The Use of Formal Models in the Sociology of Culture

John Mohr
UC Santa Barbara
Prepared for ASA Culture Section
20th Anniversary Mini-conference on Cultural Models
August 15, 2007
As simplifying representations of what exists in the world, models mediate between our theories and methods. Models stand for and help us see abstract patterns in concrete data, and define what kinds of data we need. In other words, models are conceptual tools we use to guide our research.

Chandra Mukerji, Culture, Vol. 21, no. 2
I. A Brief History of Formal Models in the Sociology of Culture

A. Culture, Social Organization and Formalization 1930-1960

- Simple Statistical Models
- Little or no distinction social/cultural
- Largely Deductive

B. Post-Parsons: The Epistemological Break

- Phenomenological Turn/Sophisticated Measures
- Culture Left Aside (Formal Models)
- Largely Inductive
C. 1975 — Peterson & Berger
Production of Culture  
(see last slide for cites)

Culture, Social Organization & Formal Modeling Together Again (w/ Focus on Measuring Social Organization of Culture)

<table>
<thead>
<tr>
<th>Year</th>
<th>Labels</th>
<th>Firms</th>
<th>Firms with Only One Hit</th>
<th>Concentration Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 Firm</td>
</tr>
<tr>
<td>1948</td>
<td>11</td>
<td>11</td>
<td>5</td>
<td>81</td>
</tr>
<tr>
<td>1949</td>
<td>9</td>
<td>8</td>
<td>3</td>
<td>89</td>
</tr>
<tr>
<td>1950</td>
<td>11</td>
<td>10</td>
<td>3</td>
<td>76</td>
</tr>
<tr>
<td>1951</td>
<td>10</td>
<td>8</td>
<td>2</td>
<td>82</td>
</tr>
<tr>
<td>1952</td>
<td>12</td>
<td>11</td>
<td>5</td>
<td>77</td>
</tr>
<tr>
<td>1953</td>
<td>12</td>
<td>11</td>
<td>3</td>
<td>71</td>
</tr>
<tr>
<td>1954</td>
<td>13</td>
<td>12</td>
<td>4</td>
<td>73</td>
</tr>
<tr>
<td>1955</td>
<td>16</td>
<td>14</td>
<td>7</td>
<td>74</td>
</tr>
<tr>
<td>1956</td>
<td>22</td>
<td>20</td>
<td>10</td>
<td>66</td>
</tr>
<tr>
<td>1957</td>
<td>20</td>
<td>18</td>
<td>9</td>
<td>40</td>
</tr>
</tbody>
</table>
D. 1982 — DiMaggio Cultural Capital (see last slide for cites)

Treated Culture as Equivalent to other resource attributes of individuals

Table 3. Results of Regression of Grades on Ability (1), Father's Education (2), Cultural Capital (3), Middlebrow Activity (4), and Cultural Interests (5) for Male and Female Eleventh Graders

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>R²</th>
<th>Increase in R² with Vars. 3-5</th>
<th>Reduction in beta of father's education with Vars. 3-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MALES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades in All Subjects</td>
<td>B</td>
<td>.5078</td>
<td>.1158</td>
<td>2.2330</td>
<td>.1488</td>
<td>-.1256</td>
<td>.1228</td>
<td>.0286</td>
</tr>
<tr>
<td></td>
<td>s.e.</td>
<td>.0623</td>
<td>.0971</td>
<td>.4330</td>
<td>.4830</td>
<td>.3830</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>beta</td>
<td>.2791***</td>
<td>.0409</td>
<td>.1706***</td>
<td>.0106</td>
<td>-.0113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades in English</td>
<td>B</td>
<td>.0493</td>
<td>.0223</td>
<td>.2730</td>
<td>-.0025</td>
<td>.0412</td>
<td>.1034</td>
<td>.0310</td>
</tr>
<tr>
<td></td>
<td>s.e.</td>
<td>.0077</td>
<td>.0120</td>
<td>.0540</td>
<td>.0603</td>
<td>.0476</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>beta</td>
<td>.2255***</td>
<td>.0660</td>
<td>.1716***</td>
<td>-.0015</td>
<td>.0309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades in History</td>
<td>B</td>
<td>.0715</td>
<td>.0012</td>
<td>.2646</td>
<td>-.0059</td>
<td>.0259</td>
<td>.1279</td>
<td>.0254</td>
</tr>
<tr>
<td></td>
<td>s.e.</td>
<td>.0080</td>
<td>.0125</td>
<td>.0561</td>
<td>.0627</td>
<td>.0495</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>beta</td>
<td>.3096***</td>
<td>.0033</td>
<td>.1577***</td>
<td>-.0033</td>
<td>.0184</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grades in Mathematics</td>
<td>B</td>
<td>.0510</td>
<td>.0189</td>
<td>.1685</td>
<td>.0133</td>
<td>-.0387</td>
<td>.0723</td>
<td>.0102</td>
</tr>
<tr>
<td></td>
<td>s.e.</td>
<td>.0082</td>
<td>.0128</td>
<td>.0575</td>
<td>.0625</td>
<td>.0507</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>beta</td>
<td>.2223***</td>
<td>.0531</td>
<td>.1011**</td>
<td>.0075</td>
<td>-.0277</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N = 809
II. Renaissance of Formal Models in Sociology of Culture

Extensive Proliferation Formal Models
(1980’s until now) but includes series of Variations & Alternative Trajectories.

