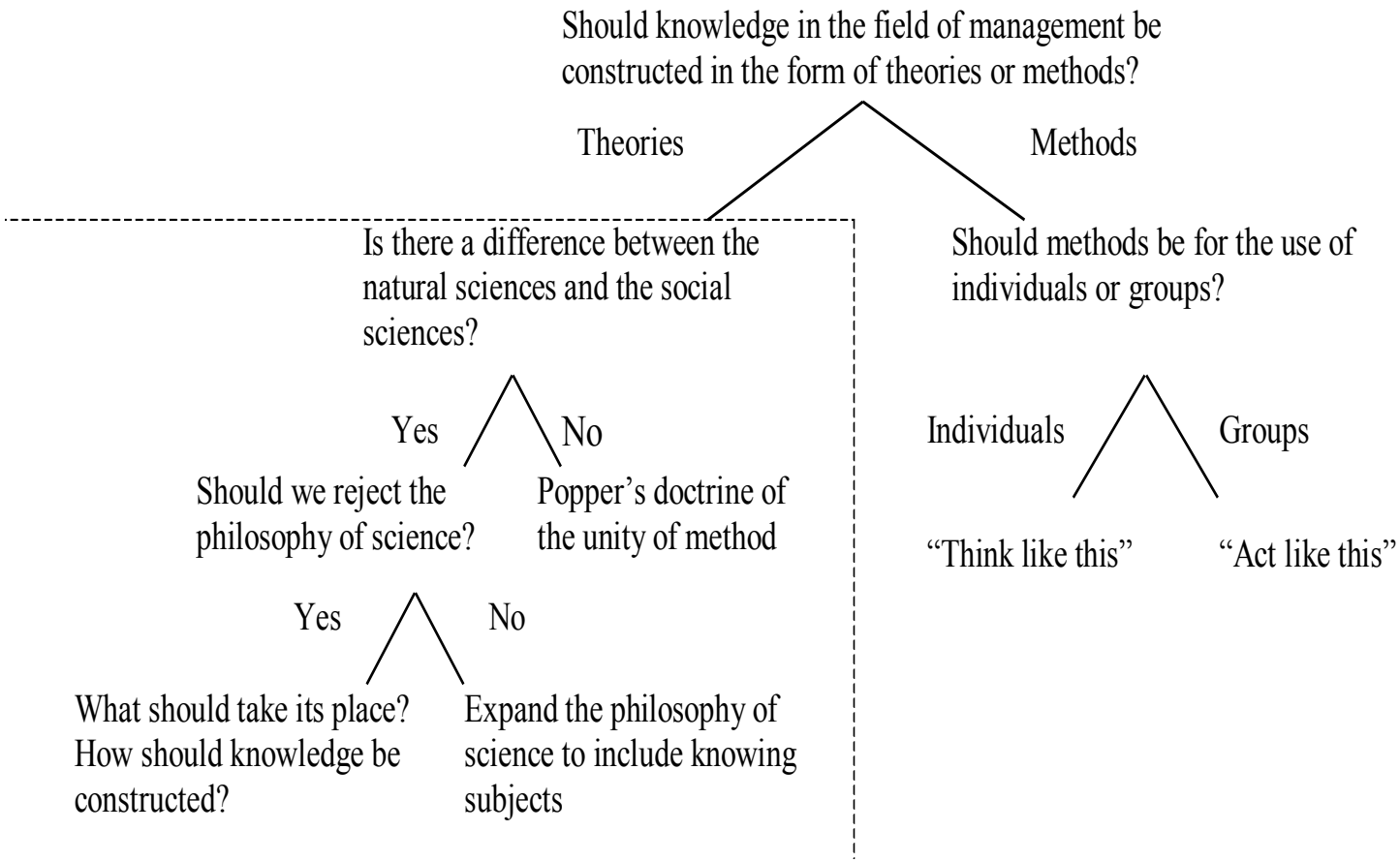
- How Marxism was interpreted in the U.S., in W. Europe, and in Russia and China
- The effects of deregulation in the U.S., U.K., and other countries
- Stock options to tie CEO rewards to firm performance
- In corporate governance a shift from stakeholder concerns to shareholder returns

