Professional Diversity and Classification Resolution

Occupations in US Metropolitan Statistical Areas

A good fit at all resolutions:

\[ D(N_e) = d_0 \frac{(N_e/N_0)^\gamma}{1 + (N_e/N_0)^\gamma}. \]
The rank size distribution of professions

From $D(N)$, for all $N$, derive frequency distribution

$$f(i) = \frac{N_e}{N_0} \left( \frac{d_0 - i}{i} \right)^{1/\gamma}.$$ 

$$p(i) = \frac{f(i)}{\sum_{j=1}^{D(N)} f(j)} = \frac{1 - \gamma}{\gamma} \frac{i^{-1/\gamma}}{1 - D(N)^{-1-\gamma}};$$

Indices of Diversity:

$$HH(N) = \sum_{i=1}^{D(N)} p^2(i) = \frac{\delta^2}{1 - \delta^2} \frac{1 - D_0^{-\frac{1+\delta}{1-\delta}} N^{-1-\delta}}{(1 - D_0^{\frac{1+\delta}{1-\delta}} N^{-\delta})^2} \approx \frac{\delta^2}{1 - \delta^2} \left(1 + \frac{2}{D_0^{\frac{1+\delta}{1-\delta}} N^{\delta}}\right).$$

$$S = -\sum_{i=1}^{D(N)} p(i) \ln p(i) \approx \frac{1}{\delta} - D_0^{-\delta/(1-\delta)} N^{-\delta} \ln(D_0^{1/\gamma} N).$$
Redundancy

Diversity + Complementarity

Poor

Rich

Diversity + Complementarity
Implications for Urban Planning and Policy

Problems, methods and tools
SIGNIFICANT EVENTS OF THE APOLLO 11 AND PROPOSED CONSTELLATION MISSION

Symbol meanings:
- Outbound
- Inbound
- CSM Lunar orbit
- Earth departure stage conducts trans-lunar injection burn
- Apollo 11 mission events
- Constellation mission
- Common Apollo/Constellation event

Legend:
- Common Apollo/Constellation event
- Apollo 11 mission events

Saturn V Launch
Ares I & V launch
CM and EDS/LM dock
Touchdown
Orient CM for re-entry
CM/SM separation
EDS jettison
CM reoriented to dock with LM
Earth departure stage conducts trans-lunar injection burn
LM conducts LOI burn
CSM LM docking
CSM conducts LOI burn
CSM and LM separation
CSM LM jettison
CSM/LM undock
CSM pulls up
CSM conducts transearth injection
CSM orbit Apollo 4 days
Constellation 7 months
LM descent orbit insertion
Constellation polar outpost landing
Apollo 11 Equatorial landing

NB: This diagram is representative only.
THE USES OF BIG DATA IN CITIES

Luís M.A. Bettencourt
Santa Fe Institute, Santa Fe, New Mexico

The logic of engineering - feedback control

Three conditions:

1) To act **faster** than the time scale of the system
2) To have a **well-defined and measurable objective**
3) To be able to **act on the system** towards the set-point

Information Technologies are now much much faster than humans!
Which urban issues can be solved in this way? Which cannot?

<table>
<thead>
<tr>
<th>Problem</th>
<th>Timescale</th>
<th>Spatial Scale</th>
<th>Outcome Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transportation (buses, subway)</td>
<td>minutes</td>
<td>meters</td>
<td>simple</td>
</tr>
<tr>
<td>Fire</td>
<td>minutes</td>
<td>meters</td>
<td>simple</td>
</tr>
<tr>
<td>Epidemics (HIV, Influenza)</td>
<td>years, days</td>
<td>city-wide</td>
<td>simple</td>
</tr>
<tr>
<td>Chronic Diseases</td>
<td>decades</td>
<td>city-wide</td>
<td>simple</td>
</tr>
<tr>
<td>Sanitation</td>
<td>years</td>
<td>city-wide</td>
<td>simple</td>
</tr>
<tr>
<td>Crime</td>
<td>minutes</td>
<td>meters</td>
<td>simple</td>
</tr>
<tr>
<td>Infrastructure (roads, pipes, cables)</td>
<td>days</td>
<td>meters</td>
<td>simple</td>
</tr>
<tr>
<td>Traffic</td>
<td>minutes</td>
<td>Meters-km</td>
<td>simple</td>
</tr>
<tr>
<td>Trash collection</td>
<td>days</td>
<td>meters</td>
<td>simple</td>
</tr>
<tr>
<td>Education</td>
<td>decades</td>
<td>city-wide</td>
<td>complex</td>
</tr>
<tr>
<td>Economic Development</td>
<td>decades</td>
<td>city-wide</td>
<td>complex</td>
</tr>
<tr>
<td>Employment</td>
<td>years</td>
<td>city-wide</td>
<td>complex</td>
</tr>
<tr>
<td>Poverty</td>
<td>decades</td>
<td>neighborhood</td>
<td>complex</td>
</tr>
<tr>
<td>Energy and Sustainability</td>
<td>years</td>
<td>city-wide</td>
<td>complex</td>
</tr>
<tr>
<td>Public housing</td>
<td>years-decades</td>
<td>neighborhood</td>
<td>complex</td>
</tr>
</tbody>
</table>

Table 1. Urban issues, their temporal and spatial scales and the character of their associated metrics. Outcome metrics are to be interpreted on the time scale in the table. On longer timescales socioeconomic issues, characterized by long times, become part of every problem.
In order to describe a **wicked-problem** in sufficient detail, one has to develop an exhaustive inventory of all conceivable solutions ahead of time.

