Infrastructure Business models, valuation and Innovation for Local Delivery

Systems Thinking to Develop Alternative Infrastructure Business Models

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Systems Approach to Infrastructure BMs

WS1: The business of interdependence

WS2: Re-thinking infrastructure value

WS3: Issues of scale in local delivery

WS4: Integrative case studies

WS5: Co-creation phases

iBUILD in a Nutshell
Business Model
The method or means by which a company tries to capture value from its business. It may be based on many different aspects of a company, such as how it makes, distributes, prices or advertises its products.
(Harding, R., Financial Times)

Business Case
An explanation of how a new project, product etc. is going to be successful and why people should invest money in it.
(Longman Business English Dictionary)
Systems Approach to Infrastructure BMs

The Systems Praxis Framework, a joint project of the International Council on Systems Engineering and the International Society for the Systems Sciences

INTEGRATIVE SYSTEMS SCIENCE
Identifying, exploring, and understanding patterns of complexity through contributions from Foundations
- Meta-theories of Methodology
- Ontology
- Epistemology
- Axiology
- Praxiology (theory of effective action)
- Teleology
- Semiotics and Semiosis
- Categories, etc.

Theories
- General Systems Theory
- Systems Pathology
- Complexity
- Anticipatory Systems
- Cybernetics
- Autopoiesis
- Living Systems
- Science of Generic Design
- Organization Theory, etc.

Representations
- Models
- Dynamics
- Networks
- Cellular Automata
- Life Cycles
- Queues
- Graphs
- Rich Pictures
- Narratives
- Games and Dramas
- Agent-based Simulations, etc.

SYSTEMS THINKING
Appreciative and reflective practice using 'systems-paradigm' concepts, principles, patterns, etc.

SYSTEMS APPROACHES TO PRACTICE
Addressing complex problems/opportunities using methods, tools, frameworks, practice patterns, etc.

Pragmatic, Pluralist, or Critical multi-methodology
- Uses heuristics, prototyping, model unfolding, boundary critiques, etc., to understand assumptions, contexts, and constraints, including complexity from stakeholder values and valuations; chooses appropriate mix of 'hard', 'soft', and custom methods; sees systems as networks, societies of agents, organisms, ecosystems, rhizomes, discourses, machines, etc.

'Hard' methods are suited to solving well-defined problems with reliable data, clear optimization goals, and at most objective complexity; use machine metaphor and realist/functionalist foundations.

'Soft' methods are suited to structuring problems involving incomplete data, unclear goals, perspective and role complexity, etc.; use learning system metaphor and constructivist/interpretivist foundations.

Outcomes
Actions

http://www.systemspraxis.org

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Critical Infrastructure Interdependencies
(National Association of Regulatory Utility Commissioners, USA)
Example of Infrastructure Interdependence

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Business Model Development Process
Dependencies Relating to Solid Waste Management
### Systems Approach to Infrastructure BMs

<table>
<thead>
<tr>
<th>Monetised values</th>
<th>Non-monetised values</th>
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<tbody>
<tr>
<td>Employment</td>
<td>Social cohesion</td>
</tr>
<tr>
<td>Carbon Dioxide Reduction</td>
<td>Social equity</td>
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<tr>
<td>Reduced congestion</td>
<td>Local embeddedness</td>
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<tr>
<td>Tourism</td>
<td>Service improvement</td>
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<tr>
<td>Tourism</td>
<td>Health and wellbeing</td>
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<tr>
<td>Land Value</td>
<td>Knowledge transfer</td>
</tr>
<tr>
<td>High value projects support</td>
<td>Environmental preservation</td>
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<tr>
<td>low value projects</td>
<td>Access to ownership</td>
</tr>
<tr>
<td>Capital Receipts</td>
<td>Inclusion</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Ecosystem services</td>
</tr>
<tr>
<td>Reduced cost of service</td>
<td>Sustainability</td>
</tr>
<tr>
<td>Revenue generation</td>
<td>Achieving legislative targets</td>
</tr>
<tr>
<td>Growth (GDP)</td>
<td>Heritage</td>
</tr>
<tr>
<td>Value for Money</td>
<td>Understanding how infrastructure is used/demand management</td>
</tr>
<tr>
<td>Return on investment</td>
<td>Connectivity &amp; Mobility</td>
</tr>
<tr>
<td>Industry or enterprise development</td>
<td>Technology innovation</td>
</tr>
<tr>
<td>Reciprocity</td>
<td>Political/vanity purposes</td>
</tr>
</tbody>
</table>

**Value Types**
# Systems Approach to Infrastructure BMs

## Building the Value Network

('The entrepreneur’s business model: toward a unified perspective', Morris et al, 2005)

<table>
<thead>
<tr>
<th>How is value created?</th>
<th>Advantageous combinations of variables?</th>
<th>Guiding principles for execution?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who is value created for?</td>
<td></td>
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<tr>
<td>What is the source of competence?</td>
<td></td>
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<tr>
<td>How are things positioned strategically?</td>
<td></td>
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<tr>
<td>How is value captured?</td>
<td></td>
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<tr>
<td>What are time/size/scope ambitions?</td>
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input from experience and legacy practices
solicited local values, knowledge, etc.

direct input from disciplines
measured and specified data, metrics, etc.

Outcomes
Actions

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- Passenger operators
- Freight operators
- Infrastructure managers
- Rolling stock owners
- Infrastructure contractors
- Suppliers

Office of Road and Rail (Regulator) → Railway Safety and Standards Board → Industry Standards Coordination Committee

- Plant (domestic) Standards Committee
- Rolling Stock Standards Committee
- Control Command and Signalling Standards Committee
- Energy Standards Committee
- Traffic Operation and Management Standards committee

European Railway Agency → Infrastructure Standards Committee → System Interface Committees

Technical Specifications for Interoperability → Railway Group Standards (Technical Rules) → Railway Group Standards (Safety Rules)
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- Supplier Accreditation
- Hot Axle Bearings
- Train Control
- Vehicle Design
- Vehicle Operation
- Infrastructure Interface
- Vehicle Acceptance
- Accident Management
- Personnel Training
- Vehicle ID
- Fault Reporting
- Monitor in-service
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CORE Schema
(Vitech Corporation)
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Birmingham’s Waste Management Infrastructure
Reverse engineering the waste system

- The methodology appears to produce objective and repeatable system models; but,
- Waste documentation is scattered and not well cross-referenced;
- Documentation is not system-oriented; data elicitation requires care;
- Disconnect between higher level documents (policy and strategy) and operational procedures.
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Thank You

Any Questions?
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