# From linear to circular causality

- Academic articles on the financial crisis emphasize linear causal relationships
- Journalistic articles more frequently describe boom and bust cycles
- Dissertations usually emphasize linear causality due to the availability of statistical methods
- Positive and negative feedback loops reveal stability or instability

# From theories to methods

- Methods tell people what to do to achieve a goal – to improve a process, to create a strategic plan, to hire staff…
- Process improvement methods are ways of improving production methods, a kind of second order method
- Process improvement methods are the core curriculum in corporate universities


Should knowledge in the field of management be constructed in the form of theories or methods?
Theories
Methods
Is there a difference between the natural sciences and the social sciences?
Yes
No
Should we reject the philosophy of science?
Popper's doctrine of the unity of method
Yes
No
What should take its place? How should knowledge be constructed?
Expand the philosophy of science to include knowing subjects
Should methods be for the use of individuals or groups?
Individuals
Groups
"Think like this"
"Act like this"

# How is science changing?

- There are efforts to integrate the large number of independent studies. New doctoral programs are being designed to teach how to do this
- Due to the internet a study being done in one country can now be done in 2, 3, or more countries providing real time confirmation and revealing cultural differences

# How science is changing

- Theories are not separate from social systems
- Ideas have consequences
- There is a coevolution of ideas and events

The Interaction Between Ideas and Society

| Ideas | Events |
|---|---|
| | 1096 First Crusade |
| Interest in trade and in ancient learning | |
| | Marco Polo's trip to China |
| Science and technology stimulated by desire to improve trade | |
| | Traders accumulate wealth, nation–states develop and protect trade routes |
| The idea of progress, people strive to produce more than mere subsistence | |
| | Industrial Revolution in England |
| Adam Smith's *The Wealth of Nations*, 1776 | |
| | Capital accumulation, urbanization, growing gap between rich and poor |
| Marx and Engles, *The Communist Manifesto*, 1848 | |
| | Revolutions in Europe, demands for more equal distribution of wealth |
| Social reform movements in industrializing countries | |
| | World War I and the Great Depression |
| Keynes's theory justifying government intervention in the economy | |
| | World War II, World Bank and IMF established, decolonialization of the Third World |
| Friedman's monetary policy | |
| | Oil crisis in 1973 leads to abandonment of gold standard and fluctuating exchange rates |
| Environmental movement and futures research movement, many conferences on the "world problematique" | |
| | Economic progress in Asia, liberalization of communist regimes |

# Impact of Quality Improvement on Business Performance

| Performance Indicators | No. of Responding companies | Direction of Indicator | | | Average annual positive performance improvement |
|---|---|---|---|---|---|
| | | positive (favorable) | negative (unfavorable) | no change | |
| **Operating Measures** | | | | | |
| Reliability | 12 | 12 | 0 | 0 | 11.3 |
| Timeliness of delivery | 9 | 8 | 1 | 0 | 4.7 |
| Order processing time | 6 | 6 | 0 | 0 | 12.0 |
| Errors or defects | 8 | 7 | 0 | 1 | 10.3 |
| Product lead time | 7 | 6 | 0 | 1 | 5.8 |
| Inventory turnover | 9 | 6 | 1 | 2 | 7.2 |
| Costs of quality | 5 | 5 | 0 | 0 | 9.0 |
| **Employee-related measures** | | | | | |
| Employee satisfaction | 9 | 8 | 1 | 0 | 1.4 |
| Attendance | 11 | 8 | 0 | 3 | 0.1 |
| Turnover | 11 | 7 | 3 | 1 | 6.0 |
| Safety/health | 14 | 11 | 3 | 0 | 1.8 |
| Suggestions received | 7 | 5 | 2 | 0 | 16.6 |
| **Customer Satisfaction** | | | | | |
| Overall customer satisfaction | 14 | 12 | 0 | 2 | 2.5 |
| Customer complaints | 6 | 5 | 1 | 0 | 11.6 |
| Customer retention | 10 | 4 | 2 | 4 | 1.0 |
| **Financial Performance** | | | | | |
| Market share | 11 | 9 | 2 | 0 | 13.7 |
| Sales per employee | 12 | 12 | 0 | 0 | 8.6 |
| Return on assets | 9 | 7 | 2 | 0 | 1.3 |
| Return on sales | 8 | 6 | 2 | 0 | 0.4 |

