Systems Thinking for Assessments: beyond ‘getting the bigger picture’

Martin Reynolds
The Open University
Imagine one hundred years ago...

PARIS PEACE CONFERENCE
Negotiations to End the War

“Meeting of the Allied victors at the end of WWI to set the peace terms for the Central Powers following the armistices of 1918.”

MAJOR DECISIONS:
- Creation of the LEAGUE OF NATIONS
- Five PEACE TREATIES with Central Powers
- Awarding of GERMAN AND OTTOMAN COLONIES to Great Britain and France
- REPARATIONS imposed on Germany
- Drawing of NEW NATIONAL BOUNDARIES (SELF-DETERMINATION)

Treaty of Versailles
Paris Peace Conference
January 18 – June 28, 1919

Imagine the Treaty as a ‘system’:
A system to...?
A system to...?
1. Systems as imaginings: systems thinking in (environmental assessment) practice

2. Case story 1 shared imaginings: ...developing capabilities

3. Case story 2 re-imaginings: ...developmental evaluation

4. Summary: systems thinking for environmental assessments

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http://oro.open.ac.uk/view/person/mdr66.html
Open University definition of a system: “A collection of entities that are *seen by someone* as interacting together to do something” (Morris, 2009)

**Features:**

1. Inter-relationships (“entities.. interacting”)
2. Perspective(s) (“seen by someone”)
3. Bounded (by purpose... “to do something”)

There are two types of system.... (i) purposive and (ii) purposeful
Two devices for using ‘systems’: (i) fixed ontological with fixed purposes (purposive) and (ii) more fluid epistemological constructs (purposeful) but…

....In each case the ‘system’ is a conceptual construct

...often used together, eg. a wider bounded purposeful inquiry (system) into improving food production by reference to ecosystems, health systems etc.

1. Real world (ontological) device: systems as reference maps of reality

   ‘the’ health system
   an ecosystem etc.
   
   purposive engagement

2. An inquiry (epistemological) device: systems as a learning device for gaining insight to reality

   purposeful engagement
Example 1: real world ontological use of systems

DPSIR is a (reference) system; a device for understanding inter-relationships between state of the environment and other factors.

The purpose of DPSIR is to provide a more systemic understanding of the state of the environment.
Example 2: inquiry (epistemological) use of systems

MDIAK is a system for assessing state, trends, and proposals (step 2 of assessment procedure).

Can MDIAK be used in a more non-linear (chain-like) manner?

How adaptable is MDIAK as a purposeful system?
Systems thinking and imaginings

Systems thinking – an endeavour to render complicated, complex, conflictual (‘wicked’) situations into bounded (abstracted) conceptual constructs (‘systems’)

Systems makes *simple* (and therefore more manageable) complex situations
STiP involves both:

1. Being systemic (getting the bigger picture – holistic thinking) and

2. being systematic (acting through dialogue)

Systems thinking in practice is *praxis*

Systems thinking as iteration between:

1. Systemic… understanding real world (of complicatedness, complexity, and conflict)…*theory*

2. Systematic… engaging real world (e.g. listening to different perspectives)…*practice*

Not 'either/or' but 'both/and' (ying and yang)
Systems thinking in practice as praxis

STiP involves both systematic and systemic attributes of praxis.

STiP praxis is an ongoing series of ‘conversations’

1. Understanding Situations
2. Engaging perspectives
3. Reflecting on Systems

1. **Thinking**: ‘systems’ in STiP is used both as an epistemological device (primarily), for *shaping reality*, (‘systems thinking’)
   
   and
   
   • Ontological device *representing reality* (‘system-thinking’)

2. **Practice**: ‘systems’ in STiP is applied both
   
   • Systemically (primarily)
   
   and
   
   • Systematically (secondarily)
The STiP heuristic: (x3) STiP actions

1. uIR: understanding inter-relationships

2. eMP: engaging with multiple perspectives

3. rBJ: reflecting on boundary judgements

- **Agency for change**: conceptual framing of health issues through ‘systems of interest’
  - (iii) Reflecting & appreciating limits on boundaries of inter-relationships and perspectives...making/developing boundary judgements

- **Agents of change**
  - Environmental (practitioners); planners; citizens; researchers etc.

