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

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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

Is there a difference between the natural sciences and the social sciences?

Yes

Should we reject the philosophy of science?

Yes

What should take its place? How should knowledge be constructed?

No

Expand the philosophy of science to include knowing subjects

Methods

Should methods be for the use of individuals or groups?

Individuals

“Think like this”

No

Groups

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

<table>
<thead>
<tr>
<th>Performance Indicators</th>
<th>No. of Responding companies</th>
<th>Direction of Indicator</th>
<th>Average annual positive performance improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>positive (favorable)</td>
<td>negative (unfavorable)</td>
</tr>
<tr>
<td><strong>Operating Measures</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td>12</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Timeliness of delivery</td>
<td>9</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Order processing time</td>
<td>6</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Errors or defects</td>
<td>8</td>
<td>7</td>
<td>0</td>
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<tr>
<td>Product lead time</td>
<td>7</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Inventory turnover</td>
<td>9</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Costs of quality</td>
<td>5</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td><strong>Employee-related measures</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Employee satisfaction</td>
<td>9</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Attendance</td>
<td>11</td>
<td>8</td>
<td>0</td>
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<tr>
<td>Turnover</td>
<td>11</td>
<td>7</td>
<td>3</td>
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<tr>
<td>Safety/health</td>
<td>14</td>
<td>11</td>
<td>3</td>
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<tr>
<td>Suggestions received</td>
<td>7</td>
<td>5</td>
<td>2</td>
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<tr>
<td><strong>Customer Satisfaction</strong></td>
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<tr>
<td>Overall customer satisfaction</td>
<td>14</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Customer complaints</td>
<td>6</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Customer retention</td>
<td>10</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td><strong>Financial Performance</strong></td>
<td></td>
<td></td>
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<tr>
<td>Market share</td>
<td>11</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Sales per employee</td>
<td>12</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Return on assets</td>
<td>9</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Return on sales</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

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
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