Variations in:
(A) Formal Model Traditions
(B) Measurement Approaches to Culture
(C) Aspects, Arenas, Features of Culture
(D) Relation of Culture to Social Organization
A. Variations in Formal Modeling Traditions

1. Linear Model Tradition

• (usually) presumes linear metric (measures)
• Relies on Probability Theory (medium/large N)
• Co-variation is basis for Analytic Assessment
• A “model” (in regression analysis)
  \[ Y = B_0 + B_1X_1 + B_2X_2 + B_NX_N + E \]
• Dominant Tradition
• Very Sophisticated
• Privileges Causal Logic
2. Network Analysis Tradition

- relies upon relational data ("tie" measures)
- Discrete Mathematics (small/medium N)
- Relational Identity privileged over attribute Identity
- A "model" (emphasizes either network position or role structure)
- Increasingly mainstream
- Has virtue of mapping onto semiotic theory of structure as relations of similarity/difference
- Privileges Structural Reductions
2. Network Analysis Tradition: Ex. Bearman & Stovel (Network Model). (see last slide for cites)
2. Network Analysis Tradition: Ex. Mohr (Blockmodel). (see last slide for cites)
A. Variations in Formal Modeling Traditions

3. Qualitative Comparative Analysis

• relies upon shared qualities ("configuration" measures)

• Discrete Mathematics (Boolean, Fuzzy Set) (small/medium N)

• Constellation of Qualities privileged over Attributes or Relations

• A “model” (systematic reduction of complexity through Boolean logic)

• Has advantage of minimizing loss due to measurement error

<table>
<thead>
<tr>
<th>Case</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>O</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Overall, for the outcome 0, the following minimizations are possible if the logical remainders are not included:

\[\begin{align*}
A \land B \land C, A \land B \land \lnot C, A \land \lnot B \land C & \text{ can be reduced to } A \land B \\
A \land B \land C, A \land \lnot B \land C & \text{ can be reduced to } B \land \lnot C
\end{align*}\]

If the logical remainders are included and rule (4) is applied, the following reductions are possible:

\[\begin{align*}
A \land B \land C, A \land B \land \lnot C, A \land \lnot B \land C & \text{ can be reduced to } A \land B \\
A \land B \land C, A \land B \land \lnot C & \text{ can be reduced to } A \land \lnot C \\
A \land B \land C, A \land \lnot B \land C & \text{ can be reduced to } B \land \lnot C \\
A \land B \land \lnot C & \text{ can be reduced to } A \land \lnot C \\
A \land \lnot B \land C & \text{ can be reduced to } A \land \lnot C \\
A \land B \land C & \text{ can be reduced to } B \land \lnot C
\end{align*}\]
B. Variations in Intensity of Cultural Measurement

1. Varies from:
   Unmeasured <----- Richly Measured

   • Unmeasured (or indirectly measured) (e.g., Production of Culture & New Institutional Modeling Traditions).

   • Richly Measured (For example, “Cultural Classification Systems in Transition” Susanne Janssen, et. al. at University of Rotterdam, comprehensive coverage of newspaper coverage of arts and culture in 5 countries, 1955-2005).
C. Variations in Aspects, Arenas, Features of Culture being Measured.

1. Varies across levels: Individual-Group-Organization-Field-Nation

2. Varies across domains: Purely Mental <-----> Purely Material
D. Variations in Role of Culture within the model.

1. Peterson & Berger (Production of Culture):

   - Social Organization → Cultural Organization

2. DiMaggio (Cultural Capital)

   - Cultural Organization → Social Organization
D. Variations in Role of Culture within the model.

3. Meaning Mapping:

- Emphasizes internal organization of cultural forms
- Helps to advance the field through discerning complexity and internal logic of meaning systems
D. Variations in Role of Culture within the model.

3. Ex:  Paul Thagard, *Conceptual Revolutions*. (see last slide for cites)

- Kind-Relation & Part-Relation Hierarchies
- Computational Algorithm with Boolean Logics
D. Variations in Role of Culture within the model.

3. Duality Studies:

• Views two orders as mutually constitutive (neither is prior or independent)
3. Duality Studies: ex. Bourdieu, *Distinction*. Correspondence Analysis (Linear Model)

**Figure 2. Correspondence Analysis of the Meanings of Guns by Carrying Status**

The Social Meaning of Guns in Relation to Carrying Status (T2V2byCarrying)

![Diagram](image-url)
3. Duality Studies: ex. Mohr & Duquenne
Lattice Analysis structural articulation
(Network Model)  (see last slide for cites)
D. Variations in Role of Culture within the model.

3. Duality Studies: Multiple Sites

- Institutional
  - Social Order
  - Bodily Hexis

- Individual
  - Cultural Order
  - Cognitive Order

Materiality

Mentality
III. Conclusion

(A) Come very long way since 1975, still have a very long way to go.

(B) Have seen shift toward:

- Variety of different modeling traditions
- Increasing intensity of measuring culture
- Increase in variety of cultural components being measured
- Shift from causal logic to other (especially) dual logic
III. Conclusion

(C) Many Advantages to Formal Analysis

- Allows for higher level of complexity be managed
- Math enables varieties of structure preserving reductions
- Possible to formally assess efficacy, purity and efficiency of structural preserving reductions
- Replicability allows faster technology diffusion as well as greater effectiveness, efficiency of challenges

(D) Disadvantages also:

- Measurement distorts (necessarily)
- Models enable & constrain (necessarily)
- Goal should be to pursue modeling strategies maximize benefits,
IV. Citations