- **Situations of change**
  - (i) Understanding inter-relationships...making/developing factual judgements
  - (ii) Engaging with multiple perspectives...making/developing value judgements
  - (iii) Complicatedness of inter-relationships
  - (ii) Complexity of peoples’ multiple perspectives
  - (iii) Conflict in boundaries; applying ‘systems’ to situations.
Example 1: climate breakdown and economy

(Towards an improved) Governance system…

1. **Understanding interrelationships and interdependencies**
   - ? Investment *and* jobs (capital crisis)
   - ? Present *and* future generations (debt crisis)
   - ? Instrumental *and* intrinsic (values)
   - ? Etc.

2. **Engaging with multiple perspectives**
   - ? Non-human stakeholders
   - ? Commercial (single line responsibility: economic)
   - ? Media (double line responsibility: economic/social)
   - ? Politicians (triple line responsibility: regulation)
   - ? Etc.

3. **Reflecting on boundaries**
   - ? Doing the wrong things righter (clean coal…’try harder’)
   - ? Models of economy (growth or distribution)
   - ? (natural) Capitalism (other configurations of labour, natural capital, value)
   - ? Etc.
Example 2: pesticides on food production

(Towards an improved) Farming system….

1. **Understanding interrelationships and interdependencies (issues)**
   - Systemic pesticides (e.g. neonicotinoids)
   - (other) Causes of bee colony collapse (habitat degradation/ biodiversity loss/ pests)
   - Issues of food security (vis a vis ecological, water, energy security)
   - Etc.

2. **Engaging with multiple perspectives (values)**
   - Farmers and environmentalists
   - Chemical industry ((Syngenta/ Bayer group) and organic industry (cf. Greenpeace)
   - Current and future generations
   - Etc.

3. **Reflecting on boundaries (models)**
   - Technocentric (quick fix) vs deliberative (political) models
   - Models of economy (growth/ capitalism or well-being/ post-capitalism)
   - Supply driven (farm production) vs demand focus (reducing food waste) models
   - Different regulatory models/bodies (national/ international)
   - Etc.
(STiP) Action 1: understanding Inter-relationships

Getting the bigger picture (avoiding reductionism):

- Dealing with the complicatedness of wicked situations
- *(systems) Diagramming
- stakeholder mapping
- Gathering different perspectives ...
Understanding inter-relationships -1

*Systems diagramming: Open University free resources: ‘Diagramming for development’ on OpenLearn. Working for Water Programme (WWP): animated tutorials on six diagram types

Diagramming for development – 1 Bounding realities (WWP – rich pictures, spray diagrams, system maps

Diagramming for development – 2 Exploring relationships (WWP– influence, multiple–cause, cognitive mapping

Exaample: Diagramming for development – 2: influence diagram for WWP
Understanding inter-relationships -2

Gathering different perspectives through ‘snappy’ systems

List some snappy systems associated with Integrated Environmental Assessment (IEA) from different perspectives:

A system to…
- several ‘positive’ systems from different perspectives
- several ‘negative’ systems (?)

(WWP = wicked problem) …many perspectives e.g. an intervention regarded as

a system to …
- Provide rural employment
- Alleviate poverty
- Improve biodiversity
- Remove alien species from waterways
- Perpetuate rural poverty (?)
- Accentuate economic divide (?)
- Limit urbanisation - migration to cities (?)
Gathering different perspectives with simple systems?

“The core aspects of systems thinking are
1. (gaining a bigger picture (going up a level of abstraction) and
2. appreciating other people’s perspectives”

“A systems approach begins when first you see the world through the eyes of another”
C. West Churchman (1968)

Simple systems (articulating perspectives in terms of systems)

- what does the system do?
- how should the system do it?
- why is the system useful or important?