Source: Adapted from U.S. General Accounting Office,
*Management Practices: U.S. Companies Improve Performance Through Quality Efforts*, Washington, 1991, pp. 18-28.

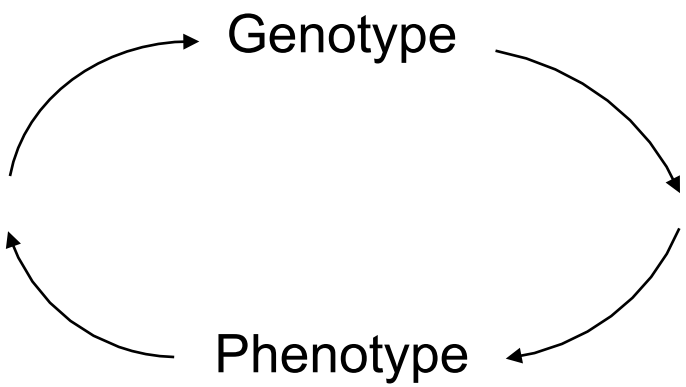
# GAO study of Baldrige winners

- The Baldrige Award is a checklist that shows managers what they need to be doing. Improvement methods can be taught and monitored
- These methods have dramatically changed management in the U.S. and abroad

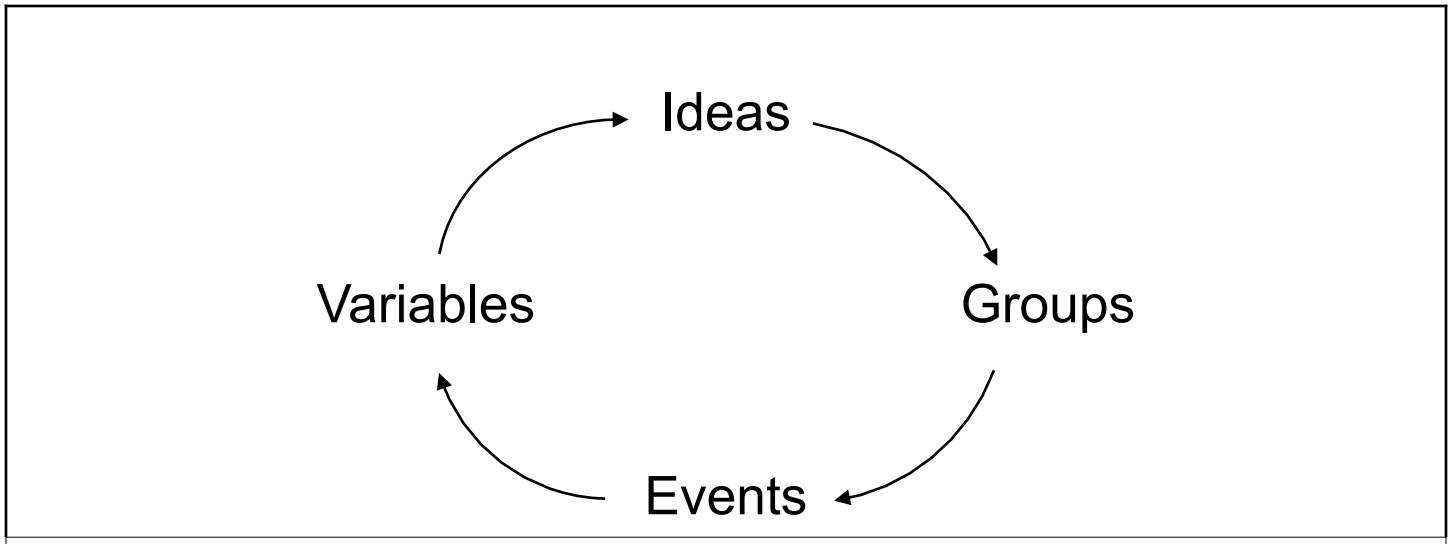
# Cybernetics itself has changed

- An early interest was to build machines that emulate human intellectual activities, Wiener's second industrial revolution
- A parallel interest was to understand human cognition and understanding itself
- A more recent emphasis has been on social systems and the role of ideas in changing social systems, i.e., reflexivity theory

# Create multi-disciplinary descriptions




**Karl Mueller's epigenetic theory**




**A model of social change using four methods for describing systems**

# Ways that disciplines describe social systems

- Variables – physics, economics
- Events – computer science, history
- Groups – sociology, political science
- Ideas – psychology, philosophy, cultural anthropology
