Root Causes of Radicalization Supplemental Materials

# Supplemental Materials for Determining Causation in Complex Systems

## Determining Direction of Causality Between Hierarchical Classes

Complex systems consist of classes organized vertically in ascending hierarchy levels; the arrangement of these hierarchies is where “each lower level underlies what happens at higher levels” and each “different level of the hierarchy function according to laws of behavior appropriate to that level...describable only in terms of language suited to that level” [25, p. 127].

Within each class is a hierarchy of ranks that may represent within-class organization such as a hierarchy at a company . Consider a business example where we identify classes by the entity's nature within the class. Workers and managers would be in the same class of entities called “people”, even if their ranks differed within that class. However, the company itself is a different entity class than people and operates at a higher level. Likewise, the markets within which the company operates and even the economy within which the market exists are separate classes of entities from companies or people and operate at higher levels of the hierarchy.

Bottom-up structural causation is when a lower-level hierarchy *causes* change at a higher-level system – the worker influences the company influences the market, which influences the economy. Top-down causation is when a higher-level action *causes* changes in the lower levels. An economic downturn constrains the market; the constrained market causes the company to furlough the worker. Root causes of complex systems tend to be a small collection of partial simultaneous causes that operate together either in a bottom-up or top-down mechanism, without which no other causes could manifest.

There are two criteria to determine whether a complex system operates in top-down or bottom-up causation across these hierarchical orders. First, "that a change of higher-level conditions alters the sequence of processes" in lower-level conditions, and second, the existence of "equivalence of classes of lower-level effects that give the same higher-level output"[25, p. 128]. If these conditions are present, top-down causation is more likely to cause the system in question; where they are absent, bottom-up causation is more likely.

## Determining Rank Causality within a Class

To determine the order of causation within a class, we leverage recent work by Ellis[25] on adapting original Aristotelean to more current terms and examples, presented in Table 1. The four causes rise from material to final causes and are taken from Falcon [26] unless otherwise noted. We use an illustrative example of building a house.

Table 1: Causal Type by Level

|  |  |  |  |
| --- | --- | --- | --- |
| Causal Type | Aristotelean Term | Current Term [25, p. 132] | Example: Why was a house built? |
| 1 | Material Cause | Physical Cause | The physical or material causes the actors use for a thing to happen. E.g., A house was built because the contractors’ hired workers hammered nails into wood to raise a frame. |
| 2 | Formal Cause | Immediate Cause | The actors or actions which directly cause the thing to happen. E.g., A house was built because a general contractor hired workers to follow the architects’ plans. |
| 3 | Efficient Cause | Contextual Cause | The cause determines the form of the act from among all the potential forms that could still fulfill the ultimate cause. E.g., A specific kind of house was built because of an architect-designed plan for it to be built in that way. |
| 4 | Final Cause | Teleos | The ultimate cause of why something is done, without which it never would happen. E.g., a house was built to have a home to live in. |

## Determining the Type of Causality

After determining directionality across classes and within classes, the next step is to determine the type of causality. Each causal relationship can take one of five forms: (1) algorithmic, (2) non-adaptive information control, (3) adaptive selection, (4) adaptive information control, and (5) intelligence[25, pp. 128–132].

# Causal Analysis: List of Simultaneous Partial Causes & Test for Directionality

The table is organized first by descending order of class hierarchy, then causal rank hierarchy within a class, then causal category or type. For each cause, we define a testable proposition. We recognize that the list is not exhaustive, as a complete list of causation in a complex system is impossible[25, p. 127], but it substantially represents the key dynamics identified above.