A system to do $P$ by means of $Q$ in order to $R$
eMP- using ‘simple systems’

Gathering perspectives for the working for water programme (WWP)

- what does the system (WWP) do?
- how should WWP do it?
- why is WWP useful or important?

A system to do *P* by means of *Q* in order to *R*

for example WWP might be described as:
*a system to reduce invasive plants by means of multiple projects in order to support development in South Africa*


But various possible perspectives on the programme (‘systems’) might be modelled depending, for example on:

1 differences in focus on *interests*: economic development, social justice, ecological protection......
2 differences in focus on *stakeholder groups*: intended beneficiaries, decision makers, experts/consultants...
eMP- modelling (x3) different interests

Gathering perspectives for the working for water programme (WWP)

A system to...
By means of....
In order to....

**Model 1 perspective: Economic development**
What: Preserve water as a key resource for economic development
How: Mobilise unemployed communities for manual clearing of water catchments
Why: Sustainable national water security accompanying food and energy security

**Model 2 perspective: Social justice**
What: Promote equitable access to clean water
How: Local participation and empowerment in programme/project management
Why: Reassert disenfranchised rights of black South Africans

**Model 3 perspective: Ecological protection**
What: Reduce population of invasive species in water catchment areas
How: Use as effective a means as possible including mechanised tools
Why: Preserve biodiversity of vulnerable ecosystems

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Gathering perspectives for the working for water programme (WWP)

- **A system to…**
- **By means of….**
- **In order to….**

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**Model 4 perspective: Intended beneficiaries (effective management)**

- **What** Reduce rural unemployment and improve rural livelihoods
- **How** Invest effectively in South African black rural communities
- **Why** For poverty alleviation and social justice

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**Model 5 perspective: Decision makers (efficient management)**

- **What** Mobilise necessary resources including international finance
- **How** Use as efficient a means as possible including low-cost labour
- **Why** Secure control over ecological preservation and ecological services

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**Model 6 perspective: Experts (assured management)**

- **What** Ensure appropriate expertise to support WWP
- **How** Use a wide range of different expert groups with appropriate know-how
- **Why** To provide assurances and lessen uncertainty regarding programme implementation
### Twelve perspectives on Climate Change Adaptation (CCA) research

<table>
<thead>
<tr>
<th>What (P)</th>
<th>How (Q)</th>
<th>Why (R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To provide decision support</td>
<td>...by narrowing the problem complexity</td>
<td>...to help farmers adapt to climate change</td>
</tr>
<tr>
<td>To understand the impact of climate change on plant physiology</td>
<td>...by experimenting with parameters of temperature, carbon dioxide and water</td>
<td>...to improve or maintain food qualities and productivity</td>
</tr>
<tr>
<td>To understand opportunities arising from change</td>
<td>...by recognizing alternative farming systems inputs, e.g., for high protein diets</td>
<td>...to facilitate on-farm capability for adaptation</td>
</tr>
<tr>
<td>To extend climate knowledge through rural stakeholders</td>
<td>...by providing basic climate and emissions education</td>
<td>...to improve the literacy of farmers on climate change</td>
</tr>
<tr>
<td>To respond to changes in policy agenda</td>
<td>...by translating existing capability and to better target capability</td>
<td>...to meet varying stakeholder knowledge needs and interests</td>
</tr>
<tr>
<td>To increase the ability for new thinking and innovation</td>
<td>...by providing opportunities for new conversation</td>
<td>...to develop strategic options for adaptation (including mitigation)</td>
</tr>
<tr>
<td>To embed change into good government policy as something we have to respond to</td>
<td>...by recognizing standards in the effects of actions taken</td>
<td>...to reflect and adapt policy according to evaluation of effects of action taken</td>
</tr>
<tr>
<td>To move beyond marginal adjustment strained by doubt and uncertainty</td>
<td>...by realising efficiencies against a changing competitive environment and resource constraints</td>
<td>...to enable 'step change' or confidence in driving action towards transformation</td>
</tr>
<tr>
<td>To support the transition to a low carbon economy</td>
<td>...by recognizing the socio-economic effects of changes in the environment</td>
<td>...to encourage innovative practice and new technologies in response to change</td>
</tr>
<tr>
<td>To create awareness of climate change issues and adaptation and mitigation options</td>
<td>...by engaging communities in discussion on issues around climate change</td>
<td>...to hear what the concerns of farmers are and feed that back into the design of R&amp;D</td>
</tr>
<tr>
<td>To develop germplasm suited to new climatic conditions</td>
<td>...by identifying traits and management practices needed for changed environments</td>
<td>...to maintain production under changes climate conditions</td>
</tr>
<tr>
<td>To help stakeholders better understand implications and opportunities and feedback their perspectives back into science and extension</td>
<td>...by engaging with and consulting peak industry bodies</td>
<td>...to encourage understanding of climate impacts and support industries in realising opportunities to increase profitability</td>
</tr>
</tbody>
</table>