- Interaction between ideas and events, a "shoelace model"

# Advantages of using all four methods

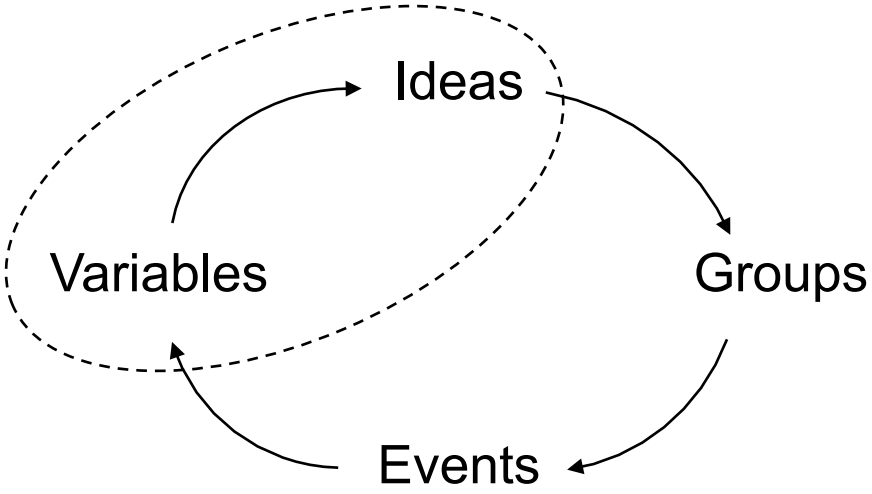
- A richer description of the social system is produced
- Important considerations are less likely to be overlooked
- The theories and methods of more than one discipline are used

# Specific advantages

- The interests of more groups are likely to be included in the analysis
- The beliefs and values of the people involved, hence culture, are likely to be considered
- Actions to produce change (events) probably will be discussed
- The results of actions are more likely to be measured (variables)

# How reflexivity theory is different

- Classical scientific theories operate in the realm of VARIABLES and IDEAS
- Soros's reflexivity theory describes the whole process of social change – IDEAS, GROUPS, EVENTS, VARIABLES, IDEAS
- Reflexivity is the process of shifting back and forth between description and action




**A reflexive theory operates at two levels**

# The theme of my talk

- Science is changing
- Knowing how and why science is changing will enable us to assume a leadership role
- We should seek to use leverage in academic research