Table 2: Partial Cause by System Hierarchy, Type & Category

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ID | Partial Cause | Hierarchy Level (Class) | Causal Type | Character of Cause | Testable Proposition |
| 1 | Template Attractiveness for Social Contagion | 5:System of Systems | 4:Teleos | 4: Adaptive Information Control | Template ideology and method behind terror contagion must be well-cohered and convey self-similarity and notoriety biases to the at-risk population. |
| 2 | Perceived Grievance & moral Outrage | 5:System of Systems | 3:Contextual Cause | 5: Intelligence | An exploitable grievance exists within or is perceived by the at-risk population. |
| 3 | Template Ideology | 5: System of Systems | 3: Contextual Cause | 3: Adaptive Selection | Cultural scripts must sufficiently convey a conspiracy narrative to an at-risk population. |
| 4 | Template Method | 5: System of Systems | 3: Contextual Cause | 3: Adaptive Selection | Cultural scripts must sufficiently convey the modus operandi of both a pathway to violence and the conducting of the incident. |
| 5 | Biological Adaptation to Predatory Mass Violence | 5:System of Systems | 2: Immediate Cause | 3: Adaptive Selection | The at-risk population possesses the evolutionary adapted trait to predatory violence suited for generating mass violence. |
| 6 | Media Reach | 5:System of Systems | 2: Immediate Cause | 1: Algorithmic | Sufficient mass-media or algorithmic social media conveys cultural scripts to at-risk populations through a one-to-many broadcast effect after an incident. |
| 7 | At-Risk Population | 5:System of Systems | 1: Physical Cause | 4: Adaptive Information Control | The at-risk population is sufficiently large enough to support the terror contagion. |
| 8 | Non-State Actor in the Ungoverned Space | 4: System of Spaces | 2: Immediate Cause | 4: Adaptive Information Control | Sufficient violent non-state actors exploit the ungoverned safe haven space to send broadcast and narrowcast cultural scripts of the template ideology & method into governed space |
| 9 | Moderating Alternatives | 3: Networks & Actors | 3: Contextual Cause | 2: Non-Adaptive Information Control | There are not enough viable alternatives for addressing the grievance within the networks of the at-risk population to dampen radicalization. |
| 10 | Abandonment Rate | 3: Networks & Actors | 3: Contextual Cause | 4: Adaptive Information Control | Abandonment pressure is not high enough within the networks of the at-risk population to dampen radicalization. |
| 11 | Activation Rate | 3: Networks & Actors | 3: Contextual Cause | 4: Adaptive Information Control | Within the at-risk population, there must be sufficient activation from radicalized to activated in those who seek to begin the pathway to violence. |
| 12 | Ratio of radicalized to non-radicalized in the at-risk population. | 2: Agents | 2: Immediate Cause | 4: Adaptive Information Control | The ratio between radicalized and non-radicalized groups of at-risk populations must be sufficient to enable radicalizing effects. |
| 13 | Time to Complete Pathway to Violence | 2: Agents | 2: Immediate Cause | 1: Algorithmic | The time delay between activation and incident initiation must be long enough to enable sufficient incident success rates but not so long as to cause forgetting within the at-risk population. |
| 14 | Template Method Pathway to Violence Success Rate | 1: Incidents | 3: Contextual Cause | 1: Algorithmic | Template Method preparation activities must enable sufficient incidents to be initiated without being thwarted. |
| 15 | Template Method OTD Success Rates | 1: Incidents | 2: Immediate Cause | 1: Algorithmic | Template Method must enable sufficient initiated incidents to be completed without being stopped. |
| 16 | Template Fatality Rates | 1: Incidents | 1: Physical Cause | 1: Algorithmic | Template Method must generate enough fatalities as a result of completed incidents to attract media attention. |

## Determine Causal Direction

As organized, Table 2 can be read vertically downward as a series of cascading simultaneous partial causes beginning with the “teleological explanation—an explanation that makes a reference to telos or purpose[25, p. 132]” at the system hierarchy's top level. The causes descend to physical or material causes at the lowest system hierarchy, the terrorist incidents themselves. Where a level resides in the hierarchy is not a reflection of complexity but its location within the chain of causes. Terrorist incidents, at the lowest level, are extremely complex but only occur when a sequence of prior causes have occurred. Our arrangement of the system hierarchy in descending causes supports one criterion of top-down causation because changing the causation at any level would change the shape, frequency, character, or even the existence of violent radicalization at lower levels.

We also believe we have satisfied the second criterion for top-down causation by demonstrating class equivalence: that different individuals, non-state actors, radicalization templates including swarm and fishermen, and even violent ideologies all operate within a common system structure leading to similar outcomes within each class regardless of entity-to-entity difference on ideological-specific content.