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Table 3 Constructed root definitions (RDs) of [x12] participants’ ‘system of interest’ in CCA research

...based on responses to interview questions

...(any sequence across the three columns should be read as ‘a system to do P (what) by Q (how) because of R (why)’)

(Grant et al., 2019 p.15)
Engaging perspectives for ‘integrated environmental assessment’ (IEA)

Model your understanding of IEA as a system of interest...

- what does the system do?
- how should the system do it?
- why is the system useful or important?

A system to do P by means of Q in order to R

Examples from Armson: A system for planting a tulip bulb

- what should the system do?
  - create a hole in the garden

- how should the system do it?
  - using a spade
  - using a hand trowel
  - bringing in a digger
  - using explosives

- why is the system useful or important?
  - to plant a tulip bulb

The ‘why’ is the wider context that gives the ‘what’ a meaning. It allows for coherence between how something is done and why it is being done. Designing a system is best done through sequencing what/why/how.
Case Story 1: perspectives and capabilities

Research project: Transforming curriculum praxis and capabilities
...changing the way the game is played

3rd action research project sponsored by eSTEeM (OU STEM Centre for Pedagogy)

Aim: (Capabilities approach) shifting from developing ‘competencies’ based on learning outcomes (playing ‘the game’ better) towards enhancing ‘capabilities’ - creating innovative space for redefining occupational, professional, and social roles and practices amongst stakeholders in the workplace

(Changing the way ‘the game’ is played)?

“It is not about being the best at playing the game ... but more about changing the way the game is played ...”

(Sports journalist, Guillem Balague, 16th April 2018. BBC)
Developing competence & capabilities

Engaging multiple perspectives (joined-up thinking-in-practice)

- Postgraduate STiP alumni students post-study experiences in application of systems thinking competencies (systems literacy) in the workplace
- Shifting from safe-fail learning environment (OU) to less forgiving fail-safe workplace environment
- Dealing with the complexity of wicked situations; i.e. engaging with wider stakeholders in workplace situations
- Promote purposefulness and avoid talking at cross purposes

From purposive competencies towards purposeful capabilities

Ensuring rigour through appropriate levels of capabilities
Developing rigour in assessment criteria

False Guarantors:
(i) not fulfilling capabilities;
(ii) privileging one capability type

Integrated Assessments:
1. Credible (CoG 1)
2. Salient (CoG 2)
3. Legitimate (CoG3)

Ensuring rigour through engagement with multiple perspectives at appropriate levels of capabilities beyond ‘best practice’

<table>
<thead>
<tr>
<th>Co-guarantor Attributes (CoGs) of Rigour</th>
<th>Positive Markers of Rigour</th>
<th>False Guarantor Attributes of Rigour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliability and Replicability</td>
<td>CoG1.1: comprehensiveness</td>
<td>Poor representation</td>
</tr>
<tr>
<td>‘Objectivity’</td>
<td>CoG1.2: addressing bias (diminishing bias or revealing biases)</td>
<td>Reductionism/holism</td>
</tr>
<tr>
<td>Resonance</td>
<td>CoG2.1: 'lay' experts</td>
<td>Poor interaction</td>
</tr>
<tr>
<td>Complementarity</td>
<td>CoG2.2: 'lay' and 'professional'</td>
<td>Dogmatism/pluralism</td>
</tr>
<tr>
<td></td>
<td>CoG2.3: 'professional' experts</td>
<td>Poor legitimacy</td>
</tr>
<tr>
<td>(social &amp; ecological)</td>
<td>CoG3.1: caring/monitoring</td>
<td>Managerialism/anarchism</td>
</tr>
<tr>
<td>Responsibility</td>
<td>CoG3.2: accountability</td>
<td></td>
</tr>
<tr>
<td>Relevance</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Towards developing capabilities in IEA...