# Leverage in academic research

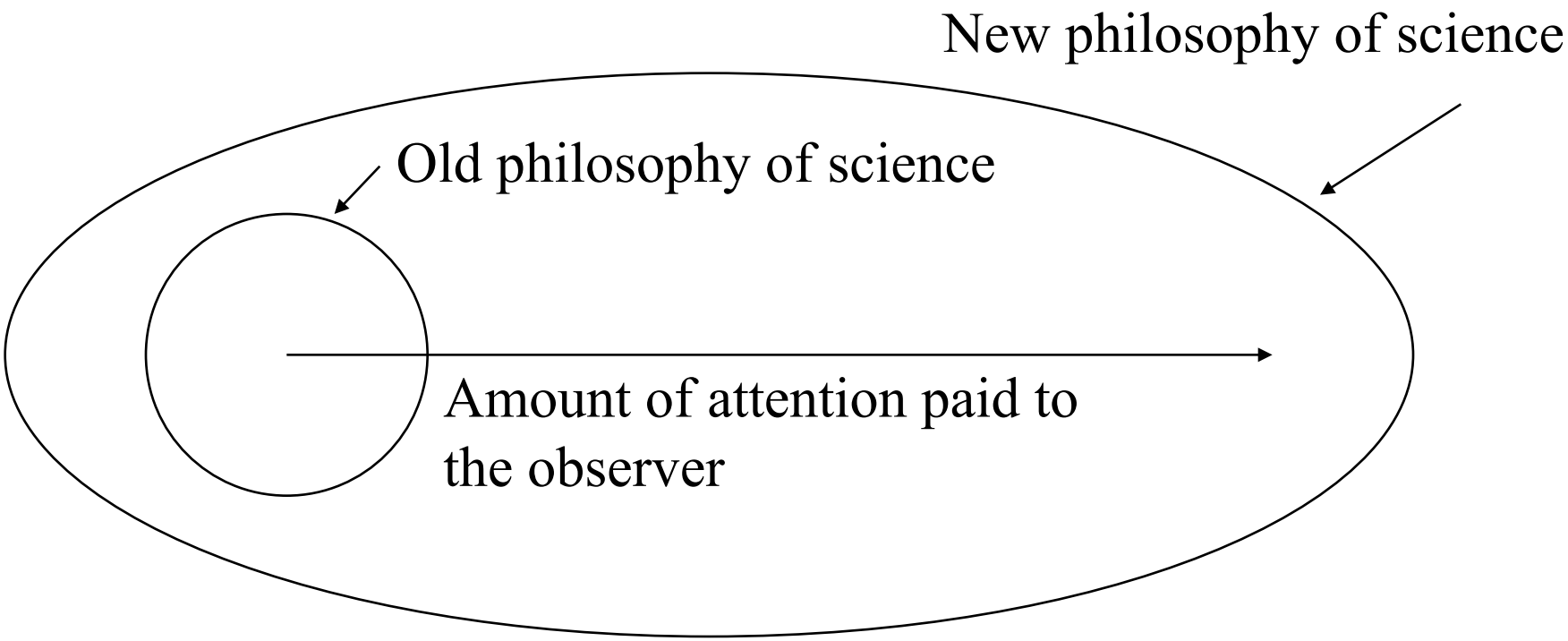
- Testing a theory within a field is one way to write a dissertation or to publish articles
- Adding a new dimension to a theory within a field provides more leverage
- Adding a dimension to the philosophy of science changes all fields of science

# New dimensions in the philosophy of science

- Two dimensions have recently been added to the philosophy of science
  - Amount of attention paid to the observer
  - The effect of a theory on the system described
- If we choose to do research that incorporates one or both of these dimensions, we shall be at the leading edge and have increased leverage

# The Correspondence Principle

- Proposed by Niels Bohr when developing the quantum theory
- Any new theory should reduce to the old theory to which it corresponds for those cases in which the old theory is known to hold
- A new dimension is required




**An Application of the Correspondence Principle**

# Contact information

Stuart A. Umpleby
Department of Management
The George Washington University
Washington, DC

www.gwu.edu/~umpleby
umpleby@gmail.com

A presentation to the Faculty Seminar in

The George Washington University
School of Business

Washington, DC
November 21, 2013