The reason is that every question asking for additional information depends upon the understanding of the problem — and its resolution — at that time.

Therefore, in order to anticipate all questions (in order to anticipate all information required for resolution ahead of time), knowledge of all conceivable solutions is required.

But this is an old problem:

The (economic) problem of society is not merely a problem of how to allocate “given” resources - it is a problem of the utilization of knowledge not given to anyone in its totality.
An “Information Crisis”

The depiction of the city, its problems and its potential still remain sorely distorted.

Most cities in the developing world are suffering from an information crisis which is seriously undermining their capacity to develop and analyze effective urban policy.
We, the invisible
a census of pavement dwellers

<table>
<thead>
<tr>
<th>Per Capita Daily Income (in Rupees)</th>
<th>Total</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 6</td>
<td>11396</td>
<td>8280</td>
<td>3116</td>
</tr>
<tr>
<td>(25.2)</td>
<td>(14.5)</td>
<td>(53.6)</td>
<td></td>
</tr>
<tr>
<td>7 - 12</td>
<td>3180</td>
<td>2298</td>
<td>(882)</td>
</tr>
<tr>
<td>(27.9)</td>
<td>(27.7)</td>
<td>(28.3)</td>
<td></td>
</tr>
<tr>
<td>13 - 18</td>
<td>2389</td>
<td>2106</td>
<td>261</td>
</tr>
<tr>
<td>(20.9)</td>
<td>(25.4)</td>
<td>(9.0)</td>
<td></td>
</tr>
<tr>
<td>19 - 24</td>
<td>1380</td>
<td>1273</td>
<td>107</td>
</tr>
<tr>
<td>(12.1)</td>
<td>(15.4)</td>
<td>(3.4)</td>
<td></td>
</tr>
<tr>
<td>25 and above</td>
<td>1572</td>
<td>1397</td>
<td>175</td>
</tr>
<tr>
<td>(13.9)</td>
<td>(17.0)</td>
<td>(5.7)</td>
<td></td>
</tr>
</tbody>
</table>
Enable many uses of neighborhood data

Community

Local authorities, land owners, utilities

National Governments

International Agencies

Research Community

Enable the creation of verifiable information

Enable effective, evidence-driven urban planning

Enable knowledge accumulation and a scientific approach to human development

create a common data platform for neighborhood development
# Informal Settlement Profile

## A. Date and Contact

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A1. Date and Time of Profile</td>
<td>A2. Profiled By</td>
<td>A3. Profiler Phone Number</td>
</tr>
<tr>
<td>yyyy-mm-dd hh:mm</td>
<td>[Insert Name]</td>
<td>International Convention (i.e. +2772....)</td>
</tr>
</tbody>
</table>

**Contact Person**

- **Contact person(s) in settlement.**

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A4 Gender</td>
<td>A5 Name</td>
<td>A6 Surname</td>
<td>A7 Telephone Number</td>
</tr>
<tr>
<td>Male</td>
<td>Female</td>
<td>[Insert Name]</td>
<td>International Convention (i.e. +2772....)</td>
</tr>
</tbody>
</table>

## B. Where is the settlement located and how did it come to be here?

**Interviewers Please Note:** Questions B1, B3, B4, B5 and B6 can be completed before going to the settlement if the information is available. Where ever possible try to engage community members in a conversation about their settlement and not just go through the list of questions. Where possible, please record any additional observations or comments in the spaces provided to give a more holistic picture of the settlement, its conditions and experiences of daily life.

### B1. GPS Coordinates

Try to collect this point as close to the centre of the settlement as possible.

- **Latitude (x:y):**
- **Search for place or address:**

[Map/Satellite View]
BRIDGING THE OPEN SOURCE SOFTWARE, NONPROFIT AND CORPORATE TECH COMMUNITIES, SOCIALCODING4GOOD CONNECTS SOFTWARE DEVELOPMENT PROFESSIONALS WITH OPPORTUNITIES TO VOLUNTEER THEIR TIME AND TECHNICAL TALENT TO ORGANIZATIONS CREATING TECHNOLOGY SOLUTIONS FOR SOCIAL GOOD.

Why you’ll love GitHub.
Powerful features to make software development more collaborative.

Great collaboration starts with communication.
Review changes, comment on lines of code, report issues, and plan the future of your project with discussion tools.

Friction-less development across teams.
Work with project collaborators or teams of people in organization accounts to communicate with ease.
KNOW YOUR CITIES
KNOW YOUR SLUM

http://civitas.santafe.edu/viz/
Complex Systems give policymakers new tools:

1. To **conceptualize** issues:
   - As “simple problems” to be solved by design & feedback control
   - As “complex problems” that emphasize coordination and information

2. To **analyze** and **model** situations:
   - operational data, agent based models, feedback, scaling, information
   - data collection platforms, common analyzes, verification and follow up: “policy as experimentation”
The history of science, like the history of all human ideas, is a history of irresponsible dreams, of obstinacy, and of error.

But science is one of the very few human activities —perhaps the only one—in which errors are systematically criticized and fairly often, in time, corrected.

In most other fields of human endeavor there is change, but rarely progress ...  

And in most fields we do not even know how to evaluate change.