**Competency approach**

1. Developing instrumental value at an individual level
2. Subject primarily to prevailing economic market demand and measures of efficiency
3. In a technocentric results-oriented (fail-safe) culture of career professional progression and purposiveness
4. With transparent measurable (evidence-based) assessment criteria
5. …with privileged focus primarily on guarantors of ‘credibility’ and objectivity

**Capabilities approach**

1. Developing system-wide intrinsic value (including confidence to act and make appropriate choices)
2. Subject to societal and ecological responsibilities and measures of wider effectiveness
3. In a democratic deliberative (safe-fail) culture of public work and purposefulness
4. With criteria that may not always be easily measurable
5. …with privilege focus more on co-guarantors; including saliency and legitimacy, addressing multiple perspectives

Effective Integrated Environmental Assessments: Credible (CoG 1)... Salient (CoG 2) Legitimate (CoG3)
(STiP) Action 3: reflecting on boundary judgements (rBJ)

Reflecting on inevitable **partiality** in practice:

1. *... partial* understanding of inter-relationships (not cognitively possible to be wholly ‘holistic’...we have limits)

2. *... partial* engaging with multiple perspectives (not possible to be impartial or ‘neutral’... we all have biases)
rBJ: Systemic triangulation of judgements

3. Systems as conceptual Tools for 'conversing' with reality, and conversing with other stakeholders about reality of (environmental) issues

(iii) Reflecting & appreciating limits on boundaries of inter-relationships and perspectives ... making/developing boundary judgements

2. People or stakeholders or practitioners

(ii) Engaging with multiple perspectives ... making/developing value judgements

(i) Understanding inter-relationships ... making/developing factual judgements

1. Context of change: complicated, complex, and conflictual

Boundary judgements

Value judgements

Factual judgements

Boundary critique

Systemic triangulation (ontological device)

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Imagine the Treaty as a ‘system’…

1. Factual judgements: vanguished not included
2. Value judgements: restrictive perspectives of 4 countries – France, UK, USA, Italy
3. Boundary judgements: Peace process as ‘a system’ failed to gain civil legitimacy

**Treaty of Versailles**

*Paris Peace Conference*

January 18 – June 28, 1919

The Iron Triangle (Ralph Pulitzer 1919)

The military industrial complex (Eisenhower, 1961)

“If the Peace Conference is allowed to remain between governments instead of between peoples it is apt to degenerate…”

<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Inter-relationships (contexts)… the hammered</td>
<td>(on the ground) professional soldiers of victors (militarism)</td>
<td>Bureaucracy</td>
</tr>
<tr>
<td>2. Perspectives (people)… the hammerers</td>
<td>Interests of military industry (materialism)</td>
<td>Interest groups</td>
</tr>
<tr>
<td>3. Boundaries (ideas/tools)… the hammer(s)</td>
<td>Decisions of politicians (bourbonism)</td>
<td>Decisions of Congress</td>
</tr>
</tbody>
</table>

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Case Story 2: developmental evaluation

Imagine Evaluation (or IEA) as a systemic ‘system’ of making judgements...

1. Factual judgements:
2. Value judgements:
3. Boundary judgements:

Comparing two models of assessment

Comparing evaluation (assessment) in practice as:

(existing) Evaluation-industrial complex (purposive)
(proposed) Evaluation-adaptive complex (purposeful)

<table>
<thead>
<tr>
<th>Actions assessed ...associated with Evaluand</th>
<th>Descriptive (actual) ‘is’ perspective Evaluation-industrial complex</th>
<th>Ideal (normative) ‘ought’ perspective Evaluation-adaptive complex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformation From...</td>
<td>Situations systematically recognised as either simple, complicated (tame), or complex (wicked)</td>
<td>Situations systematically viewed as comprising all of (i) complicadedness (ii) complexity and (iii) conflict</td>
</tr>
<tr>
<td>a) Audit Check:</td>
<td>Purposive ...fixed goals and targets as ascribed measures.</td>
<td>Purposeful - agile, flexible, adaptive measures</td>
</tr>
<tr>
<td>b) Plan: terms of reference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>..etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c), d), e), and f)</td>
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Re-imagining models of assessment

Being systematic(proposed) Evaluation-adaptive complex (purposeful)

X3 ethical principles of systems thinking in assessment practice based on systemic triangulation
1. Embrace humility (inter-relationships)
2. Practice empathy (multiple perspectives)
3. Accept fallibility (boundary judgements)

X6 ‘operating principles’ of systems thinking in evaluation (assessment) practice

a) (audit) start systemically (all situations having complications, complexities, and conflict)
b) (plan) keep objectives flexible in time (cf. adaptive action.. Glenda Eoyang)… purposeful
c) (evaluation summative) attend to ethical criteria of wellbeing… who might be the victims? …as against ‘efficiency’
d) (evaluation formative) privilege power-to and power-with relations (rather than power-over relations)
e) (commissioning) provide robustness/ rigour without rigor-mortis (trapped in one co-guarantor of ‘objectivity’ at expense of other co-guarantors)
f) (learning) generate learning that questions ethics (doing the right thing) as well as politics (power and knowledge…who determines what’s right?)
Re-imagining models of assessment

Case story 1: Assessing capabilities


Case story 2: Assessing evaluation-in-practice

Nexus thinking (i.e. ‘framings’ over space)
1. Science: environmental/economics/social
2. Policy: food/water/energy (+ environmental security)

Science – policy – society (nexus)

Historic thinking (i.e. ‘framings’ over time)
1. Science... Paradigms (Kuhn, 1962)
2. Policy...... Muddling through/ social learning (Friedman, 1997)
3. Society... Shared imaginations/ homo deus/ anthropocene (Harari, 2018)
   • e.g. religions, nations, tribes, family, economics, health security,
   • e.g. economic systems, health systems, ecosystems etc.

Systems thinking in practice (special form of sharing imaginings over space and time)
1. Purposeful systems with Purposive systems
2. Systematic thinking with Systemic thinking
Imagine being a STiP IEA practitioner....

Juggling with (2 balls of...) dualities

- Engaging multiple perspectives (eMP) and understanding inter-relationships (uR)
- Value judgements and factual judgements
- Epistemological drive (knowing) and ontological drive (knowns/unknowns)
- Systematic and systemic
- Perspective/perception and inter-relationships, perspectives, boundaries
- Practice and knowledge
- Action and research
- Meaning and evidence
- Humanities and sciences
- Trust and truth
- Empathy and humility

All mediated through reflection on (3rd ball of...) boundary judgements

Systems praxis

...or ‘bricolage’ making improvements with existing tools

+ Having fun in the process
Summary

1. **Systems as imaginings**: systems thinking in (environmental assessment) practice comprises systemic and systematic thinking in understanding inter-relationships (uIR).

2. **Shared imaginings**: requires engaging with multiple perspectives (eMP) using systems as devices...developing capabilities.

3. **Re-imagining**: requires reflecting on boundary judgements (rBJ) towards ongoing...developmental evaluation.

4. **Systems thinking for** environmental assessments involves bricolage – making use of existing available skills and tools for uIR, eMP, and rBJ.

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**Martin Reynolds**

- Information on STiP modules
- Publications available on Open Research Online
- Systems thinking resources available online
  ...including free Badged Open Course

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European Environment Agency
Thank you!

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